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ON
DIPHThERIA.

BY

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PUBLISHERS' NOTICE.

THE prevalence of Diphtheria in this country, and the daily demand for a recent and practical treatise on this disease, have induced the publishers to issue the treatise of DR. EDWARD HEADLAM GREENHOW, immediately after its appearance from the English press. The author is recognised as one of the ablest writers on epidemic diseases. In the belief that this work will meet the necessities of practitioners, it is submitted to the medical public.

PREFACE

PUBLISHERS' NOTICE

The proprietors of *Illustrations in this country*, and the
daily demand for a recent and practical treatise on this
disease, have induced the publishers to send the treatise
to the London Business Quarantine immediately
after its appearance from the English press. The
author is recognized as one of the ablest writers on
epidemic diseases, in the belief that this work will
meet the necessities of practitioners, it is admitted
to the medical public.

The author's object in writing this work was to supply
the want of a practical and concise treatise on this
disease, and to give a full and accurate description
of its nature, progress, and treatment, and to point
out the means of its prevention and cure. The author
has endeavored to do this in a plain and simple
manner, and to give such information as will be
of service to the practitioner. He has also given
a full and accurate description of the disease, and
of the means of its prevention and cure. He has
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P R E F A C E .

THE following treatise is founded partly upon the study of diphtheria in public and private practice, partly upon information obtained in the course of an inquiry into the causes, symptoms, and treatment of the disease, made for the Privy Council, in the spring of 1859.* In the progress of this investigation I visited several districts in which diphtheria then prevailed, both for the purpose of observing the disease and also of ascertaining the result of the experience of those provincial practitioners who had been most extensively engaged in its treatment. From these gentlemen I received the most efficient aid in the prosecution of my inquiry, and I gladly take this opportunity to express my sense of their kindness, and of the great value of the information with which they supplied me. The materials then collected having been published in an official form, I have felt myself at liberty to make use of them for my present purpose.

Being desirous that my book should contain as complete an account as possible of the present state of professional knowledge on the subject of diphtheria, I have not scrupled, especially in the chapters devoted to the history of the disease, to quote freely from other authors whatever facts were suitable for my purpose, in every instance stating my authority for information not resulting from my own experience.

* The minute containing the heads of this inquiry, and the report of its results, have been printed in the *Second Report of the Medical Officer of the Privy Council*, pp. 167-237. London, 1860.

The facts recorded in the following pages, in my opinion, clearly prove that the recent epidemic of diphtheria has been occasioned by some wide-spreading influence, deriving intensity of action from local conditions either of population or of place. It is only on such a supposition that we can account for the wide extension of the epidemic; its mildness in some districts, its excessively malignant character in others; its occasional limitation within very narrow bounds; and its tendency to linger in particular districts, or to return again and again to the same spot. These conditions being as yet undiscovered, and our acquaintance with the disease being of so recent a date as to render it doubtful whether we have as yet witnessed all its phases, I have for the most part confined myself to the statement of facts, and in a great measure avoided the expression of theoretical opinions which could at best be founded on but imperfect data.

I am well aware that the work which I now venture to submit to the judgment of my professional brethren cannot claim to be regarded as containing a perfect elucidation of its subject. Perhaps the time has not yet arrived when such a work could possibly be written. My object will, however, have been attained, if my inquiries should be found to have supplied information which may lead to a more enlarged and perfect acquaintance with so formidable a disease.

LONDON, *November 1, 1860.*

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ON DIPHTHERIA.

CHAPTER I.

PRELIMINARY OBSERVATIONS—DEFINITION OF THE DISEASE.

THE history of epidemic diseases forms at once one of the most interesting and important subjects of medical inquiry. For the most part, prevailing simultaneously over a wide extent of country, and attacking large numbers of the inhabitants, these diseases are yet sometimes remarkable for the singular immunity enjoyed by particular places or persons at times when all around are subject to their influence. Thus the disease which forms the subject of this memoir has been repeatedly observed, whilst very prevalent in certain districts, to pass over others in their immediate vicinity, of precisely the same character with respect to soil, climate, aspect, and inhabitants. A remarkable illustration of this fact came under my own observation in the summer of 1859. Diphtheria had prevailed for many months, and had proved most fatal in a certain district of the Union of Christchurch, in Hampshire; the remaining portion of the Union having been almost, if not entirely, exempt from the epidemic. The two districts are divided by the River Stour, and the disease prevailed in all the hamlets on the western side of the river, while scarcely any cases occurred on the eastern, although both are similar in character, and appeared to be exposed to the same influences. The sweating sickness of the fifteenth and sixteenth centuries is said, by Caius, to have attacked almost exclusively the upper and wealthier classes of the community, and in some of its visitations the English race so exclusively, that no alien was affected by it in this country, and none but the English suffered from it abroad. Diphtheria is said to have exhibited a manifest preference for the English at Boulogne during its late severe visitation of that town.

The medical history of the present century is remarkable for the reappearance in this country of two very definite forms of epidemic disease

described by the physicians of former centuries, but unknown to our immediate predecessors. I have elsewhere shown that the disease which, in our day, is called Asiatic or epidemic cholera, is identical with a disease named *Dysenteria incruenta* by Willis, and *Diarrhœa colliquativa* by Morton, which prevailed during many years of the middle and latter part of the seventeenth century.* The kind of epidemic sore-throat, now called diphtheria, which has prevailed so extensively during the last four years, though unknown to the last two or three generations of physicians, was familiar to the medical practitioners of this country about the middle of the eighteenth century, under the names of malignant sore-throat, epidemic croup, and *morbus strangulatorius*. Both cholera and diphtheria have, it is true, been observed from time to time in a sporadic form; and small outbreaks of each of these diseases have sometimes occurred: but in an epidemic form they had been long unknown when they reappeared in our own time.

The terms cholera and diphtheria are, generally speaking, and perhaps properly, only applied to the malignant forms of these epidemic diseases, to the exclusion of the milder and commonly more numerous cases of illness induced by the epidemic influence. These milder cases, although characterized by an affection of the same mucous surfaces, lack the more striking features usually understood to be associated with the terms cholera and diphtheria. The mucous membrane of the alimentary canal is alike the seat of the principal phenomena, both in cholera and the diarrhœa which commonly prevails so extensively during a visitation of cholera. The mucous membrane of the throat, especially of the tonsils and immediately adjacent parts, is not only the seat of the simpler form of sore-throat which has prevailed so extensively during the last three or four years, but is likewise, almost invariably, the situation in which the first symptoms of the more severe cases, properly termed diphtheria, manifest themselves. The diarrhœa of cholera times does not present the excessive prostration, the blue, cold, clammy surface, the pulseless extremities, or the whispering voice of fully-developed cholera; the simpler sore-throats which have usually prevailed simultaneously with diphtheria have been often unattended by the characteristic exudation of false membrane, or by the prostration of strength, and have rarely, if ever, been followed by the raucous nasal voice, the paralysis of the muscles of deglutition or of locomotion, and the impaired vision which so frequently follow in the train of diphtheria; but the diarrhœa

* Willis's *Pharmaceuticæ Rationalis*. Translated by S. Borden. Part I., pp. 51-6. London: fol. 1684. *Pyretologia seu Exercitationes de Morbis Universalibus Acutis*. Londini: 1692, pp. 420-1. *On the Study of Epidemic Disease, as illustrated by the Pestilences of London*. By E. Headlam Greenhow, M.D., 8vo. Also, *The British and Foreign Medico-Chirurgical Review*, vol. xvii. pp. 292.

and sore-throat are respectively congeners of cholera and diphtheria, from which their difference is less one of character than of degree.

I will not pause to inquire whether the term diphtheria should be applied to sore-throat epidemics, of which cases, characterized by diphtheritic exudation, sometimes form but a small section. It would, perhaps, have been better to have retained the English name, 'epidemic sore-throat,' or the older term 'angina,' as the generic name of such epidemics; but as the word diphtheria is now in ordinary use for one form of the disease, I shall employ it as the generic term for the entire epidemic. The following description will, I trust, be found sufficiently comprehensive to include every variety of the disease, from that of mild epidemic sore-throat to the severest form of malignant diphtheria.

Diphtheria, comparatively rare as a sporadic disease, more frequently prevails as an epidemic, in which form it often exists contemporaneously over considerable tracts of country, or it may occur in smaller groups, limited to particular hamlets, or even to particular houses. Sometimes it has prevailed so extensively, that distant countries, including portions both of the Old and New World, have been simultaneously or successively visited by it.

Diphtheria is sometimes preceded, and usually accompanied, by fever, which, in certain epidemics and in severe cases, is only transient, speedily giving place to depression. There is often a stiffness of the neck at the commencement of an attack, and usually more or less swelling and tenderness of the glands at the angles of the lower jaw. The tonsils are commonly swollen, and, together with the immediately contiguous parts of the mucous surface, more or less inflamed. Sometimes the swelling and inflammation subside without further local mischief; at others, the inflamed surface presents, from an early stage of the disease, whitish specks, or patches, or a continuous covering of a membraniform aspect, which may appear as a mere thin, almost transparent pellicle, but usually soon becomes opaque, and in some cases assumes the appearance of wet parchment or chamois leather. This membranous concretion varies in colour from being slightly opaque to white, ash-colour, buff, or brownish, and in rarer instances, to a blackish tint.

This false membrane is a true exudation which has coagulated upon the mucous surface, from which it may often be readily separated, leaving the subjacent membrane mostly unbroken or merely excoriated, usually reddened, vascular, tender, and dotted with small bloody specks or points, but sometimes superficially ulcerated, and more rarely in a sloughing condition. When the false membrane has been artificially removed, it is apt to be renewed; and when not meddled with, to become thicker by continued exudation from the mucous surface. The severity of the disease is commonly in proportion to the continuity and density of the exudation; but cases sometimes occur in which the membranous exuda-

tion is inconsiderable, and yet the general symptoms are of a very alarming kind. If the patches are small and remain distinct, the case ordinarily runs a favourable course; if they rapidly spread and coalesce, if the membrane becomes thick, and especially if it assumes a brownish or blackish colour, danger is imminent. In proportion as the membrane increases in thickness and density, does its attachment to the subjacent surface generally become firmer. The surface of the mucous membrane around the exudation is red and vascular, and so tender that in severe cases it bleeds on the slightest touch.

The throat is in general the primary seat of the disease; but the inflammation is apt to spread along continuous mucous surfaces, and thus to extend upwards into the nares and to the conjunctiva; down the pharynx into the œsophagus; through the glottis into the larynx, trachea, and downwards into the bronchial tubes; or forwards on to the buccal mucous membrane, the gums, and lips. Wounds and excoriations of the skin, and the mucous membrane of the nymphæ and vagina when tender or irritated, especially in persons already suffering from diphtheria of the throat, are during an epidemic liable to undergo the same process of exudation, which, coagulating, forms a false membrane analogous to that on the tonsils and throat.

Albuminuria, commencing early in the disease, usually within a few hours, and gradually disappearing with the local affection, sometimes, but by no means invariably, accompanies diphtheria. If the urine be much loaded with albumen, the complication is a serious one; but cases have done well in which a considerable cloud of albumen was deposited from the urine by the proper tests, and very severe and even fatal cases of diphtheria have been unattended by albuminuria.

After a time the false membrane is thrown off, either entire, so as to represent a mould of the parts it covered, or, which is more usual, comes away in shreds or flakes intermingled with mucus. Sometimes it undergoes decomposition prior to separation, giving rise to a very offensive smell. When the membraniform exudation has come away spontaneously, it is sometimes repeatedly renewed, each successive false membrane becoming less and less dense, having less and less of the character of exudation, and more and more that of mucous secretion, until at length the affected surface is merely covered with a thick mucus, which gradually disappears as the mucous membrane recovers its healthy condition. In other cases the exudation is not renewed when it has once been thrown off, but the subjacent membrane is observed to be either redder or paler than natural, has a rough, ragged appearance, or is depressed below the adjacent surface on the parts where dense false membrane has existed. Occasionally sloughing takes place beneath the exudation, or even more deeply, as in the centre of a tonsil, and may implicate the tonsils, uvula, and soft palate. More rarely the tonsils suppurate.

Hæmorrhage from the nose and throat, independently of the co-existence of purpura, often occurs in the course of diphtheria, and is sometimes very profuse. The local affection may pass into a chronic form, in which relapses or exacerbations are readily produced by vicissitudes of weather or by exposure to damp or cold. Even perfect recovery from an attack affords no immunity from the disease in future.

A peculiar character of the voice, resembling that produced by affections of the throat in secondary syphilis, is a common result of diphtheria, and often continues for many weeks after recovery. The power of swallowing is sometimes so impaired that there has been difficulty in sustaining life during convalescence; and liquids especially are apt, even after a comparatively slight attack of the disease, to be regurgitated through the nostrils. Extreme anæmia, impairment of vision, a peculiar form of paraplegia, weakness of the hands and arms, numbness, tenderness of the limbs, tingling, wandering pains, and more rarely, nervous sequelæ of a hemiplegic character, are, in the order here written, ulterior consequences of diphtheria. Gastrodynia, and sometimes dysenteric diarrhœa, occasionally follow diphtheria. Pain of the ear, deafness, and abscess, are occasional but rare results of the disease.

CHAPTER II.

DIPHTHERIA IN THE SIXTEENTH, SEVENTEENTH, AND EIGHTEENTH CENTURIES.

ALTHOUGH diphtheria as an epidemic disease is new to the present generation of medical practitioners, it was well known, and has been very accurately described, under other names, by several of the older physicians. Like cholera and influenza, it has prevailed in so many countries and in so great a variety of climates, as may well entitle it to be called pandemic. It prevailed in Spain, Italy, Sicily, and other European countries in the sixteenth and seventeenth centuries. It visited England, France, Italy, Sweden, Holland, Germany, and North America about the middle of the last century, and, then disappearing, seems to have remained almost unnoticed till towards the close of the first quarter of the present century. Within the last three or four years it has prevailed in an epidemic form on the Continent, in this country, in North America, and in Australia.

It would occupy more space than is compatible with my present purpose were I to endeavour to trace fully either the local or the literary history of diphtheria; but it seems desirable to adduce such evidence as may suffice to show the disease is not of recent origin, its tendency to prevail epidemically at uncertain periods, and its very wide distribution at such times as regards region and climate.

The following extracts from his description of ulcerations about the tonsils, quoted from the English version of his works published by the first Sydenham Society, evidently show that Aretæus was well acquainted with diphtheria.*

‘Ulcers occur on the tonsils; some, indeed, of an ordinary nature, mild, and innocuous; but others of an unusual kind, pestilential and fatal. Such as are clean, small, superficial, without inflammation and without pain, are mild; but such as are broad, hollow, foul, and covered with a white, livid, or black concretion, are pestilential. If the concretion has depth, it is an eschar, and is so called; but around the eschar there is formed a great redness, inflammation, and pain of the veins, as in car-

* *The extant works of Aretæus the Cappadocian.* Book i. chap. ix. pp. 253-255. London, 1856.

buncle;* and small pustules form, at first few in number, but others coming out, they coalesce and a broad ulcer is produced.'

Aretæus then goes on to describe the extension of the disease to the tongue and gums, and sometimes to the windpipe, when it rapidly proves fatal by suffocation. Children under the age of puberty are, he says, especially subject to the disease. Egypt, Syria, and more particularly Cœlo-Syria, engender the complaint, which has hence derived the name of Egyptian and Syrian ulcers. In describing the mode of death, Aretæus speaks of the fœtor as so loathsome that even the patients themselves cannot endure it (a fact which has also come under my own observation), of the regurgitation of liquids through the nostrils, and of hoarseness and loss of speech.

Three Spanish physicians, Villa Real,† Fontecha,‡ and Herrera,§ who wrote early in the seventeenth century, have described with great accuracy the garrotillo, or *morbis suffocans*, then prevailing in Spain, which was evidently identical with the diphtheria of our own time. Fontecha, whose work was published in 1611, says he had seen the disease as far back as 1581, and adds that it prevailed in an epidemic form in 1599 and 1600. Villa Real mentions its appearance in Andalusia and other parts of Spain in 1590 and 1591.

Dr. de Fontecha|| says garrotillo sometimes began with little, at others

* 'Quòd si concreta illa sordes altius descenderit, affectus ille eschar est, atque ità Græcè vocatur, Latinè crusta; crustam verò circumveniunt rubor excellens et inflammatio, et exiguæ raræque pustulæ orientes, hisque aliæ supervenientes in unum coalescunt, atque indè latum ulcus efficitur.'—Aretæus, quoted by Bretonneau.

† *Joannis de Villa Real, de Signis, Causis, Essentiâ, Prognostico, et Curatione Morbi Suffocantis.* Compluti, 1611.

‡ *Disputationes Medicæ super ea quæ Hippocrates, Galenus, Avicenas, necnon et alii Græci, Arabes, et Latini, de Anginarum naturis, speciebus, causis et curationibus scripsere diversis in locis; et circa affectionem hisce temporibus vocatam GARROTILLO.* Opus Doctoris Johannis Alphonsi de Fontecha, &c. Compluti, 1611.

§ *De Essentiâ, Causis, Notis, Præsagio, Curatione, et Præcautione Faucium et Gutturis Anginosorum Ulcerum Morbi Suffocantis, GARROTILLO Hispanè appellati, &c.* Authore Doctore Christophero Perez de Herrera, &c. Matrili, 1615.

|| 'Aliquando incipit cum parvo dolore, aliquando cum magno, aliquando cum parvo tumore super ligulam, aut ad latera, aliquando altiori, quandoque vero cum ampula, aliquando minime, quandoque cum veseicula, multoties vero deficit. Sæpe tumor magnus ostenditur ad partes externas ita, ut descendat usque ad os juguli, redendo vero quasi planum spacium, quod interest inter mandibulam et jugulum; millies vero non videtur, nunc per initia majora ulcera apparent albicantia, et ferè scamosa; nunc vero solus quidam color albicans, aut inter libidum, et passeum. Per initia et vidimus scarum nigricantem, aut in livorem, ceu colorem chloron tendentem; aliquando hæc omnia ab oculis effugiunt; febris concomitata frequenter hanc affectionem: sæpe vero anno isto 1597, vidi ipsam deficere, veluti etiam contingit in epidemica illâ affectione anni 1599 et 1600 in hoc regno. Sit ergo certum, quotiescumque apparet quidam color veluti farinaceus in gutture aut faucibus (etiam si non reperiat magnus dolor) cum aliquali deglutiendi difficultate: 'et febris, pulsusque parvus,

with much pain. There was always more or less swelling of the throat, both external and internal. At one time large whitish scabby ulcers appeared, at other times, only a white colour. He had also seen at the beginning, a blackish crust, inclining to a blueish or greenish hue. Sometimes these signs were not discoverable. Fever often accompanied the disease, but was also frequently absent, particularly in certain epidemics. He adds that the disease was unquestionably present when, although there was little pain, a colour like flour appeared in the throat and fauces, accompanied by some difficulty in swallowing, by fever, and a small, weak, irregular pulse. And these signs denoted not only the presence of this throat affection, but likewise, its intensity.

In describing the diagnostic signs of *morbus suffocans*, Villa Real says the disease did not always begin in the same manner; for the mouth being opened and the tongue held down, at one time he saw the apex altogether white; at another, a certain membranous crust, not perfectly white, but of a blueish colour, covering the fauces, throat, and gullet. The tongue, from the root upwards, was also either wholly or partially white, a symptom, which, taken in conjunction with difficulty in swallowing during the prevalence of an epidemic, was a sure proof of the commencement of this disease even before the white false membrane became apparent to the eye. For although whiteness of the tongue is not uncommon in other acute diseases, yet if the *morbus suffocans* be prevailing at the time, and there be difficulty in swallowing, it certainly indicates the existence of the white crust in the unseen adjacent parts, and also that it will presently appear in the œsophagus and throat. The certainty is much increased if tumefaction be observed in the neck behind and below the ears, such swelling being always present in this disease, but especially in cases where the crust tends to a livid hue, and resembles a membrane.*

Although the diseased parts in *morbus suffocans* were swollen, the

debilis, et inæqualis; adest et anginosa lues dicta; reliqua enim uti ulcera supra dicta, et reliqua signa jam non solum affectionem hanc conotant, verum, et illam jam valde confirmatam sævitiem causarum, et illarum extensionem, et intensionem. Ita ut nullus fere fuit visus ex his, qui habent illum tumorem, non remittenti febre, qui non fuerit et mortuus.—*Fontecha*, loc. cit., p. 28.

* 'Circa signa propria, quæ in hoc morbo conspiciuntur, non semper eodem modo apparent; nam ore aperto, et depressâ linguâ, modò conspiciebam apicem omnino album, exeuntem ab imo gulæ, et impedièntem deglutionem, modo quandam crustam, veluti membranam, cingentem fauces, guttur, et gulam, non perfectè albam, sed declinantem ad lividam; quæ diversitas nascitur ex causæ diversitate; et simul cum hoc apparebat lingua alba, à radice ejus usque ad medietatem, aut ferè totam, per quod signum simul cum difficultate deglutiendi et grassante tali epydemiâ, potest cognosci morbus hic incipiens, anteaquam appareat frustrum illud album; albedo enim linguæ indicat esse in parte subjectâ, et inferiori, crustam albam, quæ jam jam per œsophagum, aut guttur, se manifestat: nam licèt possit reperiri lingua alba, in febre aliâ acutâ, aut secus, et sic non sit

material which caused the swelling was not effused into the pores, but external to the part, as if it had flowed over the surface, which it covered like a solid membrane. The false membrane is said by Villa Real to have been so consistent and elastic that it could be handled and stretched like moist leather or wet parchment, without injury to its texture and shape.* These statements, he says, were founded upon experience, for he had often observed the excretion of white or blueish fragments of membrane, flexible as wet leather, in patients who recovered; and in the post-mortem examination of those who had died, had found the fauces covered with a similar membrane, which he could raise with an instrument, leaving the subjacent parts apparently sound.† As has been sometimes observed in this country during the recent epidemic, the white false membrane often existed in the throat at the very commencement of the illness, without any previous indisposition.‡ Hæmorrhage from the nose or mouth, always a serious symptom in diphtheria, was, according to the experience of Villa Real, invariably fatal.§

proprium et pathonomicum hujus morbi; tamen sensata simul difficultate deglutendi, et grassante tali epydemiâ, sis certus morbum esse suffocantem. Auget certitudinem, si in collo, et retro aures declivius, tumores conspicias; nam tales tumores in omnibus reperiuntur, et magis in illis, quorum crusta ad lividum declinat, et est velut membrana, hic enim tumores simul cum aliis signis, syndromen constituunt signorum morbi suffocantis, nondum apparente crusta; aut si jam appareat, sit tamen puer renitens oris apertioni: in grâdioribus enim crusta jam manifesta, ore adaptato, et depressâ linguâ, evidenter cognoscitur.—*Villa Real*, loc. cit., pp. 90, 91.

* 'Tamen nullus scripsit vidisse in faucibus, gula, et gutture, quasdam velut membranas (como pergamino) cingentes fauces, &c., et tali constantes modo substantiæ, ut si propriis manibus tendas, videas ejus partes cedere, quas si desinas, videas refluere, propriumque acquirere locum: non secus ac si corium madidum aut membranam madidam tendas et sinas. Hæc experientiâ didici, tum in viventibus exercetâ causâ per os, tum in morientibus factâ anatomiâ.—*Villa Real*, loc. cit., pp. 34, 35.

† 'Partes vero, quæ in hoc morbo apparent affici, tument supra naturam, non tamen vero tumore: nam materia morbi suffocantis non est in partis poris, eandem in tumorem attollens, sed per modum irrigationis partis superficiem afficit, et velut membrana quædam solida cingit fauces, guttur, et gulam; neque enim propter maximam ejus crassitiem, et soliditatem, potest recipi in poris. Quæ ratio desumitur ab experimento: nam sæpe vidi, in his qui fuerunt liberati, excerni frustra quædam alba, aut ad livorem declinantia, membranosa quidem, et velut corium madidum flexibilia, et in his qui interierunt, factâ anatome, inveni dictam membranam cingentem partes dictas, quam instrumento ferreo levavi, parte subjectâ integrâ apparente; est ergo causa hujus morbi per modum adhærentis, et irrigantis corporis, non per modum tumoris præter naturam.—*Villa Real*, loc. cit., pp. 102-3.

‡ 'Ego vero, qui millies vidi hos ægrotantes, statim in primo insulto morbi, conspexi jam adesse frustrum album in faucibus, gulâ, aut gutture, nullâ prius (dicente ægro), sensata læsione.—*Villa Real*, loc. cit., p. 34.

§ 'Observavi sæpissime, sanguinis narium aut oris fluxum, in hoc morbo esse lethalem; nullum enim vidi liberatum ex his, qui sanguinêm è naribus, aut ore rejecerunt.—*Villa Real*, loc. cit., p. 136.

Herrera describes eight varieties or stages of this destructive disease, which tally very nearly with what has been observed in this country during our own time. Indeed, it is evident that these Spanish physicians studied the complaint very carefully, and described what they saw with great fidelity; their descriptions, as far as they extend, being quite applicable to the disease which, after an interval of two centuries, has so lately appeared among ourselves.

The first two varieties closely resembled common sore-throat, and were characterized by inflammation of the throat and surrounding parts, unaccompanied either by exudation or ulceration, and, whilst differing from each other in intensity, were very mild in comparison with the others. Although perhaps less properly called *morbis suffocans*, yet Herrera places them in the same category, seeing that they may pass into it; a circumstance which, as will hereafter be seen, has also been observed during the recent epidemic. Indeed, there can be no doubt that Herrera was perfectly justified in considering these milder kinds of sore-throat as caused by the same epidemic influence, and identical with the more malignant disease, from which they differed only in intensity, as is acknowledged to be the case with simple and malignant scarlet fever, discrete and confluent small-pox, or choleraic diarrhœa and cholera. The third variety had advanced a stage farther; there was excoriation, attended by slight soreness. In the fourth, there was ulceration, with purulent secretion and severer pain. In the fifth, a spreading sanious ulcer, with still intenser pain and an offensive smell, but without the crust. In the sixth variety, the characteristic crust, from which the disease derives its modern name, diphtheria, was plainly observable upon the ulcer. In this variety, which was more dangerous than any of the preceding, the crust was of a white colour. In the seventh variety the crust was livid; and in the eighth, which is the worst variety of all, the crust was black.*

Herrera mentions the peculiar character of the voice in this disease,

* 'Cujus perniciosi morbi octo sunt species seu gradus. Primus, quando capacitas ipsius gutturis et ambitus, et partes vicinæ, ut aspera arteria, epiglottis, larynx, aut œsophagus, muscoli interni et externi, fauces et aliæ rubescere incipiunt. Secundus, quando partes prædictæ insigniter rubescunt, et inflammantur, discretæque afficiuntur, et jam quodammodo dolorem aliquem sentiunt: qui gradus respectu reliquorum benigni nuncupari possunt. Et hæc duæ species primæ absque ulcere non ita propriæ hujus morbi suffocantis species sunt; sed communis cum angina, qui gradus, etsi veræ anginæ sint ex permutatione ejusdem anginæ in morbum suffocantem quandoque transeunt: et quousque excoriari, aut exulcerari partes illæ incipiunt, nomen suffocantis affectus non meretur, cum hi duo gradus ad alterutrum, anginam scilicet, et morbum suffocantem viæ existant. Et quoniam hujus morbi principia sunt, ad majorem intelligentiam et ad indicationem curativam principii hujus morbi merito inter species retulimus. Tertius gradus est, quando ulcera apparent, et est sævior. Quorum ulcerum tres etiam sunt species, seu differentiæ. Prima scilicet, quando sola excoriatio cum aliquo dolore ulceroso perspicitur, quæ tertia est in ordine graduum. Secunda, quando ulcus cum suo pure, majorique cum dolore adparet, et est quarta.

resembling that of persons suffering from secondary syphilis. This, he says, disappeared altogether in the course of time, after the patient had recovered; a circumstance which scarcely happens in the venereal disease. It is hardly necessary to observe that this symptom affords additional confirmation of the identity of the *morbis suffocans* of the seventeenth with the diphtheria of the nineteenth century; or that it shows partial paralysis of the muscles of the throat to have been a common sequel of the disease when Herrera practised as well as now. Lastly, he mentions the occurrence of diarrhœa as an unfavourable sign, at whatever stage of the illness it appeared.*

Some years after its appearance in Spain, but yet early in the seventeenth century, the *morbis suffocans* showed itself in the kingdom of Naples, and afterwards in Sicily, where it raged with much severity, proving very fatal among children, and overspread the whole island. I have not had an opportunity of consulting the writings of the Neapolitan physicians who described the epidemic in Italy, but I have read the account of the disease in Sicily written by Alaymus and Cortesius. The latter, in his introductory observations, asserts that the several Neapolitan physicians held very different and often quite opposite opinions respecting the nature of the disease, which they called by various names, in accordance with the diversity of their views.† In Sicily it was called simply the throat disease—*gulæ morbus*.’

As in the present day, the disease differed greatly in malignity, in the

Tertia, cum canerosum instar carbunculi et cum sanie percipitur, pessimique odoris et figuræ; attamen sine crusta, cum dolore tamen vehementiori, qui usque ad octavum et ultimum gradum incrementum accipit, quæ quinta in gradu existit. Sextus est gradus, cum crusta supra ulcus jam clarè conspicitur, et serpit, corrodendo, et putrefaciendo partem; et tunc verè et propriè crustosum ulcus, et carbunculolum, canerosumque appellari potest; et est omnibus prædictis gradibus periculosior. In triplici etiam differentia tale ulcus versatur, album scilicet, quod in sexto etiam est gradu; lividum in septimo, et nigrum in octavo, et omnium graduum pessimo.’—*Herrera*, loc. cit., pp. 6, 7.

* ‘Depressa lingua, in imo gulæ nota quædam alba solet conspici, quæ in causa est, ut ægri non benè loquantur, ut accidit in his, qui morbo Gallico corripuntur . . . et ægroti ad sanitatem redacti decursu temporis equè ut antea loquuntur; quod in morbo Gallico sæcus accidit’ . . . *Herrera*, loc. cit., p. 19.

† ‘Ex alvi fluxu symptomatico, continuo et immoderato, sine ope et auxilio medicamenti purgantis, malum etiam potest desumi præsagium, sive in principio, sive post accidat.’—*Herrera*, loc. cit., p. 20.

† ‘Morbus hic, cujus naturam scire optas, respirationem, sed maxime degluttonem lædit, nullumque aliud nomen in hac Urbe adeptus est, nisi gulæ morbum, eò quòd appareat partes spectantes ad gulam ita læsas esse, ut etiam deglutiendi actio planè lædatur. De eo variè quidem multi authores Parthenopæi hactenus scripserunt, sed inter se parum constantes sunt, sive nomen, sive essentiam consideremus; alii enim affectum strangulatorium, alii phlegmonem anginosam, alii pestilentem faucium affectum, nonnulli epidemiam gutturis luem, et aliqui tandem variis nominibus pro variâ ipsorum opinione designarunt; et hæc quo ad nomen.

extent of the local affection, in its tendency to spread over the adjoining parts, and in depth; being sometimes wholly superficial, at others attended by much swelling and inflammation, both of the external and internal parts of the neck.* Sometimes there were redness and inflammation of the surface of the palate and uvula, the tonsils remaining unaffected; but at others, and more frequently, these glands were swollen, and sometimes so much so, that they touched each other, thereby interfering with deglutition and respiration. In the beginning there were usually swelling, heat, and redness; afterwards, pain and difficulty of swallowing. When there was only inflammation of the parts about the throat, the sick easily recovered; but sometimes a certain pituitous substance (exudation), descending from the head, so speedily and unexpectedly followed the inflammation, that the patient was suddenly suffocated. Very often a white substance, which presently became livid, and afterwards black, unaccompanied by pain, appeared on the inflamed surface. This material could be readily torn away from the subjacent parts, either by the finger or an instrument; but, although the operation caused no pain, the patient invariably died a short time afterwards, as happened, amongst others, to the son-in-law and grandchild of Cortesius. Sometimes mortification, accompanied by fœtor, quickly invaded some part of the throat; and when this occurred, whether fœtor were present or not, remedies proved unavailing, and the patient died about the fourth day, or even earlier; rarely so late as the seventh day.†

‘Quod spectat ad essentiam, alii scribunt eum esse aphtas malignas, alii arbitrati sunt reponendum esse in genere carbuncolorum, alii intrepidè pronuntiarunt esse anginam, qui inter se tamen divisi sunt; nam horum aliqui existimarunt esse anginam propriè dictam, alii è contra anginam lato modo, et impropiè acceptam, alii determinarunt esse erysipelas, seu ignem sacrum faucium, alii denique putarunt esse inflammationem propriè dictam, quam phlegmonem Græci appellant.’—*Joannis Baptistæ Cortesii, Miscellaneorum Medicinalium Decades Densæ*, p. 696. Messanæ, 1625.

* ‘Et propterea ulcerum alia sunt maligniora, alia minus maligna, alia magis, alia minus serpentia, alia profundiora, alia minus descendencia, alia sordidiora, alia minus, alia escharam profundiora, alia superficialem habent, alia gangrenosa, et alia sphacelata, alia crustam, et sorditiem albam, alia nigram admittunt, alia maxima cum inflammatione, et tumore, tum internarum, tum externarum gulæ partium conjunguntur, alia verò minus, alia, et ut plurimum, in tonsillis, alia in columella, alia in faucibus, alia aliquando in laringe, et in musculis gutturis, alia, et rarè in palato, alia in naribus nascuntur.’—*Marci Antonii Alaymi, Consultatio, pro Ulceris Syriaci nunc Vagantis Curatione*, p. 54. Panhormi, 1632.

† ‘Hæc affectio lædit pharynga. . . . Modus erat diversus; nam aliquando pars extima palati rubicunda, et inflammata simul cum ipsa uvea apparebat intactis glandulis, nonnunquam et sæpius glandulæ prædictæ intumescebant, cum calore, et rubore primùm, deinceps cum dolore, et magna deglutiendi difficultate, nonnunquam adeò tumidæ erant, ut ad invicem se contingerent, viam ad deglutiendum, et respirandum intercludentes, igitur omnes istæ partes aliquando sola inflammatione, nonnunquam solo erysipelate, interdum omnes simul corripiebantur uno, vel altero affectu. Verùm si ad hunc remansissent modum, hoc est vel inflammatione, vel

Cortesius notices the frequent occurrence of several fatal attacks in the same family; a circumstance which has also added largely to the distress and alarm which diphtheria has lately caused in England. According to Alaymus, the disease generally commenced in the tonsils, the uvula, or the fauces; sometimes in the larynx; at others, but rarely, in the palate, and occasionally in the nostrils.* There was reason for supposing the disease to be contagious, and a case reported by Cortesius strengthens the opinion. A monk being attacked by the disease, constantly complained that he observed a foul odour proceeding, as he supposed, from his mouth; and, to assure himself of the truth, requested a friend to verify the fact by smelling. Not many hours after doing so, in the presence of Cortesius and others, the friend was laid up with inflammation of the fauces and tonsils, and, remedies proving useless, died on the fourth day of his illness.†

erysipelate affectæ, facîlè ægotantes liberati fuissent, sed ad prædictarum partium inflammationem subsequebatur interdum materia quædam pituitosa à capite tam repente, et inopinatò descendens, ut miseri ægotantes subito suffocarentur. Non rarò apparebat materia quædam alba in superficie, quæ paulò post ad livorem, deinde ad nigredinem absque dolore mutabatur, quod gangrænæ signum est manifestissimum, verùm in sola superficie esse sensus judicabat, et quod magis est, videbatur à subjectis partibus facîlè divelli posse.

‘Si quis tamen vel digitis, vel aliquo instrumento levi ipsam auferre tentasset, quamvis operatio hæc fieret absque dolore, ea tamen ablata brevissimo tempore peribant ægotantes, quod præ cæteris in Petro Soprano genero meo observatum est, cui cùm hujusmodi mortificatio apparuisset in supremâ superficie dictarum glandularum faucium, et palati, ita ut videretur esse maximo respirationi, et deglutioni impedimento, Chirurgus existimans posse facillimo negotio à subjectis partibus eam separari solis digitis, levissimè quidem eam abstulit, qua ablata tantum abest ut juverit deglutionem, aut respirationem, ut potius utraque actio læsa magis fuerit, unde brevissimo tempore miser meo cum maximo dolore mortem oppetiit, id quod etiam in aliis quamplurimis, pueris sæpius observavi, et præsertim in ejusdem Petri filiolo nepoti ex filia quinque annorum mihi carissimo, qui post paucos dies eodem modo, quo pater vitam cum morte mutavit.

‘Aliquando, ut dixi, harum partium unam tantum, vel duas, vel etiam omnes simul hujusmodi mortificatio celeriter invadebat cum fœtore, et ubi tale symptoma apparebat, sive cum fœtore, sive sine fœtore easus omninò erat deploratus; omnia enim medicamenta tam intus, quàm extra frustra admovebantur, quia ægotantes celeriter moriebantur, nonnunquam in quarta die, et citiùs etiam, rarò septimam diem attingentes, et quod miserabile admodum erat, observabatur in una, et eadem domo plures periclitari et absque auxilio interire.’—*Cortesius*, loc. cit., p. 697.

* *Loc. cit.*, p. 54.

† ‘An modo contagiosus fuerit hujusmodi morbus, non vacat suspitione; nam multi medici observantes tot interire, et præsertim in una et eadem domo, et tam frequenter cogitabant omninò morbum esse contagiosum. . . . Anno præterito contiguit res digna auditu. Divi Francisci Custos vir doctrina et moribus insignis hac lue obsessus, tonsillas solummodo, et gargareonem inflammatione læsa habebat, et continuò querebatur se percipere in ore fœtorem quandam, et ut hac de re certior redderetur, ad se vocavit Baccalaureum quendam sibi amicissimum, qui maximo affectu assistebat, rogavitque, ut vellet olfacere, percipereque naribus, an verum esset talem

Although the description of the disease given by these Sicilian physicians is in some respects less minute and graphic than that of the Spanish authors already quoted, it is impossible to study their writings carefully without coming to the conviction that the disease recorded by them was identical with the *garrotillo* of the Spanish authors, and also with the disease termed diphtheria described by Bretonneau and other writers of the present century. The several varieties of the disease mentioned by Cortesius and Alaymus closely correspond with those described by Herrera, and also with those recorded by later observers. The simple inflamed sore-throat, yielding readily to remedies; the sloughing of the tonsils and adjacent parts of the pharynx; the foul fetor of the throat, in certain cases; the exudation of a white, livid, or blackish crust on the inflamed surface, from which it was often readily removed without pain; the rapid and sometimes unexpected death from suffocation; the peculiar nasal voice; the probable communicability of the disease, and its dire ravages in households attacked by it, are unmistakable features identifying the fatal Sicilian disease with the recent epidemic of diphtheria.

Thus, then, undoubtedly diphtheria, although under other and various names, prevailed for many years as an epidemic in the south of Europe about the close of the sixteenth and commencement of the seventeenth centuries. Whether it then disappeared altogether as an epidemic or not I have been unable to discover; but it certainly prevailed again epidemically in many parts of the continent of Europe, in Great Britain, and in North America, about the middle of the following century.

The earliest notice of the disease in this country is that contained in Dr. Fothergill's *Account of the Sore Throat attended with Ulcers*, published in 1748. A disease, supposed to be the *morbus strangulatorius*, had been observed in London or the neighbourhood in the year 1739, and cases were now and then met with by most medical men in extensive practice, especially in the City, during the subsequent years, until 1746, when it broke out in a more alarming manner at Bromley in Middlesex, and at Greenwich. It afterwards appeared more generally in the metropolis and the surrounding villages. Children and young people were more liable to it than adults, girls than boys, women than men, the delicate than the robust. The illness usually began with giddiness, chilliness or shivering followed by fever, acute pain in the head, stiffness of the neck, soreness of the throat, and sometimes vomiting and diarrhœa.

fœtorem emittere, an ab imaginatione ejus prodiret: olfecit Baccalaureus me præsentē, et multis aliis, at statim non multis elapsis horis decubuit sola faucium, et glandularum inflammatione vexatus absque aliqua manifesta corruptione partium, omnibusque præsidiiis ex arte frustra factis quarto die suffocatus periit, et tamen Custodem non tetigerat, sed solo olfactu aërem ab ore prodeunte naribus traxerat, quare ab hujusmodi exemplo veni in sententiam hunc morbum non esse absque aliqua contagione.—*Cortesius*, loc. cit., p. 698.

The pain, heat, and restlessness increased towards night, and were often mitigated by the breaking out of a sweat towards morning.

‘If the mouth and throat,’ says Dr. Fothergill, ‘be examined soon after the first attack, the uvula and tonsils appear swelled; and these parts, together with the *velum pendulum palati*, the cheeks on each side near the entrance into the fauces, and as much of them and the pharynx behind as can be seen, appear of a florid red colour. This colour is commonly most observable on the posterior edge of the palate, in the angles above the tonsils, and upon the tonsils themselves. Instead of this redness, a broad spot or patch of an irregular figure, and of a pale white colour, is sometimes to be seen, surrounded with a florid red, which whiteness commonly appears, like that of the gums, immediately after having been pressed with the finger, or as if matter ready to be discharged was contained underneath.

‘Generally on the second day of the disease, the face, neck, breast, and hands to the fingers’ ends, are become of a deep erysipelatous colour, with a sensible tumefaction; the fingers are frequently tinged in so remarkable a manner, that from seeing them only, it is not difficult to guess at the disease.

‘A great number of small pimples, of a colour distinguishably more intense than that which surrounds them, appear on the arms and other parts. They are larger, and more prominent in those subjects, and in those parts of the same subject, where the redness is least intense, which is generally on the arms, the breast, and the lower extremities.’*

These white places presently became more of an ash colour, ‘when it was discernible that what at first might have been taken for the superficial covering of a suppurated tumour, was really a slough concealing an ulcer of the same dimensions.’ All parts of the fauces were liable to be affected; but the disease in general first appeared in the angles above the tonsils, or on the tonsils themselves, on one of the arches formed by the uvula and tonsils, on the posterior wall of the pharynx, on the inside of the cheeks, or on the base of the tongue.

In the milder form of the disease, an irregular superficial ulcer, scarcely to be distinguished from the sound parts but by the roughness of surface it occasioned, appeared on one or more of the above-mentioned parts. ‘A thin, pale, white slough seems to accompany the next degree; a thick, opaque, or ash-coloured one is a further advance; and if the parts have a livid or black aspect, the case is still worse. These sloughs are not formed of any foreign matter spread upon the parts affected, as a crust or coat, but are real mortifications of the substance; since, whenever they come off, or are separated from the parts they cover, they

* *An Account of the Putrid Sore Throat*, by JOHN FOTHERGILL, M.D., pp. 32-34. Fifth edition. London, 1769.

leave an ulcer of a greater or less depth, as the sloughs were superficial or penetrating.*

In one case these sloughs were separated by a surgeon's probe without much difficulty; but the same parts were covered the following day with thick, dark, ash-coloured sloughs penetrating deep into the substance.† The eruption was not always present, and especially in the winter of 1754, it either did not appear at all, or its appearance was retarded. There was commonly much swelling of the parotid glands and neighbouring parts, and the tonsils and uvula were sometimes so much swelled as to leave but a narrow entrance to the gullet, which was also frequently surrounded with ulcers and sloughs. Yet, although food was some times forced back through the nose, patients often swallowed with little difficulty or pain. An offensive putrid smell and a corrosive sanious discharge from the nostrils often accompanied the complaint;‡ which was also sometimes attended by an excessive faintness, the greater or less urgency of which seemed to indicate the degree of danger.§ There was less thirst than is usual in other acute diseases, and the tongue was moist and seldom furred. Hæmorrhage from the nose and mouth sometimes suddenly carried off the patient.||

Dr. Fothergill distinguished the disease from scarlet fever, for which one of his cases was mistaken by the persons about the patient;¶ but several of the symptoms he describes, particularly the appearance of a red rash on the second day, are rather those of scarlet fever than of diphtheria. It seems probable, as has sometimes happened in more recent epidemics, that scarlet fever and diphtheria were intermingled; that the cases of scarlet fever had a diphtheritic character; and that whilst, in all probability, Dr. Fothergill saw some cases of uncomplicated diphtheria, especially of that kind in which the exudation remains until the subjacent surface sloughs, he yet confounded the two diseases. Indeed, we have other evidence, both that scarlet fever sometimes presented unusual features, and that diphtheria, uncomplicated by scarlet fever, prevailed in this country about the time when Dr. Fothergill observed the particular form of sore-throat described in his book.

Dr. Nathaniel Cotton, in a letter addressed to Dr. Mead, describes a peculiar form of scarlet fever which had broken out in St. Albans towards the end of September, 1748. The early symptoms were sickness, vomiting, and purging, accompanied or speedily followed by sore-throat and swelling of the tonsils, parotids, and maxillary glands. Sometimes the tonsils only were inflamed and swollen, at others there was likewise considerable tumefaction of the external glands. 'Upon looking into the mouth, there were frequently seen, especially after the disease was a little advanced, *ulcuscula* scattered up and down the fauces, which were

* *Loc. cit.*, p. 61.

† *Loc. cit.*, p. 62.

‡ *Loc. cit.*, p. 38.

§ *Loc. cit.*, p. 58.

|| *Loc. cit.*, p. 40.

¶ *Loc. cit.*, p. 53.

pretty broad upon and about the tonsils, superficial (at least all that I saw were superficial), and covered with a whitish slough. The eyes appeared watery, and the countenance, particularly the eyelids, was puffed up as in the measles. In many, the neck, arms, and hands were puffed up and swelled likewise.* The scarlet efflorescence differed as to extent and time of appearance; there was high fever, intense thirst, a moist and but slightly furred tongue, often cough,† sudden loss of strength, and great dejection of spirits, especially towards evening, which continued for some time after the patient was convalescent.‡

An epidemic sore-throat which prevailed in Cornwall about the same period, and was admirably described by Dr. Starr, was evidently identical with diphtheria, which has also again recently prevailed in the same neighbourhood. The disease first appeared in Cornwall about 1748 or 1749. Dr. Huxham, who also wrote an account of it, as seen at Plymouth, says it had prevailed in that neighbourhood from the latter part of the year 1751 to 1753; but adds that it had raged with great fatality in and about Lostwithiel, St. Austel, Fowe, and Liskeard a year or two earlier.§

Dr. Starr says the disorder did not always begin with the same train of symptoms; but, 'on the contrary, a vast difference was observable.' It often commenced with swellings of the tonsils, parotid, and submaxillary glands. What he terms gangrenous sloughs, but which clearly were false membranes, often formed in the mouth at an early stage of the illness; sometimes so early that the disorder was scarcely complained of until the slough appeared. Others, again, only complained of a slight pain in swallowing, succeeded by fever; a short, low, 'hacking,' hoarse cough, which sooner or later was productive of a difficult, noisy, and strangulated respiration.|| After an illness of a day or two, the voice usually became so hoarse that it was difficult to understand. The expectoration was never 'a well-digested or concocted phlegm or mucus; on the contrary, the greatest part was of a jelly-like nature, glairy, and somewhat transparent, mixed with a white, opaque, thready matter, sometimes more, sometimes less resembling a rotten membranous body or slough.'¶

The prevalence of simple sore-throat during the epidemic is mentioned by Dr. Starr, and also by Dr. Huxham, who likewise records the frequent occurrence of sore-throat as an attendant of other diseases, especially

* *Observations on a particular Kind of Scarlet Fever that lately prevailed in and about St. Albans, in a Letter to Dr. Mead*, by NATH. COTTON, M.D., p. 4.

† *Loc. cit.*, p. 4. ‡ *Loc. cit.*, p. 13.

§ *A Dissertation on the Malignant Ulcerous Sore Throat*, by JOHN HUXHAM, M.D., &c., p. 3. London, 1759.

|| *Phil. Trans.*, vol. xlvi., pp. 437, 438.

¶ *Loc. cit.*, p. 440.

small-pox, during the epidemic.* Thus the epidemic diphtheria of that day, like that of our own time, was apt, so to speak, to impress its character upon other diseases, and included simple sore-throats unaccompanied by exudation, as well as those of a more malignant nature.

Membranes, or, as Dr. Starr calls them, sloughs, analogous to those seen on the fauces, also formed on the raw surfaces of blisters and other parts of the skin denuded of cuticle. 'Such a slough I have seen generated on the neck and arm where blisters had been before applied. The blisters had been dressed with colewort leaves, and ran but little; but, contiguous to them, small red pustules, not exceedingly fiery, arose, which, sweating plentifully, in a few hours became quite white. These, hourly enlarging their bases, united and covered a large surface, fresh pustules arising in the adjacent parts. This white surface had the aspect of an oversoaked membrane which was becoming absolutely rotten. . . . I scratched the slough,' says Dr. Starr, of one of these cases, 'with my nail; it separated with ease, and without being felt by the child. What my nail took off afforded the same appearance with the matter of the spittle before mentioned.†

The same disease, observed by Dr. Huxham, of Plymouth, began in various ways, but commonly 'with chills and heats, load and pain of the head, soreness of throat and hoarseness, some cough, sickness at stomach, frequent vomiting and purging, in children especially, which were sometimes very severe, though a contrary state was more common to the adult. There was in all a very great dejection of spirits, very sudden weakness, great heaviness on the breast, and faintness, from the very beginning. The pulse in general was quick, small, and fluttering, though sometimes heavy and undose. The urine, commonly pale, thin, and crude, was however, in many grown persons, in small quantities, and high-coloured, or like turbid whey. The eyes were heavy, reddish, and as it were weeping; the countenance very often full, flushed, and bloated, though sometimes pale and sunk.

'How slight soever the disorder might appear in the day-time, at night the symptoms became greatly aggravated, and the feverish habit very much increased, nay, sometimes a delirium came on the very first night; and this exacerbation constantly returned in the evening through the whole course of the disease. Indeed, when it was considerably on the decline, I have been often pretty much surprised to find my patient had passed the whole night in a phrenzy, whom I had left tolerably cool and sedate in the day.

'Some few hours after the seizure, and sometimes cotemporary with it, a swelling and soreness of the throat were perceived, and the tonsils became very tumid and inflamed, and many times the parotid and

* *Huxham*, loc. cit., pp. 11-14.

† *Phil. Trans.*, vol. xlv., p. 440.

maxillary glands swelled very much, and very suddenly, even at the very beginning; sometimes so much as even to threaten strangulation. The fauces also very soon appeared of a high florid red, or rather of a bright crimson colour, very shining and glossy; and most commonly on the uvula, tonsils, velum palatinum, and back part of the pharynx several whitish or ash-coloured spots appeared scattered up and down, which oftentimes increased very fast, and soon covered one or both the tonsils, uvula, &c. These, in event, proved the sloughs of superficial ulcers (which, sometimes, however, eat very deep into the parts). The tongue at this time, though only white and moist at the top, was very foul at the root, and covered with a thick yellowish or brown coat. The breath also now began to be very nauseous; which offensive smell increased hourly, and in some became at length intolerable, and that too, sometimes, even to the patients themselves.*

By the second or third day the sloughs were much enlarged and of a darker colour, and the surrounding parts tended much more to a livid hue. 'The breathing became much more difficult, with a kind of rattling stertor, as if the patient was actually strangling, the voice being exceeding hoarse and hollow, exactly resembling that from venereal ulcers in the fauces. This noise, in speaking and breathing, was so peculiar, that any person in the least conversant with the disease might easily know it by this odd noise; from whence, indeed, the Spanish physicians gave it the name of garrotillo, expressing the noise such make as are strangling with a rope. I never observed in one of them the shrill, barking noise that we frequently hear in inflammatory quinzies. The breath of all the diseased was very nauseous, of some insufferably fœtid, especially in the advance of the distemper to a crisis; and many about the fourth or fifth day spit off a vast quantity of stinking, purulent mucus, tinged sometimes with blood; and sometimes the matter was quite livid and of an abominable smell. The nostrils likewise, in many, were greatly inflamed and excoriated, continually dripping down a most sharp ichor, or sanious matter so excessively acrid, that it not only corroded the lips, cheeks, and hands of the children that laboured under the disease, but even the fingers and arms of the very nurses that attended them. . . . Not only the nostrils, fauces, &c., were greatly affected by this extremely sharp matter, but the windpipe itself was sometimes much corroded by it, and pieces of its internal membrane were spit up, with much blood and corruption, and the patients lingered on for a considerable time, and at length died tabid; though there were more frequent instances of its falling more suddenly and violently on the lungs, and killing in a peripneumonic manner.†

Patients could often swallow with tolerable ease, notwithstanding the swelling of the tonsils and throat. Purpura sometimes attended the

* *Loc. cit.*, pp. 18-21.

† *Loc. cit.*, pp. 22-25.

disease, which also in several instances proved rapidly fatal to adults, either from the accession of pneumonia, or of cerebral affection, in which the patient either died raving or comatose. Sometimes a troublesome cough, attended by purulent expectoration, spitting of blood, and hectic fever, following the disease, proved fatal after the lapse of several weeks.*

It seems probable that the epidemic witnessed by Dr. Huxham, like that described by Dr. Fothergill, included cases of a mixed character, in which diphtheria and scarlet fever were combined; for he speaks of the breaking out of a crimson efflorescence on the surface of the body on the second, third, or fourth day, and adds that in cases, especially those of adults, where there had been no eruption, a very great itching and desquamation of the skin sometimes ensued. That diphtheria in that day, as well as in our own time, was frequently confounded with scarlet fever, is indeed abundantly evident from the study of contemporary authorities.†

Dr. Wall, of Worcester, distinctly affirms that Fothergill's sore-throat, at its first appearance, generally went by the name of scarlet fever, the affection of the throat not being much attended to, or at least considered only as an accidental symptom. There is ample evidence in his paper that Dr. Wall saw diphtheria both in an idiopathic form and also complicated with scarlet fever, with small-pox, and also, probably, with measles. The parts about the fauces and throat were, he says, the principal seat of the disease. The pathognomonic symptoms were 'aphthous ulcers, and sloughs on the tonsils and parts about the pharynx.' Very few patients had the scarlet efflorescence on the skin, which was rather an accidental than an essential symptom; but in some persons the skin was covered with petechiæ and purple spots; and in one or two, when the disease was far advanced, large black spots appeared on the tonsils. The complaint was manifestly infectious, and very liable to return. 'In particular, if they who have once had it are

* *Loc. cit.*, pp. 24-30.

† See also Dr. Withering's classical work on *Scarlet Fever*, in which he expresses his belief that *angina gangrenosa* and *scarlatina anginosa* constitute but one species of disease, arising from the same poison. On the other hand, he mentions the infrequency of anasarca after Fothergill's ulcerated sore-throat (a circumstance which he attributes to the free action of the skin) and also the liability of persons to suffer subsequently from 'specky sore-throat,' which he asserts is neither contagious nor identical with the primary ailment. He endeavours to explain the case of a family of children, who, having suffered from ulcerated sore-throat in May, were seized with scarlet fever in August, which would otherwise militate against his view, by supposing the illness in May to have been aphtha, for he says 'the gums and insides of the cheeks were affected as well as the throat.'—*An Account of the Scarlet Fever and Sore Throat, or Scarlet Fever Anginosa; particularly as it appeared at Birmingham in 1778*, by W. WITHERING, M.D., F.R.S. London, 1793.

at any time afterwards seized with a fever of a putrid kind, they seldom fail to have this complaint likewise.'

It was surprising that the glands about the throat should be so much affected, and yet the patients experience so little uneasiness. 'I have frequently known,' says Dr. Wall, 'the parts very much swelled, and covered with thick sloughs, while the sick person made little complaint of the soreness, and swallowed nearly as well as in perfect health. A very remarkable instance of this I cannot forbear mentioning. A gentleman at Ludlow, of great fortune, merit, and learning, but of a sedentary studious life and tender constitution, took this disease by infection from his lady, who had it in a violent manner and recovered. He also got well; but, going a journey soon afterwards, took cold, and had a return of the same complaint, though so little sensible was he of it himself, that, being at table and feeling something loose in the inside of his lips, he wiped his mouth with a napkin, and, laying hold of the skin, drew off not only the cuticle from the inside of his lips and roof of his mouth, but a large slough also from the left tonsil, which went deep and left a wide opening in the gland. This, for some time afterwards, used to bleed upon every slight occasion, a small branch of an artery having been opened by the separation of the eschar.*

An epidemic of croup, at Chesham, in Buckinghamshire, in the years 1793 and 1794, appears, like the Cornish epidemic forty years earlier, to have really been idiopathic diphtheria.† It was not confined to the town, which lies in a valley, but appeared likewise with equal violence upon the neighbouring hills, at a distance of five or six miles. The subjects were children from the first to the fourteenth year of their age; and it attacked many fine, healthy, robust children, as well as the pale, phlegmatic, and delicate. The illness crept on imperceptibly at first, the patient appearing to be in good health, the countenance not altered, and, excepting at intervals, the appetite and spirits unimpaired; but it sometimes happened that symptoms which had appeared trifling for two or three days suddenly increased, and the disease then advanced so rapidly as to prove fatal before many hours had elapsed.

The Reporter, Mr. Rumsey, says that he met with about forty cases, although croup had been previously a rare disease in the neighbourhood; his father, who had been in extensive practice at Chesham for upwards of forty years, not recollecting to have seen more than eight or ten cases. This circumstance alone would militate against the belief that the disease was an epidemic of ordinary croup, even if other facts mentioned in Mr. Rumsey's excellent history of the epidemic did not conclusively prove it to have been diphtheria. The disease rarely proved fatal earlier than

* *Gentleman's Magazine*, Nov. 1751, pp. 497-501.

† *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, vol. ii., pp. 25-62. London, 1800.

the fourth or fifth day, often later. Two or more children in a family were sometimes seized with it, whilst, on other occasions, where it proved fatal to one or two children, several others escaped without any particular pains being taken to keep the healthy apart from the sick. Ulcerous sore-throats, though not very frequent, were now and then met with during the epidemic, and many children suffered from 'erysipelatous inflammation behind the ears, in the groins, in the labia of girls, or wherever the skin folded, attended with a very acrid discharge.'*

The following is Mr. Rumsey's description of the more important symptoms, including those which, taken in conjunction with the epidemic character of the disease, lead to the conclusion that it was diphtheria.

'At first the cough was dry; but in the course of the disease—viz., by the third day, or sooner—the passage of the air was obstructed by viscid matter in the trachea; some of which was occasionally thrown up by cough or retching, and, according to the quantity thrown up, respiration was more or less relieved. Several children brought up portions of a film or membrane of a whitish colour, resembling the coagulated matter which was found in the trachea of those children whose bodies were opened. This was thrown off by violent coughing or retching; and the efforts made to dislodge it were often so distressing, that the child appeared almost in a state of strangulation: This was succeeded by an abatement of all the symptoms, until a fresh quantity of the same substance was formed, when the distress recurred as before.

'Most of the cases which occurred in November, and afterwards, were attended with inflammation and swelling of the tonsils, uvula, and velum pendulum palati; and frequently large films of a white substance were formed on the tonsils. The swallowing was usually less impeded than might have been expected from the degree of disease which existed in the throat.†

In three post-mortem examinations made by Mr. Rumsey he found a film or membranous substance lining the cavity of the trachea; in two instances it was lying loose, but in one it adhered firmly at the lower part. This membrane he considered as an exudation from the blood-vessels, which had coagulated on the surface of the mucous membrane.‡

About the middle of the eighteenth century, when diphtheria, either in an idiopathic form or complicated with other diseases, existed in Great Britain, it also prevailed among several nations of the Continent. An epidemic angina, described by Ghisi, which occurred at Cremona in 1747 and 1748, was evidently of this kind. Two several forms of the disease were observed. One, readily distinguishable even by the relatives of the sick, was characterized by the presence of

* *Loc. cit.*, pp. 35–37.

† *Loc. cit.*, pp. 28, 29.

‡ *Loc. cit.*, pp. 32 and 34.

inflammation or ulcers in the throat, attended by a sense of pricking, constant and copious salivation, and difficulty of swallowing, so that food and medicines were rejected through the nostrils. Respiration was commonly unaffected, unless excessive swelling of the inflamed parts prevented the air from passing freely into the windpipe; but the sick person spoke with a nasal tone. The complaint began with fever and a full pulse; but, as soon as the ulcers appeared, and they were a very prompt and certain consequence of the inflammation, the fever diminished, and the pulse became small and feeble. There was also often much swelling about the neck.

The other form was of a treacherous and fatal character. Deglutition was frequently free and unimpaired; there was great thirst; the countenance was pale, and there was a dry, harsh cough. Respiration was difficult, and the larynx almost always affected by pain or a sense of pricking. The voice was shrill, pulse feeble and generally irregular, and the external fever scarcely observable. By and by these symptoms were followed by others of a more alarming nature; the pulse became extremely irregular and intermittent, the skin dry, and the extremities cold. There was extreme restlessness, so that even his bed became insupportable to the patient, and the respiration was most difficult and attended by agonizing efforts. The sufferers generally died on the third, fourth, or fifth day; sometimes, but rarely, as early as the second or as late as the seventh day. Although the cough was generally dry, the patient often in the act of coughing detached from the air-passages a substance very like the buffy coat of blood, or the pseudo-polypous substance met with in the heart or large vessels after death. Many patients who had this tracheal form of angina continued to speak with a nasal voice, and to reject food through the nostrils for some time after recovery.*

An exceedingly dangerous sore-throat, very different from the ordinary form of sore-throat and quinsy, broke out in Paris about the year 1743.†

Its identity with diphtheria is unquestionable; and it appears to have been idiopathic, and entirely unconnected with scarlet fever. At first none attacked by it recovered; but, fortunately, the disease did not become very prevalent until January, 1746, when its violence had somewhat diminished. Two varieties of the disease were observed. In one its seat was the œsophagus, and it was attended with slight difficulty in swallowing; in the other the trachea was affected, and patients could swallow without difficulty. Of the two forms, the latter was by far the more fatal.

* Not having access to Ghisi's work in the original, I have taken the above account from a translation by Double, published in the *Journal Général de Médecine*, tom. xxxvii., pp. 227, &c., 1810.

† *Mémoires de l'Académie Royale des Sciences*, pp. 154-156. Année 1746.

Respiration was, in the majority of cases, unaffected. All the patients had hoarseness. The amount of febrile excitement bore no proportion to the seriousness of the case, and fever often disappeared as the malady became worse. Children often played about until within a few hours of death. The disease never terminated until the patient had expectorated eschars or membranous shreds, or sometimes a membranous tube* marked with the rings of the trachea, and, if the illness lasted long enough, pus likewise; in which case the lungs also were affected—a fact proved by post-mortem examination, which also showed the extension of the disease upwards to the nose.†

The epidemic continued to prevail, more or less, until 1748. An outbreak among the boarders in a convent, in the latter year, has been described by Chomel, who identifies it with the complaint which had prevailed in Spain, Italy, and Sicily at the end of the sixteenth and beginning of the seventeenth centuries.‡ The following are the symptoms, as described by Chomel: At first the uvula was elongated; there was slight heat in the throat, accompanied by some pain; the tongue was, more or less, swelled; and there was generally a little fever. Insensibly, and within the first twenty-four hours, one or other of the tonsils became covered with a white aphthous spot, which, extending in

* *Loc. cit.*, p. 157.

† 'On a vû dans le commencement de cette année des maux de gorge extrêmement dangereux, et qui avoient des signes différens de ceux des esquinancies, et des maux de gorge ordinaires.

' Cette maladie épidémique n'a attaqué que les jeunes personnes, particulièrement les enfans : ces maux de gorge étoient souvent sans douleur, quelquefois sans difficulté d'avalier, et toujours sans tumeur, ni externe, ni interne.

' Lorsque le siège de la maladie étoit dans l'œsophage, les malades avoient avec un peu de difficulté; et au contraire lorsqu'il étoit dans la trachée-artère ils avaloient aisément, mais la maladie étoit encore plus funeste dans ceux-ci, que dans ceux-la.

' La respiration a été libre dans la plupart de ces malades, ils ont tous eu de l'enrouement, la fièvre n'y a jamais été proportionnée à la grandeur du mal, elle devenoit insensible dans le temps, que la maladie devenoit plus dangereuse, et même ces malades approchoient de leur fin sans s'en apercevoir. Souvent les enfans malades de ces maux de gorge, s'amusoient à l'ordinaire quelques heures auparavant leur mort, qui arrivoit à la plupart entre le troisième et le cinquième, et presque à tous avant le septième jour de la maladie.

' Cette espèce d'esquinancie ne s'est jamais terminée sans que les malades aient rejeté, en toussant, des escharres ou des lambeaux des membranes; ceux qui n'en mouraient qu'après le septième jour, crachoient de pus avec les escharres, et ils mouraient pulmoniques, parce qu'après ce temps, la corruption s'étoit communiquée de la trachée-artère aux poumons même: c'est ce qu'on a reconnu par l'ouverture des cadavres, par le moyen de laquelle on a vû aussi que le siège du mal étoit étendu, dans quelques-uns, vers les parties supérieures, jusque dans le nez.—*Mémoires de l'Académie Royale des Sciences*, p. 155. Année 1746.

‡ *Dissertation Historique sur l'Espèce de Mal de Gorge-gangréneux qui a regné parmi les Enfants l'Année dernière*, pp. 36-42. Paris, 1749.

every direction, reached the uvula, descended towards the pharynx, and ascended to the pituitary membrane. These symptoms were fully developed within two or three days.

About the third day, an aggravation of the illness was manifested by an increase of fever, a faint unpleasant odour observable on approaching the sick, and by the whitish eschar which, without extending much farther, grew thicker, became a crust, and seemed disposed to loosen; but was either still held by numerous pedicles, or, if it fell, left a second crust hidden under the first.* There was ichorous discharge and often bleeding from the nostrils, and the smell became putrid and insupportable; the trachea was eroded by ulceration; the respiration became laborious and sibilous, and the lung ulcerated. Death took place sometimes on the fifth, more frequently on the seventh or ninth day. The sick, emaciated from day to day, had a difficulty in articulating, and spoke with a nasal tone. Sometimes there were large swellings of the glands of the neck, which did not suppurate. Convalescence was much retarded, patients remaining long feeble and delicate.

The illness was neither preceded by shiverings like acute and inflammatory diseases, nor was there headache, delirium, nor the other symptoms of malignant fever. The digestion was unimpaired. The patients were free from heat and thirst; and, when pressed to drink, were able to do so, and even to eat without pain. The disease especially attacked children, whom, when they lived together, it seized either all at once or one after the other, and but rarely affected persons above the age of fifteen or sixteen years.

The epidemic which had prevailed in France, Italy, and England for some years previously appears to have reached Sweden in 1755, where it still existed after a lapse of ten years.† It raged in Stockholm in the autumn of 1757 and the early part of 1758, particularly in the month of January, when as many as nine cases occurred in the same house. The epidemic was observed at Upsala and its neighbourhood, especially in the parish of Rasbo, during the years 1761 and 1762. In many

* 'Insensiblement et dans les premières vingt-quatre heures l'une ou l'autre des amygdales est couverte d'une tâche blanche qui prend le caractère d'aphte. Cette tâche paroît sans tumeur; elle s'étend en tous sens, gagne la luvette qu'elle ronge, descend vers le pharynx, remonte jusqu'à la membrane pituitaire. . . .

† 'L'accroissement de la maladie s'annonce dès le troisième jour par la fièvre, qui se développe davantage; par une odeur fade et désagréable qu'on sent en approchant des malades, et par l'escarre blanchâtre, qui sans s'étendre beaucoup plus, s'épaissit, devient croûte, paroît vouloir se détacher, mais tient encore par plusieurs pédicules, ou ne tombe que pour en laisser paroître une nouvelle cachée sous la première.'—*Loc. cit.*, pp. 36-37.

† *Dissertatio Medica de Angina Infantum in patriâ recentioribus annis observata* Auctore HENRICUS CHRIST. DANIEL WILCKE. Upsaliæ, 1764. *Sandifort Thesaurus Dissertationum*, vol. ii., p. 351.

houses it carried off all the children, proving fatal sometimes as early as the second, but more commonly on the fourth or fifth day of the illness. It appeared to be contagious, children from other houses who visited the sick being frequently seized by the disease shortly afterwards.*

The disease, as has so frequently occurred in other places, appeared under two forms. In one the tonsils, uvula, and pharynx were found, on inspection, to be the seat of the characteristic membranous exudation. In the other the symptoms were almost exclusively referable to the larynx and trachea, which were found after death to be covered with false membrane. On account of their difference of situation and character, the two varieties were regarded as distinct diseases by some of the Swedish physicians; the former variety being classed as malignant sore-throat (*mal de gorge gangréneur, cynanche pharyngea epidemica*), the latter as croup.† The description of the first form of the disease given by Wilcke, on the authority of Professor Berg, does not differ materially from that of the physicians of other countries about the same time. At the commencement of the epidemic the illness began with shivering, succeeded by fever in the afternoon, followed by rigidity of the neck, cough, hoarseness, and the white exudation or—as he calls it—ulceration upon the uvula or tonsils. As was observed by some of the English physicians, during the almost contemporaneous epidemic in this country, the fever remitted, there being a daily shivering before noon, succeeded by an accession of fever, which became milder from day to day, in the afternoon.‡

* 'Anno 1751 et 1762, non tantum hic Upsaliæ passim, sed in vicinia etiam frequentius, visa hæc Angina est. Prioris anni mediæ æstate, in parœcia Rasbo tam celeriter per infantes stragem dedit, ut mense Augusto, quum adveniret medicus, fere quotquot superstites essent, vel exhausti viribus, vel in agone constituti, inveniuntur. Parentes nonnulli prorsus infantibus erant orbat; et pueri, qui ex aliis domibus ægotantes visitaverant, brevi post tempore morbo correpti erant. Nunquam secundo, plerumque quarto, vel quinto, moriebantur nychthemero.'—*Wilcke*, loc. cit., p. 352.

† *The Diseases of Children and their Remedies*, by ROSEN VON ROSENSTEIN, translated by ANDREW SPARRMAN, M.D., pp. 294-6. London, 1776.

‡ 'Primum horrores sentiebat ægrotus vehementiores, quos intensus calor post meridiem sequebatur. Dein quotidie ante meridiem horrores, post meridiem æstus recurrebant, sed ita tamen, ut mitior indes observaretur æstus. Interea cervix, vel alterutrum modo colli latus, obrigescere cœpit, accedente plerumque tussi, post etiam raucedine. Simul exulceratio quedam apparere incipiebat vel uvulæ, vel tonsillarum; cujus prima mox indicia albus color ostendebat, et cujus celere adeo erat incrementum, ut intra aliquot modo dies albesceret uvula tota.

'Insequente autem Januario, angina hæc frequentissima plures ita corripiebat, ut novem simul in eadem domo illa vexatos, in suburbio australi viderim. Variare quoque pristinam faciem jam videbatur, quum sine horroribus manifestis inciperet, tumentibus statim tonsillis, uvula, cæteris. Dein febris accedebat, per totum nychthemeron constans, valida, cum pulsu duro et celeri, nec non debilitate et cephalalgia. In singulas ferè horas tumor crescebat, et primo nychthemero nondum finito, in partibus tumidis exulceratio aderat albida, quæ celerrime ita serpebat, ut

At a later period of the epidemic the disease became more severe, and, departing from its original type, began without shivering. The swelling of the tonsils, uvula, and other parts about the throat commenced before the appearance of fever, which was of the continued form and high, with a quick hard pulse, prostration of strength, and headache. The swelling increased almost hourly, and in less than four-and-twenty hours white ulceration appeared on the swollen parts, and spread so rapidly, that within a few days all the parts which were swelled were found to be white, and the uvula appeared to be rotten. Hoarseness, noisy breathing, and a discharge of thin acrid humour from the nostrils followed these severe symptoms. At length, the fauces and throat being almost occluded, patients died, with stertorous and difficult breathing, on the fourth, sixth, or some later day of the illness. Diarrhœa always occurred at the close of fatal cases. Notwithstanding the swelling in the throat, patients both desired and were able to swallow food up to the moment of death. In some cases the neck became swollen and was disfigured with ulcers discharging serum; a circumstance also noticed by Dr. Starr during the epidemic in this country, and by Dr. Bard in that of America, hereafter mentioned.

On examination after death, the usual tubular false membrane was found in the windpipe, grey and rugged from decomposition on its free surface, purplish and bloody on that by which it had adhered to the trachea. As it descended towards the lungs the redness became paler, and in the finer ramifications of the bronchial tubes the false membrane was entirely white, and resembled the membrane which lines the inside of an egg-shell. The false membrane was everywhere distinguishable from the proper bronchial membrane.*

paucos intra dies, partes omnes, quas tumor occupaverat, albentes invenirentur, et marcida appareret uvula. Exasperatis sensim symptomatibus adjungebant se rucedo, in spiritu strepitus, et è naribus aëri imperviis destillatio tenuis humoris, qui labia rodebat. Denique faucibus et gutture tumore ferè oclusis, quarto, sexto, aut sequentibus diebus, cum multo stertore et orthopnœa, ægroti moriebantur. . . . Peculiare erat, quod tumentibus licet maxime oris partibus, nihilominus cibos et appetere ægroti, et deglutire valerent, immò firmiores plerumque postularent, quamvis etiam instare mors videretur, quin ad extremum usque halitum cibos cape- rent. Letali morbo ultimum diarrhœa semper superveniebat. In nonnullis collum intumescibat, et ulceribus serum stillantibus fœdabatur.—*Wilcke*, loc. cit., p. 351.

* 'Asperam arteriam intus undique singulari inductam membrana observavit, quam sponte fere nexu omni solutam peculiaris tubi instar, extraxit; crassiore, grisea et ex putredine laciniosa, qua cavum sui spectabat; qua vero asperæ arteriæ adhæserat, sanguineo purpurea. Quo longius in pulmones descenderet, eo pallidioris fuit ruboris, et in subtilissimis quidem bronchicorum ramis prorsus albicans, speciem præbuit membranæ, quæ ovi putamen intus investit; quacun- que vero se extenderet, evidenter a membrana bronchiis propria distingui potuisse judicavit vir acutissimus (Doct. Rolandus Martin). Pulmones non fuerunt inflammati, neque ulla ratione læsi, ut suffocatione infantem periisse constare.'—*Wilcke*, loc. cit., p. 352.

The disease still lingered in Sweden as late as the year 1765, when a sister of Michaeli's died of the laryngeal form of the complaint. It is also probable that an epidemic croup which prevailed at Wertheim in 1775, was of the same nature.*

The disease which thus prevailed so extensively in the Old World about the middle of the eighteenth century likewise extended to America. The following graphic description, taken from a paper by Dr. Bard, satisfactorily proves the identity of the epidemic in America both with the European disease of the same century and with that which has recently occurred on both continents.†

‘In general this disease was confined to children under ten years old, though some few grown persons, particularly women (while it prevailed), had symptoms very similar to it. Most of those who had it were observed to droop for several days before they were confined. And the first symptoms, in every case, were a slightly inflamed and watery eye, a bloated and livid countenance, with a few red eruptions here and there upon the face; and in one case a small ulcer in the nose, whence oozed an ichor so sharp as to inflame and erode the upper lip. At the same time, or very soon after, such as could speak, complained of an uneasy sensation in the throat, but without any great soreness or pain. Upon examination, the tonsils appeared swelled and slightly inflamed, with a few white specks upon them, which in some increased so as to cover them all over with one general slough; but this, although a frequent symptom, did not invariably attend the disease, and some had all the other symptoms without it. The breath was either no ways offensive, or had only that kind of smell which is occasioned by worms; and the swallowing was very little, if at all impeded.

‘These symptoms, with a slight fever at night, continued in some for five or six days without alarming their friends; in others a difficulty of breathing came on within twenty-four hours, especially in the time of sleep, and was often suddenly increased to so great a degree as to threaten immediate suffocation. In general, however, it came on later, increased more gradually, and was not constant; but the patient would now and then enjoy an interval of an hour or two, in which he breathed with ease, and then again a laborious breathing would ensue, during which he seemed incapable of filling his lungs, as if the air was drawn through too narrow a passage.

‘This stage of the disease was attended with a very great and sudden prostration of strength; a very remarkable hollow dry cough, and a

* *Michaelis de Anginâ Polyposâ sive Membranacéâ*. Gottungen, 1778. Pp. 254-61.

† *An Enquiry into the Nature, Cause, and Cure of the Angina Suffocativa, or Sore-throat Distemper*. By SAMUEL BARD, M.D., &c. *Transactions of the American Philosophical Society*, vol. i., pp. 388-404. Philadelphia, 1789.

peculiar change in the tone of the voice; not easily described, but so singular, that a person who had once heard it, could almost certainly know the disease again by hearing the patient cough or speak. In some the voice was almost entirely lost, and would continue very weak and low for several weeks after recovery. A constant fever attended this disease, but it was very much more remarkable in the night than in the day-time; and in some there was a remarkable remission towards morning. The pulse at the wrist was in general quick, soft, and fluttering, though not very low; and it was remarkable, that at the same time the pulsations at the heart were rather strong and smart than feeble. The heat was not very great, and the skin was commonly moist.

‘These symptoms continued for one, two, or three days. By that time it was usual for them to be greatly increased in such as died, and the patients, though commonly somewhat comatose from the beginning, now became much more so; yet even when the disorder was at the worst, they retained their senses, and would give distinct answers when spoken to, although, on being left to themselves, they lay for the most part in a lethargic situation, only rising up now and then to receive their drink. Great restlessness and jactation came on towards the end of the disease, the sick perpetually tossing from one side of the bed to the other; but they were still so far comatose as to appear to be asleep immediately upon changing their situation or posture. An universal languor and dejection were observed in their countenances; the swelling of the face subsided; a profuse sweat broke out about the head, neck, and breast, particularly when asleep; a purging in several came on; the difficulty of breathing increased, so as to be frequently almost entirely obstructed, and the patient died apparently from the suffocation. This commonly happened before the end of the fourth or fifth day; in several within thirty-six hours from the time the difficulty of breathing came on first. One child, however, lived under these circumstances to the eighth day, and the day before he died his breath and what he expectorated were somewhat offensive; but this was the only instance in which I could discover anything like a disagreeable smell, either from the breath or expectoration.

‘Out of sixteen cases attended with this remarkable suffocation in breathing, seven died; five of them before the fifth day, the other two about the eighth. Of those who recovered, the disease was carried off in one by a plentiful salivation, which began on the sixth day; in most of the others by an expectoration of a viscid mucus.’

The two following cases are so interesting, so well told, and agree so nearly with later observation, that they deserve to be quoted in detail:—

‘I have had an opportunity of examining the nature and seat of this

disease, from dissection, in three instances. One was a child of three years old. Her first complaint was an uneasiness in her throat. Upon examining it, the tonsils appeared swelled and inflamed, with large white sloughs upon them, the edges of which were remarkably more red than the other parts of the throat. She had no great soreness in her throat, and could swallow with little difficulty. She complained of a pain under her left breast; her pulse was quick, soft, and fluttering. The heat of her body was not very great, and her skin was moist; her face was swelled; she had a considerable prostration of strength, with a very great difficulty of breathing; a very remarkable hollow cough; and a peculiar change in the tone of her voice. The next day her difficulty of breathing was increased, and she drew her breath in the manner before described, as if the air was forced through too narrow a passage, so that she seemed incapable of filling her lungs. She was exceedingly restless, tossing perpetually from side to side, was sensible, and when asked a question would give a pertinent answer, but otherwise she appeared dull and comatose. All these symptoms continued, or rather increased, until the third night, on which she had five or six loose stools, and died early in the morning.

‘Upon examining the body, which was done on the afternoon of the day she died, I found the fauces, uvula, tonsils, and root of the tongue interspersed with sloughs, which still retained their whitish colour. Upon removing them the parts underneath appeared rather pale, than inflamed. I perceived no putrid smell from them, nor was the corpse in the least offensive. The œsophagus appeared as in a sound state. The epiglottis was a little inflamed on its external surface, and on the inner side, together with the inside of the whole larynx, was covered with the same tough white sloughs, as the glands of the fauces. The whole trachea, from the larynx down to its division in the lungs, was lined with an inspissated mucus, in form of a membrane, remarkably tough and firm, which, when it came to the first subdivisions of the trachea, seemed to grow thinner and disappear. It was so tough as to require no inconsiderable force to tear it, and came out whole from the trachea, which it left with much ease, and resembled more than anything, both in thickness and appearance, a sheath of shammy leather. The inner membrane of the trachea was slightly inflamed; the lungs, too, appeared inflamed as in peripneumonic cases; particularly the right lobe, on which there were many large livid spots, though neither rotten nor offensive; and the left lobe had small black spots on it, resembling those marks left under the skin by gunpowder. Upon cutting into any of the larger spots which appeared on the right lobe, a bloody sanies issued from them without frothing; whereas upon cutting those parts which appeared sound, a whitish froth, but slightly tinged with blood, followed the knife.’

The other case ended favourably, and appears to have been followed by the paralysis of the muscles of deglutition, and weakness of the lower limbs so frequently witnessed during the later epidemics in this country and in France:—

‘The patient was a child of about two years and a half old, who had complained for about a week of a sore-throat and hoarseness. The day before I saw her she had some difficulty of breathing, which on that day was greatly increased. . . . Upon examining her throat I found the tonsils swelled, inflamed, and covered with sloughs of a yellowish colour. Her breath was not in the least offensive; her pulse was small and fluttering, and her skin pale and clammy. Two very large blisters were immediately applied, one behind each ear, so as to meet at her throat. She took four grains of calomel, with a quarter of a grain of opium.

‘About eight that evening she had something like a fit; and at nine the strangulation in her breathing was much increased; her pulse was sunk; her countenance changed; her nose appeared to be pinched up; her eyes were fixed and glassy, a blue ring was observable about her mouth, and she was comatose.

‘The next morning I was greatly surprised, not only to find her living, but in a sitting posture, eating her breakfast, with little or no difficulty of breathing, having her natural countenance returned, with some colour in her cheeks, and her pulse rather risen. At twelve o’clock, however, her breathing grew more difficult, and though not so strangulated as the day before, was very quick and uneasy. From this time for five days she remained in a very dangerous situation, and gave but little reason to expect her recovery. Her breathing continued quick and laborious, and her voice was almost entirely gone; her pulse was quick and low; she sweated profusely, particularly at nights, and constantly lay in her bed in a comatose situation, giving, however, distinct answers when spoken to. I could discover nothing disagreeable in her breath, though sometimes what she brought up was a little offensive. During this time, and for many days after, the blisters discharged considerably, and the matter of the discharge was so sharp and corrosive as to inflame and erode the skin almost from the chin to the sternum. She constantly took twice a day three grains of calomel; and, except the first dose, without opium, until she had taken upwards of thirty grains.

‘On the seventh day from the time I first saw her, she began to cough a good deal, with which she expectorated pretty freely, and brought up some very tough mucus. She breathed more freely, opened her eyes, and looked about with some sprightliness, and drank a glass or two of wine. From this time she gradually grew better, and by the fifteenth day from the time I saw her, all her symptoms had left her, except great weakness, and so remarkable a hoarseness, or rather loss of voice, that

it was with great difficulty she could be heard, and a peculiar sensibility of the larynx with regard to fluids, so that the moment she attempted to drink she fell into a fit of coughing, although she could swallow solid food without difficulty. This however soon left her, but her weakness and lowness of voice continued a much longer time, so that in two months she could hardly walk alone, or speak in a tone above a whisper.'

Some cases during the epidemic were attended by an eruptive affection, which began with a few red pimples behind the ears. These itched violently, and discharged profusely, the discharge consisting of an acrid ichor which eroded the neighbouring parts, so that in a few days the whole of the back of the ears and neck became affected. The difficulty of breathing was rarely present in these cases, and never became alarming so long as the discharge continued. These ulcers would sometimes continue for several weeks, and appeared in some places to be covered with sloughs resembling those on the tonsils.

CHAPTER III.

DIPHTHERIA IN THE NINETEENTH CENTURY.

Two memoirs on a kind of sore-throat which he called Diphthérite, were communicated to the Académie Royale de Médecine in the year 1821, by M. Bretonneau, a physician at Tours. In 1825 and 1826 the same physician recorded his observations upon epidemics of diphthérite in La Ferrière and Chenusson. The first cases of the disease, which had been previously almost, if not altogether, unknown in Tours, occurred in the neighbourhood of the barracks in the year 1818, and hence it was supposed to have been imported into the town by the military legion of La Vendée. It continued to prevail in Tours until the year 1821. The epidemic broke out at La Ferrière in the month of November, 1824, and was confined to the hamlet, not being observed in any of the surrounding places. The disease had never previously been known to occur at La Ferrière. Late in the year 1825, the epidemic extended to Chenusson, a small town about a league south of La Ferrière, cases having previously occurred intermediately between the two places. This form of angina was first called diphthérite by M. Bretonneau, whose memoirs contain the earliest account of any epidemic of this disease during the present century. He considered the epidemics observed by himself to be identical in character with the disease described by the Italian and Spanish physicians of the seventeenth century, under the names of *morbus syriacus*, *morbus suffocativus*, and popularly known in Spain under the name of *garrotillo*, and believed diphthérite and croup to be the same disease. Being probably unacquainted with true croup, he undervalued the labours of our countryman Dr. Francis Home, and asserted that the publication of his treatise suspended the progress of observation, subverted the more accurate opinions which had been handed down from remote antiquity, and became the source of misapprehensions which have not yet been removed by the labours of subsequent writers.

The special character of diphthérite, according to Bretonneau, is the exudation, whence the name he has applied to the disease. No inflammation unattended by exudation is diphthérite, and no inflammation attended by exudation is diphthérite unless it be propagable by conta-

gion; the virus, according to M. Bretonneau, being the membranous exudation which forms the distinctive pathological feature of this disease. On the one hand, he asserts it to have been proved by numerous facts that persons who attend the sick cannot contract diphtheria 'unless the diphtheritic secretion in the liquid or pulverulent state be placed in contact with a soft or softened mucous membrane, or with the skin on a point denuded of epidermis, and this application must be immediate. In a word, a true inoculation is the only mode of transmission of the disease.' On the other hand, he states that 'the facts supplied by the epidemics of diphtheria which have broken out in the department of Indre-et-Loire, or which have extended to the surrounding departments, prove in the most evident manner that the atmosphere cannot transmit the contagion of diphtheria.'*

The following is M. Bretonneau's description of the specific characters of diphtheria, quoted from Dr. Semple's translation of his memoirs, printed by the New Sydenham Society:—

'At the beginning of the disease, a circumscribed redness is perceived, covered with a coagulated semi-transparent mucus. This first layer, which is slight, supple, and porous, may be still further raised up by some portions of unaltered mucus in such a manner as to form vesicles. Often in a few hours the red spots extend perceptibly from one to another by continuity or by contact, like a liquid which is effused on a flat surface, or which flows by streaks in a tube. The concretion becomes opaque, white, and thick, and it assumes a membranous consistence. At this period it is easily detached, and does not adhere to the mucous membrane except by some very slender prolongations of concrete matter which penetrate into the muciparous follicles. The surface which it covers is generally of a slight red tint, with points of a deeper red; this tint is more vivid at the periphery of the spots.†

'If the false membrane, in detaching itself, leaves the surface of the mucous membrane uncovered, the redness which was obscured by the exudation returns, and the points of a deeper red allow blood to transude. The concrete coating is renewed, and becomes more and more adherent upon the points which have been first attacked; it often acquires a

* *Memoirs on Diphtheria*.—Selected and translated by Dr. SEMPLE, for the New Sydenham Society. Pp. 176-7.

† 'The mode of circumscription of the diphtheritic spots presents varieties which it is necessary to notice in practice. Sometimes an intense redness, accompanied by tumefaction, circumscribes these spots. Sometimes a thinner, half-transparent membrane spreads rapidly, and does not appear circumscribed. Instead of forming upon the surface of the tonsils membranous layers which present the appearance of a deep ulceration, it covers and envelops them. In this last case, the danger of its extension and propagation into the air passages is still more to be feared. I have sometimes availed myself of the epithet 'enveloping,' to denote this disposition of the pellicular exudations.'

thickness of several lines, and passes from a yellowish white colour to brown, grey, or black. At the same time the transudation of blood becomes still more free, and is the source of those *stillicidia* which have been so generally remarked by authors.

‘At this time the alteration of the organic surfaces is more apparent than at the beginning; portions of concrete matter are often effused into the substance itself of the mucous tissue; a slight erosion and a few ecchymoses are observed in the spots which, by their situation, are exposed to some friction, or from which the avulsion of the false eschars has been attempted. It is, above all, towards this period that the pellicles which are being decomposed exhale a foul odour. If they are circumscribed, the œdematous swelling of the surrounding cellular tissue makes them appear depressed, and by this appearance alone we might be tempted to believe that we have under our eyes a foul ulcer, with a considerable loss of substance. If, on the contrary, they are extended over large surfaces, they are partly detached, they hang in more or less putrified shreds, and they put on the appearance of the last stage of sphacelus.’*

From the period of its appearance in Tours, diphtherite, or, as I shall henceforth call it, diphtheria, continued to occur in various parts of France.

In a paper on croup in the adult, M. Louis has given the particulars of eight cases of diphtheria,† which, as six of them occurred in the months of June and August, 1823, probably formed a portion of an epidemic. Most of the cases were complicated, the affection of the throat having supervened in persons who had been some time in hospital for other complaints; a fact very interesting when viewed in connexion with the recent history of diphtheria in England. Six of the cases were in ‘L’Hôpital de la Charité;’ the others, one in ‘L’Hôpital Necker,’ the other in ‘La Salpêtrière.’ The first patient, a servant aged twenty-three years, had been for fourteen days in hospital with typhus before the throat became affected. The second patient, a young man aged nineteen years, who had been previously subject to sore-throat and pulmonary catarrh, had been ill for a month when admitted for chronic pleurisy on June 24th, 1823. He improved very much in the hospital, and was considered as almost convalescent, when, in the last days of July, he was attacked by diphtheria, which soon proved fatal. The third patient, aged twenty-nine years, had been for more than a month in hospital, under treatment for inflammation of the gastro-intestinal mucous membrane, prior to being attacked by sore-throat. The fourth case was one of simple diphtheria in an old woman aged seventy-two years; the fifth of diphtheria complicated with gastritis, in a water-

* *Loc. cit.*, pp. 24–25.

† *Archives générales de Médecine*. Tom. iv., pp. 5–50 et 369–387. Paris, 1824.

carrier aged twenty-two, both of whom died in a few hours after admission. In the sixth patient diphtheria supervened upon advanced phthisis in a woman thirty-two years of age, who had been a fortnight in hospital before the appearance of the throat affection. The seventh case, that of a woman aged thirty-two years, was one of simple diphtheria, which proved suddenly fatal at the end of ten days. The larynx and trachea were lined with a thick false membrane, which formed a complete tube, and extended to the third ramification of the bronchial tubes. In the eighth and last case, diphtheria occurred during the course of typhoid fever, in a boy aged fifteen years. The affection was of a more chronic kind than in the former cases; and after lasting several weeks, ended in convalescence.

The following is a translation of M. Louis's very admirable summary of the symptoms during life, and of the local morbid appearances observed after death.

The commencement of the disease was marked by more or less severe pain in the throat, which, nevertheless, was sometimes preceded by the formation of false membrane in the nasal cavities, and by coryza. This pain was accompanied by a more or less vivid redness of the pharynx, tonsils, and soft palate; by slight swelling, tightness, pricking, and especially by difficulty in swallowing. The difficulty in swallowing, commonly inconsiderable at first, sometimes became so great that the patients returned a portion of their drink by the nose, or deglutition even became impossible, and the separation of the jaws impracticable. Sooner or later after the commencement of the pain in the throat a false membrane was observed, which successively or simultaneously covered the pharynx, soft palate, uvula, and tonsils. Once only, throughout the whole course of the disease, were only some of these parts covered by the membrane. The neck became more or less swollen. A slight pain in the larynx and trachea was observed sometimes before, sometimes simultaneously with the appearance of the false membrane, but always after the commencement of pain in the throat. This pain, the character of which was, in general, difficult to describe, manifested itself in certain subjects under the form of a burning heat, which they endeavoured to mitigate by the application of cold. Soon after its appearance the voice, which until then had exhibited only a change similar to that which occurs in simple sore-throat, assumed a character more or less perfectly analogous to what is called croupal voice. Respiration became more or less difficult, but was rarely sibilous; and out of the five patients whose cases have been related, it was only observed to be so in one a few hours before death. Throwing back the head appeared in certain cases to lessen the dyspnoea. The cough was sometimes distressing, but generally so slight that it only inconvenienced the patient by exasperating the pain in the throat. Paroxysms of suffocation were very rare. Some of the

patients exhibited great uneasiness and anxiety: others, though very uneasy about their condition, did not lose the kind of quietness in which we saw them, till a few hours before death.*

What the morbid phenomena indicated, the inspection of the organs after death confirmed. Thus the false membrane, which lined the nasal passages, the pharynx, the soft palate, the uvula, the tonsils, the larynx, the trachea, and sometimes the bronchial tubes, diminished in thickness and consistency in the order in which we have named the organs. The subjacent mucous membrane was more or less red, and its redness diminished from the pharynx towards the trachea. The mucous follicles of the pharynx were sometimes much developed, especially at its upper part. The cervical glands were, in many cases, red and swollen. The false membrane which lined the larynx and trachea where it was generally thin, diminished but little their capacity, and certainly offered no mechanical obstruction to the admission of air into the lungs. Nevertheless, one patient, in whom the false membrane was doubled upon itself, afforded an exception to this rule. Moreover, we need not stay to show at length that there was an exact proportion between the thickness of the false membrane and the time of its development; that where it was found thickest in the dead subject, it had been formed the earliest. Our two first cases sufficiently prove this, since, having observed the false membrane from its commencement, we saw it become thicker and more opaque from day to day.†

Whilst Bretonneau, who first applied the term diphthérite to this disease, was also the earliest author of the present century who gave a perfect description of the epidemic form of diphtheria, the essential fact that putrid sore-throat was liable to end in croup had already been observed and recorded by some of the physicians of Glasgow, prior to the publication of Bretonneau's very valuable and important essay. In a brief paper, published in 1825, Dr. Mackenzie says that the exudation of fibrin in croup 'very frequently commences on the surface of the tonsils, thence spreads along the arches of the palate, coats the posterior surface of the *velum palati*, sometimes surrounds and encloses the uvula; and at last descending, covers the internal surface of the pharynx and œsophagus, the larynx and trachea.‡ Dr. Mackenzie's views both of the pathology and treatment of the disease coincide very exactly with those of Bretonneau; a circumstance, he says, in a subsequent paper, which, as it arose without any knowledge of each other's labours, tends to confirm the observations of both. In this second communication Dr. Mackenzie gives a brief but yet fuller account of the manner in which he had been led to study the subject. He says that he saw two fatal cases of

* *Du Croup considéré chez l'Adulte.* Par M. LOUIS, D.M.P. *Loc. cit.*, pp. 370-1.

† *Loc. cit.*, pp. 372-3.

‡ *Edinburgh Medical and Surgical Journal*, vol. xxiii. p. 296.

sore-throat, ending in croup, as early as 1812 or 1813; and that the same form of disease prevailed very much in Glasgow in 1819, when he had the opportunity of inspecting the bodies of several children who had died of it. In May, 1820, Dr. Thomas Brown read a valuable paper on the disease to the Glasgow Medical Society. In 1821 two cases of the disease proved fatal under Dr. Mackenzie's care. 'In both, the fœtor of the breath and the sloughy appearance of the effused lymph were remarkable. In the first case,' he adds, 'I was surprised, on dissection, to find the tonsils and uvula entire, and coated over only with an effusion; for I had laid my account to find a gangrenous loss of substance in these parts.' He now announced to several of his medical brethren that what had been considered as ulcers and sloughs in this disease, were nothing else than effused lymph, the progress of which over the velum and uvula, and towards the elementary and respiratory passages, he had distinctly observed.*

The disease excited little attention in England until the lapse of many years from the publication of the observations of Dr. Mackenzie and of M. Bretonneau. The French memoirs on diphtheria were, it is true, familiarly known to the medical men of this country; but they were scarcely thought to have any immediate practical interest for ourselves until the memorable epidemic outbreak at Boulogne early in 1855. This epidemic, usually called the Boulogne sore-throat, lasted until 1857, and excited very great interest here, both on account of the large number of English who resided at Boulogne, and also perhaps because it is said to have especially attacked the English portion of the population. Between the outbreak of the epidemic at Boulogne in January, 1855, and the month of March, 1857, it caused 366 deaths; 341 of which were those of children under ten years of age.

Diphtheria prevailed in various parts of France in 1856, and differed in this respect from the epidemics so well described by M. Bretonneau, that it more rarely extended into the larynx, producing death by the accession of croupy symptoms. It has also been remarkable for frequently coinciding with, and sometimes following, epidemics of measles or scarlet fever. Thus, in the arrondissement of Arras, diphtheria followed an epidemic of scarlet fever; and at St. Omer, out of 188 deaths of children, 36 were caused by measles, 44 by diphtheria. The proportion of deaths to cases seems to have varied much; for whilst out of 150 children under fourteen years of age who were attacked by diphtheria at Chateau-Chinon 45 died, only 10 died out of 120 attacked in La Ferté-sur-Amance. M. Lemaire, who reports the history of the disease in the arrondissement of Cosne, mentions the occurrence of many cases of incomplete amaurosis, and of pain with debility of the lower limbs,

* *Medico-Chirurgical Review*. New Series, vol. vi., p. 290.

which he describes as rare and curious phenomena. The mention of the occurrence of tracheal complications as a rather uncommon event, and of impairment of sight, and a kind of paraplegic weakness of the lower limbs, as common consequences of diphtheria, show that the later epidemics in France have coincided very closely with the majority of recent local epidemics in this country.

The first cases of the present epidemic in this country, of which I have obtained any accurate account, came under the care of Mr. Wilkinson, of Spalding, at Whaplode Drove, in Lincolnshire, in July, 1856.* Several deaths occurred from it in the village on that occasion, when it ceased, and did not reappear in that neighbourhood until the autumn of the following year. About the same time (July, 1856) an epidemic sore-throat, of very fatal character, intermingled with scarlet fever, appeared at Leek, in Staffordshire. Its true character was not known at first to the medical men, but they distinguished it from scarlet fever, and several of them called it malignant angina. Whether at the commencement it had the true diphtheritic character, is not quite certain; but, be this as it may, the epidemic at a later period merged into diphtheria, and the probability of its having been of this character from the beginning is strengthened by the circumstance that unquestionable cases of diphtheria came under the observation of Dr. Heslop, of Birmingham, in the month of August following, and of Mr. West, of Birmingham; Mr. Scofield, of Highgate, Birmingham; Mr. Shirley Palmer, of Water Orton; and Mr. Oates, of Erdington; in the months of September, November, and December, 1856, and of January, 1857.

Thus the epidemic appeared in several parts of England in the early autumn of 1856, and has continued more or less prevalent until the present time. From Leek and Birmingham the disease had never entirely disappeared at the time I made the inquiries by which these facts were elicited. It ceased in the neighbourhood of Spalding after the little outbreak at Whaplode Drove until late in the autumn of 1857, when cases were again observed; but the general epidemic did not really commence in that neighbourhood until the summer of 1858, when it broke out with much violence, and is said to have attacked a thousand persons in the town of Spalding alone. As in many other places, it appeared in the rural districts before it reached the town; having shown itself at Pinchbeck, a village near Spalding, in March, the earliest cases in the latter town did not appear until the following June. In like manner it prevailed at Coningsby, in the union of Horncastle, in May, and only reached the town, at the earliest, in the following month.

Having prevailed, as we have seen, at Leek, in Staffordshire, in 1856,

* A case imported from Boulogne came under the care of Mr. Eastes, of Folkestone, on July 2nd, 1856. *Second Report of the Medical Officer to the Privy Council*, p. 323. London, 1860.

it did not show itself in other parts of that county or neighbourhood until the following year, when it appeared at Brewood, Wolverhampton, Dudley, and elsewhere. I do not possess materials for tracing the progress of the epidemic with accuracy, and it is not probable that such materials could now be procured by any amount of labour; but it is at least an important point in the history of the epidemic to have ascertained that it began, to all appearance, spontaneously in several centres sufficiently remote from one another to prove their complete independence.

The first case that came under my own notice was that of a medical friend in London, who consulted me early in October, 1857, for a sore mouth attended by a very thin, filmy, but opaque white exudation, chiefly upon the gums and buccal mucous membrane, but also partially covering the tonsils and uvula. The exudation did not uniformly cover the parts, but was in separate patches, each of considerable size. There was excessive prostration of strength, from almost the first moment of indisposition; much more indeed than the ailment, which appeared to be only slight, seemed adequate to explain, and it was necessary at a very early period to give generous support, including port wine and tonics. The case was tedious, and recovery only took place when the tonic effects of change of air had been added to the other regimen.

For some months previous to the occurrence of the case just mentioned, sore-throat, unattended, so far as I observed, either by ulceration or exudation, had been especially prevalent in London. Scarlet fever, which prevailed about the same time, presented some unusual features, the most remarkable being that at the end of ten or twelve days, when the throat had usually ceased to be troublesome, the fever had disappeared, and the patients appeared to be convalescent, there would be a well-marked accession of febrile symptoms, attended by a relapse of sore-throat. This peculiarity has now ceased to occur, and for some months past scarlet fever has for the most part been of milder type. But sore-throats, which were remarkably frequent during the years 1857, 1858, and 1859, continue to prevail;* and I have received information from medical friends residing in various parts of the country, that they have noticed the same fact even in districts where diphtheria, attended by exudation, has not been observed. This prevalent sore-throat has been characterized by inflammation affecting especially the tonsils, soft palate, and uvula, but also often extending to the posterior fauces; it has sometimes been attended by slight febrile symptoms, and has in general speedily yielded to simple treatment; but one attack appears to have predisposed to another, for I have frequently been consulted again, after the lapse of some weeks or months, by the same persons.

* March, 1860.

Whilst this form of sore-throat has never entirely disappeared since the summer of 1857, it has been more than usually prevalent at certain periods. The first of these, of which I have any record, was in October, 1857, shortly previous to an epidemic of catarrhal fever, which prevailed extensively among children at the end of October and during the first week of November in that year, and was characterized by an accompanying sore-throat. The tonsils in this catarrhal affection were moderately swollen and injected, and there was more or less inflammation of the throat, attended by shivering, fever, cough, and sometimes pneumonia, or bronchitis. This epidemic was almost limited to children, and was attended and followed by an unusual amount of depression. A second well-marked epidemic period of the same disorder occurred late in the autumn of 1858, and there have been several other outbreaks of a like character. A recent catarrhal epidemic has also been attended by sore-throat. Headache, coryza, and cough, have commonly ushered in the disorder, but the tonsils have generally been more or less enlarged, the soft palate, and sometimes the posterior wall of the pharynx, inflamed, and there have frequently been slight swellings of the lymphatic glands near the angles of the lower jaw. A case of this kind, unattended by diphtheritic exudation, recently under my care, has in other respects presented features closely resembling diphtheria. It is that of a young lady aged twelve years, whose throat, after the preliminary catarrhal symptoms above described, became intensely red, but without much pain or difficulty of swallowing. The follicles of the tonsils secreted a thick tenacious white matter, which remained adherent to the parts for a day or two, but presented none of the characteristics of diphtheritic exudation. There was slight fever at first, which was soon followed by so much depression as to require the copious use of wine and tonics. The patient was previously healthy, and is now convalescent; but I am told several other cases of sore-throat have occurred in the same household.

During the existence of this tendency to throat ailments, sore-throat has been a common attendant of other diseases; so that very frequently the throat has been found inflamed, or the tonsils enlarged, in cases where, at ordinary times, no such affection would be looked for.

Not unfrequently in such cases the throat has presented a distinctly diphtheritic character, manifested by a glaziness of the posterior fauces or the presence of a filmy pellicle, or of distinct spots of exudation upon the tonsils. Such affections have perhaps been most common in cases of chronic pulmonary disease, especially bronchitis; but have been by no means limited to them, for I have notes of their occurrence in various other sub-acute or chronic diseases.

The tendency of other ailments to be modified by the epidemic influence has also been observed by Dr. Gull, who relates the following cases in a paper published in the last Annual Report of Mr. Simon, Medical

Officer to the Privy Council. These cases are the more interesting because they could not be traced to direct communication with persons already suffering from diphtheria.

The first case was that of 'a gentleman, aged sixty-five, at Clapham Rise, confined to his room with bronchitis; a second, a lady of nearly the same age, living in the Kent Road, confined to her bed with rheumatism; and a third, a gentleman, aged fifty-six, having *morbis cordis*, living at Barnsbury. These patients had not been in a position for contagion, and none of their friends were affected. The disease was in these cases well marked, and of that general kind which affects the lips, cheeks, tongue, and palate, and not the more faucial form.*

'In three other instances which occur prominently to me, besides those I have just referred to, this diphtheritic modification was probable.

'A young girl, aged fifteen, was taken with acute pleuro-pneumonia. The diphtheritic relations of the disease were not suspected until the fauces and inside of the cheeks were found covered with the membrane. The onset of the illness was plainly traceable to wet and cold, and no doubt the local inflammation would equally have arisen whether diphtheria prevailed or not; yet when it set in, the evidence of the diphtheritic modification was unequivocal.

'A second case was similar, but with what seemed to me still greater modification. A woman was admitted into the hospital, dying of pleuro-pneumonia. After death, the fauces were found covered with the diphtheritic exudation; and, in addition to the pleuro-pneumonia, the meninges of the brain and cord were in a state of suppurative inflammation, the subarachnoid space being full of soft purulent lymph.

'In a third case, a female, aged twenty-eight, with acute pneumonia, the tongue, lips, and fauces were covered with diphtheritic exudation.'

This engrafting, as it were, of the epidemic character upon other diseases has been by no means peculiar to London. My friend, Dr. Heslop, of Birmingham, says, in a communication with which he has favoured me on the subject, that his attention has been drawn to the remarkable frequency of what he terms a diphtheritic taint in other maladies during the prevalence of diphtheria. This has been especially observable in zymotic diseases, but has been by no means confined to them, in illustration of which he mentions the following cases:—A patient, suffering from acute rheumatism, at Christmas, 1858, besides being affected with endo-pericarditis, had the whole surface of the buccal membrane coated with fibrinous deposit. In November, 1858, diphtheria of the posterior fauces was developed in a little girl, aged seven

* *Second Report of the Medical Officer to the Privy Council*, pp. 298-99. London, 1860.

years, who had been suffering from typhoid fever for nearly a fortnight before the appearance of the throat affection. The case was very lingering, speech and the use of the limbs being much impaired for a lengthened period. Three other cases of typhoid fever occurred successively in the same house, in one of which, that of a boy, aged ten years, diphtheritic exudation on the throat also took place. A case of semi-confluent small-pox was admitted into the Queen's Hospital, under the care of Dr. Heslop, on August 18, 1858. On the tenth day of the eruption, the patient complained of uneasiness about the throat and neck, and the tonsils and fauces were observed to be slightly inflamed. On the following day the inflammation of the tonsils, uvula, and fauces had increased, and a small patch of diphtheritic exudation was seen on the left side. The patient eventually recovered, but the throat was not perfectly well until the 14th of September.*

The late Mr. Edwardes, of Wolverhampton, who himself fell a victim to diphtheria, also wrote in some MS. notes with which I have been favoured by Dr. Topham, of that town, that whenever sickness occurred during the epidemic prevalence of diphtheria, it manifested a tendency to put on the diphtheritic character. I need scarcely add that the same circumstance has been observed in most, if not all, true epidemic diseases, other ailments during the prevalence of plague or influenza, for example, being very apt to merge into the prevailing epidemic. For the following very interesting case, which bears directly upon this subject, I am indebted to Dr. Fleming, of Birmingham, under whose care it was treated in the Queen's Hospital:—

A. B. was admitted into the hospital under one of the surgeons for gonorrhœa. After two or three days she was transferred to the physician for a papular rash, supposed to be secondary syphilis, but she soon presented remarkable and unaccountable depression; complained of the throat, and was so depressed as almost to faint when she sat up in bed to have it examined. The throat presented two or three patches of grey, coriaceous membranous exudation, which rapidly spread so as nearly to cover the whole throat; pulse 130, small and weak; very early in the disease the urine presented a slight trace of albumen; its specific gravity was 1012, and it contained lithates in great abundance. The throat passed through the usual stages; the membrane on separation left ulcers of the mucous membrane of the fauces; there was much sanious discharge from the mouth and nares, and there was fœtor. A considerable hæmorrhage oozed from the ulcers of the throat later in the disease. She never recovered from the exhaustion produced by the hæmorrhage, and died on the twenty-first or twenty-second day of the

* Three cases of diphtheria after small-pox, which had occurred in the Small-pox Hospital, are related in Mr. Simon's last report, on the authority of Mr. Marson. *Loc. cit.*, p. 324.

illness, and the nineteenth from the accession of sore-throat. She suffered occasionally from difficulty of breathing, and the urine continued to show a trace of albumen up to the last, but the lithates were much diminished in quantity. The rash very soon disappeared after the commencement of the exudation.

Post-mortem Examination.—Several ulcers on the tonsils and upper and back part of the fauces; coriaceous membrane covering the upper part of the œsophagus, but too low down to be seen during life; larynx healthy; both lungs much congested; kidneys enlarged; cortical substance pale and granular; spleen enlarged and soft; heart healthy.

But the disease which more than all others has been associated with diphtheria is scarlet fever. Many examples of this have fallen under my observation, but the most remarkable were afforded by a small epidemic at a hamlet called Tattershall Thorpe, near Coningsby, in Lincolnshire. Two cases of uncomplicated diphtheria had occurred shortly before June, 1859, when scarlet fever broke out in the hamlet. Measles had been prevailing just before, and in two or more cases the rubeolous and scarlatinous rash are said to have existed simultaneously in the same patient. There had already been three fatal cases previous to my visit, besides several then convalescent, whose throats were reported to have presented the diphtheritic character, though no trace of this remained when I examined them. The following cases are here reported from notes taken at the time.

James White, aged three years, has been ill four days with mild scarlet fever; the traces of the characteristic rash still remain. Posterior fauces covered with membranous exudation; tonsils much enlarged, free from ulceration, clean, but said to have been covered with diphtheritic exudation.

Martha Atkins, aged two years, was taken with scarlet fever fourteen days ago. Two days after the scarlatinous rash appeared, rubeolous rash showed itself; it was in patches, and chiefly, perhaps exclusively, on the arms. Some of the spots were much larger than the ordinary rash of measles; there was neither coryza nor the other catarrhal symptoms which usually accompany measles; but this disease was prevalent in the hamlet, and cases had occurred in the next house shortly before the child was taken ill.

The skin of the hands, arms, and legs is soft and smooth, but that of the body is desquamating freely; the nostrils are inflamed, and discharging an acrid, ichorous fluid. There is an enormous tumour on the left side of the neck, which is boggy, and indistinctly fluctuating. On being opened, it discharged only bloody serum, mixed with streaks of pus. The pulse is quick, feeble, and thready; the tongue has not the red, injected appearance common after scarlet fever. The tonsils are much enlarged, and to the right one is hanging a distinct, ragged-look-

ing piece of white membranous exudation. The uvula is partly covered with white closely-adherent exudation; and the posterior fauces, so far as they could be seen, are covered with a similar exudation of a darker colour; there are also several distinct patches of exudation on the gums; urine not albuminous.

James Cunningham, aged twelve years, is manifestly recovering from scarlet fever. The skin is desquamating; pulse 64, very compressible; tongue clean and free from the red, injected character usual after scarlet fever; tonsils much swollen, red, not ulcerated or abraded, but bled freely on being accidentally touched. There is a small but distinct patch of exudation on the left tonsil, and likewise a small circular patch on the posterior fauces. Mr. Lambden, a most competent observer, under whose care all these patients are, reports that James Cunningham's tonsils were entirely covered with diphtheritic exudation.

Selina Taylor, aged five years, is recovering from scarlet fever; skin desquamating freely; pulse quick and feeble; tongue coated with a white fur; profuse diarrhœa. The tonsils have an excavated appearance, but there is neither slough nor ulceration. Both the tonsils and uvula are partially covered with white, filmy membranous exudation; the posterior fauces with a dense-looking, ash-coloured exudation.

Mary Anne Taylor, aged fifteen years, convalescent from scarlet fever; skin desquamating freely; tongue clean and not injected. There is a distinct patch of diphtheritic exudation on the right tonsil, and besides this, both tonsils are partially and the posterior fauces entirely coated with some transparent grey matter. There is neither pain of throat nor difficulty of swallowing.

Benjamin Taylor, aged seventeen years, was taken ill yesterday, June 18, and the rash of scarlet fever is scantily appearing to-day. Pulse 120, of fair volume but very compressible, skin pungently hot, tongue white and dry; there is much pain in swallowing; tonsils much swollen, posterior fauces red and injected without ulceration. Upon the left tonsil and posterior fauces are patches of ash-coloured exudation; upon the right tonsil a large patch of viscid, semi-membranous secretion, loosely attached, and which, on its removal, left the subjacent membrane without abrasion. Urine not albuminous.

The next case is chiefly interesting on account of the diphtheritic affection of a wound on the foot.

Joseph Taylor, aged nine years, is recovering from scarlet fever; the skin is desquamating freely; tongue clean, slightly injected; pulse 76, very compressible. The throat presents no trace of ulceration; the tonsils are much enlarged, and have one or two superficial depressions such as are sometimes seen after the separation of diphtheritic concretions, with which, in this case, they are said to have been covered; posterior fauces coated with a thick layer of dirty-looking grey stuff closely

adhering to the mucous membrane, but which has not exactly the customary aspect of exudation. The boy is lame in the left foot, which is swollen and hard, as if the cellular tissue were infiltrated with some firm kind of exudation; the swollen part is of a faint rose colour, slightly tender, and does not pit on pressure. He pricked the foot at the angle between the great and second toes with a muck-fork six weeks ago; the wound healed kindly, and the foot appeared quite well until his present illness. The wound has now re-opened, is of a pink colour, appears to be lined with a white substance, and is discharging a very small quantity of ichorous, non-purulent fluid. There is no distinct line of demarcation between the white and pink portions, and the part is not particularly sensitive, an unsuccessful attempt to separate a portion of the white lining for examination having produced neither bleeding nor much pain.

These cases well illustrate the combination of a diphtheritic condition of the throat with scarlet fever. The next case illustrates the occurrence of diphtheria after measles.

Frank Richardson, aged five years, had measles attended by the usual catarrhal symptoms, rather more than a fortnight ago; has been ailing ever since; is very pallid and anæmic. There is no desquamation of the cuticle or trace of eruption; tongue clean, nose sore and discharging; pulse quiet and very feeble. The tonsils are covered with a filmy membrane, and the posterior fauces with a distinct diphtheritic exudation.*

For the following report of a case of diphtheritic scarlet fever among the patients of the Western General Dispensary, I am indebted to our late zealous house-surgeon, Mr. Plaskitt.

George Owen, aged eight years, was seized on Monday, October 4, 1858, with premonitory symptoms of scarlet fever, after exposure to the infection; and three days afterwards presented the characteristic rash diffused over the entire body. The throat, which had suffered much almost from the first, had by Sunday, October 10th, become exquisitely painful, and much swollen, both externally and about the fauces and tonsils, which presented patches of yellowish exudation. Deglutition was almost impossible, and respiration much impeded; the tongue, lips, and teeth, were covered with black sordes; protrusion of the tongue was impracticable; there was delirium and excessive prostration. The patient remained in this, or even a worse condition throughout the following week, and death was hourly expected. On Saturday, October 16, a considerable quantity of blood was expelled, apparently by vomiting, and with it several fleshy-looking substances, one of which was about an eighth of an inch thick, larger than a crown-piece, membranous in structure, and appeared to correspond with the tonsils and fauces.

* Several cases of diphtheria, complicating measles, are related in Mr. Simon's recent report, on the authority of Messrs. Chaldecott, of Dorking. *Loc. cit.*, pp. 325, 326.

The expulsion of this body was followed by an expression of instant relief, great improvement of all the symptoms, and a rapid convalescence.

Mr. Schofield, of Highgate, near Birmingham, in reporting the particulars of twelve fatal cases of diphtheria which occurred in his practice, mentions the following:—

A. G., aged two years, died after eighteen days' illness with scarlet fever, during the last twelve of which diphtheria also was present. Croup came on three hours before death. Two other children in the house were suffering from scarlet fever, and one child from diphtheria at the same time.

C. R., aged four years, died December 22, 1858, of croup supervening upon scarlet fever and diphtheria.

J. H., aged eleven years, died January 6, 1859, of scarlet fever and diphtheria, after an illness of about three weeks. This case was only seen after death, and was the second that happened suddenly in the same house. The parents said she had had scarlet fever three weeks before; got tolerably well; then had sore-throat for a day or two, but not badly; began to sink during the night, and had been dead a few minutes when Mr. S. saw her at seven a.m. There was abundant diphtheritic membrane on the tonsils and back of the mouth.

CHAPTER IV.

DIPHTHERIA AS A SPORADIC AND ENDEMIC DISEASE.

ALTHOUGH, like cholera and influenza, diphtheria has generally appeared as a wide-spread epidemic disease, yet it sometimes occurs in a sporadic form. At other times it has been so limited in extent, or has adhered so tenaciously to particular places, or even to single houses, as to resemble rather an endemic than an epidemic disease. In a sporadic form, or in the form of very small groups confined to a limited district, diphtheria has probably never been absent from this country; in this respect resembling cholera, the other novel epidemic of the present century.

From various sources we learn that it occurred in France as a sporadic, if not an epidemic disease, during the earlier years of this century, anterior to M. Bretonneau's observations. Indeed, this author himself mentions that diphtheria was probably the cause of death in the case of the Empress Josephine. A case of croup, related by M. Martin, of Lyons, in which no mention is indeed made of membranous exudation on the fauces, but in which the throat does not appear to have been examined, coincides in other respects so closely with diphtheria, that there can be little hesitation in considering it to have been a case of this disease. Blood and membranous fragments of the thickness of a line, and of various sizes, were expectorated in coughing. The tissue of these fragments was firm and solid, their colour a whitish grey, and their shape irregular. One of their surfaces was smooth, the other covered with mucous flakes striated with blood. There was also bleeding from the nose to the extent of a wine-glass full. The excoriations formed by blisters became covered with a thick, membrane-like layer, surrounded by inflammation. These membranous exudations on the blistered surfaces were renewed after their first disappearance or removal, but nevertheless the patient eventually recovered.*

Reports of cases analogous to diphtheria lie scattered through the English medical periodical literature of the present century. I have not attempted thoroughly to ransack the journals for such cases, my intention being merely to show that the disease existed in this country either in a sporadic form, or in that of small local outbreaks, long anterior to

* *Journal Général de Médecine*, vol. xxxvii., pp. 353-62. Paris, 1810.

the late more general epidemic. The following facts will perhaps serve sufficiently to illustrate this point.

The late Dr. Mackintosh, of Edinburgh, appears to have seen sore-throat accompanied by diphtheritic exudation; for in his description of cynanche tonsillaris he says:—

‘In some cases, only one tonsil is inflamed, in others, the uvula only; sometimes white specks are seen upon the inflamed parts, surrounded by a viscid exudation, which present the appearance of ulcerations. The white specks alluded to are sometimes produced by exudations of lymph, at others by sebaceous matter making its escape from the mucous follicles.’*

The only subject for surprise is, that so accurate an observer as Dr. Mackintosh should have failed to recognise the resemblance between such cases of tonsillitis and diphtheria, with which he was well acquainted through the writings of Bretonneau.

A case of diphtheria, treated in the wards of the Royal Infirmary under the name of diphtheritis, formed the subject of a clinical lecture, delivered in 1830, by the late Professor Alison, of Edinburgh.† On the day of the patient’s admission into hospital, there was inflammation of the left tonsil, soft palate, and uvula, characterized by diffused swelling, pain, a deep red colour, and the effusion of coagulable lymph, which was, however, not more abundant than usually happens in slight inflammatory affections of these parts. The accompanying fever, though decidedly of inflammatory type, was mild, the pulse being only 96. For some days the difficulty of deglutition was slight, nor was the breathing much affected; but on the eighth day the inflammation showed a tendency to spread down the air-passages, and continuing to do so, notwithstanding the measures adopted for the patient’s relief, proved fatal within thirty-six hours.

Under the title of inflammation of the œsophagus, Dr. Abercrombie relates the following case of sporadic diphtheria. It is described with his usual care, and is so much to the purpose that I quote it entire.‡

‘A gentleman, aged twenty-six, came to town in June, 1826, to consult me about complaints in his head. On his journey he thought he caught cold in crossing the Firth of Forth, and when I saw him he complained of his throat, and there was a glandular swelling on the right side of his neck. His voice was hoarse, with a peculiar husky sound. The fauces were of a bright red colour, without much swelling, but were covered in several places with aphthous crusts. He was at this time not confined, and there was no fever; but after a few days, he became fever-

* *Practice of Physic*, Third Edition, vol. i., p. 226. Edin., 1835.

† *Lancet*, 1829-30, vol. i., pp. 734-5.

‡ *Pathological and Practical Researches on Diseases of the Stomach, &c.* By JOHN ABERCROMBIE, M.D. Second Edition, pp. 95-96.

ish, the other symptoms continuing as before. He was now confined to bed and actively treated, and after eight or nine days he was much better, so as to be able to be out of bed; but there was still some rawness of the throat, with small aphthous crusts, and a husky sound of the voice.

‘After a few days there was a recurrence of fever, which now assumed a typhoid type, with considerable appearance of exhaustion. He had some dyspnoea, with considerable difficulty of swallowing. The attempts to swallow excited sometimes cough and sometimes vomiting; and by both he brought up considerable quantities of a soft membranous substance. He became more and more exhausted, without any remarkable change in the symptoms, and died at the end of about three weeks from the first appearance of the disease. For twelve hours or more before his death he swallowed pretty freely.

‘*Inspection.*—The whole of the pharynx was covered by a loose, soft, adventitious membrane, which also extended over the epiglottis; and portions of it were found lying in small irregular masses within the larynx, at the upper part. A similar membrane was traced through the whole extent of the inner surface of the œsophagus, quite to the cardia. Near the cardia it lay slightly attached, forming a soft continuous mass about a third of an inch in diameter, and with the œsophagus closely contracted around it. The other parts were healthy.’

In 1850, Dr. Webster, of Dulwich, in a paper on Diphtheritis and Ulcerated Sore-throat involving the larynx, published the particulars of six cases of sore-throat that occurred in his practice during the years 1824–29, and which he classed together—‘because they all had, in reality, an assemblage of similar symptoms, and the common point of danger was the windpipe.’ The two first cases occurred in April and May, 1824, and were nearly similar to those which M. Bretonneau observed at Tours, and to which he gave the name diphtheritis; but the disease was then unknown in this country. The third case assumed a mixed character, at first resembling common sore-throat, afterwards diphtheritis. The fourth was a case of ulcerated tonsils, as the sequel of scarlet fever. The fifth and sixth had all the symptoms of ulcerated sore-throat.* The first two cases happened in the same house, and both

* Dr. Farre has related the history of two fatal cases of cynanche laryngea, in the third volume of the *Med. Chir. Trans.* (pp. 86–88), which appear to have been of a diphtheritic nature. There was no exudation in the first case; in the second the pharynx is described as inflamed, somewhat vesicated, covered with coagulable lymph about the epiglottis, but free from inflammation near to its termination in the œsophagus. The right tonsil was also inflamed and vesicated. The mucous membrane of the larynx and trachea was pale.

‘Dr. Baillie and Sir Everard Home have each recorded three cases of throat disease, which perhaps bore some analogy to diphtheria. In Sir E. Home’s cases the epiglottis was the seat of inflammation. There was pain and difficulty in

patients died with symptoms of laryngeal affection. In the first, aged five and a half years, there were spots or patches of a 'greyish' aspect in the mouth and on the tonsils, followed by croupy symptoms, ringing cough, difficult respiration, and death on the tenth day. In the second patient, aged four years, there were a few ash-coloured spots on the mouth and tonsils, which spread to the fauces and uvula; and croupy symptoms setting in, she also died on the tenth day of her illness. The third case, that of a child, aged seven years, occurred in February, 1827. The attack came on with well-marked pyrexia several days before being visited. When seen, a slough, the size of a sixpence, appeared on each tonsil; and the whole of the uvula was in a similar state. 'The sloughs are of the usual ash colour, surrounded with a rather dusky red margin. The constitutional symptoms are slight; appetite tolerable; is free from fever, and playing about the room. There is little swelling of the nostrils or pain in swallowing, and no cough or hoarseness.*' This patient died with pharyngeal symptoms ten days after Dr. Webster's first visit. On examination after death, extensive ulceration of the tonsils and velum was found; the pharynx had lost its redness and ulcerated appearance, and the upper surface of the epiglottis was apparently healthy. The under surface of the epiglottis and a portion of the rima glottidis were ulcerated; and there was a patch of unattached mucus or lymph, having the appearance of false membrane, on the centre of the thyroid cartilage.

Mr. Frederick Ryland, of Birmingham, writing in 1837, describes an epidemic affection of the mucous membrane of the fauces, accompanied by membranous exudation, which had fallen under his notice in the previous year. The cases are well told, and the more interesting on account of the diphtheritic affection having usually appeared as a complication of measles.† The following passages, extracted from Mr. Ryland's work, sufficiently show the nature of the epidemic:—

'On June 8, 1836, James Overton, a delicate, unhealthy child, aged

swallowing; but, excepting in the third case, in which they are said to have been inflamed and ulcerated, there was no affection of the tonsils. Dr. Baillie's three cases proved fatal. They all occurred in the same season; there had been intercourse between two of them, a circumstance which suggests the possibility of contagion, and each of the three patients had been previously more or less subject to inflammation of the throat. The disease, says Dr. Baillie, had a strong resemblance to croup, but there was not the same kind of ringing sound of the voice, and no layer of coagulable lymph was found upon the surface of the inner membrane of the larynx and trachea.—*Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, vol. iii., pp. 268-289.

* *The Institute*, vol. i., p. 100.

† *Treatise on the Diseases and Injuries of the Larynx and Trachea, founded on the Essay to which was adjudged the Jacksonian Prize for 1835.* By FREDERICK RYLAND, Surgeon to the Town Infirmary, Birmingham. Pp. 165-169. London 1837.

five years, was brought to me at the Infirmary, covered with the eruption of measles, which the mother assured me had come out since she left home. I desired the mother to take the child home, and to send for me if any unfavourable symptoms showed themselves. She sent on the morning of the 10th; the measles still continued out, the bowels were relaxed, the breathing was accelerated and attended with a mucous rattle; there was great difficulty of swallowing, a hoarse cough, and almost total suppression of the voice. I could not manage to see the back of the fauces, but there were spots of membranous concretion on the roof of the mouth. The case proved fatal.

On examining the body of the patient thirty-nine hours after death, 'the submaxillary glands were considerably enlarged. There was a thin, ash-coloured, membranous exudation upon the uvula, upon that part of the pharynx which is contiguous to the larynx, upon the laryngeal surface of the epiglottis, and upon the lips of the glottis as far as the margins of the ventricles of the larynx. In the last-mentioned situation the false membrane adhered rather firmly; in the other places it was but loosely connected with the subjacent parts. The mucous membrane of the epiglottis was thickened and slightly injected; that of the lips of the glottis and ventricles was greatly reddened; the trachea exhibited but little traces of inflammation.

'About the time that this case occurred, many children died of a similar affection of the throat, complicated with measles; but no examination was made of their bodies after death. They had, in most instances, cough, difficulty of swallowing, impeded respiration, hoarseness; ultimately suppression of the voice, and, in many cases, swellings of the submaxillary glands.

'On the 8th of June, I was called to Julia Bayliss, aged fourteen months, who, after a slight eruptive fever, broke out with measles. She had neither cough nor dyspnoea; her bowels were relaxed, and she had extreme difficulty in swallowing anything. An examination of the fauces showed the fauces and *velum palati* covered with a thick, ash-coloured membrane. A strong solution of alum was applied three times during the first day, and on the second, no vestige of the false membrane remained, and the mucous surface was but slightly reddened in the situations where the membranous exudations had existed.

'On the 18th of the same month, I was desired to see John Guest, a delicate boy, aged five years. On inspecting the fauces, the soft palate was found to be of a deep red colour, and the tonsils and uvula were enlarged and covered by a false membrane; the sub-maxillary glands were painful and very much swelled; bowels confined. On the following day the state of the patient was but little altered. On the third day the false membrane on the tonsils and uvula had not extended, but was become thicker and of a brown colour, and the breath had a most offen-

sive odour. On the sixth day no trace of the false membrane remained, and the breath had lost its fœtor.

'The two last cases—those of Julia Bayliss and John Guest—were examples of plastic angina; the other cases that occurred about the same time were probably of a similar kind. Taken together, they show the existence of an epidemic affection of the mucous membrane of the fauces, which was inflammatory, and prone to terminate in the formation of membranous concretions. Almost all the cases were complicated with measles.'

Single cases of diphtheria occurred in the wards of St. Thomas's Hospital, in the years 1852 and 1853, of which the following record is taken from papers by Dr. Bristowe:*

The first case, that of a male, J. P., aged thirty-five years, was admitted into hospital on June 29, 1852, for psoas abscess. He went on under a tonic regimen until October 13, when, probably on account of croupy symptoms, the treatment was changed, antiphlogistic remedies being applied. On the 15th, a blister was applied to the throat, and on the same day he died. On examination after death, the tonsils were healthy, but the surface of the pharynx behind them was covered by a thick, loosely-adherent, white, softish material, which extended in large quantities half-way down the œsophagus, and studded the remainder of the tube and a small portion of the stomach near the cardiac orifice in the form of aphthous patches. The mucous membrane of the pharynx and upper half of the œsophagus was much ulcerated; that of the lower half of the œsophagus congested, and in places excoriated. The upper half of the larynx was loaded with a similar deposit, and its mucous membrane was œdematous and ulcerated. The deposit under the microscope appeared to consist almost entirely of epithelium mixed with fragments of fibrillated material and extraneous matters accidentally present.

Another case, that of a maid-servant, aged twenty-two years, was admitted into hospital early in February, 1853, for acute pulmonary disease, and appears to have gone on well, as she was soon put upon tonic treatment. On the 12th March, a sudden change of treatment, indicative of some inflammatory affection of the throat, was made, and she died on the 24th.

'At the post-mortem examination the mucous membrane of the pharynx, fauces, and base of the tongue was covered by a layer of tough, dirty greyish lymph, between a half and a quarter of a line thick. Its free aspect was irregular, fissured, and in places flocculent. It adhered pretty firmly to the subjacent mucous surface, which was congested, and here and there excoriated. It ceased gradually at the

* *Transactions of the Pathological Society of London*, vol. x., pp. 333, 334. *Medical Times and Gazette* (Aug. 20th, 1859), vol. xl., p. 181.

lower part of the pharynx, and the œsophagus was healthy. Both surfaces of the epiglottis, and the rest of the mucous membrane of the larynx, were similarly enveloped in a layer of adherent lymph, which was prolonged into and filled the sacculi laryngis. The mucous membrane was congested and much thickened. There were a few patches of lymph in the trachea. The membrane presented under the microscope a fibrillated structure, mixed with epithelium and nuclear bodies. Pleuræ healthy. Lungs of moderate size, but firmer and heavier than natural. They were congested, and, on close examination, presented a peculiar mottled aspect, owing to numerous patches of a dark colour being scattered uniformly and thickly throughout the substance of the organs, but separated from one another by a network of lighter and more healthy looking tissue. The solid patches were small (about the size of one or two lobules each), airless, granular, and in some instances as black as pulmonary clots. They were observed microscopically to consist of air-cells, filled with a coherent mass of nuclei, having a close but not perfect resemblance to pus. The bronchial tubes contained much frothy fluid. The pericardium and heart were healthy.*

In 1851 or 1852, cases of diphtheria were seen at Barton-under-Needwood, by Dr. Webb, now of Wirksworth, in Derbyshire, and by Mr. Birch. In a communication with which the latter gentleman has favoured me he writes that, about the time above mentioned, he saw several cases of diphtheria presenting the characteristic false membrane in the fauces and pharynx. There were at least three fatal cases, in two of which the bodies were examined after death. The false membrane in the pharynx was found to extend through the glottis, down the wind-pipe, and throughout the larger bronchial tubes.

I have obtained much oral evidence of the occurrence of sporadic cases or limited outbreaks of diphtheria, in several parts of the country, anterior to the present epidemic. Thus, Mr. May, of Malden, informs me that he saw a case at Danbury, in Essex, twenty years ago, which he and another gentleman who saw it with him, agreed in considering an example of the disease described by Bretonneau. Mr. Lambden, of Coningsby, has seen a case or two in that neighbourhood every year since he commenced practice; he also informs me that there are traditions among the country people in his neighbourhood of cases exactly similar to those of the present epidemic as long ago as twenty years. Dr. Keyworth, of Birmingham, saw cases at Sittingbourne, in Kent, in 1845, and Dr. Russell, of the same town, saw a case in Herefordshire, in 1848 or 1849. About the same time, Mr. Cooper, of Cromer, saw a few cases in a marshy district, near Yarmouth, where he then practised.

As has so often been observed of other epidemic diseases, the general

* *Medical Times and Gazette* (August 20th, 1859), vol. xl., p. 181. *Transactions of the Pathological Society of London*, vol. x., p. 332.

epidemic which has prevailed during the last three or four years, was preceded by a few dropping cases here and there. Dr. Wade saw a case in the Birmingham General Hospital in 1854; three well-marked cases were seen at Cork, by Dr. Fleming, at that time Professor of *Materia Medica* in the Queen's College, in 1856; and Dr. Cammack, of Spalding, and Mr. Falls, of Bournemouth, each saw a single case about the same time; that seen by the latter gentleman having occurred at Hampstead, in Middlesex.

Mr. Dodge, of Lifton-on-the-Tamar, in Cornwall, informed my friend Dr. Sanderson, that about twenty-four cases occurred in the neighbourhood of that village, in 1852. The epidemic must have been singularly mild, as none of the cases proved fatal.

An epidemic of malignant sore throat, which proved extensively fatal to children, occurred at Ashford and the neighbourhood in 1817. It was never accompanied with any eruption, and differed from scarlet fever in the insidiousness of its onset and the absence of febrile reaction. A medical practitioner now living at Ashford, who himself suffered from the disease, and lost a brother and two sisters by it, describes the condition of the fauces as identical with that of diphtheria.*

It would probably be an easy matter to multiply such facts by further inquiry, but those already related will suffice to show that, although new in an epidemic form to the existing generation, diphtheria has, from time to time, appeared as a sporadic disease.

The tendency to be limited to particular districts, or even to particular houses, is a remarkable fact in the history of diphtheria. Sometimes while epidemic sore-throat of a milder kind has prevailed all around, cases of severe character, attended by exudation, have been confined within a comparatively narrow area; at others, the milder as well as severer cases have, in certain districts, been confined within very restricted limits. This peculiarity was observed by Bretonneau, who informs us that the epidemic of La Ferrière did not extend beyond that hamlet. The limitation of the epidemic to a particular district of Christchurch, Hampshire, has already been mentioned in a former page. A similar history attaches to the epidemic at Dursley, in Gloucestershire. A group of three cases occurred at the village of Cam, about a mile from the town of Dursley, in February, 1858. Early in 1859 there was another group of five cases in the same village, and in the following June a general outbreak of diphtheritic sore-throat, which was almost entirely confined to the village; for out of 113 cases attended by Mr. Leonard, the Union Medical Officer, 101 resided in the parish of Cam, and only twelve belonged to the rest of his district, which includes the town of

* *Second Report of the Medical Officer to the Privy Council*, p. 244. London, 1860.

Dursley. One of the earliest groups of cases during the recent epidemic was the little outbreak in Whaplode Drove, Lincolnshire, in July, 1856, which has already been referred to, and was limited to that village.*

The occasional limitation of diphtheria to particular dwellings, as if the houses themselves were the source of infection, is even more remarkable. Thus, in the case of a family at Spalding, of which mention has already been made, every member of the household—parents, children, governess, and servants—suffered from diphtheria in November, 1858; another female servant, subsequently engaged, was attacked by the disease in the same house in March, 1859.

An entire family was swept away by the epidemic at Strouden, near Throop, in Hampshire. The house was well conditioned, pleasantly situated, and there was nothing either in the house itself or its immediate neighbourhood which could be supposed to account for the calamity which befell its inmates, all of whom perished, but at different periods. The first death happened on March 15th, 1859; a second on June 9th. I visited the house in the first week of August, when the other members of the family, five in number, were in good health; but I have been subsequently informed that all died of diphtheria before the close of the year.† Dr. Gull relates some cases of a similar kind which came under

* Since the above was in type, I have had the opportunity of investigating an outbreak of diphtheria in the Hitchin Union. The disease was uncomplicated diphtheria, and proved fatal, sometimes by the accession of croup consequent upon the extension of the disease into the larynx and trachea, at others by exhaustion. The earliest cases, five in number, occurred in a lone farm-house in the parish of Stevenage, in August, 1859. Three of them proved fatal, and the disease then disappeared, no other cases having been seen in the neighbourhood until July, 1860, when the disease broke out in the parish of Knebworth, at the distance of two miles from Morley's Farm, where it had proved so fatal the previous year. Between the beginning of July and the end of September, about forty cases occurred among a population of less than three hundred persons; and of these eleven or twelve have proved fatal. The remarkable points in the history are, that the disease was, on the first occasion, confined to a single house in the parish of Stevenage, and that on the second it has hitherto been restricted to the parish of Knebworth; the surrounding parishes (a mild case in Codecote excepted) having altogether escaped.

† Six cases of diphtheria, of which two were fatal, are reported by Dr. F. Ogier Ward in the *Pathological Transactions*. All occurred in the same house, which is large, roomy, well drained, and has a south aspect. The two first cases were sisters, as were also the four latter, and all were delicate children. There was no eruption in any case, nor any other symptoms indicative of scarlet fever or of any peculiar exciting cause. The two first cases occurred in November, 1857, the four latter between the 8th of April and the 2nd of May, 1858, and no similar cases took place during the interval in the house or its vicinity. In each attack there were other children in the house, who remained unaffected, though no very rigid separation was enforced at first.—*Transactions of the Pathological Society of London*, vol. ix., p. 217.

his notice. In three different houses, after a child had died of diphtheria, the rest of the family were sent from home, and remained absent until all danger from infection was supposed to have ceased. In each instance they remained well during their absence, but, on their return home, the disease reappeared, and fatally.*

* *Second Report of the Medical Officer to the Privy Council*, pp. 297, 298. London, 1860.

CHAPTER V.

NON-IDENTITY OF DIPHThERIA AND SCARLET FEVER.

CASES of diphtheria and scarlet fever have very frequently been intermingled in the same place. This occurred at Leek, in Staffordshire, at Tattershall Thorpe, at Brentwood, Maldon, Belper, Wirksworth, Derby, Dursley, Christchurch, Spalding, Horncastle, Birmingham, Dudley, Wolverhampton, West Bromwich, Nantwich, North Walsham, Coltishall, and other places during the present epidemic. It is also evident, on a careful study of their writings, that the same intermingling of cases of diphtheria and scarlet fever existed in the epidemics described by Drs. Fothergill and Huxham about the middle of the last century, and that then also, as more recently, the ordinary angina of scarlet fever often assumed a diphtheritic character. Sometimes cases of diphtheria and scarlet fever have even been intermingled in the same family, or diphtheria has appeared in persons who had been in communication with patients suffering from scarlet fever. Mr. Chavasse, of Sutton Coldfield, mentioned to me a case of diphtheria under his care, which occurred in a house simultaneously with two cases of scarlet fever. It exhibited the characteristic exudation of diphtheria upon the mucous membrane of the fauces, but had neither the red injected tongue, the rash, nor the subsequent desquamation of the skin peculiar to scarlet fever, from which disease the patient had not previously suffered. The following group of cases occurred in the practice of Mr. Duncalf, of West Bromwich, and their history is abridged from a report with which he has kindly favoured me.

Thomas Roberts, aged thirty-six years, was seized, October 1, 1857, with alternate shivering and flushing, followed by vomiting and fever. When seen on the following day, the skin was very hot, the face flushed, and he complained of head-ache and of uncomfortable sensations in the stomach. The pulse was 100, full; urine scanty; bowels costive; made no complaint of sore-throat. On the evening of the third day a sudden and alarming change occurred. His body was bathed in perspiration; his breathing irregular; pulse under 60; and there was the most profound collapse. He complained of pain and uneasiness in the throat; and the tonsils, uvula, and pharynx were covered

with layers of fibrine, capable of being detached, leaving a reddened abraded surface below. The sides of the cheeks and the palate were studded with minute red points, on many of which were white specks, the coalition of which appeared to produce the coagulum. This condition of the throat and mouth, and the extreme prostration, lasted for two or three days, each day appearing to add to the thickness of the false membrane. The patient then improved under the free use of stimulants, nutriment, and quinine. The pulse, though still under the healthy standard, became more frequent, and the skin warmer. The perspiration diminished, and although the throat still remained coated, the membranous exudation began to come away piecemeal, leaving the subjacent mucous surface slightly ulcerated. It was fully a year before this patient entirely recovered from the effects of his illness.

On October 7, while the above-mentioned patient was ill, a child, aged four years, residing in the same house, had an attack of well-marked scarlet fever, without dangerous complication; and on October 15, a second and younger child also had milder scarlet fever. Both these cases were followed by dropsy.

Two miles from the residence of Thomas Roberts, lived his brother and sister, aged respectively twenty-one and eighteen years. They had constant communication with the patient during his illness. On October 12, the sister had scarlet fever, attended by no unusual symptoms; and a fortnight later, the brother had a well-marked attack of diphtheria, less severe than that of his brother, but accompanied by great prostration. The membrane was generally distributed over the throat, especially the tonsils and fauces, but did not seem to increase by additional exudation from below; he slowly recovered.

This frequent concurrence of scarlet fever and diphtheria as epidemics, in the same place and at the same time, and perhaps still more the frequency with which a diphtheritic character has been engrafted, so to speak, on to scarlet fever, has sometimes led to the supposition that these diseases are essentially the same, or, in other words, that diphtheria is but a modified form of scarlet fever, unaccompanied by the scarlet rash.

For some time after the appearance of diphtheria, I was myself disposed to hold this opinion, but careful observation and more ample experience have satisfied me that, notwithstanding their frequent concurrence in the same place, and their occasional coincidence in the same individual, diphtheria and scarlet fever are distinct diseases. To render this more evident (for much confusion exists on the subject), it will be well briefly to consider the points in which they resemble each other, before stating the reasons which appear to forbid our considering them as identical.

Setting aside the occasional but rare occurrence of scarlet fever with-

out sore-throat, the two diseases agree in the fact, that both are attended by angina; sore-throat being in diphtheria always, and in scarlet fever frequently, the most prominent symptom. Cases of vaginal diphtheria have, indeed, been reported, in which the throat affection was said to be absent; and I have myself seen cases of diphtheritic exudation upon blistered surfaces unattended by the characteristic affection of the fauces; but I should scarcely consider such to be cases of diphtheria, a term which should be applied only to cases in which the mouth, fauces, or œsophagus are the seat of exudation.

The appearance of the throat in certain forms of scarlet fever is very similar to that of diphtheria, the crimson or claret-coloured fauces being apt to exhibit patches of grey-coloured exudation, which are sometimes mistaken for sloughs, but which are in reality very analogous to diphtheritic membrane. And this exudation sometimes extends into the nares and œsophagus, and occasionally, but more rarely, into the larynx.

The only other point of resemblance between these diseases to which I need refer, is the frequent occurrence of albuminuria both in scarlet fever and diphtheria. These are, in brief, the chief points of resemblance which have led to the confounding of the two diseases; and, as in very malignant forms of scarlet fever the rash is sometimes very evanescent, and at others entirely absent, and persons who have previously had that disease occasionally suffer from sore-throat without cutaneous eruption, when brought into relation with patients suffering from scarlet fever, it cannot be surprising, considering the occasional similarity of the throat affection in the two diseases, that diphtheria should have so frequently been considered as only a modified result of the scarlet fever poison.

It is an acknowledged fact, that persons who have once suffered from scarlet fever enjoy a comparative immunity from future attacks of that disease. When a second attack does occur, it is most frequently unattended by rash, or severe affection of the throat, and usually, at least, runs a favourable course. These two circumstances in the history of scarlet fever—the infrequency of a second seizure, and its usually mild character when this happens—appear to contradict the belief that diphtheria and scarlet fever are essentially identical. That they possess some striking analogies has already been admitted; but if they proceeded from the same cause, we should naturally expect that persons who had previously undergone one form of the disease would either be exempt from susceptibility to the other, or that, at least, the operation of the poison would be modified, as is generally seen to be the case in second attacks of scarlet fever and the other exanthematous diseases. But this is not the case; on the one hand, persons who have previously had either scarlet fever or diphtheria are not rendered thereby the less susceptible to the other; and, on the other hand, unlike scarlet fever, a second attack of which comparatively seldom occurs, diphtheria very

frequently attacks the same person a second and sometimes even a third time within a few months, and the subsequent seizures, instead of being milder, have sometimes proved more severe than the first. This fact seems to have so important a bearing on the question of the non-identity of the two diseases, that it may be well to illustrate it by several examples.

A. B., a female aged thirteen years, had scarlet fever whilst on a visit in a house five miles from Leek, in Staffordshire, and was attended by my informant, Mr. Cooper. The attack was a severe one, but she perfectly recovered from it, and six weeks afterwards returned home to Leek, where diphtheria was then prevalent. A fortnight after her return, and therefore eight weeks after her perfect recovery, four of her brothers and sisters were seized with scarlet fever. Whilst they were ill of this disease, A. B. took diphtheria, of which she died.

I am also indebted to Mr. Cooper for the record of two cases of scarlet fever in Mill-street, Leek, attended by him in 1858; one of these patients also has since died of diphtheria after a considerable interval.

Several cases of diphtheria occurred in a large farm-house at Penn, near Wolverhampton. They were well-marked cases; for I saw some of them whilst they were still suffering from the impaired vision and hoarseness so characteristic of convalescence from diphtheria. The patients had all had scarlet fever in 1851. A second group of cases, three of which proved fatal, that occurred in connexion with the cases at Penn, had all suffered from scarlet fever nearly a year before they had diphtheria.

A similar history attaches to the following cases, which clearly show that the pre-existence of scarlet fever affords no immunity from diphtheria:—

A merchant's family residing in Spalding, consisted of himself, his wife, six children, a governess, and two servants. The wife took diphtheria on October 30th, 1858; on November 3rd, two children were attacked; on the 5th, a third; on the 6th, the father fell sick; on the 13th, a female servant; on December 1, the other servant; the governess also was seized with the disease. The cases were all attended by the characteristic exudation, and all recovered. Late in November, two boys of the same family, who had escaped diphtheria, were attacked by scarlet fever. The first fell ill in another house, whither he had been sent to avoid the complaint then prevailing at home. The second case occurred at home, but the child had been in communication with his brother. Both perfectly recovered, but between seven and eight weeks after the complete recovery of the second boy from scarlet fever, he took diphtheria. Of the other cases, the three eldest children had, at a former period, had scarlet fever.

Of twenty-four cases of diphtheria at Heybridge Basin, near Maldon,

into which I made a personal inquiry, eight had certainly had scarlet fever at some antecedent period. There was reason to suppose that some of the others had likewise had it, but the evidence on this point was not quite conclusive. Of the remaining cases eleven had certainly not previously suffered from scarlet fever.

E. C., of Spalding, had diphtheria on November 17, 1858, from which she had quite recovered, when, on February 8, 1859, she was taken with scarlet fever.

Of two fatal cases of diphtheria in a parsonage in Norfolk, one had, the other had not, previously had scarlet fever. I am indebted for the particulars of the following cases to Mr. Oliver Pemberton, of Birmingham. Two children (relatives of Mr. Pemberton's) were ill at the same time. The one, a girl, aged nine years, had well-marked diphtheria, characterized by fibrinous exudation on the throat, and attended by great depression and quick pulse. There was neither the redness of tongue, the rash, nor the subsequent desquamation usual in scarlet fever. She recovered. The other, a boy aged seven years, suffered from what was termed malignant sore-throat. The throat was ulcerated, the ulcers were excavated, coloured with a yellow secretion, and offensive. There was also an offensive and copious discharge from the nose and mouth, and the tongue was much furred. Symptoms of laryngeal affection supervened on the third day, and proved fatal after thirty-six hours; the child dying asphyxiated, but able to swallow readily to the last. Neither of these children had previously had scarlet fever. The other members of the family entirely escaped. Of a family of cousins, five in number, who resided half a mile from the last group, but had maintained continual intercourse with the sick household, three had severe ulcerated sore-throat at the same time with the others, but the existence of exudation is not mentioned. These three last children, who had sore-throat in January, 1858, were seized with scarlet fever in the following December.

It may thus be affirmed, on the one hand, that the previous existence of scarlet fever, whether recent or more remote, does not in any respect lessen the susceptibility to contract diphtheria, nor modify the progress of the disease; and, on the other hand, that a previous attack of diphtheria affords no protection from the scarlet-fever poison. Unlike scarlet fever, which is always an acute disease, running a very definite course, diphtheria is sometimes of protracted duration, and occasionally becomes almost chronic. Moreover, a first attack affords no protection against future seizures.

On March 20, 1859, I visited a person, aged twenty-eight years, in the neighbourhood of Spalding, who had been suffering from diphtheria for eight weeks. There was still a white filmy patch of exudation on either side of the arch of the fauces, and likewise a spot of opaque white false membrane on either side of the posterior wall of the pharynx.

About the same time I visited, with a medical friend, a lady who, having had diphtheria in September, 1858, after her recovery went out one raw evening, caught cold, felt the throat uncomfortable, and suffered a relapse of the complaint. At the time of our visit, nearly six months after the commencement of the illness, the posterior fauces were coated with a milk-white pellicle, through which some small ramifying vessels could be faintly observed. There had been a constant succession of these pellicles from the time of her taking cold; and so susceptible was her throat, that every raw day brought on an aggravation of discomfort. The primary attack had been very severe.

I have notes of several cases of relapse soon after the primary attack, but the following will suffice to show that one attack of diphtheria insures no immunity from the disease in future. In one of these cases, which occurred in the practice of Mr. Lambden, of Coningsby, the first attack of diphtheria occurred in July, 1858; the second, after a long interval of good health, in the following January. The second case is that of a delicate little girl, aged ten years, who had an attack of diphtheria in July, 1858. After perfect but slow recovery from this first attack, she had a second in October, from which she rallied more quickly; and, finally, a third, and more severe attack in June, 1859. A third case, which, like the first, occurred in the practice of Mr. Lambden, is that of a little girl, named Chapman, four years of age, who had diphtheria at Mareham, shortly before Christmas, 1858. In April, 1859, long after she was perfectly recovered from the first illness, she again fell ill with diphtheria, of which disease she then died. Dr. Gull, in his communication to Mr. Simon, already quoted, says:—‘I have known the same patient suffer with diphtheria, and, after eleven months, have the malady a second time.’*

I have notes of other cases in which a second attack has occurred, after a sufficient interval to prove the independence of the successive seizures; but those already related sufficiently show the important distinction that exists in this respect between diphtheria and scarlet fever.

In my opinion, the circumstance that the course of neither scarlet fever nor diphtheria is modified in patients who have previously suffered from the other of these complaints, taken in conjunction with the tendency of diphtheria to occur a second and even a third time in the same person, and to be engrafted upon several other disorders, is conclusive of their pathological independence. But there are other reasons which strengthen this conviction, such as the uniform absence of scarlatinal rash in pure diphtheria, extensive epidemics having occurred in which not a single case of scarlet fever has been seen.

Albuminuria, an occasional symptom of both, occurs at very different

* *Second Report of the Medical Officer to the Privy Council*, p. 304. London, 1860.

stages of these diseases. In scarlet fever it rarely or never occurs until the primary and characteristic stage of the disease is past. In a series of cases of scarlet fever, in which the urine was carefully examined from day to day by myself, with a special reference to this question, I found albumen during convalescence in nearly all, but as early as the tenth day from the appearance of the rash, in only a single instance; more frequently it was not met with until the twelfth or thirteenth day. In only one of the cases—that of an adult—was the albuminuria attended by anasarca. The albumen was sometimes in very small quantities, and then did not usually last longer than three or four days; but it was found much oftener than I had expected, for the cases were taken indiscriminately, and eight of them were in the same house. In diphtheria, on the contrary, albuminuria is of less frequent occurrence (if the above-mentioned cases are to be received as an index of the frequency of its existence after scarlet fever); and, when it does occur, it is at an earlier period of the disease, sometimes within a few hours of the commencement of the illness. I have notes of a case in which I found albumen in the urine thirty-six hours after the first symptoms of indisposition, and before the exudation had attained its maximum intensity.

The extension of inflammation into the larynx, common in diphtheria, is a rare event in scarlet fever, seeing that, in several hundred cases of this disease which have been under my care, I have only known it to occur twice. Then the two diseases differ very materially in their sequelæ. Anasarca, a common sequel of scarlet fever, has but once, and that a doubtful case, fallen under my notice after diphtheria. Neither have I seen after diphtheria the peculiar kind of arthritis which sometimes follows scarlet fever. Suppuration of the glands of the neck, very common after scarlet fever, is at least rare after diphtheria. Pericarditis and chorea, very rare but occasional sequelæ of scarlet fever, have not, so far as I have learned, been observed after diphtheria.

Besides the absence after diphtheria of the well-known sequelæ of scarlet fever, the former disease is succeeded by sequelæ of a character peculiar to itself, and such as have not been observed to follow scarlet fever. These are, partial paralysis of the muscles of deglutition and voice, impairment or disorder of vision, paraplegia, hemiplegia, partial paralysis of the upper extremities, numbness of the hands or feet, tenderness, pricking or tingling of the extremities, and gastrodynia. Then, lastly, the occurrence of diphtheria on other parts of the body, as on abrasions of the skin or wounds, or on the pudenda, has no parallel in scarlet fever. When to these differences we add that the anæmia which soon occurs, and for a long time subsequently follows diphtheria, is more intense than in any other acute disease with which I am acquainted, cholera not excepted, there can be little hesitation in accepting the conclusion that diphtheria and scarlet fever are not the same disease.

CHAPTER VI.

HUMAN AND BRUTAL DISEASES COINCIDENT WITH DIPHThERIA.—RELATION OF PLACE, AGE, SEX, AND SOCIAL POSITION TO THE EPIDEMIC.

THE fact that diphtheria has so often manifested a decided tendency to be restricted to particular places, and to cling, as it were, to particular houses, would seem to indicate either that it spreads exclusively by communication, direct or indirect, between the sick and the healthy, or that it is an endemic rather than an epidemic disease, dependent rather upon some condition of persons or places than upon any generally distributed cause. And yet, on the other hand, its wide-spread prevalence in both the earlier and more recent visitations seems to bring it fairly within the category of epidemic diseases. In truth, however, it is scarcely possible to determine with accuracy the distinction between epidemic, endemic, and contagious diseases. There are epidemic diseases which, like cholera—in this climate at least—appear to require some local peculiarity for their development. There are endemic diseases which, like ague during the last two or three years, assume, from time to time, in consequence of peculiarity of season, almost an epidemic character. There are times when contagious diseases, such as scarlet fever and smallpox, acquire so great a tendency to spread that they become really epidemic. Under whichever of these classes diphtheria may ultimately be ranked, whether it be an endemic or an epidemic disease, or whether, being endemic or epidemic, it be also contagious, it is at least important to inquire into the local and personal circumstances which have been associated with it, and especially to determine the question of its communicability from the sick to the healthy. Further investigation, and especially the collating of careful observations, made in a variety of places, and, if possible, in several successive epidemics, may, indeed, be necessary before we can venture to pronounce a positive opinion on these questions. Meanwhile it may be useful to put on record even the scanty information I have been able to procure either from my own personal experience or from friends; it may at least do good service by showing what is necessary to complete the history of the disease.

My attention on these points has been especially devoted to inquiring into the coincident existence of other diseases either of the human subject

or the lower animals with diphtheria ; into the nature of the situation as to elevation, exposure, soil, and drainage ; as to dryness or moisture, as to urban or rural, as to barren or cultivated ; and into the cleanliness, construction, or overcrowding of houses in places where diphtheria has prevailed ; into the age, sex, habit, and social position of the persons attacked by it ; and, lastly, into the indigenous or imported origin of the disease itself.

In addition to the already mentioned existence of a tendency to sore-throat during the last four years, this period has been marked by the unusual prevalence of several other diseases. Scarlet and typhoid fevers, in particular, have prevailed extensively throughout the country ; and ague has not only been more frequent in the ordinary places of its abode, but has reappeared in districts which it had long abandoned, or where it had not previously been known within the memory of man. Thus ague was said by the medical officer of the western district of Christchurch to have been more common of late than for many previous years. Always more or less prevalent in the fens of Lincolnshire, it had been unusually rife around Spalding in the years 1857 and 1858, and at Coningsby in 1858. It was more frequently in the neighbourhood of Horncastle during the same year and the early part of 1859, than had been known for the forty preceding years. Ague had also appeared about the same time in parts of Norfolk, where it had been long unknown. Mr. Edwardes, of Wolverhampton, noted that bronchial affections, erysipelas, boils, carbuncles, and other skin diseases, had been more prevalent during the last two or three years than at any time within his recollection, and, as he had been for many years in very extensive general practice, his opportunities of observation were unusually good. A furuncular epidemic lasting eighteen months also immediately preceded the sore-throat epidemic at Sudbury. Erysipelas has very often coincided in prevalence with diphtheria. Dr. Nicholson, of Redditch, informs me that erysipelas of severe and unmanageable character commenced, increased, and declined simultaneously with diphtheria in that place. An unusual prevalence of erysipelas was also observed by some of the medical practitioners of those places to have occurred at Birmingham, Brentwood, Tolleshunt D'Arcy, Maldon, Wirksworth, Derby, Dudley, Wolverhampton, and Leek, during the epidemic of diphtheria. In several of these places puerperal and typhoid fevers were also observed to be unusually frequent, as was also, especially in Birmingham and Dudley, a tendency to hæmorrhagic affections. An exanthematous disease, called by the medical men *roseola*, resembling very mild scarlet fever unattended by sore-throat, preceded the appearance of diphtheria in Christchurch ; and Dr. Heslop, of Birmingham, speaks of the frequency, during the recent epidemic of scarlet fever in Birmingham, of cases in which the eruption exhibited a speckled appearance

resembling the disease called *Röthlen* by the Germans, and, in this country, considered by some writers as a hybrid of scarlet fever and measles.

While the period during which diphtheria has prevailed in this country has thus been characterized by an unusual prevalence of certain diseases in the human subject, as well as by the tendency of other diseases to be modified in character by the prevailing epidemic, it is interesting to note that some of the domestic animals have likewise suffered from peculiar and uncommon forms of disease. A new kind of epidemic, affecting the mouth, lips, and nose with apthous ulcerations, and the teats and feet with vesicles and ulcerations, hence called 'the eruptive disease,' or 'the foot and tongue disease,' appeared among the cattle of this country about the year 1839. This disease had almost entirely disappeared until recently, when it has again prevailed very extensively, and often simultaneously with diphtheria. An epidemic in which the lungs are chiefly implicated, called pulmonary murrain, or 'lung disease,' and perhaps more accurately named by Professor Gluge, of Brussels, 'exudative pleuro-pneumonia,' likewise broke out a year or two later than the preceding, among the herds of this country, and has never entirely disappeared, although during the succeeding twenty years there have been some periods when it has very greatly declined, and others when it has prevailed in a more epidemical manner. One of the latter periods began in 1857, and still continues.

What renders these cattle epidemics peculiarly interesting in connexion with the present subject, is the fact that, although at the time of their appearance, twenty years ago, they were quite new to the existing generation of dairymen, farmers, and cow-doctors (there being no record of their existence in this country during at least the preceding half century), pulmonary murrain, preceded by an eruptive murrain, prevailed about the middle of the last century, just before the outbreak of diphtheria which then occurred. Towards the close of the first half of the century, when Fothergill, Cotton, Huxham, Starr, and other writers, were describing the diphtheritic epidemic then prevalent, an anonymous member of the College of Physicians, and Drs. Brocklesby, Hurd, and Layard, wrote their accounts of the murrain then prevailing epidemically among horned cattle. This may, indeed, have been a mere coincidence, but that the appearance of the eruptive and pulmonary diseases among cattle, and of diphtheria in the human subject, are in some measure attributable to the operation of a common cause, seems more than probable, seeing that several of the older writers on *morbus strangulatorius* mention its coincidence with certain diseases among cattle. Thus, Ghizi says there was a great resemblance between the epidemic angina which prevailed at Cremona in the years 1747 and 1748, and a disease affecting the respiratory passages at that time prevalent among oxen. Dr. Wall, speaking of the epidemic in England about the middle of the

eighteenth century, says, 'This disease has so great a resemblance to the epidemic sickness amongst cattle, that I am persuaded it is of the same nature.*' Severinus, who wrote in the seventeenth century, also mentions that a great mortality among cattle preceded the appearance of malignant sore-throat; † and M. Malouin, in his account of the epidemic diseases observed at Paris in 1746, says that the disease among cows had already appeared in France when children were attacked by epidemic sore-throat. ‡ The same reporter, in his remarks upon the diseases of October, 1748, when this form of epidemic sore-throat ('*maux de gorge gangrénaux*') was again prevalent, says it had been noticed that oysters disagreed with every one who ate them during the month, especially before the weather became cold. §

Both eruptive and pulmonary murrain have in many districts prevailed contemporaneously with diphtheria. I have myself ascertained this fact with regard to London, from some respectable butchers in extensive business, and, less directly, through professional friends with reference to other places. Thus, Mr. Williams and Mr. Leonard, of Dursley, inform me that 'mouth and hoof disease' (another name for eruptive murrain) was prevalent among cattle and pigs in that neighbourhood during the spring of 1859, about the time that diphtheria prevailed at Cam. || At Birmingham several of the medical men informed me, on the authority

* *Gentleman's Magazine*. Nov. 1751, p. 501.

† 'Hunc annum Christi supra 1618, in nostram gentem ingressum antecessit boum annua lues quâ mirum in modum strangulati concidebant.'—*Severinus*.

‡ 'La maladie des vaches avait déjà commencé en France lorsque les enfants furent attaqués à Paris de cette espèce d'esquinancie, comme elle avoit commencé en Italie long temps avant que l'esquinancie des enfants parût à Naples.'—*Mémoires de l'Académie Royale des Sciences*, p. 156. 1745.

§ *Mémoires de l'Académie Royale des Sciences*, p. 562. 1748.

|| The following interesting fact is taken from the information on diphtheria collected by Dr. Sanderson, published in Mr. Simon's report. Whether the animals took the disease by contagion in consequence of eating the discharges from the throat of persons ill of diphtheria, or not, is of little consequence as regards the present question.

'During the prevalence of diphtheria at Hertingfordbury, a similar affection was observed among swine. Three sows, which were the subjects of it, were attacked severally on the 19th, 20th, and 22nd of December, 1858. The sty inhabited by these animals was contiguous to a cottage in which cases of diphtheria were at that time under treatment; and it was suggested that they might have swallowed the discharges or concretions from these patients, which were thrown on a piece of waste ground to which the animals had access. The first sow attacked was observed, on the day that she died, to have enormous swellings of the submaxillary glands, and to be unable to swallow. She had been apparently in health the previous day. An anatomical examination was made next day in presence of Mr. Elliee, of Hertford, who states that there was intense redness and swelling of the fauces, the mucous membrane being covered by a characteristic membranous concretion. In one of the animals death was preceded by

of the butchers, that 'mouth and hoof disease' and pulmonary murrain had been very common among cattle during the year 1858 and the early part of 1859. At North Walsham and Coltishall, in Norfolk, and at West Bromwich, in Staffordshire, 'mouth and foot disease' likewise prevailed among cattle simultaneously with diphtheria in the human subject.

Mr. Duncalfe, of West Bromwich, has favoured me with a memorandum in which he states, on the authority of a farrier, that a disease attended with cough, thirst, discharge of mucus from the mouth and nostrils, and inflammation of the lungs and trachea, apparently, therefore, a kind of influenza, had been very prevalent, and often fatal among horses, in that neighbourhood since 1857. A similar disease appears to have prevailed in the vicinity of Tallehshunt D'Arcy, in Essex; for Dr. Walker writes that a veterinary surgeon had informed him that a low form of influenza, very often rapidly fatal, attended with great difficulty of swallowing and refusal of food, had been common among 'mammals.' Dr. Morris, of Spalding, also informs me that a disease, accompanied with discharge from the nostrils and fœtor of breath, was very prevalent among cattle during the epidemic of diphtheria in the human subject. He had also himself seen a horse affected with swelling of the glands about the jaw, in which the mouth and throat presented an appearance similar to that of persons suffering from diphtheria. This horse died; but three others, diseased in the same way, recovered. Influenza was also prevalent among horses in the vicinity of Wolverhampton, about the time when the human population was suffering from diphtheria.

Diphtheria has not existed exclusively in any particular kind of locality. It prevailed in Birmingham, Wolverhampton, and Leek—places situated on high ground, forming, as it were, the backbone of England; in Hanley, said to be the most elevated town of its size in England; in villages on the ridges near Launceston, among which some of the smaller tributaries of the Tamar take their rise; in the flat parts of Sussex, Norfolk, Kent, and Essex; and in the fens of Lincolnshire. It prevailed both at Trimingham, the highest point at Norfolk, and in the neighbouring parish of Southrep, a very low and marshy district. It has prevailed both in exposed situations on hills and in sheltered valleys; on the dry, sandy, or gravelly soil of Birmingham and Christchurch, and in the marshes of Essex and Lincolnshire; on the cold clay of Penn and Dudley, and the light dry soil of Hertingfordbury, and of several places in Norfolk; on richly-cultivated soil, and on barren, almost uncultivated moorland; in the most open country, and in the densest towns. But, although this is undoubtedly true, diphtheria has

symptoms of suffocation, the head being thrown violently backwards, and the body rolled from side to side. It is worthy of notice that a number of sucking pigs kept in the same building remained exempt.'—*Second Report of the Medical Officer to the Privy Council*, p. 246. London, 1860.

c/ not prevailed to an equal extent in each of the above districts, having been, upon the whole, most common in places either marshy or otherwise damp, as from the retention of moisture by an impermeable subsoil, or the proximity of water. It is also noteworthy that several of the places where sporadic cases of diphtheria were observed anterior to the last five years, are situated in marshy districts. And yet sometimes whilst drier places have suffered very severely, damp districts in their vicinity have entirely escaped,—a circumstance also noticed by Bretonneau in the epidemics of France. Indeed, it is evident that some other factor besides damp is required for the causation of this disease, seeing that humidity, in every conceivable form and degree, always exists in one place or another; whereas diphtheria had been unknown as an epidemic in this country for three-quarters of a century previous to its recent invasion. Dampness must therefore be regarded rather as an auxiliary than as a principal cause of the disease.

When public attention was first drawn to the increasing spread and fatality of the epidemic, diphtheria was injudiciously and hastily asserted to be caused by the effluvia from decomposing organic matter, an opinion quoted from certain French authorities; but as hitherto no one has been able to point out any particular kind of district as its special birthplace, so have my inquiries and personal observation entirely failed to connect its occurrence with the defective construction of houses, or with the uncleanness of dwelling, imperfect drainage, or any other cause of offensive effluvia. Indeed, this disease has rather prevailed more extensively in rural districts, country villages, and small semi-rural towns, where offensive nuisances are less common and, from the free ventilation, less dangerous, than in populous cities, where such nuisances are more common, and their effluvia are less rapidly dispersed. Some of my informants in the provinces, indeed, suppose the disease to be connected with local sanitary defects; but such opinions have sometimes appeared to me to arise from the fact that the practice of these gentlemen was almost restricted to the poorer classes of the community, residing in the worst sort of dwellings; at others, from the common supposition that disease, especially of the kind called zymotic, is mainly attributable to sanitary defects.

The absence of relation between diphtheria and effluvia is, in a great measure, confirmed by the circumstance that many practitioners whose experience is confined entirely to the wealthier classes, have seen more cases of the epidemic than the union medical officers of the same places. One very acute observer, in large general practice, Mr. Clowes, of Stalham, who had treated about one hundred and fifty cases of diphtheria, stated to me that he had endeavoured to connect the existence of the epidemic with sanitary defects, in the hope of effecting some much-needed local improvements, but that he had completely failed; for he

met with cases as frequently in the best as in the worst-conditioned houses, among his more affluent as among his poorer patients, and quite irrespectively of the presence or absence of local impurities.

I myself visited between thirty and forty houses in the villages of Holdenhurst, Throop, Muscliffe, Charminster, and Redhill, in the union of Christchurch, in which thirty-one deaths from diphtheria had occurred. There had been altogether about seventy-five cases in these houses, which were, for the most part, clean and well-kept. Some of them stand on high ground and in a dry situation; others on low-lying ground near to the River Stour. Some of them were quite free from any kind of uncleanness, either within doors or in the neighbourhood; others had nuisances, such as manure heaps, or pools of foul stagnant water, in their immediate vicinity; but so far as I could discover, there was no marked preference of the disease for one class of residence rather than the other. Thus the first two fatal cases in the district occurred at Redhill, a dry, elevated situation, and in houses near to which there was no discoverable nuisance. Seven fatal cases successively occurred in a clean, well-conditioned, dry, comparatively elevated cottage at Strouden. The cottage stands apart from other houses, was remarkably neat and pretty, with a nicely-tended garden in front, and had no nuisance in its vicinity; and the inmates were subject to no privation, being in comfortable circumstances. Five deaths took place at Muscliffe, a pleasant hamlet, situated on slightly rising ground near the River Stour. Three of the deaths occurred in a clean, well-ordered gamekeeper's cottage, around which no nuisance was observable; and while the epidemic had thus fatally attacked the younger members of this household, the children in two squalid-looking cottages, partially surrounded with filth, at the other extremity of the village, had escaped. Eight or nine cases occurred in two houses at Holdenhurst. In one of them, a clean, roomy, and by no means overcrowded farm-house, four children, aged from sixteen years downwards, died of diphtheria. Their father also had the same disease, followed by its characteristic sequelæ, paralysis of the hands and legs, hoarse voice, impaired vision, and difficulty of swallowing liquids. The site of the house is low, and not more than a quarter of a mile from the river. There was much manure in the farm-yard adjoining the house, but it was not offensive at the time of my visit, which was on a sultry day in August. Not far from this house was a cottage in which also there had been five cases including that of an adult. The house was clean, but less airy and roomy than the other; close to it was a farmyard containing much manure, and on the other side, almost touching the wall of the house, a pond full of filthy, dark, discoloured water, which received the house drainage. Yet all the cases here recovered, although, if offensive effluvia have any influence over the disease, they would have died rather than the others.

Although, perhaps, less conclusive on account of the complication of scarlet fever with diphtheria, the history of the outbreak in Tattershall Thorpe affords no support to the opinion that diphtheria is either necessarily associated with local uncleanness, or that it derives intensity from its presence. Tattershall Thorpe was free from any obvious sanitary defects at the time of the outbreak; the houses were remarkably clean; there was no stagnant water in the neighbourhood; there were neither manure-heaps, pig-styes, nor other causes of offensive effluvia near the dwellings. The houses were neither overcrowded nor built back to back, and were at least tolerably well ventilated. The inhabitants were in comfortable circumstances, exposed to no privation, and considerably above the class of paupers. On the whole, the sanitary state of the place and the condition of the inhabitants were superior to what usually exists in small country hamlets.

At Cam, near Dursley, in Gloucestershire, the epidemic, which was singularly mild, showed no predilection for the inhabitants of ill-conditioned dwellings. The following illustration will show that the epidemic prevailed indifferently in houses of the best and worst description, irrespective of their sanitary condition. Several cases occurred in a row of clean, well-situated houses at Richard's Mill, separated from the mill stream by a space of neatly tended garden ground, about thirty or forty yards in breadth. A second group of cases was seen at a farm-house in Upper Cam. The house itself was in unexceptionable order, but very near to it was a large, stagnant pond, the water of which was brown from the admixture of the drainage from a foul privy, some pigstyes, and a heap of farmyard manure. A third group of cases was seen in a prettily-situated cottage, used as a boarding-school for girls. This cottage stands on elevated, dry ground, and there were no nuisances in its vicinity, nor any local circumstances to which the sickness could be attributed. Amongst the places visited at Cam was a row of cottages inhabited by weavers. There were gardens behind these cottages, and sometimes, but not generally, the privies were in an offensive condition. In the gardens were here and there large tubs sunk in the ground into which the urine from several adjacent cottages was collected to be sold for scouring cloth. Diphtheria did not prevail more commonly or prove more severe in the cottages nearest these local nuisances than in such as were more remote. Indeed, the cases in this row of cottages were of the mildest kind.

At Maldon, in Essex, the epidemic first appeared in some ill-drained, ill-ventilated houses in the lower part of the district inhabited by an indigent, badly fed population; but subsequently attacked persons of a better class, possessed of ample means, residing in good houses, and in the higher part of the town. Heybridge, a damp, low-lying village, barely raised above the level of the river, almost entirely escaped. The

epidemic was very rife at the Basin or Port, a low-lying place, scarcely elevated above high-water mark, and intersected by sluggish ditches, serving as common sewers, into which the sea-water occasionally penetrates at unusually high tides. Except at such times there is not a sufficient flow of water through these ditches to cleanse them, and the stench is said to be almost intolerable, especially in hot weather, to the inhabitants of the adjoining houses. The country around the Basin is marshy, ill-drained, barren, and imperfectly cultivated. I visited several houses in which there had been cases of diphtheria, but it appeared that the character of a dwelling had exerted little or no influence on the disease. In two adjoining houses, each consisting of four very small rooms, two on the ground-floor, two on the first-floor, but so constructed that the light and ventilation of one room on each floor was derived from the other, there occurred five deaths from diphtheria. Each house contained nine inmates, six of whom in the one and five in the other had suffered from the epidemic, of which three of the cases in the former and two in the latter died. The houses were overcrowded and ill-ventilated, and the inhabitants poor; but the situation was not within reach of the effluvia from the ditches, and no striking nuisance existed in the vicinity. In a roomy, well-ventilated house, also out of reach of the effluvia from the ditches, but a little damp, six out of eight inmates had diphtheria, one of them fatally, and all severely. Several were still suffering from the peculiar nervous sequelæ at the time of my visit several weeks afterwards. Lastly, in another clean, well-ventilated, and in all respects well-conditioned six-roomed house, standing remote from all causes of atmospheric contamination, out of four inmates two had diphtheria, one of whom died.

The inmates of badly-constructed, unwholesome, or overcrowded houses were not especially attacked by diphtheria at Southminster, where persons in good circumstances suffered as much from the epidemic as those who endured the privations of poverty. The board of guardians had effected many improvements under the Nuisances Removal Act during the two preceding years, and the district was in a much improved sanitary state at the time of the outbreak. At Witham the epidemic first appeared in an isolated house occupied as a ladies' boarding-school. It was not overcrowded, and its arrangements as regards health were superintended by a medical practitioner fully alive to the value of sanitary precautions, who assures me that the house was in all respects in a wholesome condition when the disease appeared.

Dr. Capron (now of Guildford), who took careful notes of the cases he saw at Spalding, says that the deaths chiefly occurred in the vicinity of the river or of stagnant water. The house in which the disease proved so fatal at Foxearth, near Sudbury, although in other respects salubrious, is surrounded by a moat, separated from the dwelling by the

out-buildings and garden. At Lowestoft the epidemic was observed to haunt a row of newly-constructed, first-class houses, only recently occupied, and therefore, probably, still damp. These facts seem to bear out the inference already deduced from the character of the districts in which diphtheria has chiefly prevailed, that the disease is apt to arise or to be worse in damp situations, and I now proceed to narrate several other cases confirmatory of the same inference.

Two very severe but not fatal cases occurred to children, aged twelve and sixteen years respectively, residing in a first-class house at Water Orton, near Birmingham. The cellars of the house at the time of the illness were flooded with water from the roof, of so foul a smell as to pervade the lower rooms. A case occurred in Dr. Heslop's house at Birmingham in September, 1857, when, from some alterations being made, the cellar was flooded. And a fatal case occurred at the residence of Mr. Schofield of Highgate, near Birmingham, in March, 1858, when, in consequence of an accident to the drains, the cellars were full of water. At Bromford, a damp hamlet on the River Tame, below Birmingham, the disease long continued to linger; and cases were especially observed to occur when the wind blew from the east. It was noticed at Leek that the number of cases increased in damp and foggy weather. I have also remarked, as have likewise some of my professional friends, a greater liability to diphtheria among the inhabitants of recently built houses.

Age is the most powerful predisposing cause of diphtheria, children between the second and twelfth or thirteenth year being the most subject to it. The susceptibility diminishes rapidly after puberty, and is very slight in infancy. Out of 113 cases treated by Mr. Leonard, of Dursley, sixty-three were under ten, and only seventeen above twenty years of age. This quite accords with my own observation, a large majority of the cases I have seen having been those of children. Comparatively few infants have been attacked, but I was told in Birmingham of an infant aged only three months having had the disease, and coughed up a membranous cast of the fauces; and I have myself seen three or four young children under one year of age suffering from the epidemic. Of persons more advanced in life, I have seen a woman of sixty years of age, and a man of nearly fifty, suffering from severe and fully developed diphtheria, besides many as old who had some form of sore-throat without exudation at the time when younger members of the same household were ill with diphtheria. Mr. Leonard took me to see a woman, aged sixty-five years, who was convalescent from the disease. She was still anæmic, but all traces of exudation had disappeared from the fauces, leaving the mucous membrane about the arches of the palate somewhat reddened. Mr. Clowes, of Stalham, had seen a case in a person aged seventy years, and had attended fatal cases in persons aged fifty-eight,

thirty-three, thirty-two, and twenty-two years respectively. Other medical friends have told me of the exceptional occurrence of cases in advanced life. Not only does the susceptibility to diphtheria diminish with the progress of life, but so likewise does the tendency to a fatal result, a greater number of adults than of children recovering in proportion to the number attacked.

The influence of habit, age, and sex upon the susceptibility to the disease still requires much careful investigation. The strumous constitution appears to render persons more prone to suffer from diphtheria, and so also does chronic disease of the throat, especially enlargement of the tonsils, and likewise a tendency to inflammatory sore-throat and quinsy.

It has appeared to me that among the analogies of diphtheria with scarlet fever, is the tendency of certain families to suffer more severely from the disease than others, who, excepting in this respect, are placed under similar circumstances. Many years of observation justify me in making this remark concerning scarlet fever; for I have noticed children of the same family very apt to die from it in successive epidemics, even when such epidemics have been, as regards the rest of the world, of a very different intensity, and when the other circumstances of the patients had been materially altered in the interval. Sometimes the tendency to a fatal result is greater, or may even be exclusively limited to one sex, so that all the male or all the female children of a single family shall be swept away by the disease in successive outbreaks, the children of the other sex passing through it unscathed. It would be premature to form a conclusive opinion on such a subject from the facts observed in one epidemic of diphtheria, but many instances which have fallen under my own notice, or have been reported to me by other practitioners, appear to point in this direction.

Station of life, and the enjoyment of affluence or exposure to the privations of poverty, seem to have exercised but small influence either in predisposing persons to take or to suffer severely from the disease. I have myself attended bad cases in families possessed of every luxury, and in other respects placed in the most favourable circumstances, and professional friends who have had the widest experience of the epidemic in various parts of the country, inform me that many of the worst cases have occurred among their wealthier patients. Doubtless, in a disease characterized by such intense depression as diphtheria, an ill-nourished or anæmic person, if attacked by it in a very severe form, is less likely to struggle successfully through the illness than another in the opposite condition, but the liability to suffer severely from the disease is evidently irrespective of station or social circumstances.

CHAPTER VII.

COMMUNICABILITY OF DIPHTHERIA.

IN common with many of the older writers, Bretonneau considered diphtheria as contagious, but only by means of actual contact with the secretions from the throat, and not through the atmosphere. In this respect he compares it to syphilis and the vaccine disease, which are communicable only by inoculation.* This view of Bretonneau's receives no support from the facts which have come under my observation, and yet I do not feel that my experience would altogether justify me in contradicting it. I, at least, have witnessed no case in which the disease could be supposed to have arisen from the kind of inoculation considered by Bretonneau as essential to its propagation; and, with the exceptions about to be mentioned, my informants—among whom are included many practitioners who have had the most favourable opportunities of observation—agree in asserting that they have not known the disease communicated by means of the secretions from the throats of the sick. The exceptions referred to are those of two medical friends, Mr. Leonard, of Dursley, and Dr. Morris, of Spalding, who, while attending cases of diphtheria, both suffered from ophthalmia, which they attributed to contagion conveyed by the spluttering of fluids from the throats of patients while undergoing local treatment. There is, however, no proof that the ophthalmia was in either case of the diphtheritic character, seeing that it was unaccompanied by exudation; and, as the throats of the patients were being touched with some caustic application at the time of the discharge, the ophthalmic irritation was probably caused by this rather than by inoculation with diphtheritic secretion. The sole evidence I obtained tending to confirm the opinion that diphtheria is communicable from the sick to the healthy by means of the exudation, was an observation made by Mr. West, of Birmingham, that frequent ablution and great cleanliness appeared to insure a marked immunity from the disease; whilst diphtheria soon spread in houses where the same feeding utensils and napkins were used indiscriminately for the sick and the healthy.†

* *Memoirs on Diphtheria, translated by Dr. Semple for the New Sydenham Society*, pp. 176, 177.

† By way of testing the contagiousness of diphtheria by means of the exuda-

But although I have no proof that diphtheria is communicable by means of the exudation, many facts have fallen under my notice which convince me that the disease is in some way or other communicable. I attach little importance to the circumstance that diphtheria so often attacks simultaneously, or at short intervals, several members of the same household; such facts may be explained on the supposition that the patients have in such instances been all exposed to one common cause, be it endemic or epidemic. But if, soon after the arrival of a patient from an infected district, diphtheria should break out in a place where it did not previously exist, and attack persons who have been in direct communication with the invalid, and especially if it attack only such persons, then have we the strongest presumptive evidence of its being a contagious disease.

Facts already related have, in my opinion, clearly shown that diphtheria is of indigenous origin, and capable of being generated anew. It will probably be allowed that the following facts, most of which I myself carefully inquired into, are equally conclusive as to the communicability of the disease.

Diphtheria broke out in a ladies' boarding school at Witham, in June, 1858, and proved fatal to one of the pupils. Several others caught the disease, and the school was consequently dispersed. One pupil, who was considered convalescent, returned home to an isolated farm-house at Foxearth, a parish on the borders of Suffolk, some miles from Witham. At the time of her arrival she was still ailing, was voiceless, the tonsils were swollen, and the posterior fauces congested. There was intense depression, and paraplegia supervened soon after her return, from which she slowly but at length perfectly recovered. On June 18th, about a week after her return home, a sister, aged seven years, was found to be suffering from diphtheria, and died within twenty-four hours. The following day another sister, aged seventeen, likewise fell ill, and died

tions and secretions from the throat, Dr. Harley inoculated some dogs and a snake with the false membrane and yellowish-coloured mucus secreted by the denuded surface of the pharynx of a woman, aged twenty-three years, supposed to be suffering from diphtheria. The animals selected for the experiment were two young pups; a sickly, ill-fed, full-grown dog; a perfectly healthy adult dog, and a common snake. The four dogs were thoroughly well inoculated in the fauces and pharynx; the snake on the back of the neck, close to the head. 'Twenty-four hours after the performance of the operations, the two pups were killed and examined, but nothing was detected save the marks of the scarifications. Four days afterwards the sickly dog died. On examination no change was found to have taken place about the throat, except that a small ulcer had formed in the centre and most posterior part of the soft palate. This ulcer was not covered with anything resembling a diphtheritic exudation.' The other dog and the snake were both quite well at the expiration of seven days after the operation.—*Transactions of the Pathological Society of London*, vol. x., pp. 315, 316.

within three days. Four other cases of sore-throat, with swollen tonsils, two of them attended with specks of exudation, occurred in the house about the same time. On the 29th of the month the family removed to Lowestoft, where, it is alleged, diphtheria did not then exist, and soon after their arrival two other children were seized, and died of the same disease. The malady did not extend beyond this household, and has not, so far as I know, become epidemic in the neighbourhood. The only other cases in the district of which I have obtained any record, were at the village of Bulmer, distant some five or six miles from Foxearth, where, out of eight or nine cases, four proved fatal.

A group of cases at Penn, in Staffordshire, were supposed to have originated from communication with the mother of a child which had died of the disease in the immediate neighbourhood. The fact was by no means clearly established, but the whole household, comprising the master, mistress, five young people, and a maid-servant, were successively seized with diphtheria, from the sequelæ of which several were still suffering when I saw them. As soon as the servant was deemed convalescent she was allowed to visit her friends who resided in a hamlet at the distance of several miles. The disease, it is said, did not exist in the neighbourhood of her father's dwelling at the time, but was more or less prevalent in the surrounding country. A few days after the arrival of the young woman, two of her brothers and a sister were seized with the complaint, which proved fatal to all three.

The next group of cases is, perhaps, less conclusive, inasmuch as scarlet fever prevailed simultaneously with diphtheria, and some of the patients are said to have shown transient redness of skin. This circumstance casts a shade of suspicion on the evidence deducible from the history in support of the contagiousness of diphtheria, although it is undeniable that this disease, uncomplicated with scarlet fever, existed in the district. Notwithstanding this doubt, the facts are worth relating. The first case at Christchurch, Hampshire, occurred at Redhill. A girl named Sarah Hunt was supposed to have contracted the disease from communication with a person sick of diphtheria at Bournemouth; but, on investigation, this part of the evidence broke down. There was certainly a case of diphtheria which subsequently proved fatal after an unusually protracted illness at Bournemouth at the time Hunt was there; but the most careful inquiries failed to trace any communication between this patient and the girl who, on her way from Bournemouth to Redhill, was exposed to rain, and was wetshod for some hours only three days previous to the commencement of her illness. However the disease originated, the girl's was the first case in the district, and it is quite certain that the next victim, a boy named George Boyte, who lived in a neighbouring cottage, had been in frequent communication with Sarah Hunt during her illness. The third fatal case was that of a girl named Plowman,

living at Muscliffe, who was the first person attacked in that hamlet, where eventually several deaths occurred. She had been in daily communication with Boyte, and fell sick at Redhill, but was removed home and died at Muscliffe. Hunt went to school at Throop, and her illness began in the school. The fourth fatal case was that of a child named Butler, residing at Holdenhurst, who went to the same school; and the fifth, another pupil of the same school named Fry, who also lived at Holdenhurst. Fry had been absent from school for several weeks, but was there for two days immediately preceding her illness, which appears to have been simultaneous with that of Butler, as they appear to have died within a few hours of each other. It would be impossible satisfactorily to trace the progress of the disease after the death of Fry; and if possible, it would serve no useful purpose. Eventually eleven or twelve children who went to the same school with Hunt, and seven pupils of the national school at Throop, died of the epidemic. In several instances, when a child from one of the schools fell sick, its illness was followed by that of other members of the same family who had not been at the school.

I am indebted to Mr. Lambden for the following facts relating to the communicability of diphtheria. The first case in the parish of Coningsby was that of a farm-labourer, who came from Langrick, a parish five miles distant from Coningsby, in May, 1858. At the time of his arrival he was suffering from sore-throat, which presently assumed the character of severe diphtheria. I have been unable to ascertain whether the disease prevailed at Langrick at the time of his departure, but it was very prevalent there soon afterwards. This man was convalescent on May 28th, and on June 3rd, his brother, aged eight years, died of the disease after three days' illness. Two other cases soon followed in the same house. In April, 1859, a little girl named Chapman, aged five years, who had recently returned home from Marcham, where diphtheria prevailed, to an outlying hamlet in Coningsby, became sick with the disease, and died on the 25th of the month. No previous case had occurred in the hamlet. On May 2nd, a female servant named White, who lived in the house, and on the following day a brother of Chapman's, aged twenty years, also fell ill with the disease. The brother's case was very severe and tedious, but finally he recovered; and no more cases have since occurred, either in Mr. Chapman's house or in the hamlet. On May 15th, being then quite convalescent, the maid-servant White left her place, and passed a night at her father's cottage in the hamlet of Tattershall Thorpe, where also there had hitherto been no cases of diphtheria, and then went into service in that neighbourhood. The convalescence of the girl White had been imperfect; for soon after her arrival at Tattershall Thorpe, she suffered a relapse; her throat again became sore, and exhibited a return of diphtheritic exudation. After her visit

to her parents, a younger sister fell ill of diphtheria, marked by the characteristic symptoms, and made a favourable recovery. After this, a boy, residing in the adjoining cottage, suffered from sore-throat, but was not visited by any medical man. Soon afterwards a second child, whose case was of uncertain character, appearing to be diphtheria complicated with either measles or scarlet fever, or both, fell sick. It also recovered. From this time a mixed epidemic of scarlet fever, diphtheria, and measles prevailed in the hamlet. The cases of scarlet fever all presented a diphtheritic character, but there were several cases of diphtheria uncomplicated with scarlet fever; and diphtheria became engrafted on to measles after the recedence of the rash in one or more instances. Measles had prevailed in the hamlet previous to the arrival of White. How scarlet fever was introduced is uncertain, as it did not exist at that time in any other part of the parish of Coningsby, but most probably it came from Horncastle, where it had been prevailing a few weeks before. It is, however, quite certain that it did not appear until after the illness of the two Whites, and that neither the cases of the Chapmans nor the Whites were complicated with scarlet fever. It is equally sure that there were no cases of diphtheria in the hamlet of Tattershall Thorpe previous to the arrival of the servant White on the visit to her parents.

Another group of cases, which occurred in an isolated farm-house in the parish of Coningsby, seems also to have originated in contagion. The farmer had two houses at a distance of ten miles from each other; the family was divided between the two places, and diphtheria had prevailed among that portion which occupied the more distant residence. About the middle of April, 1858, a child came from the more remote house, where diphtheria then existed, to the house in Coningsby, and soon after its arrival fell sick of the disease. In a short time a second child, which had not left the residence in Coningsby, likewise took the disease and died. Both cases were pure, uncomplicated cases of diphtheria, and the only ones in the neighbourhood at the time.

Mr. Chavasse, of Sutton Coldfield, favoured me with the following particulars, which occurred under his own observation. Diphtheria was believed to have been imported into a boarding-school at Sutton Coldfield by a day-boarder, some of whose family were suffering from the disease at the time. Five cases exhibiting the exudation upon the throat, one of them very severe, occurred among the pupils. The patient most severely attacked was removed home, a distance of forty miles from Sutton Coldfield, when convalescent, and is supposed to have communicated the disease to her family, two children and a servant having been taken ill, and died of it, subsequent to her return.

My friend Dr. Sanderson relates the following case in his Report on Local Inquiries into Diphtheria:—‘Daniel Cooke, aged eighteen, servant in the farm of Eastoft Hall, contracted diphtheria on August 7th. In

this farm two cases had occurred in the family in the previous fortnight, and three of the servants were attacked during the next few weeks. Diphtheria was also prevalent in the adjoining village of Eastoft. Daniel Cooke was sent home ill to Derrythorpe, which, up to that time, had been exempt from diphtheria. Four days after his arrival his sister, æt. twelve, took ill, and recovered. Three days later, a boy, æt. five, and in four days more the youngest child, æt. twenty-one months, were attacked. The latter died September 3rd. On that day the father became ill, and exhibited the symptoms of diphtheria at the time of my visit, September 6th.*

The following cases, illustrative of the communicability of diphtheria, are related in Mr. Simon's Report, on the authority of Mr. Eastes, of Folkestone, and Mr. Rumsey, of Cheltenham :†—

'No case of diphtheria had ever been seen in Folkestone during my time until Isabella W., æt. four and three-quarters, arrived from Boulogne on the evening of July 2nd, 1856, being then in an advanced stage of the disease. She died on the following day. On the 6th July, Cath. W., her sister, aged ten, was attacked, but she had never been in France; she had always resided on the East Cliff, Folkestone, in the same house to which her dying sister was brought four days previously. One other case occurred in the same house three days after, and all terminated fatally.'

'A schoolboy, convalescing from diphtheria, contracted by him at Swansea, where it was epidemic, and arriving at home in an open, healthy suburb of Cheltenham, where at the time there was no diphtheria, was received and embraced by one of his two sisters. On the fourteenth day afterwards, she was attacked by diphtheria, and suffered severely. Her sister, who did not meet the brother, helped to nurse her, and was attacked in fourteen days after the first sister by the same specific disease with equal severity. Strict separation from all but mother and nurse was enforced, with thorough ventilation; and no other case occurred in the house.'

The next group of cases, which came under my own observation, appear to show that the milder kinds of sore-throat, unaccompanied by exudation, which prevailed so commonly during the epidemic period, were likewise contagious. In December, 1858, a boy returned to London from school in Sussex. Sore-throat had been prevailing in the school, and diphtheria in the neighbourhood. He felt unwell on the way home, and was taken ill with sore-throat soon after his arrival. A nursery-maid, aged seventeen years, attended on him during his illness, and, on the third or fourth day after his return, was also seized with sore-throat, and sent home to her friends.

* *Loc. cit.*, p. 256.

† *Loc. cit.*, pp. 323, 324.

At this time sore-throat was not prevailing in the neighbourhood of the girl's residence, neither did it make its appearance in an epidemic form in the parish in which she lived until after the lapse of several months. A day or two afterwards, the father, mother, and I am told some other members of the boy's family, likewise took sore-throat. Thus far my report is, from the statement of the girl's mother, confirmed as regards the illness of the boy, by other testimony. The girl became a dispensary patient under my care, and recovered in the course of ten days; her ailment having been simple inflammatory angina with swelling of the tonsils without diphtheritic exudation. Two or three days after the nursery-maid's return to her parents' house, a younger sister also fell ill with the same kind of inflammatory sore-throat, and, eventually, within the space of three weeks, nine persons residing in the house, who had been in communication with the nursery-maid, but were not all members of her family, suffered in succession from the same disease. They all came under my observation, and careful notes of the cases were made at the time, but need not be recapitulated here. The ninth case exhibited a small patch of firm, white, false membrane on either tonsil; the patch on the left tonsil being about as large as a horse-bean; that on the right, no bigger than a small pea. The cases all recovered, and, excepting the last, did not present the proper diphtheritic character. Whilst referring to these cases I may mention that the urine of three of the patients was examined and found to be free from albumen, and that most, if not all, of them had been under my care, as dispensary patients, in the previous year for scarlet fever.

The preceding facts appear to demonstrate the communicability of diphtheria, although, it is true, they do not show in what manner the disease is conveyed. It is, however, evident, that diphtheria is much less contagious than either scarlet fever or small-pox, inasmuch as I have seen many instances where only one member of a family has suffered from the disease, whilst others have had free intercourse with the sick, and no cases have been observed in which there was the slightest reason to suppose the disease had been conveyed otherwise than by direct transmission from the sick to the healthy. The contagion of scarlet fever or small-pox may, undoubtedly, be conveyed from place to place by means of clothing or other articles which have been in contact with the sick, but no such instances of the transmission of diphtheria by means of fomites have come under my notice, neither have any such cases been related to me by other observers.

CHAPTER VIII.

SYMPTOMS.—DESCRIPTION OF THE SEVERAL GRADES AND VARIETIES OF DIPHThERIA.

DIPHThERIA, taking the word in its widest acceptation, as including the several forms of sore-throat observed during the epidemic period, generally begins with very slight, or almost imperceptible premonitory indisposition. Sometimes there is slight malaise for a few days before the throat becomes sore; sometimes drowsiness or chilliness, occasionally amounting even to shivering, followed by febrile reaction. Sometimes aching of the limbs and loins, or head-ache; and, less frequently, nausea or vomiting are forerunners of the local affection. More commonly the earliest complaint is of slight stiffness of the neck or of soreness, or a sense of pricking in the fauces. On examination, the glands at the angles of the lower jaw are almost always found to be slightly swollen and tender. Internally, one or both tonsils are for the most part swollen, and usually reddened and inflamed; but occasionally much enlarged without much redness. The redness, when present, is of a rose colour in young children, and of a crimson or deep claret colour in older children and adults; the hue varying with the intensity of the disease. The arches of the palate, the velum, uvula, and sometimes the posterior wall of the pharynx, generally participate more or less in the inflammatory action. The tonsils are sometimes so much swollen that they touch one another, and impede deglutition and speech, especially when, as is common in severe cases, the uvula also is much enlarged. Deglutition is sometimes painful, but is often easy, even to the termination of the worst cases, and is rarely, if ever, so difficult as in the angina of scarlet fever, or in ordinary tonsillitis. Indeed, the pain and difficulty of swallowing afford no index of the intensity of the disease, being sometimes very slight in the most serious cases, and severe in the slightest. Some of my patients have spoken of the uneasiness in the throat as being rather a sensation of fulness or of a 'lump' in the throat, than of pain.

The pulse is usually accelerated, but not very high at this period of the disease, and the temperature of the skin slightly, but not much above the standard of health. There is never, so far as I have observed,

the pungent heat or dryness of skin which accompanies scarlet fever, and most other acute febrile diseases.

The general malaise, drowsiness, discomfort, and soreness of throat, bear no direct proportion to the severity of the succeeding attack, being frequently more marked in cases which do not present symptoms of a severe character than in others of the worst description. Indeed, in the severest forms of diphtheria, these premonitory symptoms are sometimes so slight as to escape observation altogether, and the illness is not noticed until it has assumed a serious aspect. It has frequently happened, especially with children, that patients have continued to go about without complaining until the disease has reached an almost hopeless stage.

Thus far there is little, if any, difference between true diphtheria and the cases of mild sore-throat that so often prevail simultaneously with it, and which, as I have already said, probably differ from it only in degree. The essential character of both is inflammation of the throat and fauces, but little prone to terminate in suppuration or ulceration; and although the milder kind differs greatly from fully-developed diphtheria, the two forms pass insensibly into each other, so that cases of every intermediate degree of severity may often be observed in the same epidemic.

The following is a good example of diphtheritic sore-throat unaccompanied by exudation. The case is the more interesting, as there had recently been one of diphtheria in the same house:—

Miss E., aged three years, having been previously in excellent health, came under my care on March 2, 1860:—

Complains of head-ache; the skin is hot and dry; the pulse about 100; tongue slightly coated with a white fur; voice thick; glands at the angles of the lower jaw slightly enlarged and tender; tonsils much swollen; and, together with the posterior fauces, slightly inflamed. There is much thirst, total loss of appetite, and difficulty of swallowing:—

R	Liq. ammon. acet.	℥ ij.
	Syr.	℥ j.
	S. ammon. aromat.	℥ ij.
	Aquæ ad	℥ vj.
M.	Cap. cochl. med. 4tâ q. horâ.	

March 3.—Skin cooler; pulse 84; complains less of head-ache, but the tonsils remain swollen, and she still complains of uneasiness in swallowing. Pergat.

March 6.—Very much better; appetite returned; is playing about, and cheerful, but the tonsils are still swollen, the left having the appearance of a thin filmy coating.

R	Tinct. sesquichl. ferri.	ʒ ij.
	Aquæ. cinnam.	ʒ vj.
M.	Cap. cochl. med. 6tâ q. horâ.	

March 12.—Convalescent.

If it be conceded that the kind of mild sore-throat unattended by diphtheritic exudation, which prevails so commonly during epidemics of diphtheria, differs only in degree from the latter, then does the early stage above described sometimes comprise the whole of the disease. In other cases it is but the prelude to the exudation of fibrinous material upon the inflamed mucous surface, the tendency to which constitutes the essential local character of diphtheria. In such cases the inflammation, instead of terminating in suppuration of the tonsils, or in ulceration of the inflamed membrane, as in the commoner inflammatory affections of these parts, is followed by an effusion of plastic fibrinous material upon the free surface of the mucous membrane, where it coagulates, forming a false membrane, or more rarely a pasty or friable deposit. This exudation, which has frequently been mistaken for sloughs, takes place when the preliminary symptoms have lasted, with more or less intensity, for a time which in some cases extends to a few days, and in others terminates in the course of a few hours. It usually appears first on one of the tonsils, or the soft palate; sometimes simultaneously upon both; or upon the posterior wall of the pharynx, more rarely—at least, during the recent epidemic—upon the buccal mucous membrane, or the gums.

The exudation generally shows itself at first in the form of detached specks, which, enlarging at their edges, coalesce, forming plates of deposit, investing the inflamed surface, and bordered by a margin of inflamed membrane, the more or less deep hue of which presents a striking contrast to the white, grey, or ash-coloured concretion. In some cases both tonsils, the soft palate, and the posterior fauces are coated with exudation, which, if it coagulates firmly, forms an exact cast of the parts it envelopes. The disease often likewise creeps upwards into the nares, or begins there simultaneously with its appearance in the throat, or it extends downwards into the œsophagus, or through the glottis into the larynx and trachea. Besides growing in extent with the wider spread, or increased intensity of the inflammation, the deposit increases in depth by successive additions from below, until it occasionally attains a thickness of more than a line. In other cases the diseased action is more limited, the deposit manifesting but little tendency to extend either in depth or breadth, and appearing only upon the tonsils or the posterior wall of the pharynx, where it may consist of a single patch or of several distinct patches, or of a mere film, covering the parts at first affected. The intensity and danger of a case, though mostly, are by no means always, in exact proportion to the extent of the exudation. Sometimes cases attended by extensive exudation make a favourable recovery; at

others, the exudation is of small extent, where the case is in other respects of severe character.

The exudation is sometimes firmly attached to the subjacent mucous membrane, from which it is with difficulty removed; at others, it is so loosely adherent as to be easily rubbed off, or removed with forceps. In either case the subjacent membrane is generally more or less deeply reddened, and if there should have been difficulty in removing the false membrane, it exhibits spots of blood. With this exception the mucous surface is, in general, free from ulceration or abrasion. In some cases the inflamed membrane surrounding the exudation is much congested, very tender, and so lacerable that the slightest touch with any instrument used for depressing the tongue, or removing the false membrane, causes hæmorrhage.

When the exudation has been artificially removed, it commonly reappears within a few hours, and several successive false membranes may thus be formed on the surface of the throat. Sometimes, even when the exudation has come away spontaneously, it is followed by a second, or by several others in succession; but when this happens, the later membranes are for the most part less and less dense, more and more filmy, and whiter than the preceding, until the diseased part recovers its normal condition.

Frequently, when the false membrane has exfoliated naturally, it leaves the subjacent surface unbroken, paler than in health, and either ragged or sensibly diminished in size. The uvula, for example, if it have been affected, appears shrunken, the tonsils more or less excavated, and the flat mucous surface depressed; the depression being often abruptly bounded as if its margin corresponded with that of the space lately covered by the false membrane. This depression of the surface which has been covered by false membrane is sometimes very marked after death; and is, perhaps, in some measure attributable to the loss of fluids by the part consequent upon the exudation, but probably still more to the pressure of the false membrane which, in coagulating, contracts, and will thus, when only moderately inherent, exert considerable pressure upon the subjacent surface. In other cases the false membrane, instead of exfoliating entire or in large slips, wastes insensibly day by day, until it disappears, lessening from the circumference towards the centre, but probably also at the same time becoming attenuated.

The exudation varies much in texture in different cases, being sometimes dense, firm, coherent, and elastic; at others soft, gelatinous, almost liquid; or dry and friable. In colour, it varies from white to grey or ash-coloured, brown and blackish. Although these varieties do not proceed from any essential difference in the nature of the disease, they indicate different degrees of its intensity, and their careful observation affords valuable aid to prognosis.

In the several epidemics which I have had the opportunity of studying in different places, but more particularly in this metropolis, many cases of diphtheritic sore-throat, the course and symptoms of which, save for the presence of exudation, have scarcely differed from those of simple tonsillitis, have been intermingled with the severer form of the disease. The most common, and as regards danger or suffering to the patient, the least important of these, have been cases of inflamed sore-throat, attended by a thin exudation, glazing the posterior wall of the pharynx or the tonsils, and manifesting little or no tendency to increase in breadth or thickness. Sometimes the exudation is almost transparent, and gives to the surface it covers the aspect of being painted over with varnish or thin glue; at others it is opaque and white, but filmy, the mucous surface being covered with an extremely fine pellicle. The transparent glazing is most frequently seen on the posterior wall of the pharynx, where it is very apparent from its refractive property. The filmy pellicle is seen both on the tonsils, the posterior fauces, the inside of the cheeks, and the gums. The swelling of the tonsils is generally either absent or slight in these cases, and the redness of the inflamed mucous membrane is not intense. There is usually slight depression of strength and more or less general malaise, but the constitutional symptoms are mild, and such cases rarely or never terminate seriously or are followed by troublesome results.

This form of diphtheritic sore-throat, for the most part, yields readily to treatment, but is very liable to relapse, and sometimes becomes chronic, causing uneasiness of the throat of many weeks' duration.

The following cases will serve as illustrations of the above-mentioned varieties of diphtheritic sore-throat.

Emma Farrer, aged thirty-five years, came under my care in the Western General Dispensary on April 5, 1859. Had been suffering from sore-throat for a week, her health having previously been good.

The tonsils are swollen, the arches of the palate congested, and of a pink colour, and the posterior fauces have a glazy aspect, as if varnished over with a transparent glutinous fluid. Pulse 72, of fair volume; tongue clean; bowels regular.

R Potass. chlorat ʒj.
 Acid. hydrochl. dil. ʒ ij.
 Tinct. ferri sesquichl. ʒ iij.
 Aquæ ʒ xij.

M. Cap. cochl. ij. magn. 4tā q. horā.

The mixture to be used also as a gargle.

April 7.—Feels better; throat less sore, and tonsils less swollen; the posterior wall of the pharynx appears to be covered with a very thin, semi-transparent filmy membrane. There is no albumen in the urine.

April 12.—Has continued to improve, but the filmy membrane still

remains on the posterior fauces ; tongue clean ; pulse 74, feeble. Has a pallid, anæmic aspect.

R Quinæ disulph. gr. xxiv.
 Acid. hydrochl. dil.
 Tinct. ferri sesquichl. āā . . . ʒ ij.
 Aquæ cinnam. ʒ xij.
 M. Cap. cochl. ij. magn. ter die.

From this time she gradually recovered, without any ulterior consequences.

The above case is typical of this form of diphtheritic sore-throat. The following, which belongs to the same class, was more severe, and attended by greater depression than is usual.

Sarah Waller, aged thirty-four years, a delicate, nervous woman, became a patient under my care at the Western General Dispensary on March 31, 1859. She was then suffering from symptoms of a mild catarrhal character.

April 4.—Complains of great feebleness, languor, and sore-throat. Pulse very feeble and depressed, scarcely exceeding 60; skin cool; tongue slightly furred; there is neither swelling nor redness of the tonsils, but the posterior fauces have a glazy aspect, as if covered with a thin, semi-transparent white pellicle.

R Tinct. sesquichl. ferri . . . ʒ j.
 Acid. hydrochl. dil. . . . ʒ ij.
 Aquæ cinnam. ʒ xij.
 M. Cap. cochl. ij. magn. 4tā q. horā.

April 7.—Complains much of debility and extreme prostration. Pulse 72, very feeble; surface cool; tongue white; the arches of the palate are now of a dusky red colour, but there is no enlargement of the tonsils; posterior wall of pharynx covered with a thin, white, filmy pellicle; bowels confined; urine contains no albumen. Pergat.

April 12.—Improving; but the left side of the posterior wall of pharynx still presents the filmy white exudation, the right side being now free from it, and merely a little injected, without abrasion of surface. Has become very anæmic.

To have two glasses of port wine in the day, and good nourishment.

R Quinæ disulph. gr. xxiv.
 Tinct. ferri sesquichl.
 Acid. hydrochl. dil. . . . āā ʒ ij.
 Aquæ cinnam. ʒ xij.
 M. Cap. cochl. ij. magn. 6tā q. horā.

April 19.—Is much better in all respects; the glazy exudation having entirely disappeared, and her strength partially returned.

From this time she rapidly improved.

Henry Wood, aged twenty-four, resides at Tilsdown, near Cam, in Gloucestershire. *July 27, 1859.*—Has had sore-throat for nearly a week, which has to-day become worse, and is accompanied by considerable debility. The soft palate, tonsils, and posterior fauces are red and glazy; the tonsils are much enlarged; but, except the filmy glaziness, there is no diphtheritic exudation: has much difficulty in swallowing; the glands at the angles of the jaw are slightly swollen, and tender on both sides; tongue white; pulse 66, compressible.

July 28.—Throat much as yesterday, certainly not worse; pulse quicker, feeble; voice hoarse.

The two following cases evidently belong to the same category as the foregoing; but the affected membrane was rather covered with a vitiated secretion than an exudation properly so called.

H. Reeve, aged nine years, *July 28, 1859,* complains of sore-throat, but apparently is not otherwise indisposed. Tonsils much swollen, and, together with the rest of the throat, of a dusky red colour. There is no membranous exudation, but the posterior wall of the pharynx is covered with a layer of thick white mucous secretion, capable of being removed with a sponge, leaving the subjacent mucous membrane much injected, but without abrasion.

Charles Lewis, aged fifteen years. *July 28, 1859.*—Pain and difficulty in swallowing, with a feeling of slight general indisposition; tonsils much enlarged, and, together with the arches of the palate and the posterior fauces, slightly inflamed; but the redness is not intense, and is less dusky in colour than is usual in the milder cases of diphtheritic sore-throat. There is a little fulness and tenderness at the angles of the jaw; skin cool; pulse 72. Posterior wall of pharynx coated with a layer of yellowish creamy secretion, which, on being removed, leaves the subjacent membrane red, but apparently intact.

A second variety of mild diphtheritic sore-throat is that in which the exudation is opaque, and less filmy than in the form just mentioned; but more circumscribed in extent. It usually consists of several small white or cream-coloured spots, which manifest but little tendency to spread, and do not coalesce. The tonsils are usually much enlarged, and there is generally an erythematous redness of the soft palate and throat. The spots are usually seated on the tonsils, more rarely on other parts of the throat, and sometimes only consist of small but distinct specks of thick, creamy-looking fluid, which, at first sight, appear to correspond with the orifices of follicles; but, on removal with a brush or sponge, show slight abrasion of the mem-

brane underneath. At other times they are formed of bits of fibrinous exudation, of firm consistency, closely adherent to the subjacent surface, from which they are with difficulty detached. They in general disappear imperceptibly; but, occasionally separating first at their edges, they hang for a time in rags to the tonsils before coming away, leaving the subjacent surface without abrasion. The tonsils are rarely much injected or tender, and do not so readily bleed on being touched as in the severer forms of diphtheria, although to this rule there are occasional exceptions. When in this class of cases there is exudation on the posterior fauces, it is usually of small extent, is not surrounded by much redness, and consists of one or two, rarely more, small, white, opaque membranous plates, rather firmly adherent to the mucous surface, thinner at the edges, and without evident depression or elevation. Cases of this class generally, perhaps always, terminate satisfactorily, and the limitation of the exudation, and mildness of the general symptoms, commonly justify a favourable prognosis.

The following are examples of this form of diphtheria:—

Sarah Reynolds, aged 21, came under my care as a patient of the Western General Dispensary, on March 19, 1859. Illness began last night with sickness and vomiting, aching of limbs, languor, slight cough, and sore-throat. Pulse 60, depressed and feeble; skin cool; tongue slightly furred; the throat is red, and has an erythematous aspect; tonsils much swollen and inflamed. There is much difficulty and pain in swallowing. Behind the left tonsil is a small patch of firmly adherent false membrane; and there are two similar patches on the right side; one on the tonsil, and one on the pharynx. To have two glasses of port wine in the day, and beef-tea and arrow-root.

R Chlorat. potass. ℥ij.
 Tinct. sesquichl. ferri . . . ʒ iij.
 Acid. hydrochl. ferri . . . ʒ iss.
 Aquæ ʒ viij.
 M. Cap. cochl. ij. magn. 4tâ q. horâ.

March 20.—There are two additional patches of exudation on the throat to-day; and the erythema continues. Tongue slightly furred; pulse 120; very feeble; there is no albumen in the urine; bowels confined.—Pergat.

March 21.—The patches first seen have partially disappeared, leaving the membrane beneath them without ulceration or abrasion of surface. The two bits of exudation seen yesterday, for the first time, have not enlarged; the pulse continues above 100; is very feeble, and the patient much depressed.—Pergat.

March 23.—Is decidedly better; pulse 100, of better volume; tongue clean. The exudation has now all disappeared, leaving the tonsils pale,

but rough and ragged. The velum and arches of the palate still present an erythematous appearance.

From this date the patient continued to improve. On the 27th of March the sulphate of quinine, with tincture of the sesquichloride of iron and hydrochloric acid, was substituted for the previous medicine. She was well supported with nourishment and wine, and recovered without any sequelæ.

Neither in the foregoing, nor in the following case, was any application made to the fauces, by means of brushes or sponge; nor, excepting for the purpose of examination, was the false membrane removed from the throat.

In the next case, although there was much depression, I formed a favourable prognosis from the beginning, founded chiefly on the absence of any tendency in the patches of false membrane to coalesce, and the very moderate amount of injection in the intermediate portions of the mucous surface.

Miss A. N., aged 17 years, previously in good health,—

March 26, 1860.—Has been slightly ailing for a day or two; complains of head-ache, languor, and loss of appetite, but of no definite local uneasiness. Pulse 72, feeble; skin cool; tongue slightly furred; bowels regular; deglutition easy.

The patient did not complain of sore-throat, but there being slight swelling about the angles of the jaw, the throat was examined. Both tonsils were swollen and inflamed. Upon the right were seven or eight small distinct white patches, so adherent, that one of them was detached with difficulty. It consisted of a tough, thin, membranous film, the removal of which from the mucous membrane was followed by slight hæmorrhage. The posterior surface of the pharynx was covered with a white membrane, apparently thick in the upper, and becoming thinner and diaphanous towards the lower part of the pharynx. There is no affection of the speech, and neither coryza nor uneasiness of the nostrils.

℞	Tinct. sesquichl. ferri . . .	ʒ ij.
	Acid. hydrochl. dil. . . .	ʒ iss.
	Potass. chlor.	ʒ ij.
	Aquæ	ʒ viij.
M.	Cap. ʒ j. 4tâ q. horâ.	

To be also used frequently as a gargle.

March 27.—Much depressed; pulse under 70, feeble; throat much as yesterday. The left tonsil remains free from exudation, and the patches on the right tonsil and posterior pharynx have neither extended in breadth, nor apparently in thickness. There is still no difficulty in swallowing; glands at the angles of the jaw slightly swollen, and very tender.

A glass of wine three times during the day, and any nourishment she can take.—Pergat.

March 28.—Decidedly better. The patch of exudation on the posterior pharynx looks thinner, as if wasting away insensibly; and the patches on the tonsils have loosened at the edges, but are hanging still adherent by the centre. Tongue slightly furred.—Pergat.

March 30.—Throat very much improved. The patches on the tonsils have nearly all come away; that on the pharynx is not larger than a sixpence, but continues adherent to the subjacent surface. The tonsils are still swollen, but, excepting a streak along each arch of the fauces, there is much less general congestion about the throat; the uvula is elongated, and bent to the right side; the tongue coated with a white fur. Notwithstanding this local improvement, the general condition of the patient is worse; the pulse is 90, and feeble; there is slight heat of skin; aching of the head and limbs; increased languor; entire loss of appetite, and frequent husky cough.

Continue the wine, beef-tea, and arrow-root, or other liquid nourishment.

℞ Hyd. c. cretâ . . . g. iij.
 Pulv. Jacobi ver. . . gr. vij.
 M. H. s. sum. Cap. 3 ij. ol. ricini cras mane.

March 31.—General state much as yesterday, but the throat continues to improve. The face is swollen, and exhibits a slight measly mottling, but excepting the troublesome cough, there are no catarrhal symptoms. The patient had measles several years ago.

℞ Liq. ammon. acet. . . ℥ iij.
 Mist. camphor, . . . ℥ iv ss.
 Sp. ammon. aromat. . . ℥ ss.
 M. Cap. cochl. ij. magn. 6tâ q. horâ.

April 1.—The throat continues better; the eruption is more fully out, and extends to the arms and chest; it resembles neither the rash of scarlet fever, nor that of measles; but consists of closely-aggregated rose-coloured spots, about the size of flea-bites, resembling the maculæ of typhoid fever, like which also they disappear on pressure, but return almost immediately. Those on the face are grouped in irregular patches; those on the chest and arms are equally distributed over the skin, but most thickly upon the arms. There is still much cough, the pulse continues quick, and the skin warm.—Pergat.

April 2.—The eruption is paler upon the face, but has extended over the trunk and lower extremities, though more sparsely than on the arms and chest. Numerous sudamina, giving a roughness to the skin, are now also intermingled with the other eruption.

To continue the wine and other nourishment.—Pergat.

April 5.—The eruption has now disappeared; the sudamina have dried up, leaving a great roughness of skin; tongue cleaning; cough diminished; pulse .80; skin cool; appetite returning. The throat is still somewhat congested, and the tonsils enlarged. Is very anæmic and feeble.

℞ Cit. quinae et ferri . . . ʒ ss.
 Aquæ cinnam. . . . ʒ viij.
 M. Cap. cochl. ij. magn. ter die.

April 15.—Convalescent, but the throat is still not quite in a normal condition.

The following is a case belonging to the same class. I saw the patient only twice with a medical friend:—

Mr. M., aged 19, *May 31, 1859.*—Has been ill three days; pale, languid; pulse 68; tongue clean anteriorly, is coated posteriorly with white fur. Both tonsils slightly swollen, the right exhibiting several points covered with white pellicular exudation, which comes away readily, leaving the subjacent membrane deeply reddened, but without abrasion. It is very tender, and bled freely on being accidentally touched by the spoon employed for depressing the tongue. The left tonsil also presents a small patch of exudation. The posterior fauces are coated with a thin, diaphanous pellicle, which remained after cleansing the throat. There is but little pain in the throat, and very slight difficulty in swallowing. The urine, free from albumen, contains phosphates in great abundance.

℞ Tinct. ferri sesquichl. . . ʒ ss.
 Mellis. ʒ j.
 Aquæ ad ʒ vj.
 M. Ft. gargarism. sæpe utend.

℞ Infus. serpentariæ . . . ʒ viij.
 Ammon. sesquicarb. . . ʒ ij.
 Sp. Ammon. aromat. . . ʒ ij.
 M. Cap. cochl. ij. magn. 6tâ q. horâ.

June 2.—Throat somewhat less congested, but the surface of the tonsils continues very tender. The patches of exudation have a ragged appearance, as if separating. Surface cool; pulse 60, feeble.

To have two glasses of wine during the day, and any nourishment that can be taken. Patient recovered.

The following is another case of the same class, which I saw only once, and am therefore unable to report in detail. It terminated favourably:—

M. B., aged three years, *July*, 1859.—Has been ailing for three days. Throat inflamed, and of a bright red colour; tonsils much enlarged. On the right tonsil there is a patch of exudation the size of a sixpence; on the left a smaller patch of the size of a grain of wheat; there are also three small patches on the posterior wall of the pharynx. These patches are of an ash-colour, and firmly adherent to the natural surface. The pulse is quiet; tongue creamy; there is no remarkable depression, no heat of the skin, and apparently no difficulty of swallowing. The glands at the angles of the lower jaw are slightly swollen, but the child is playful, and does not present the appearance of serious illness.

These varieties of diphtheria, in which the exudation exhibits the appearance of a filmy glazing of the posterior fauces and tonsils, or of small circumscribed patches which do not coalesce, are comparatively mild, and rarely, if ever, prove fatal. In most epidemics they have formed a majority of the cases, but, although so mild, since they exhibit the characteristic local test of the disease, they must be regarded as genuine cases of diphtheria. From their usually favourable termination, they have probably given rise to mistakes as to the efficacy of treatment, particularly of local treatment. They, for the most part, recover readily under the use of simple remedies, and, though more tardily, under the application of caustics and other powerful irritants to the throat; and such recoveries have perhaps been sometimes erroneously attributed rather to the efficacy of the treatment than to the mild nature of the ailment.

The class of cases to which attention must now be directed is of a much more serious kind than any of those hitherto described. The exudation may, as in the former varieties, commence in the form of a thin translucent pellicle, or in detached patches; but it rapidly becomes thicker, and the separate patches coalescing, soon cover the inflamed surface, which often continues to widen in extent, until the disease has crept into the nose, the œsophagus, or the larynx. This variety of diphtheria is, in truth, one of the most formidable of diseases, and very often indeed baffles the best-directed efforts of the practitioner. The exudation may appear either as a granular deposit, possessing little cohesion, and of various degrees of dryness or humidity, or as a more or less dense, elastic, and coherent false membrane. Doubtless the two forms pass by insensible gradations into each other; and, as in the subjoined case, may coexist on different mucous surfaces of the same subject.

The patient, a little girl aged eight years, had been ill for several days when she came under my care in December, 1857, and died within a few hours after being visited. Had been suffering from slight catarrh and sore-throat for four or five days, but was up and about until within five or six hours of death. There was slight cough, and the breathing

was rather stridulous, but not distressingly so. The tonsils appeared swollen, and both they, the arches of the palate, and the posterior fauces, were closely covered with a greyish or ash-coloured deposit. Dyspnœa came on suddenly in the course of the night, and the patient expired before medical aid could be procured.

A post-mortem examination of the throat only was permitted. The ash-coloured deposit which loosely covered the pharynx, tonsils, and velum, was found to be dry, granular, and friable. The subjacent mucous membrane was pale, rough, and excoriated. The œsophagus was perfectly healthy, the exudation ceasing a little below the level of the epiglottis. The upper surface of the epiglottis was partially covered with granular deposit similar to that on the tonsils and pharynx. This deposit gave place at the rima glottidis to a white croupy membrane, which extending through the larynx, and downwards as far as the third or fourth ring of the trachea, formed a perfect tubular cast of the parts it covered. It was thick and tough above, but became gradually thinner as it descended into the windpipe, and terminated in an exceedingly thin, semi-pellucid, soft, and easily lacerable margin. It was loose, merely adhering by a few points, and was readily lifted away by forceps, leaving the mucous membrane slightly reddened, continuous, but with a few very small bloody points where the membrane had been still attached. There was a loose portion of membranous exudation in the larynx, and also a pellet of granular material similar to that in the pharynx, from which it had possibly passed in the progress of the hasty post-mortem examination.

The variety of diphtheria attended by granular deposit has been less common during the recent epidemic than the other, from which, in the cases I have seen, it has differed but little as regards severity or danger, but has been more frequently accompanied by excoriation or superficial ulceration of the mucous membrane.

The most usual appearance of diphtheritic exudation is that of a false membrane possessing more or less cohesion, and frequently very firm and elastic. Doubtless liquid when first effused, it speedily coagulates, and, as it grows in thickness, becomes denser, firmer, and tougher. It usually makes its appearance in the form of detached spots, very frequently upon one or both tonsils; these spots becoming thicker by successive additions from below, at the same time extend in circumference, and coalesce, so as to form a single plate of deposit. When first seen they are usually white or ash-coloured; and when these have united so as to form a uniform layer, they very closely resemble wet parchment; thus agreeing very accurately with the description given by Villa Real of the false membrane observed by him in the Spanish epidemics of the sixteenth and seventeenth centuries. By and bye they become discoloured from the effects of decomposition or exposure, or

stained of a blackish hue, probably in consequence of slight hæmorrhage. In other cases, the membrane assumes a buff or brownish colour, very much resembling damp wash leather, and then usually adheres very firmly to the subjacent surface. In either case, the breath is apt to smell offensively, partly, no doubt, from the decomposition of the exudation; but likewise, and especially as the smell sometimes exists at a very early stage of the disease, from the depraved secretion of the tonsils. Whichever of these appearances the exudation may present, the disease is very apt, as has already been said, to spread along continuous mucous surfaces, and thus to invade the nares, and sometimes, but rarely, the eye, to extend to the lower part of the pharynx, to the larynx and trachea, more rarely to the œsophagus, and sometimes forwards on to the cheeks and gums.

The invasion of the nares by diphtheritic inflammation is generally manifested by redness of the margin of the nostrils, and a discharge of sanious ichor, resembling that common in scarlet fever, and also, like it, sometimes excoriating the upper lip. Epistaxis is not an infrequent consequence of nasal diphtheria.

Hæmorrhage from the throat also occurs in pharyngeal diphtheria, but, unless in connexion with purpura, less frequently, I think, than that from the nose. In either case, the loss of blood, by exhausting the already enfeebled powers of life, has sometimes appeared to determine a fatal result, and must always be regarded as an unfavourable symptom.

I have not myself seen diphtheria of the conjunctiva. Dr. May, of Maldon, informs me that he saw one case in which the disease spread upwards, through the nasal duct to the right eye. The eye was much swollen; and the palpebral conjunctiva covered with false membrane, which came away in shreds before death.

Mr. Thompson, of Launceston, who has seen a great deal of this disease, says, only one case of diphtheritic ophthalmia occurred in his neighbourhood; the deposit extended over the lower half of the conjunctiva.*

Mr. Jonathan Hutchinson has published a case of diphtheria of the eye, treated at the Royal London Ophthalmic Hospital, of which I here quote the main facts:—

‘Herbert P., an infant at the breast, aged six months, was brought to the Ophthalmic Hospital, June 6, 1859. He was a stout, well-grown child. The eyelids of both eyes were extremely swollen; the skin being tense and glazed. There was a certain amount of unhealthy secretion flowing from them. On opening the lids of one of the eyes, the conjunctiva in every part, palpebral as well as ocular, was concealed from sight by a thick layer of coherent lymph. This layer ended abruptly at the circumference of the cornea, and the latter structure was throughout

* *British Medical Journal* (June 5, 1858), p. 450.

dimly opaque, though still preserving its perfect form, and free from any appearance either of ulceration or sloughing. There was no true purulent secretion; what of fluid was present consisting of a thin ichor. The pellicle was examined microscopically by Dr. Bader, immediately after removal, and was found to consist of exudation cells entangled in the meshes of a loosely fibrillating matrix. The diphtheritic pellicle might be peeled off with forceps in fragments of considerable size, and the mucous membrane beneath it was swollen, intensely congested, and readily bled. The two eyes were in an exactly similar condition. The little patient was pale, with a hot dry skin and an oppressed aspect. His tongue was a perfect type of what is known as the strawberry tongue of scarlet fever, from which disease his two brothers were then suffering. One of these, a child aged three years, had sickened with scarlet fever four days before the ophthalmia commenced in the infant. With regard to the latter it appeared that the eyes had been attacked simultaneously four days before application at the hospital. There had been considerable discharge from the nostrils, and the diphtheritic inflammation evidently extended in a slight degree to the nasal passages.

Treatment.—Having separated the lids by means of a speculum, I carefully peeled away, partly by scraping with a scoop and partly by forceps, the whole of the false membrane, and then brushed the conjunctiva in every part with an almost saturated solution of nitrate of silver. A saturated solution of chlorate of potash was prescribed to be used as an injection into the eye—internally the administration of chlorate of potash with liquor cinchonæ was prescribed.

Subsequent Progress.—On the following day I repeated the application of the nitrate of silver. The diphtheritic exudation had been partially reproduced, but not very extensively. On the third day the condition of the eyes seemed much improved, the swelling of the lids had greatly diminished, and there was very little false membrane. The corneæ, however, were still quite opaque. There was now a rash upon the child's chest; it consisted of scattered, minute, red points, but more resembled certain forms of *lichen* than the rash of scarlet fever; the skin was still harsh and dry, but the tongue was improving, and its papillæ less prominent. There had been throughout no sore-throat whatever, nor any inflammation of the mouth. On the fourth day the rash had disappeared. There were now central sloughs on both corneæ. On the seventh day the sloughs were separating, and it was evident that both eyes were lost. The diphtheritic exudation had now wholly passed off. The child was still more feeble and looked very ill; ammonia in combination with bark was ordered. On the tenth day a large abscess had formed over the right shoulder. It fluctuated freely, and having very little induration of the surrounding cellular tissue, much more closely resembled a pyæmic deposit of pus than an ordinary abscess.

'After the date of the last note the child was not brought to the hospital for several months. On October 15, both globes were collapsed, their entire corneæ having been destroyed. The abscess over the shoulder had been opened by another surgeon, a few days subsequent to the last attendance at the hospital. It had healed, and no other had formed. The child still remained pale and cachectic, and its constitution had evidently received a most severe shock from the illness through which it had passed.'*

Mr. Hutchinson remarks that 'the case was one of a class entirely new to him, and that so extensive and well developed was the pellicular exudation which covered the ocular mucous membrane that there could be no hesitation in considering it as a true diphtheria. It may be remarked that the remedies used were rapidly efficient in attaining their immediate object, that of preventing the re-formation of the false membrane. Had the case been seen earlier, they might, in all probability, have saved the corneæ.'

The above case can scarcely be considered as one of pure uncomplicated diphtheria, seeing that the child had been in relation with the poison of scarlet fever, which was present in the house at the time of its illness, and that although unaccompanied by the specific rash or sore-throat of that complaint, its tongue exhibited the character of the tongue in scarlet fever. But there is no doubt the character of the ophthalmia was determined by the epidemic influence, and that the case belongs, therefore, to the same category with the diphtheritic affections associated with external injuries and with other diseases already recorded. The rarity of diphtheritic ophthalmia may be inferred from the circumstance mentioned to me by Mr. Dixon, that out of the thousands of cases which annually come under the notice of the surgeons to the Royal Ophthalmic Hospital, this is the only genuine case of diphtheritic ophthalmia he had ever seen. This fact is the more remarkable, as it appears from the statements of French, and especially of German writers, that this particular form of the disease is by no means uncommon abroad.

The extension of diphtheria to the larynx and trachea is a common occurrence in some epidemics and in particular localities, but rare in others. It was very common in at least the earlier epidemics seen by Bretonneau; and in some of the older epidemics, which, on this account, obtained for the disease the name of *morbus strangulatorius*, or garrottillo. Of fifty-two post-mortem examinations made by Bretonneau in two years, the larynx or trachea was only free from exudation in one instance, that of a child, who appeared to die from exhaustion on the fifteenth day of the disease.† The recent epidemics in the North of France, and the English epidemics of the last four years, have less uniformly manifested

* *Ophthalmic Hospital Reports* (October, 1859), pp. 130-2.

† *Memoirs on Diphtheria*, Selected and Translated by Dr. Semple, p. 16.

this character. In a few places the disease is said to have manifested no disposition to attack the larynx or trachea; in others, most of the cases ending fatally have terminated in croup consequent upon the extension of the disease through the glottis. But in a large proportion of the districts where the disease has prevailed, its character has, in this respect, been mixed, many cases ending in recovery or death without affection of the larynx, others being complicated with the symptoms of croup. Dr. Heslop, of Birmingham, informs me that he does not think the disease has reached the larynx in more than five per cent. of the cases he has seen in that neighbourhood. Of thirteen fatal cases in the practice of Mr. Schofield, of Highgate, near Birmingham, with the particulars of which he has favoured me, only three were accompanied with symptoms of croup. Diphtheria had been the sequel of scarlet fever in all three. Of nine fatal cases seen by Dr. Capron, of Guilford, only three died with laryngeal symptoms. Of twenty-six fatal cases reported by correspondents of the *British Medical Journal*, only nine, including one from bronchitis, appear to have proved fatal from laryngeal complication.* Mr. Thompson, in an account of the disease in the neighbourhood of Launceston, says, that of 485 cases that came under his observation, the air-passages were involved in fifteen, eleven of which died, generally within a few hours after the commencement of croupy breathing.† The case of the child already related (page 104) well illustrates that form of diphtheria in which extension of the inflammation into the larynx or trachea leads to a fatal result. For the following well-reported case, which I have somewhat shortened, I am indebted to Mr. Jauncey, of Birmingham:—

Samuel, aged six years, a delicate, scrofulous-looking child, was seen for the first time on May 28, 1858. He had just been brought home from the country, and had been ailing slightly for the previous four or five days. Typhoid fever was prevalent in the village where he was staying, but of diphtheria nothing was heard.

May 28.—Tongue thickly covered with white fur. Tonsils enlarged, and of a deep-red colour, without exudation; skin moist; pulse 90; bowels open; appetite impaired.

To be kept in bed. Beef-tea diet; poultices to be applied round the throat; to gargle with barm and water.

R Infus. rosæ co. $\frac{3}{4}$ ss.
4tis hor. sum.

29th.—Thick exudation over tonsils and uvula, showing fibrinous structure under the microscope, and also a specimen of 'oidium albicans.'

* *British Medical Journal* (June 25, 1859), p. 489.

† *Loc. cit.* (June 5, 1858), p. 449.

Urine sp. gr. 1016; clouded by heat and partially cleared by nitric acid. The throat was brushed with equal quantities of dilute muriatic acid and water. To take four drops each of tr. ferri mur. and dil. muriatic acid every third hour; port wine and jelly.

30th.—Exudation less.

31st.—False membrane still covers the throat; breathing easy; patient does not seem depressed; continue treatment; ol. ricini.

June 1.—A croupy cough came on in the night, and is well marked this morning. Urine free from albumen. Seen in consultation by Dr. Heslop. To have an acid gargle and a mustard emetic.

Vespere.—The breathing is accompanied by marked stridor, which was easier after an application of the acid.

2nd.—‘Croupous’ symptoms very marked. A blister on the throat, and emetic of sulphate of zinc and ipecacuan.

Vespere.—Countenance dusky; stridor great; voice suppressed. Mustard emetic to be repeated.

3rd.—Died at four o’clock, A. M.

P.-m. Examination.—No pleuritic effusion; lungs emphysematous in front, patches collapsed posteriorly.

Deposit of tubercle in two bronchial glands, and also of the size of a horsebean in the right lung. A patch of false membrane at the bifurcation of the trachea. Trachea reddened, but free from exudation. Larynx and epiglottis covered with lymph, as were also the pharynx, tonsils, and uvula. Between the pharynx and vertebræ was an abscess about the size of a walnut. Liver, kidneys, and spleen healthy; the kidneys were examined microscopically.

Comparatively few persons recover when diphtheria extends downwards into the air-passages; but sometimes moulds of the larynx, trachea, and bronchial tubes, to their third or fourth division, and in a case seen by Mr. Thompson, of Launceston, to the fifth division, are expectorated with immediate, though too often only temporary, relief to the patient, who frequently succumbs from a renewal of the exudation. Sometimes casts of the smaller bronchial tubes are brought up piecemeal in a glairy expectoration. Occasionally the relief afforded by the expectoration of casts of the larynx and trachea is permanent. A case of this kind, in which the patient was, as it were, snatched from the jaws of death by the separation of a membrane which had threatened speedy suffocation, has been already mentioned (page 56); and I have in my possession an almost entire cast of the larynx expectorated by another patient, who appeared to be dying. The excretion of the membrane was, in this case, also followed by speedy and permanent relief.

A case related by Dr. Starr, which came under his care in 1749, is so well told, so well exemplifies the tendency to a renewal of the exudation, and so well shows the identity of the disease in the present with that

which prevailed in the last century, that I am induced to quote the more important parts of his description.*

'December 11, 1749.—I was called to the son of Mr. Kitto, a farmer in the parish of St. Eve, a lad aged ten and a half years. This was the seventh day of his illness. His first complaints were a pain in swallowing, not great; a cough, hoarse, vexations, like an incipient catarrh; a pain on coughing shot into his ears. This was still felt at times. A thin ichor ran from his mouth in great plenty, supposed to be a quart or three pints daily.

'His pain in swallowing was now so trifling that I saw him drink a considerable draught without removing the vessel. He was now so hoarse that he could scarcely be heard. His cough was rough, low, short, and ineffectual; he breathed with much straitness and noise, especially in inspiration; the wheezing or rattling might be heard at a great distance. Was always worse during a coughing fit, or for a short time after. When he spit by the cough it was glairy, but glutinous; a whitish, rotten sort of stuff would sometimes accompany it, its quantity never great. Examining his mouth, he could move his tongue every way without the least pain; forward it was clean, but behind a little furred. Depressing it with a spatula, a white body was seen on the *velum pendulum palatinum* and tonsils. I desired Mr. Scotchburn, a surgeon present, to examine with his forceps if this body adhered firmly to the velum, or was loose; on trial he found it strongly adhered. The lad complained of no pain on his taking hold of it. The circumambient parts were of a somewhat deeper red than natural; his breath stinking, and highly offensive. . . . In a violent fit of coughing with a deal of slimy, filthy stuff from the pipe of the lungs, the membrane separated from the *velum palatinum*. It was not rotten like a slough, but retained, though dead, its membranous structure; was strong; would bear handling and stretching without breaking.† . . . The lad immediately, as I was told, breathed better, without that wheezing and noise heard before, and was less hoarse. . . . But, as usual, this relief did not prove lasting. In an hour and a half the noisy respiration began anew; his hoarseness increased, and his cough, though short and low, was busy and vexatious; now he appeared as if quite strangled, and in the agonies of death; now he would again revive. . . . At length, his father perceiving somewhat in his mouth, drew it out. It was a hollow bag. . . . I found the supposed bag was the

* *Phil. Trans.* A. D. 1756. Vol. xlvi. pp. 442-3.

† A figure of the membrane is published with Dr. Starr's paper in the *Phil. Trans.* It very closely resembles one sent from the same county by Mr. Thompson, of Launceston, and exhibited by Dr. Murchison at a meeting of the Epidemiological Society in 1858. See also *Trans. of Path. Society of London.* Vol. x. p. 320.

mucous coat of part of the larynx, the whole *aspera arteria* with the grand division of the bronchial ramifications.

'There was something bloody visible about its middle. It was more rotten and tender than the former. . . . He now complained of soreness in the pipe, and pointed to the first and second costa as the place of its termination. Examining his mouth, no ulcer or wound was discernible in that part of the velum, &c., to which the slough adhered. It was smooth, clean, and looked only like a new skin not quite hardened. . . . He died in the end somewhat suddenly, though in his perfect senses.'

The extension of diphtheria to the œsophagus is rather to be inferred from symptoms, than proved by examination. From Dr. Gull's observations, it seems probable that diphtheria may commence in the lower part of the pharynx, out of reach of vision, and thence extend into the œsophagus.* The symptoms are extreme difficulty of deglutition, amounting sometimes to total inability to swallow even fluids, followed in some instances by vomiting, as if the disease had extended to the stomach. In one of Dr. Gull's cases the fauces were injected, but free from exudation; the finger passed into the lower part of the pharynx discovered a thickened and obstructed state of the part. Any attempt to swallow, even a small quantity of fluid, was followed by its ejection through the nostrils. In a second case, the fauces were not noticeably affected.

Mr. Stiles, of Pinchbeck, informs me that he has met with cases in which there was difficulty of swallowing, without any evident throat affection. He attributed this to the existence of diphtheritic exudation in the lower part of the pharynx, or the œsophagus, beyond the reach of vision. In one instance, a patient thought from a sensation of choking that some substance was sticking in his throat, and on passing a probang, shreds of false membrane were brought up on the sponge. Diphtheria existed in the patient's house at the time. Probably œsophageal diphtheria is most frequently caused by the extension of the disease from its usual seat in the fauces, and thus sometimes occurs after the disease would seem to have disappeared. It is attended by extreme difficulty of deglutition, often followed within a day or two by pain either during the passage of food through the œsophagus, or after it has arrived in the stomach. Indeed, severe gastrodynia is not of infrequent occurrence during convalescence from diphtheria; but has not, under my observation, led to any worse result than delaying recovery by preventing the patient from eating. In one instance, in the practice of Mr. Balls, of Spalding, diphtheria was followed, after apparent recovery, by intense pain at the epigastrium, vomiting and collapse, which proved fatal in thirty hours.

* *Loc. cit.*, pp. 300, 305.

The patient had been imprudent in diet the day previous to the attack of pain ; but this would scarcely have determined so serious an affection. Unfortunately, as no post-mortem examination was made, it is impossible to decide whether the cause of death was, as supposed, perforation of the stomach, or not. Mr. Coleman, of Wolverhampton, also had a case of diphtheria, that of a female, aged twenty-two years, in which severe pain of the cardiac extremity of the stomach, much aggravated by taking food or wine, came on after the exudation had disappeared from the throat, and the patient was supposed to be going on favourably. The case proved fatal.

Mons. Espagne, of Montpellier, relates a case of œsophageal diphtheria in a patient, aged ten and a half years, suffering from typhoid fever. The diphtheria came on about the twenty-third day of the illness ; and the patient died three days afterwards. On examination after death, the arch of the palate, the uvula, and tonsils were covered with shreds of firm, grey-coloured false membrane. The entire posterior wall of the pharynx was coated with a thick false membrane, which extended, without breach of continuity, down to the cardiac orifice of the stomach. This false membrane was exactly moulded upon the œsophagus, and about the thickness of a line almost throughout its entire length. It became notably thinner towards the stomach, ceasing abruptly at the lesser curvature, but ending by some very thin portions prolonged in the direction of the greater curvature. The diphtheritic concretion formed a complete tube, flattened from before backwards, and plaited longitudinally. It was easily detached from the œsophagus, the mucous membrane below it being injected and of a violet colour, without any trace of ulceration. The larynx and trachea presented no appearance of false membrane.*

The extension of diphtheria forwards into the mouth has been less common in this country than it would appear, from the French writers, to have been in France. The exudation has occasionally appeared on the gums, has sometimes extended on to the buccal mucous membrane, and has more rarely formed a complete covering to the palate and inside of the cheeks, from the fauces to the teeth. One such case proved fatal in the practice of Mr. Rush, of Southminster ; and in a second, the patient nearly died of starvation from inability to swallow after the membrane had come away. The first case seen by me was one of pelticular diphtheria of the inside of the cheeks and gums ; and I have observed exudation in the same locality in several other instances ; but the danger in such cases has always arisen from the condition of the fauces, and not from that of the mouth.

* *De la Diphthérie, de sa Pathogénie, de ses Caractères et de son Traitement.* Par le Docteur Adolphe Espagne, p. 107. Montpellier, 1860.

CHAPTER IX.

SYMPTOMS.—DIPHTHERIA ON THE CUTANEOUS SURFACE AND WOUNDS—
OCCASIONAL CONCOMITANTS OF THE DISEASE—MANNER OF DEATH.

ALTHOUGH the presence of fibrinous exudation upon the surface of the mouth and throat and the several tracts of mucous membrane continuous with it, is the essential local sign of diphtheria, similar exudations sometimes occur on other parts of the body, where, from abrasions or other causes, the skin approximates to the condition of a mucous surface. The pudenda and vaginal mucous membrane are, perhaps, after the throat, the most common situations of diphtheritic deposit. As in the following case from my own notes, pudendal diphtheria is generally an accompaniment of diphtheritic disease of the throat, but sometimes occurs without the latter.

E. P., aged one year and a half, has been ill five days.

March 20, 1859.—Is sitting up; pulse under 80; skin cool. The tonsils and uvula are covered with a thick, white false membrane, which appears to be separating at the edges. The injected mucous membrane surrounding the exudation bled freely on being accidentally touched with the tongue depressor. There is an ichorous discharge from the nostrils, which look sore and red. The pudenda are swollen, and covered with a white membranous deposit, extending over both labia, and surrounded by a blush of inflammatory redness. There is also an excoriated surface on the buttock, which is partially coated with a less perfect membrane. The exudation on the mucous membrane of the pudenda could be detached in flakes; and, on lifting up its edge with a pair of forceps, the surface below was seen to be red and tender, but not ulcerated. There is no swelling of the lymphatic glands, either at the angles of the lower jaw or in the groins. The breathing is slightly stridulous.

Symptoms of croup became more fully developed subsequent to my visit, and the little patient died from the extension of the disease into the larynx.

The late Mr. Edwardes, of Wolverhampton, saw two cases of vaginal diphtheria, both of which proved fatal from exhaustion. The disease accompanied diphtheria of the fauces, and both children were inmates of the same cottage where there had already been two fatal cases.

Mr. Cooper, of Cromer, had in one instance seen the pudenda of a little girl covered with exudation unattended by diphtheria of the throat. Dr. Nicholson, of Redditch, also writes me word that he has met with one case of pudental diphtheria in a patient whose throat remained unaffected; and several practitioners in the fenny parts of Lincolnshire, Cambridgeshire, and Norfolk, inform me that they have, from time to time, met with cases of pudental diphtheria, unaccompanied by throat affection, anterior to the recent outbreak. In Dr. Nicholson's patient the parts were abraded by acrid discharge, there was great depression, requiring the free use of stimulants, and recovery was very tardy.

Wounds and abrasions of the skin often become covered with diphtheritic deposit, analogous to that on the throat. This sometimes occurs during the prevalence of diphtheria without the corresponding affection of the fauces, but more frequently in persons who are already suffering from the ordinary form of the disease. Dr. Nicholson, to whose notes I have already been indebted for valuable facts, mentions the occurrence of diphtheria on wounds in two cases without throat affection. One of these, a man aged thirty-two years, had been operated on for *fstula in ano*. On the fifth day diphtheritic exudation appeared upon the wound, which eventually sloughed under the use of caustics. The patient died. The other case was that of a female, aged fifty-three years, who was suffering from caries of the metacarpal bones of the second and third fingers. On the third day, after an abscess connected with the diseased bones had been opened, the wound became covered with diphtheritic exudation. The parts were subsequently amputated, but diphtheria reappeared on the new wound, hæmorrhage from the bowels supervened, and the patient sank fourteen days after the operation.

More frequently diphtheritic exudation has appeared on wounds simultaneously with the occurrence of diphtheria in the fauces. I have already related (page 56) a case in which diphtheria attacked a punctured wound on the foot of a boy. The following case occurred in the practice of Mr. Stephens, of Christchurch:—A. B., aged thirty-two, wife of a labourer, came under treatment in February, 1859. She had an infant ten months old, and had been suffering for several weeks from an abscess in the left breast, previously to which time her health had been good.

February 10.—Complains of stiffness in the throat, difficulty in swallowing, and pains in the ears. The tonsils, soft palate, and uvula are of a deep claret colour, but free from both ulceration and fibrinous deposit. Pulse 140, small and weak; skin warm and perspiring; tongue moist and covered with a creamy fur; bowels confined; entire loss of appetite. There is no rash on the skin, and no thirst. On the side of the left nipple is a sore the size of a shilling, from which issues a thin watery discharge.

Poultices to be applied to the breast.

℞. Pulv. rhæi gr. viij.
 Hyd. c. cretâ gr. v.
 M. Statim sum.

℞. Ammon. sesquicarb ℥j.
 Decoct. cinchonæ ℥vj.
 M. Cap. cochl. ij. magn. 4tâ q. horâ.

February 12.—Feels worse; has had no sleep; great pain in the ears; bowels have been twice freely opened; tongue much as before; pulse 138, very weak; urine neutral, scanty, high coloured, contains no albumen. Skin perspiring; there is a diphtheritic patch, the size of a bean, on the left tonsil.

Beef-tea and port wine.

February 13.—Has not slept, feels much worse; bowels not opened; tongue dry and brown; pulse 160; skin dry; urine scanty. The patch on the left tonsil is much increased in size, and there is now also one on the right tonsil. Complains of stiffness in the left breast, the sore upon which is covered with a yellow diphtheritic deposit. Applied hydrochloric acid, mixed with honey, to the tonsils. Omit the steel mixture, and resume the ammonia and bark.

14th.—Much better. Has slept some hours; felt no pain from the application of the acid; bowels not opened; pulse 140, softer; skin perspiring copiously; tongue moist, and cleaner at the edges; deposit on the tonsils of a darker colour; velum of a less deep red; no pain in the ears; urine more plentiful; has taken nourishment more freely. Continue the medicine, and repeat the aperient with rhubarb and grey powder.

15th.—Decidedly better; has slept well; pulse 110, softer and fuller; tongue cleaning; skin warm and moist; aperient has acted once; urine is depositing lithates. There is no exudation on the right tonsil, and that on the left is much smaller. No ulceration. The deposit on the sore has come away on the poultice. Continue medicine and nourishment.

The patient went on favourably from this time, the deposit on the tonsils having entirely disappeared by the 19th, and convalescence being established on the 26th of February.

Diphtheritic membranes frequently form on the excoriations caused by blisters, but although perhaps then most common, their occurrence is probably not restricted to times when diphtheria of the throat is epidemic.

M. Becquerel mentions the occurrence of eighteen cases of gangrene of blistered surfaces during an epidemic of diphtheria at the Hospital for

Sick Children in Paris, in 1841. The gangrene was always preceded by the development of false membrane upon the raw surface. This false membrane did not separate, but became confounded with the slough which very frequently spread so as to occupy a gradually widening surface. The affection sometimes occurred simultaneously with diphtheria of the throat, but, in several cases, independently of any other diphtheritic disease.*

Quite irrespective of the presence of diphtheria, blistered surfaces in cachectic persons, especially in children suffering from measles, are apt to become coated with a white membranous substance which is commonly considered as a slough, but, in reality, appears very analogous to diphtheritic exudation. Like the latter, it is surrounded by an inflamed border, which sometimes, acquiring a tendency to spread, extends beyond the margin of the original sore. Around this, small vesicles occasionally form, which, on breaking, show the denuded cutis covered with a dirty white pellicle similar to that on the blistered surface. After a time true sloughing takes place, and the patient either dies, or the skin-like exudation is thrown off, leaving a healthy suppurating surface. More rarely the false membrane dries up, and peels off in shreds, leaving the subjacent skin unbroken, and merely red and tender.

The formation of false membranes on blistered surfaces may thus, perhaps, be regarded as at least an occasional result of the epispastic action of cantharides; and M. Bretonneau has shown that pellicular exudation is the normal consequence of the application of oil of cantharides to the mucous membrane of the mouth. 'In less than twenty minutes' after the application 'the epidermis shrivels and becomes raised and detached. It is soon replaced by a concrete pellicle, at first thin and semi-transparent, which speedily becomes more opaque and thicker. This membrane, which is at first slightly adherent, is detached and reproduced with great readiness. Within a period of six or seven days it may be several times renewed.†

Diphtheritic exudation often forms on other abrasions of the skin, and on the denuded cutis of vesicular eruptions, as well as on blistered surfaces. In his account of the epidemic of the last century, Dr. Starr has well described the occurrence of diphtheria in connexion with cutaneous eruptions. The following case affords a good illustration of diphtheria of the cutis:—

Jane Smith, aged fourteen years, admitted under my care as a patient of the Western General Dispensary, April 14th, 1859.

Has been suffering from sore-throat since Friday, the 8th instant.

* *Gazette Médicale de Paris*, 1843, p. 692.

† *Traité de Diphthérie*, p. 356. Also *British and Foreign Medico-Chirurgical Review*, vol. xxv. p. 4. Also *Memoirs on Diphtheria*, published by the New Sydenham Society, pp. 185–189.

There is great difficulty in swallowing, and the glands at the angles of the lower jaw are swollen and tender. The right tonsil is much enlarged, and was covered with a dense, buff-coloured, leathery membrane, which came off readily on being laid hold of with forceps, leaving the surface of the mucous membrane rough and bloody, but not ulcerated. There is also an extensive false membrane on the posterior wall of the pharynx. Voice raucous; breath very offensive; bowels confined; tongue creamy; pulse about 100, exceedingly small and feeble; is light-headed at night. The catamenia have come on since her illness, being a fortnight before the proper period; urine highly albuminous. On inquiry I find there are four cases of slight sore-throat in the patient's house.

	Garg. cum chlor. sodæ	℥ xij.
	Sæpe utend.	
R	Tinct. ferri sesquichl.	ʒ ij.
	Aquæ cinnam.	ʒ vj.
M.	Cap. cochl. ij. magn. 3tiâ q. horâ.	

April 15.—Walked a distance of nearly a mile to see me this morning. Is better; there is less false membrane, and the place on the right tonsil, from which the leathery exudation was removed yesterday, is to-day much less red and inflamed. There are several patches of false membrane on the right tonsil, and a considerable-sized piece is hanging partially attached to the right side of the pharynx. Tongue cleaner; papillæ at its tip slightly enlarged, giving it a strawberry-looking appearance; pulse 120, but of better volume; the catamenia continue; the bowels are confined; the nose is sore, and the edges of the nostrils much excoriated by an acrid discharge. The offensive smell from the throat is much diminished. There is no kind of eruption on the skin. On the dorsal aspect of the metacarpal part of the left thumb is an irregular-shaped vesicle of about the area of a half-crown, which originated in a scratch received about six days ago. On lifting up the loose cuticle, no moisture was found in the vesicle, but the cutis was covered with a dense membranous exudation of a pinkish colour, insensible to touch, separated from the cuticle which lay loosely over it, but firmly adherent to the cutis. The lymphatics of the arm and hand are inflamed. A portion of the false membrane being peeled off without causing pain to the patient, was found, on examination under the microscope, to consist of corpuscular and fibrinous exudation, analogous to that from the throat.

18th.—Throat less inflamed, but there is now a tendency to ulceration, and the offensive smell from it continues. There is still a considerable quantity of membranous-looking exudation on the posterior fauces, and when the patient attempts to swallow liquids, they are regurgitated

through the nostrils. Voice improved; tongue slightly furred; pulse 74, feeble; catamenia continue. The exudation on the thumb has separated under the use of white-bread poultices, leaving a red surface, from which there is scarcely any discharge. There is a slight watery hæmorrhage from the nose, which has excoriated the edges of the nostril and the upper lip. There are several claret-coloured, purpurous-looking patches, varying in size from a pea to a horse-bean, on the thumb, fore-arm, and inner aspect of the left elbow.

20th.—Appears better in several respects, but the throat is now evidently sloughing. There is great difficulty in swallowing, and the patient takes but little sustenance. Is delirious at night; bowels act daily; pulse 84, exceedingly feeble; urine highly albuminous. The wound on the left thumb is less sore and irritable. The claret-coloured patches on the thumb, fore-arm, and left elbow, are paler: complains of numbness in the right hand and arm.

21st.—Appears to be improving. To continue the wine, beef-tea, and the steel mixture, and to remain in bed, which she was very unwilling to submit to, and which her friends did not enforce.

22nd.—Continues better in all respects. Appetite returning. Notwithstanding my urgent recommendation yesterday, she was sitting on a sofa downstairs at the time of my visit, and her friends could scarcely believe that danger was still imminent. She died very suddenly the same night. A post-mortem examination was refused.

The following cases of cutaneous diphtheria, from Mr. Simon's *Second Annual Report*, are given on the authority of Dr. Sanderson:*

'At Ash, in a family consisting of an infant, æt. nine months, and two older children, the latter contracted faucial diphtheria, which assumed its ordinary characters. During their illness the infant was suffering from extensive excoriation of the skin of the chest, produced by the constant dribbling of an acrid discharge from the mouth. When first seen, the whole of the inflamed surface was covered by a membranous concretion of firm consistence. The infant died in the course of the following day. No affection of the fauces could be discovered.

'A little girl, æt. eleven, one of a family in which two fatal cases of faucial diphtheria had recently occurred, was, on March 4th, under treatment for a scald of the foot. On that day she contracted the disease. About a week after the concretion had appeared on the fauces, the scalded surface became covered with a pellicle, which soon acquired sufficient thickness and firmness to be detached in flakes. This separated spontaneously, leaving a healthy sore. There was no sloughing at any time, and the patient did well. In another example a similar concretion was formed on the reddened and partly blistered sur-

* *Loc. cit.*, p. 273.

face produced by the application to the skin of the linimentum ammoniæ.'

Sometimes exudation forms on the surface of the cutis when denuded by natural vesication. This happened both in the Cornish and American epidemics of the last century, and has sometimes, though not frequently, occurred during the recent visitation. The following good example is taken from the information collected by Dr. Sanderson:*

'W. G., æt. eight, became ill June 7th, on which day a bulla of rupia simplex appeared on his right index knuckle, and another on the forehead at the root of the nose. On the third day after their appearance it was found that the surface of the corium, beneath the now flaccid and ruptured epidermis, was covered by a firm white pellicle. Each eye was surrounded by a zone of erysipelas, with vesication here and there on the red and swollen surface. There was intense swelling and redness of the velum, uvula, and right tonsil, and the last was covered with diphtheritic concretion. The skin was cool and pallid; there was extreme muscular weakness and prostration. Pulse 84. He died the following day.'

Cases of ulcerated sore-throat are said to have been sometimes intermixed in the same epidemic with others exhibiting the characteristic exudation of diphtheria, and sloughing occasionally takes place at an advanced stage of the latter. Of this class of cases, I have seen several examples; but although careful observers have mentioned their occurrence, I have not myself seen any cases of simple ulcerated or gangrenous sore-throat coincident with an epidemic of diphtheria. Mr. Thompson describes the sore-throat prevalent about Launceston as having been of two kinds, both presenting the same general symptoms, but differing locally in this respect, that whilst in the one the tonsils, and sometimes the pharynx, nares, and soft palate, were covered with diphtheritic deposit, in the other the tonsil was scooped out into an ulcer with raised violet-coloured edges; the bottom of the ulcer exhibiting a dark ash-coloured slough. In another class of cases there was at first neither deposit nor ulceration, the tonsil being simply swollen and painful. Such cases generally terminated in ulceration, which, beginning in several distinct spots, gradually involved the whole tonsil. Sometimes the tonsil sloughed very extensively, leaving a considerable cavity after recovery.† Dr. Capron also mentions having seen cases, during the epidemic at Spalding, in which swelling and œdema of the soft palate, uvula, and tonsils, were rapidly followed by sloughing or gangrene, attended by severe constitutional symptoms.

Sloughing and ulceration are occasional concomitants of diphtheria,

* *Second Report of the Medical Officer of the Privy Council*, p. 273. London. 1860.

† *British Medical Journal* (June 5, 1858), p. 449.

occurring generally at a comparatively advanced stage of the local affection. Sometimes, when cases presenting the brown leathery exudation recover, the diphtheritic deposit on separating leaves a slowly-healing ulcer of the subjacent parts. In other cases, sloughing commences in the centre of the tonsil, and extending to the mucous membrane, causes considerable loss of substance, and sometimes destruction of a portion of the velum, uvula, or other soft parts. One such case, shown to me by Dr. Morris, of Spalding, had quite recovered, with the loss of the uvula and the greater portion of the soft palate; and I have seen several in which perforation of the velum, or slight destruction of substance, such as a portion of the uvula, had occurred. Probably sloughing would be more frequently seen, were it not for the rapid progress of severe cases to a fatal termination; for in two instances I have observed sloughing in the centre of the tonsils after death, the mucous membrane being still apparently continuous, and covered with membranous exudation.

The following case of ulceration occurring after the exudation, is taken from a paper on *Diphtheritic Sore-Throat*, by Dr. Sanderson.*

'M. F., aged nineteen, previously in good health, first complained of sore-throat on the 24th of August. I saw her August 25, when her condition was as follows:—

'No complaint ('feels better'), except of weakness. Skin natural; pulse regular, but weak; breathing natural; no cough; no headache; urine loaded with albumen; voice weak and nasal; intense swelling of the tonsils and adjacent parts on the left side. A dirty white, apparently thin coating covered the tonsils, velum, and arches, as far back as could be seen, and extended forwards, on the left side, over the soft palate.

'August 27.—Pulse 88, weak; urine still albuminous; the membranous concretion partly detached from soft palate; swelling diminished; other symptoms as before.

'After this she gradually improved; and, in the course of a few days, the concretion had, for the most part, become detached, when it was found that an ulcer existed of the left half of the soft palate, which had completely divided the anterior faucial arch on that side, and occasioned a hiatus, which was rendered apparently larger by the retraction of its margin by muscular action. The cavity of the ulcer was covered with an adherent pultaceous fibrin, and its edges were surrounded by a border of crimson mucous membrane. When last seen (Sept. 14), the cavity had diminished, but was still considerable; the voice was much improved, but was still nasal; there was no regurgitation of liquids by the nose.'

M. Becquerel has described an epidemic of diphtheria, complicated with gangrene of the fauces, which came under his observation at the

* *British and Foreign Medico-Chirurgical Review*, vol. 25, p. 191.

Hospital for Sick Children at Paris, in 1841. It comprised cases of laryngeal diphtheria, of pharyngeal diphtheria, complicated with gangrene, and also cases in which the raw surface of blisters became gangrenous.

The laryngeal cases presented nothing unusual; but the pharyngeal bear immediately upon the subject now under consideration. Of seventeen cases of gangrenous angina, fifteen proved fatal, and two only were cured. In thirteen of these cases the gangrenous affection followed, or was coincident with, false membrane. In two only gangrenous ulceration, which had evidently been left by the separation of a slough, was found at a post-mortem examination; but it could not be determined whether the gangrene had been preceded by false membrane or not. In two other cases gangrene had unquestionably taken place without being preceded by exudation. The gangrene was altogether in the centre of the tonsils, and surrounded by a tissue of increased density, friable, and manifestly infiltrated with blood.*

Suppuration of the swollen tonsils sometimes, but rarely, occurs in diphtheria; and still more rarely suppuration of the external glands. More or less swelling of the glands at the angle of the lower jaw may be said to exist in every case. Sometimes it is very slight; at others very considerable. It is in the latter class of cases that suppuration sometimes occurs. In one such case I was present when the tumour was punctured. Previously to the operation, the tumour conveyed to the touch rather the boggy sensation caused by an infiltration of pus, than the fluctuation of a defined abscess; but the skin was tense, red, extremely tender, and there was distinct pointing. These circumstances appeared to justify the making of an incision, which was followed by a discharge of bloody sanies, mixed with streaks of pus.

Dr. Gull mentions having seen in a child suppuration of the inguinal glands simultaneously with slight diphtheria of the fauces.† And it will be recollected that the formation of an abscess followed diphtheritic ophthalmia, in the case already quoted from the *Ophthalmic Hospital Reports*.

Albuminuria is a frequent, but not a constant, attendant upon diphtheria. Its occurrence was first observed by Dr. Wade, of Birmingham, who, in examining the body of a person who had died of diphtheria, found such changes in the kidney as induced him to examine the state of the urine during life more carefully than he had previously done.‡ He thus discovered that albumen is frequently present in the urine of patients suffering from diphtheria—a fact which has been confirmed by subsequent observers, both abroad and at home. When albuminuria occurs in diphtheria, it usually does so at an early period of the illness,

* *Gazette Médicale de Paris*, 1843, pp. 690-1.

† *Second Report of the Medical Officer of the Privy Council*, p. 301.

‡ *Midland Quarterly Journal of the Medical Sciences*, vol. ii., p. 390.

generally within a few hours after its commencement. In this respect diphtheria differs essentially from scarlet fever, in which albumen is rarely found in the urine till a much later period of the illness.

Very often a cloud, probably of phosphates, which re-dissolves on the addition of nitric acid, is thrown down by heat, a few hours before the detection of albuminuria; and in several instances a similar cloud has been thrown down for a day or two after the disappearance of albumen.

The albuminous urine of diphtheritic patients rarely, if ever, presents the smoky appearance so common in those suffering from scarlet fever. On microscopic examination, casts of the urinary tubes are generally found; but both Dr. Heslop, of Birmingham, and Mr. Houghton, of Dudley, have met with cases of profuse albuminuria in which no tube casts could be discovered. The presence of albumen in the urine must always be regarded as a serious circumstance in diphtheria; and, of course, more so if the albumen be in large quantity. But neither is its presence an absolutely fatal symptom, nor does it always coincide with great severity in the other symptoms: and it has sometimes been wanting in cases which were, in other respects, severe, and even proved fatal. Albumen was found in the urine of the following patient, the other symptoms being of a mild character.

Richard Galway, aged twenty years, labourer, a strong, healthy-looking man, was admitted under my care as a patient of the Western General Dispensary, April 9th, 1859. Dates his illness from Saturday, the 7th instant. His first feeling of discomfort was that of 'a lump in the throat,' soon followed by soreness and difficulty of swallowing. On inquiry, it appeared that he had felt indisposed during the previous week, having suffered from 'pains in the bones' and drowsiness. Voice thick, tonsils much enlarged, and together with the velum congested and of a dusky-red colour. On the right tonsil was a patch of firmly-adherent, white exudation, which resisted an effort to remove it with the forceps. There was also a smaller patch on the left tonsil, another patch on the uvula, and two patches of the same white membranous exudation on the posterior wall of the pharynx. There was swelling of the lymphatic glands at the angles of the lower jaw. Pulse 84, small and feeble; skin sweaty; bowels regular. Entire loss of appetite. Urine slightly albuminous. There had been neither scarlet fever nor sore-throat in the house in which he lives, nor, so far as could be discovered, had he been in contact with persons suffering from either of these complaints.

R	Tinct. ferri sesquichl.	. . .	ʒ iij.
	Aquæ	. . .	ʒ viij.
M.	Cap. cochl. ij. magn. 5tā q. horā.		
R	Tinct. ferri sesquichl.	. . .	ʒ vj.
	Acid. hydrochl. dil.	. . .	ʒ iij.
	Aquæ	. . .	ʒ vj.
M.	Fiat gargar. sæpe utend.		

April 11.—Pulse 80, extremely feeble. The left tonsil is almost free from exudation, but there is still a piece of tough membrane adherent to the right, and another upon the posterior fauces. That portion of the velum which was only inflamed when first seen, is to-day coated with filmy, semi-opaque membranous-looking exudation. Glands at the angle of the lower jaw remain swollen; urine still albuminous.—Pergat.

12th.—Decidedly better; pulse 72, thready and exceedingly feeble. The throat is for the most part free from exudation, and less congested, but there remains a patch of false membrane on the right tonsil near the velum, and another of smaller size on the left side of the posterior fauces. Tongue clean; bowels regular; urine very pale and abundant, is free from albumen.

From this time he gradually but slowly recovered. No change of treatment was adopted, and the illness terminated in none of the sequelæ common after diphtheria.

In a much severer case, under the care of Dr. Bristowe, in St. Thomas's Hospital, which I had the opportunity of watching from day to day, albumen was found in the urine in small quantity, about the sixth or seventh day of the illness; continued to occur about five days longer, and then disappeared as convalescence approached.

The frequency of the occurrence of albumen in the urine of patients suffering from diphtheria, and the precise circumstances under which it happens, still require much investigation. It has evidently been more common in some districts than in others. Dr. Sanderson says it was found at Hertingfordbury in all the cases, except one, in which it was sought for. At Wirksworth, Dr. Webb found it in every case in which he examined the urine. At Crowle, albumen was frequently found in the urine; but in some severe and fatal cases it could not be discovered. Mr. Carr, of Blackheath, met with it frequently, but not always.* It was often found in the urine by the Birmingham medical practitioners, but by no means always, even in severe cases. I have myself several times been unable to detect albuminuria by the proper tests in very malignant cases of diphtheria.

As patients recover from the disease, all traces of albuminuria disappear. I have omitted few opportunities of examining the state of the urine during convalescence, and in no instance have found albumen in that of persons suffering from the sequelæ of the disease, after what may perhaps be called the acute stage had gone by. Uræmia has not, so far as I know, been observed in connexion with the albuminuria of diphtheria. Dr. Sanderson, who analysed the urine of a diphtheritic patient in St. Mary's Hospital, ascertained that at the acmé of the disease, when there was total loss of appetite, the quantity of urea excreted in a period

* *Second Report of the Medical Officer of the Privy Council*, p. 309.

of twenty-four hours, was about twice as great as during a similar period when convalescence had become established, and the patient was able to take extras as well as ordinary diet.* In other respects the urine does not present any constant or remarkable character in diphtheria. It varies much, but very frequently contains an excess of phosphates, and sometimes, especially during convalescence, an excess of lithates, and the specific gravity is often high.

In no instance has anasarca occurred in conjunction with diphtheria in cases under my own observation, and most other observers agree in the same statement. I saw a case in Lincolnshire, in which the patient, an adult male, said there had been swelling of the feet and legs at night, and puffiness of the face in the morning, shortly after the attack, but he was excessively anæmiated, and anasarca certainly did not exist when I saw him. A few practitioners inform me that they have known anasarca to follow diphtheria; but its occurrence, if it ever happen, in cases uncomplicated with scarlet fever, is at least very rare.

Besides hæmorrhage from the nose, throat, or bronchial membrane, diphtheria is sometimes attended by purpura. Profuse oozing of bloody sanies from the throat, mouth, or nose, sometimes takes place concurrently with the appearance of purpurous spots on the body or limbs. What may perhaps be termed local purpura is also sometimes observed, as in the case of Jane Smith (page 117), upon whose left hand and arm were claret-coloured blotches of a purpurous nature.

Dr. Gull has met with purpura about the skin of the neck and upper part of the chest.†

Mr. Williams, of Dursley, had a fatal case at Elmcote, in which the patient died, apparently from the profuse discharge of bloody sanies, resembling claret, from the throat, amounting to two pints per day; and Mr. Clowes, of Stalham, another, a woman, aged thirty-two years, in whom purpura made its appearance ten days from the beginning of the illness, and after the membranous exudation had altogether disappeared from the fauces; there was hæmorrhage from the gums, fauces, nose, vagina, and anus, accompanied by sloughing of the nates, under which the patient sank.

Other eruptions besides purpura sometimes accompany or follow diphtheria. An irregular, measly mottling of the skin is not uncommon at an early stage; and at a somewhat more advanced stage of the disease, I have, in two instances, seen an eruption very closely resembling the rose rash of typhoid fever.‡

* *British and Foreign Medico-Chirurgical Review*, vol. xxv., p. 196.

† *Loc. cit.*, p. 304.

‡ Mr. Ray, of Dulwich, says he has only seen rash in one case of diphtheria. It occurred on the eighth, and disappeared by the eleventh day of the illness. It was very like the roseoloid rash of typhoid. There were no petechiæ, and the

A similar eruption was observed by Dr. Nicholson, of Redditch, in a case attended by alarming depression, but which ultimately recovered. I have also observed erythema nodosum in the course of diphtheria. And Dr. Gull mentions having met with erythema papulatum, and also urticaria, differing from the rash which occasionally occurs during recovery from cholera, only in the greater distinctness of the wheals. Similar eruptions have been noticed by other practitioners. In two instances under my observation, sudamina have appeared at a rather late period of the complaint; and Dr. Nicholson mentions their occurrence in nine cases at Redditch as early as the second or third day from the commencement of the exudation. The patients were young, and of ages intermediate between four and nineteen years.

The temperature of the skin, never perhaps much raised above the natural standard even in the early stage of diphtheria, usually falls somewhat below it as the disease advances; and, in severe cases, especially towards their close, the surface becomes cold. Delirium, or rather wandering of the mind, from which the patient is at once recalled when his attention is attracted, is also an occasional, but not a frequent concomitant of the disease. In my experience, this has always been a serious symptom.

The pulse varies much in frequency, sometimes differing but little from the standard of health; at others, and oftener, being quick and becoming more accelerated as the case advances to a fatal termination; in a few cases it has been below the natural frequency. Dr. Heslop informs me he has found it as low as 40 in a child only five years of age. Whatever may be the state of the pulse as regards frequency, it rarely fails to become remarkably feeble at an early period of the illness; and this circumstance, added to the remarkable anæmia, and pallid, worn aspect of the patient, has more than once led me to suspect the existence of diphtheria in cases where, the pain and difficulty in swallowing being slight, no reference was made to the throat by the patient in describing his ailment.

The tongue exhibits no uniform character in diphtheria, being sometimes coated with a white creamy fur; at others clean, excepting perhaps at the posterior part. The appetite almost invariably fails at an early period of the illness; and, at a later stage, partly from dislike to food, partly perhaps from the difficulty in taking it, but probably also from extreme debility rendering patients averse to exertion, there is often much difficulty in inducing them to take sufficient nourishment to sustain the failing strength. Many cases, I am persuaded, terminate fatally from this cause, which might perhaps be saved by the freer use of wine and food.

eruption was confined to the thorax, abdomen, and back—*Second Report of the Medical Officer to the Privy Council*, p. 327.

The proportion of deaths is high in the malignant form of diphtheria; but whilst, on the one hand, very unpromising cases sometimes do well; on the other, patients whose symptoms have not been particularly alarming to the unskilled observer, very often die. Death occurs in several modes. In one class of cases, this event is preceded by certain constitutional symptoms attendant on gangrene. The latter has been rare in this country, but has been well described by Becquerel, in his account of the epidemic already referred to. Towards the end of the case the surface of the body becomes cold, the pulse extremely quick, and finally, intermittent; the countenance becomes shrunken, and assumes the hippocratic aspect; vomiting and diarrhœa supervene, the latter soon becoming involuntary, and occasionally delirium, coma, or nervous agitation precede death.

Sometimes, in gangrenous cases, death is caused by hæmorrhage before the development of the constitutional symptoms.

In one of M. Becquerel's cases, death was the result of violent hæmorrhage from the inferior pharyngeal artery, and probably some of the cases of fatal hæmorrhage on record in this country have really arisen from gangrenous ulceration. This is the more probable, as when gangrene occurs subsequent to the formation of false membrane, it is most difficult to distinguish, and was not discovered until after death in two of M. Becquerel's cases.

More commonly, when diphtheria proves fatal, this event arises, either from the extension of the disease to the larynx and trachea, and the mechanical obstruction to respiration produced by the false membrane: from exhaustion of the powers of life; or probably, on account of its sudden occurrence, from syncope. It was from its so often terminating in asphyxia, that the disease acquired the name of *morbus strangulatorius*, by which it was formerly known. As has already been said, the frequency with which the larynx and trachea are implicated, and, of course, of this termination of the disease, varies much in different epidemics, and probably in different localities. In this class of cases death is preceded by stridulous breathing, and the other symptoms of croup. It is just possible that death by asphyxia may occur independently of any affection of the larynx or trachea. The following case, for the particulars of which I am indebted to Mr. West, of Birmingham, appears to have been of the latter kind.

A little girl, aged six years, was said to have been choked while eating her dinner. Her mother had previously remarked that she was ailing and had lost her appetite, but she had not had recourse to medical advice. On Mr. West's arrival the child was dead. The body was emaciated, and the fauces completely stuffed with a greyish white fibrinous deposit, which appeared to extend some distance down the pharynx. Layer after layer was removed in succession before the tonsils and palate

could be reached. There was no evidence of deposit nor any sign of inflammation about the larynx; but about the upper surface of the epiglottis were several large plates of fibrine, which probably assisted in producing the dyspnœa first observed by her mother a few minutes before death. A post-mortem examination on the following day showed the fauces and pharynx to be the seat of superficial ulceration, with here and there small patches of semi-detached fibrine. The larynx and trachea were healthy, and no disease existed in the abdominal or thoracic viscera.

When exhaustion is the cause of death, its approach is gradual. The pulse becomes quicker and quicker, and, at length, imperceptible. The patient's aspect becomes more and more dejected; food and wine are refused, or administered with much difficulty, and, unless disturbed, the patient lies quiet, apparently somnolent, and takes no notice of surrounding objects. There is none of the agony noticeable in cases where the larynx participates in the disease, but the end is usually quiet, and the mental faculties are preserved till the last.

Sudden death in patients the aspect of whose case is not alarming, or who appear out of danger, is a peculiar characteristic of diphtheria, and this circumstance has added greatly to the fear with which this disease has been regarded by the relatives of the sick and the public at large. One case of sudden death when the patient appeared to be improving has already been related (page 119), and many others have fallen under the notice of my medical friends and correspondents. Mr. West has sent me the history of a young woman, aged twenty, who presented herself as an out-patient of the Queen's Hospital, Birmingham, suffering from diphtheria. She declined to enter the hospital, but continued to attend among the out-patients for three successive days, on each of which she walked a distance of a mile from her home for this purpose. The throat improved in appearance daily; but, notwithstanding this amendment, she became weaker, and, returning home tired on the third day, she took some food and went to bed. She appeared very drowsy during the remainder of the day, was disinclined for exertion, refused nourishment, and continued in a dozing condition till the following morning, when she asked for breakfast. Whilst being lifted up to receive it she fell back fainting, and died before assistance could be obtained. Mr. Carr, of Blackheath, also mentions extreme suddenness of death as one of the most marked characteristics of true diphtheria, and adds that it occurs in an instant when the patient has the power of sitting up in bed, of speaking, and of swallowing.* Mr. Ritchie, of Leek, had such a case in which he had discontinued his attendance, the throat being well and the sick person apparently convalescent. The patient suddenly became worse; there was vomiting, the surface of the body was cold,

* *Second Report of the Medical Officer of the Privy Council*, p. 309.

and there was great depression without hæmorrhage or other ostensible cause. When visited the patient sat up in bed and answered questions, but then, having laid himself back and stretched out his arms, he died before the medical attendant left the room. Another case of which I have notes was that of a child who died in its chair immediately after being examined by the surgeon.

Sometimes sudden death has occurred after patients were able to resume active habits, and may perhaps have been induced, by over-exertion, whilst in the very depressed anæmiated condition produced by the disease. A boy, aged ten years, who had been suffering from diphtheria for five days, although well enough on the previous evening to hold the surgeon's horse, died on the sixth day of his illness. A carpenter's apprentice, convalescent from diphtheria, went home to visit his parents, who lived at a distance of three miles from his master's house. On his arrival he took a basin of bread and milk, went to bed, and died suddenly three hours afterwards. A man-servant, aged sixteen years, who had been ten or twelve days under treatment for diphtheria, seeming to be convalescent, obtained leave to go home and see his friends before returning to his occupation, and there died suddenly.

Dr. Bellyse mentions a case of this kind, that of a boy, aged ten years, who, having been ill nearly three weeks, had so far recovered as to be able to go out; and, on the day of his death, walked to a farmhouse at a considerable distance from his home. About ten o'clock the same evening Dr. Bellyse, on being summoned to see his patient, who had been suddenly seized with violent pain in the bowels about an hour before, found him sinking from exhaustion. Although relieved by fomentations and other remedies, he died very soon after the visit. A post-mortem examination was refused.

Indeed death, either from syncope or the accession of collapse, fatal in a few hours after exertion, has so often happened when patients have appeared to be recovering satisfactorily, that convalescents from diphtheria cannot be considered out of danger until some time after the throat is well, and the very marked anæmia produced by the disease has disappeared. It is true that death, whether sudden or otherwise, usually occurs within a few days; but sometimes as late as the sixteenth or seventeenth day of the illness, or perhaps even later.

In the following case, reported by Mr. Adams, of Harrington-square, death took place from secondary exhaustion as late as the nineteenth day of the illness. It is a rather unusual case in other respects, and especially as regards the late period at which albumen first appeared in the urine. The case is that of a schoolboy, who dwelt at Camden Town.*

* *Second Report of the Medical Officer of the Privy Council*, p. 327.

'The disease set in with a febrile attack which lasted forty-eight hours, with hot skin and rapid pulse—120; soreness of throat and stiffness of neck; but no diphtheritic effusion was observed until the day following, when the left tonsil was seen to have several white spots upon it, which by the next day had spread into one uniform patch over that body. The right tonsil now presented a few small spots, and more pain was complained of in swallowing, although no real difficulty was experienced. By the evening of the second day the fever had subsided, and the pulse fallen to its normal standing. On the fifth day the pulse began to fail in power, and therefore wine was allowed him, with citrate of iron and ammonia. On the 7th, there was no increase of mischief in the throat, but the nostrils began to discharge a serous matter, respiration became snoring, and sleep very restless; but while awake he breathed quietly, and with no difficulty. Glands on left side of neck enlarged; pulse 92; no fever. On the 9th, much the same, but albumen had appeared in the urine. 11th day: nostrils discharged less; sleep much less troubled. 13th day: diphtheritic patches were becoming detached; urine contained only a trace of albumen; pulse 92. He was cheerful, and amused himself, as he had done for several days, in reading and being read to; but his appetite now began to fail, and there was reluctance to take the quantity of wine ordered for him (8 oz. daily). 14th day: the false membrane had entirely disappeared, as also the albumen in the urine. The voice now became nasal, and more pain was experienced in deglutition; fluids occasionally passed through the nostrils; pulse fell to 80; slept well and composedly. 15th: voice more deeply nasal. Complained that swallowing gave him pain in the ears and head, and of being sick. Beef-tea and wine have returned several times; brandy was therefore substituted for wine; pulse 72. 16th: passed a comfortable night, but there was difficulty in getting him to take anything; was thirsty, and craved for water, which very generally returned immediately after it was taken; as did food, brandy, and the medicines prescribed with the hope of allaying the irritable stomach; pulse 60; no fever; no pain. 17th day: everything is rejected by the stomach immediately, and alarming attacks of vertigo, or swimming of the head, were complained of, accompanied by temporary loss of consciousness; pulse 40. . . . By the 18th day, the action of the heart had declined to 32 beats in the minute. On the morning of the 19th day, it had fallen to 24; but, on being disturbed to take food or brandy, would suddenly rise to 70 or 80 per minute. He still maintained a cheerful manner; but now and then, perhaps two or three times in an hour, the eyes would turn up, and he would lose consciousness for a moment, and recover in a state of alarm. In the afternoon he died.'

The fatal result is sometimes preceded by convulsions. I have not myself witnessed this termination of the disease; but several cases have

been reported to me. Dr. Gull mentions a case in which convulsions were coincident with suppression of urine. The patient, a child of two years and a half old, had been ill of the disease nine days. 'The urine was scanty for several days, and intensely albuminous; it then became suppressed; there was constant vomiting for two days, then convulsions, and screaming, and death.'*

The signs which indicate great danger in diphtheria are, croupy symptoms consequent upon the extension of the disease to the larynx or trachea; the occurrence of pneumonia; a brown or blackish appearance of the false membrane; hæmorrhage from the nose, throat, bronchial tubes, or intestines; purpura; copious discharge from the nostrils; intense albuminuria; great swelling of the cervical glands; marked diminution of temperature, and sickness or diarrhœa, especially at an advanced period of the illness. Any one of these symptoms denotes that the case is severe; but when—as sometimes happens—two or three are combined, the patient must be regarded as in imminent danger.

* *Second Report of the Medical Officer of the Privy Council*, p. 304.

CHAPTER X.

SYMPTOMS.—SEQUELÆ OF DIPHThERIA.

UNDER the most favourable circumstances, persons who have suffered from fully-developed diphtheria often remain feeble, ailing, and anæmic for many weeks; and the throat sometimes continues to present traces of the disease long afterwards, or is very susceptible to the influence of cold or raw weather. Occasionally, many months elapse before perfect recovery; and I have known one instance in which the patient did not regain his strength for nearly a year. Besides the extreme anæmia which is so marked a result of diphtheria, this disease is very apt to be followed by certain nervous affections of a peculiar kind. These consist of paralysis, and anæsthesia of particular muscles, tenderness and tingling of the skin, gastrodynia, impairment of vision, and deafness.

Few persons recover without impaired voice or power of deglutition, arising from paralysis of the muscles of the throat; and sometimes, though rarely, there is complete aphonia, or absolute inability to swallow. The husky, nasal voice which follows diphtheria is very striking, and closely analogous in character to that of persons suffering from syphilitic affection of the throat. It is remarkable that this affection, in common with the other nervous sequelæ not yet described, very often does not manifest itself until the patient is in other respects convalescent. The impaired power of deglutition consists sometimes of a difficulty in swallowing liquids, sometimes solids; but the former is the more common. Patients are sometimes able to eat a hearty meal without difficulty; but when they attempt to drink, a large portion of the liquid is regurgitated through the nostrils.

The difficulty in swallowing liquids and the nasal tone of voice are usually found in the same person; and although the voice is sometimes slightly affected without impaired power of deglutition, the latter is very rare without the former. Difficulty in swallowing solids, when the power of swallowing liquids is comparatively perfect, occurs but seldom. Dr. Monckton, of Brenchley, relates a case in which the difficulty of swallowing was so great fourteen days after apparent convalescence, that he was compelled to feed the patient by the aid of the stomach pump. The case, that of a strong young woman, proved fatal.*

* *Second Report of the Medical Officer to the Privy Council*, p. 296.

Paralysis of the muscles of the neck, producing inability to carry the head erect, is an occasional, but rare, sequel of the disease. Among a great many convalescents from diphtheria that I have seen, not one has suffered from this affection. I quote the following very remarkable case from a short paper by Dr. Gull, published in the *Lancet*.

‘About a fortnight ago, I was called to see a boy, of whom I received the following history:—Age eleven. Had had an affection of the throat, from which he convalesced, and was sent into the country for change of air. About five weeks from the time of his being taken ill, it was noticed that he did not carry the head erect—it drooped to one side or the other. There was occasional difficulty in deglutition; loss of voice, and attacks of dyspnœa threatening asphyxia. In a day or two from the beginning of these symptoms, the breathing became entirely thoracic. The diaphragm was unmoved in inspiration and depressed in expiration, indicating a loss of power in the phrenic nerves. Deglutition was next to impossible. The child could utter no sound. There were fearful attacks of strangulation when the head was moved in particular positions; and, even when the breathing was at the best, there was blueness of the lips and tracheal râles. The intelligence remained unaffected. The legs could be moved only feebly; the movement of the arms was not impaired; the muscles of the neck were wasted and flaccid; there was no swelling of the fauces; over the transverse processes of the cervical vertebræ, on the right side, there was tenderness, and the adjacent deep-seated absorbent glands were slightly enlarged; no febrile excitement. Pulse feeble, 90. A paroxysm of suffocation suddenly ended the case a few hours after my visit. No post-mortem examination could be obtained.’*

The above case is very interesting on account of the length of time that elapsed between the affection of the throat and the development of the secondary disease, and also of its great severity and fatal termination.

Mr. Graveley, of Newick, mentions the case of his own son, aged two years, in whom singular paralysis of the muscles of the neck occurred after diphtheria. The head rolled about by its own weight backwards, forwards, and sideways, exciting fear of dislocation; and when it settled, the child was apparently unable to move it, and looked about him with a curiously slow turning of the eyeball.†

Paraplegia is by no means an uncommon sequel of diphtheria, and, though more rarely, paralysis of the arms. Sometimes the paralytic affection is of a hemiplegic character. The following case, which I had the opportunity of seeing with Dr. Morris, of Spalding, well illustrates several of the points just mentioned, though the paralysis was less complete than in some other cases which I have seen:—

* *Lancet*, 1858. Vol. ii. p. 5.

† *Second Report of the Medical Officer to the Privy Council*, p. 279.

R. A., æt. twenty-eight years, resides in a small but clean and wholesome house at Pinchbeck. His case was the worst that Dr. Morris had seen to recover. On Friday, January 28th, 1859, he felt a 'nasty taste' in the mouth. On the following day he complained of sore-throat, and on examination by Dr. Morris, it was found to be congested and inflamed. On the 30th, the tonsils, soft palate, and posterior fauces were covered with false membrane, and the case subsequently became one of malignant diphtheria.

March 20.—Very pallid and anæmic; voice thick, snuffing, and nasal; there is a white filmy patch on either side of the arch of the palate, that on the right side being the largest; the uvula has nearly sloughed away, and he says that at the time of its occurrence the stench was so bad that he could scarcely bear it. On the right side of the posterior fauces is a patch of opaque white false membrane, the size of a split pea; the rest of the posterior fauces are covered with a semi-transparent secretion. Skin sweaty; pulse 72, feeble. Sight a little dim; complains of numbness in the belly, and in the legs, arms, and hands, but especially in the left arm and leg. Is unable to dress himself, from weakness of the arms; has lately felt pricking as of pins and needles in the fingers; is rather giddy when out of doors, and still has slight difficulty in swallowing. Three weeks since his face was puffed in the morning, and there was slight œdema of the feet and legs, particularly at night; urine pale coloured, clear, and free from albumen.

The following case of paralysis after diphtheria, which formed the subject of a clinical lecture by Professor Trousseau, well shows the serious nature of the nervous affections which sometimes follow an attack of diphtheria:*

A woman, having been recently confined, contracted diphtheria from a patient in a neighbouring bed. Alum insufflations and applications of hydrochloric acid were resorted to, with the effect of removing all diphtheritic exudation. On the tenth day she spoke with a nasal voice, and deglutition was very difficult, and accompanied by nasal regurgitation. A notable proportion of albumen was also found in the urine. The paralytic affection of the pharynx kept increasing, so that by the twenty-fifth or thirtieth day the woman could no longer swallow, and was like to have died while trying to take some solids. About the fortieth day some improvement in this respect took place, but now numbness of the hands and feet was observed, as well as defective pronunciation from imperfect movement of the tongue. By the fiftieth day, progression had become uncertain, and general nervous symptoms, chiefly consisting in delirium and convulsions, set in. The worst apprehensions were now

* *Medical Times and Gazette*, vol. ii. 1860, p. 90, quoted from the *Gazette des Hôpitaux*.

entertained; but musk having been administered, some improvement took place. So considerable, however, was the paralysis, that the patient could not raise herself without the assistance of two nurses. The bladder was also affected during two or three days, but not the rectum. With this paralytic condition anæsthesia coexisted, the patient remaining absolutely insensible to pricking with needles. On the hundred and fiftieth day the symptoms were so much ameliorated under the use of the syrup of sulphate of strychnia, that the patient could get in and out of bed easily, could knit a little, and was able to distinguish between wool and cotton by the touch. No disturbance of visual power took place, although during six weeks enormous quantities of albumen were found in the urine. 'One circumstance worthy of note is the remarkable alternations which were observed: sometimes one limb, and sometimes another, being affected to-day, and well to-morrow, to become suddenly bad again; and so on. And,' says M. Trousseau, 'as this is of common occurrence in diphtheritic paralysis, we may justly conclude that the lesion of the nervous centres is not of a very grave character.'

Impaired vision is another common sequel of diphtheria, which, like those already described, only comes on subsequently to recovery from the primary local disorder. The patient is usually able to see distant objects with sufficient distinctness, but is unable to see things close at hand. Indeed, several of the most striking cases that have come under my notice were those of children who appeared to be quite well until, on returning to their studies, it was found that they could not see to read. The defective vision comes on gradually; first of all, the patient is unable to read small print, and can only read large print when held at a distance from the eye, a power which is also lost at a later period. The restoration of sight is equally gradual. The following case, reported by Mr. West, of Birmingham, illustrates the impaired vision, and also some of the other sequelæ of diphtheria.

H. D., a boy aged twelve years, when first seen, Dec. 12th, 1857, appeared to be suffering from great prostration, both of mind and body, occasioned, as his mother thought, by the great exertions he had made to prepare for a school examination. He also complained of pain in the throat and of difficulty in swallowing. On examination some dirty white specks were visible on the right tonsil. These specks of exudation very greatly increased in the course of the three or four following days; and many shreds of false membrane and much viscous secretion were brought away in gargling.

On the 19th he was much better as regards the throat, but suffered greatly from weakness. Towards the end of the year deglutition became difficult, his food returning through the nose. The voice, which had been previously clear and harmonious, now became thick and snuffing, and at length the power of articulation was almost gone, so that he could

only make himself understood by the most painful effort. The throat, upon examination, appeared healthy, excepting that the right tonsil was smaller than the left, and that the velum was relaxed and almost without motion. After these symptoms had continued a few days, his sight also began to fail. At first he could only see to read when the book was held at a great distance, but this power gradually diminished, until he was unable to distinguish even the lines, and was compelled to give up reading altogether. There was also strabismus. His gait became uncertain and feeble, so that he moved about with much difficulty. Wine and nourishment were freely administered, but no sign of amendment appeared till January 19th, when he went into the country, where, in the course of three months, his recovery was completed, and he has since enjoyed perfect health.

Impaired vision often occurs as a sequel to diphtheria, unaccompanied by any other nervous affection, and sometimes it follows cases which, during their primary stage, were not thought to be diphtheria. A youth at school had a sore-throat at the same time with a companion who slept in an adjoining bed. The illness in both cases was so slight that I believe no medical man was called in. Just after their indisposition, the boys returned home for the holidays, when one of them was shortly seized with paraplegia, and the other with partial blindness. It was only in consequence of my inquiries that I was informed of the pre-existence of sore-throat, a circumstance which, taken in conjunction with the present attack, enabled me with confidence to pronounce the opinion that both boys had suffered from diphtheria, although in a very mild form.

Mr. Dixon, who has seen several cases of impaired vision after diphtheria, in a note with which he has favoured me, says, that the impairment of sight was due to loss of adjusting power. The sight was as good as ever for distant objects, but the patients either could not read at all, or very imperfectly. He adds, that a low convex glass remedies the want of adjustment, exactly as it does that defect in elderly persons. The correctness of Mr. Dixon's view is confirmed by a fact mentioned by Mr. Gravely, of Newick, who says that a patient of his, a girl aged fifteen years, who could not see without them, was able to do needle-work with the aid of her grandmother's spectacles.*

The several nervous sequelæ of diphtheria may occur separately, but, as in the following cases, two or more of them are often observed in the same subject. The first was mentioned to me by Dr. Bellyse, of Nantwich, and is also reported in the *Lancet*.†—

M. B., aged fifteen years, was attacked on June 9, 1858, with severe diphtheria. She complained of great pain and stiffness of the neck.

* *Loc. cit.*, p. 279.

† *Lancet*, 1858. Vol. ii., p. 513.

There was no external swelling, but the uvula and tonsils were much inflamed, swollen, and agglutinated by a large thick 'slough,' extending to the posterior fauces and anteriorly on to the palate. There was great depression, quick, irritable pulse, and the surface of the body was covered with a cold, clammy perspiration. The slough separated about the eighth day, leaving a healthy, granulating ulcer of the subjacent surface. There was, about the same time, a considerable accession of pain and stiffness of the neck, attended with complete aphonia, a constant flow of saliva, and great fœtor of the breath. These symptoms were followed in a day or two by violent pain at the epigastrium and continual sickness. Diarrhœa now also set in, and lasted ten days, leaving the patient in a state of great debility. Under the use of tonics and generous diet she improved so much as to be able to walk out of doors, but the improvement was not permanent. Pain and tingling of the limbs, with soreness of the soles of the feet, came on, and increased until the slightest movement was most painful. This state gradually passed into entire loss of power and impaired sensation of the lower extremities, which lasted for three months. She regained her voice and the use of her limbs by slow degrees, and was after a time restored to health.

The next case is the more interesting because it is that of a medical man, Mr. Moyce, of Rotherfield, who records his own sensations:—

On Nov. 8th, Mr. M. felt a sensation of pricking, which soon became burning, in the right tonsil. In the night there was much pain, with a sense of swelling. The next morning there was, on the right tonsil, a patch of exudation about the size of a farthing, which gradually extended forwards almost to the teeth; the left side was very slightly affected. There was much external swelling. After four or five days the exudation began to clear away, and then difficulty and pain in swallowing, amounting to agony, supervened. In the course of three or four weeks he got about, and attended to his practice for a fortnight. During the latter half of December the tone of his voice became altered, and he began to have regurgitation of solid food, which would accumulate in the posterior nares until it caused spasmodic cough. He was able to swallow fluids, if taken very slowly. He now lost the use of his tongue, could not move it in eating, and his speech became unintelligible; he also began to see double, and indistinctly, but could see with spectacles. Next followed tingling and tenderness of the palmar surface of the hands and fingers, accompanied by a peculiar hardness and roughness of the integument. Presently the soles of the feet and toes were similarly affected, and then there was loss of power in the limbs, especially the legs. The arms were so weak that he was unable to feed himself. The symptoms remained unabated for eight or nine weeks, and then gradually diminished in the same order in which they had begun. Even now,

after a lapse of two years and a half, he is not strong, and can neither walk nor swallow as well as before his illness.*

The following case of hemiplegia following diphtheria is related by Dr. Gull:—

A boy, of rather delicate temperament, when recovering from diphtheria, was suddenly seized with intense neuralgia in the left leg, which passed off after a day. It appeared to be connected with the femoral vein, which was rather hard and very painful to the touch. After two days he became very restless, and, in a few hours, completely hemiplegic, on the right side, including the face, and speechless. The action of the heart was most tumultuous, and the sounds muffled. The child rallied under the free use of wine and ammonia; but the hemiplegia remained for many months, after which there was slow improvement.†

The majority of cases which are protracted until the development of the nervous sequelæ, recover, but death occasionally takes place even at a remote period. Mr. Moyce mentions the death of a boy, aged eleven or twelve years, from exhaustion during the paralytic stage, two months after he had been quite free from throat affection.‡ The nervous sequelæ of diphtheria are not always in proportion to the severity of the previous illness, and do not occur exclusively after the severest cases, but sometimes follow comparatively mild attacks. Their duration is uncertain, varying from two to three or four months, but the slighter affections may perhaps sometimes pass off in a shorter period than two months, and, in all probability, severe cases are occasionally prolonged beyond the fourth month.

Diphtheria is apt to be complicated or followed by bronchitis or pneumonia. The presence of the former is denoted by the expectoration of casts of the smaller bronchial tubes, intermingled with frothy or glairy secretion, and by the stethoscopic signs of bronchitis. Mr. Thompson says, in many instances he saw casts of the smaller tubes expectorated, whilst a stethoscopic examination gave all the symptoms of capillary bronchitis. 'A gentleman, aged forty-six, died from this condition of the lungs. His throat was first affected. After a few days the breathing became impeded, with all the ordinary symptoms of capillary bronchitis in the first stage, the throat continuing to improve. He gradually sank, constantly expectorating casts of the small tubes, precisely similar to the deposits in the trachea.'§ Mr. Clowes, of Stalham, informs me that recovery has, in cases under his care, been sometimes protracted for months in consequence of the accession of bronchitis.

The occurrence of pneumonia as a complication of diphtheria has only come under my observation in post-mortem examinations. I have met

* *Second Report of the Medical Officer of the Privy Council*, p. 282.

† *Loc. cit.*, p. 303.

‡ *Loc. cit.*, p. 282.

§ *British Medical Journal* (June 5, 1858), p. 449.

with it twice, and both Mr. Simon and Dr. Bristowe note its occurrence in their communications to the Pathological Society on the morbid anatomy of diphtheria.* Mr. Rush, of Southminster, has seen two cases of diphtheria in which fatal pneumonia intervened after the exudation had disappeared from the throat, and the patients were supposed to be doing well. And although I have received no detailed cases, other practitioners who have favoured me with the results of their experience of this disease, have likewise mentioned the existence of pneumonia in conjunction with diphtheria.

* *Transactions of the Pathological Society of London.* Vol. x., pp. 316 and 321.

CHAPTER XI.

MORBID ANATOMY OF DIPHThERIA.

DIPHThERIA is essentially an inflammation of the fauces, which sometimes only causes disordered secretion from the mucous membrane; at others produces ulceration, and even gangrene; but, more frequently, an exudation which, coagulating on the surface, forms the false membrane from which the disease obtains its name. The exudation varies in consistency, from a pultaceous or almost liquid exudation, to a firm, consistent, and more or less elastic membrane. In the latter case, its outer surface is often uneven, usually less dense than the deeper portion, and sometimes flocculent or fissured. It varies from a quarter of a line to a line or more, and, in one instance I have seen, was nearly two lines in thickness. The elastic form of false membrane is not unlike the exudation poured out from an inflamed serous membrane. Sometimes the exudation is not membranous, but dry and granular.

Low forms of cryptogamic plants are occasionally found on the exudation, a circumstance which gave rise to the belief that the disease is of parasitic origin. This opinion is disproved by the facts that, on the one hand, the supposed parasite is not invariably present in diphtheria; and, on the other, that it is frequently found on unhealthy mucous surfaces which are not of a diphtheritic nature. Examined under the microscope, the exudation is found to consist of coagulated fibrine and epithelium; the latter being usually more abundant in the outer portion, or layer of membrane; whilst the deeper portion is more purely fibrinous. But in this respect there are numerous variations. Exudation cells are often intermixed with the fibrillated texture. The exudation is sometimes already undergoing decomposition, or other change, before it leaves the throat, and is at others more or less stained with blood. At first only opaque, the exudation soon becomes white or ash-coloured; if thick and adherent, brownish or buff-coloured; and if stained by slight hæmorrhage, blackish. The exudation is sometimes very loosely, at others very firmly, adherent to the subjacent surface; and occasionally, especially when of the friable, granular variety, is merely superimposed upon the natural surface.

The mucous membrane underneath the exudation, or from which the

exudation has recently exfoliated, is often intact, and generally much congested and swollen; sometimes it is white, opaque, or unnaturally pale; at others it looks raw, the epithelium having been shed with the false membrane. It often presents an excoriated and roughened appearance; is sometimes ulcerated, and, more rarely, gangrenous. When false membrane, still adherent to the mucous surface, is lifted up, it is often seen to be attached to the subjacent surface by numerous small thready adhesions, as though processes of exudation passed into the mucous follicles; and, on removing it, the mucous membrane is more or less abundantly dotted with bloody points.

The submucous tissue is often œdematous, infiltrated with blood, and sometimes the seat of interstitial exudation. The tonsils are usually swollen, and, on being cut into, are often infiltrated with blood, so as to impart to them an ecchymosed appearance; sometimes their tissue is softened; and in two instances I have found the centre of a tonsil in a state bordering on gangrene. There is generally more or less of inflammatory effusion into the structure of the tonsils; and in one instance, on the tonsil being laid open, there was an oozing from it of a creamy fluid resembling pus. In some instances, the œsophagus and the muscular and other tissues around the fauces are congested or infiltrated with blood; the parotid and submaxillary regions are much swollen, and the integuments studded with livid purpurous spots. In a case mentioned to me by Mr. Jauncy, of Birmingham, an abscess was found between the pharynx and vertebræ. The case was that of a child, aged six years, which died after an illness of nine or ten days, croupy symptoms having set in three days previous to death:—

‘The lungs were emphysematous in front, collapsed in patches posteriorly. A portion of false membrane was found at the bifurcation of the trachea, which was elsewhere free from exudation, but reddened. The larynx, epiglottis, pharynx, tonsils, and uvula, were covered with lymph. An abscess about the size of a walnut was found between the pharynx and vertebræ. Liver, kidneys, and spleen healthy. The kidneys were examined microscopically.’

When the disease extends to the larynx and trachea, the false membrane generally becomes thinner and less consistent as it descends in the tube, until it disappears gradually in the form either of a very thin pellicle, or of a creamy fluid. The mucous membrane of the affected portion of the larynx and trachea is generally more or less congested, and often thickened, so as to diminish the calibre of the passage, even after the false membrane has been removed, or has come away. The subjacent membrane is here, for the most part, intact; but sometimes, being denuded of its epithelium, exhibits, on the removal of the exudation, a red excoriated appearance, somewhat like the raw surface produced by a blister. It also, under the same

circumstances, presents small bloody points similar to those observed on the mucous membrane of the pharynx. The epiglottis, besides being covered above or below, or on both sides, with exudation, is likewise often swollen so as to contract the entrance to the windpipe. The bronchial tubes are sometimes lined with false membrane down to the third or fourth bifurcation, and even lower; and the lungs, sometimes partly emphysematous, are also liable to be affected with pneumonia, which is most commonly of the lobular form. In the latter case, the little bits of splenified lung are sometimes surrounded by crepitating and comparatively healthy lung, sometimes by portions of emphysematous lung.

The kidneys have sometimes been found quite healthy after death from diphtheria; in other cases they have been congested, and, on being sliced, have exhibited under the microscope transparent fibrinous casts of the tubes. The urine, in such cases, is generally albuminous, and also presents under the microscope fibrinous casts of the tubes, which occasionally contain blood corpuscles, or granules of hæmatine, or a few altered epithelial cells.

In a case briefly referred to by Dr. Gull, in his communication to the medical officer of the Privy Council,* the membranes of the brain and cord were in a state of suppurative inflammation, the sub-arachnoid space being full of soft, purulent lymph; and the same physician, although he gives no *post-mortem* facts in support of the opinion, suggests, that the original seat of the disease being near the cervical portion of the spinal cord, the paralytic symptoms so common in a late stage of diphtheria may arise from the disease having extended by continuity from the fauces to the upper part of the cord.† At present, this opinion can only be received as suggesting a careful examination of the cord in future *post-mortem* examinations; for thus only can it be determined whether the paralytic affection has a constitutional origin, or arises from the supposed local disease.

In a case related by Dr. Bristowe, and exhibited by him at the Pathological Society, the muscular tissue of the heart was coloured with extravasated blood. And in a more recent case treated by the same physician in St. Thomas's Hospital, in which I had the opportunity of examining the organs after death, the heart was studded with petechial spots on its outer surface.

The following cases are adduced in illustration of some of the points mentioned in the preceding account of the morbid anatomy of diphtheria. The first has been selected because it well shows the tendency of the disease to become engrafted, so to speak, on other disorders, especially the eruptive fevers; the others, mainly on account of the

* *Loc. cit.*, p. 299.

† *Loc. cit.*, p. 303.

detailed description of the microscopical appearances noted by such competent observers as Mr. Simon and Dr. Bristowe.

S. Beard, aged four years, was admitted a patient of the Western General Dispensary, under the care of my colleague Dr. Sanderson, on June 29, 1859. She had been taken ill on the previous day with the premonitory symptoms of measles, and was visited by the house surgeon, Mr. Plaskitt. It was not until the 4th of July that she complained of her throat; and she first came under the observation of Dr. Sanderson on the 6th of that month. The skin was then of a not unnatural warmth; the countenance was pale, and its expression rather distressed. The child was somewhat drowsy, and difficult to rouse; there was a slight discharge from the nostrils, which were lined with coagulated blood arising from an epistaxis on the previous day. Respiration natural in frequency; pulse 120; the mucous membrane covering the tonsils was of a deep-red colour, but less bright than is usual in ordinary tonsillitis. The anterior surface of the uvula was bare, but the posterior surface and sides were covered with a soft concretion, capable of being detached, and evidently of slight consistence. All the parts were smeared with a tenacious mucus, which was constantly being discharged from the mouth; and flakes of concretion, which had been excreted during the preceding night, were exhibited by the mother. There was very little external swelling or tenderness about the neck, and the breathing was not at all croupy, although said to have been so. Urine intensely albuminous.

July 7.—A tubular cast, of soft consistence, distinctly marked by the laryngeal rings, was discharged during the night.

July 8.—Much worse; feet and hands warm; belly hot. Pulse 160, feeble, and very difficult to count; respirations about 30. Prolonged, somewhat musical expiration sound, varying in tone from minute to minute; inspiration sound, short, less noisy, and not musical. Countenance pale, but not livid. Voice resembled a shrill whisper heard through a long tube. The cough, which occurred occasionally, was very short, and precisely similar in tone to the voice. A few small shreds of concretion were still attached to the uvula and velum; but none elsewhere. There were excoriations at the corners of the mouth, not covered with concretion. Mucous surface of a deep-crimson hue.

Vespere.—Respiration increased in frequency to 40 in the minute; countenance more indicative of distress. She died at seven a.m., of the 9th.

Post-mortem Examination (made June 10, twenty-seven hours after death).—Slight mottling on the arms, probably the remains of the eruption of measles. The upper surface of the tongue was healthy as far backwards as the base of the epiglottis, excepting that there was a small patch of exudation, not much larger than a grain of wheat, adherent to one of

the large papillæ. The subjacent surface was healthy; both tonsils, especially the right, were vascular, and presented a pitted, roughened appearance. The mucous membrane covering the margin of the epiglottis, epiglottidean folds, and arytenoid cartilages, was white and opaque. The anterior portion and edges of the upper surface of the epiglottis were of a brownish white colour. The mucous membrane of a cavity behind the left tonsil and between it and the posterior pillar of the fauces contained a creamy-looking exudation. The corresponding hollow on the right side was free from exudation. The substance of the tonsils, particularly of the right, was decidedly softened. On being incised, they exhibited patches of extravasation and of pigmentary discoloration; but in other respects the section presented a natural aspect. The mucous membrane of the larynx and trachea was unnaturally white and opaque, as though covered with exudation; but nothing could be stripped off it. This condition of the membrane became less and less obvious in a downward direction. Here and there were seen punctuated patches of redness, which sometimes followed the intervals between the rings of the trachea. Several loose fragments of exudation, some of which, although readily detached, were still adherent to the natural surface, were found in the upper part of the trachea. The subjacent mucous membrane was unbroken, and closely resembled the surrounding mucous surface.

The apex and upper portion of the left lung, as far as a line extending upwards and backwards from the notch, was emphysematous, and along the free margin were emphysematous lobules, surrounded by portions of splenified lung. The lingua and margin of notch were completely splenified. The secondary division of the bronchus leading to the apex of the left lung contained cylindrical casts, of about the consistence of boiled macaroni, at their proximate extremity; but diminishing in consistency until they disappeared in the third or fourth division of the bronchus, in the form of creamy-looking fluid. The division of the bronchus leading to the lower lobe contained no casts, excepting in one of the tertiary divisions leading towards its posterior aspect. It was not ascertained whether or not this portion of exudation was continuous with that in the bronchus leading to the apex. The mucous membrane was for the most part remarkably pale, but otherwise healthy. There was bronchitis in a few of the smaller tubes, as shown by the frothy secretion which they contained, and by slight vascularity. The parenchyma was firmly splenified throughout the lower lobe, with here and there scattered portions of emphysematous lung.

The two upper lobes of the right lung were emphysematous; the lower lobe was also emphysematous at the upper portion, and partially so below. The bronchus leading to the apex contained here and there adherent, but also partly detached, patches or fragments of soft exudation, which ceased rather abruptly in the third bifurcation, and less decidedly

terminated in creamy fluid than those on the left side. A considerable sized tube leading towards the base of the upper lobe was choked with a cylindrical mass of semi-diffuent white and opaque secretion, which, under the microscope, exhibited cells without fibrinated matrix. The bronchial branches leading to the middle and lower lobes were free from exudation. The mucous membrane of the tubes in the upper lobe, like that on the left side, was perfectly white. That of the tubes leading to the middle and lower lobes on the right side markedly injected.

The following case, communicated to the Pathological Society by Mr. Simon, is quoted from the Transactions of that Society for last year:*

'A. H., æt. thirteen, had been suffering from diphtheria for nineteen days before his death, and during the last eleven had been under treatment in St. Thomas's Hospital. On the eighth day of the disease a large mass of thick, dense, very fibrinous false membrane detached itself from the fauces, leaving the surface of the tonsils and soft palate raw (like that of skin from which the cuticle has been removed after blistering) but not ulcerated or sloughing. On part of this surface, a second thinner false membrane soon formed, and subsequently came away in shreds. There was irritating discharge from the nose, and during the last days of life some of the patient's drink escaped this way. Early in the disease there had been swelling below the jaw, but this had subsided many days before death. On the seventeenth day of the disease superficial ulceration began at the left tonsil, and on the eighteenth day had extended to the size of a shilling. On each of the last eleven days of life the urine was examined; it always gave abundant precipitate with nitric acid, and latterly also with heat; but in the earlier days it precipitated imperfectly with heat, and largely with acetic acid. Microscopically it showed fibrinous tubule-casts, containing traces of hæmorrhage, but scarcely any renal epithelium. Throughout the progress of the disease the patient was pale, feeble, and disposed to be chilly, so that wine and much external warmth had from the first been necessary. The tongue was always moist. No eruption appeared upon the skin. There was no delirium or stupor, and neither cough nor any sign of laryngeal obstruction was observed. The respiration was natural till within a few hours of death, when it became short and hurried.

'The following were the post-mortem appearances:—With the exception of an occasional very delicate film, there was no false membrane about the fauces. In the situation of the left tonsil was a sloughy ulcer, somewhat larger than a shilling. The posterior surface of the soft palate was congested, and there adhered to its somewhat swollen mucous membrane small patches of false membrane. In the recess of mucous membrane beside the epiglottis was an irregular depression, evidently

* *Transactions of the Pathological Society of London.* Vol. x., pp. 316-19.

the remains of an almost cicatrized ulcer. About an inch below the aperture of the glottis, the pharynx presented on its right side a small circular ulcer, about two lines in diameter, with somewhat raised margins, and on the left side another similar ulcer, about the size of a pin's head. In other respects the pharynx and œsophagus were healthy. On washing out the nares a strip of false membrane an inch in length was removed. The mucous membrane covering the septum showed patches of congestion, was thickened, and had shreds of false membrane adherent to it.

‘Both lungs, except in their upper and anterior parts, were greatly congested with blood, and less crepitant than is natural, especially the lower lobes, whose posterior parts were in many places nearly or quite without air; and the most solidified portions broke down on firm pressure with the finger. At one section the exuding fluid was obviously purulent, and microscopical examination showed pus extensively in other parts of the hepatized structure. The bronchial mucous membrane was a little injected; the tubes contained thin frothy fluid tinged with blood, or more tenacious reddened mucus.

‘The kidneys were large, and intensely congested. Sections of the cortex, microscopically examined, showed frequently the presence of large, transparent, colourless rods of apparently fibrinous material, soluble in acetic acid and liquor potassæ. These rods were sometimes floating free, sometimes partly or wholly held within urinary tubules, of which evidently they were casts. They were generally structureless, but (no doubt from the manner of their formation) had a disposition to transverse fracture, and sometimes presented lines curving almost concentrically across them, or had this direction given to little clusters of granular matter, probably altered epithelium, which they occasionally contained. Apart from the presence of these casts, the tubular structure of the kidney was not very obviously diseased; but, after prolonged and careful observation, it could confidently be said, that, at least in many parts, the cell-growth within it was redundant, so that the tubules were more opaque than natural, and had their interior canal encroached upon, or even quite occluded by an increased amount of epithelium. The Malpighian tufts within their capsules showed a little indistinctly.

‘The venous system was everywhere remarkably full of blood; the liver was greatly congested; the heart was healthy, with a firm coagulum in each of its four cavities.’

The next case, also taken from the *Transactions of the Pathological Society*, is from a communication by Dr. Bristowe.*

‘T. N., æt. ten, the son of a farm labourer, was admitted into St. Thomas's Hôpital, under Mr. Solly's care, on the 12th of November,

* *Loc. cit.*, pp. 326-31.

1858, with contraction of the left wrist and elbow-joints, after a burn. On the 18th he was operated upon, and continued under mechanical treatment up to the commencement of the malady of which he died. He appeared perfectly well on the 20th of March, 1859, but on that day partook of some gin and other improper articles of diet. The following morning he had a slight attack of shivering, and seemed otherwise a little indisposed. On the 22d he complained of slight soreness of the throat. This increased, and on the 24th the following notes were taken by the surgical registrar:—

“Throat much swollen externally, particularly on the right side. On looking into it the right tonsil is seen filling up the fauces, and has upon it a pultaceous material. Pulse small and weak, 130; tongue furred; skin cool.”

‘On the 25th he was placed under my care. He has slept a little in the night, and is said to be now rather better than he has been. He is extremely feeble, however, not at all feverish, and perfectly rational. The skin is cool, and gives no indication of rash. Pulse small, weak, slightly irregular, and about 100. There is great tumefaction, hardness, and tenderness in the upper part of the throat, chiefly in the parotid and submaxillary regions, and more on the right side than on the left. The anterior half of the tongue is clean, and its papillæ are healthy; the posterior half is somewhat furred. The right tonsil is much swollen, and covered by a thick wash-leather-like false membrane, which is prolonged from it on to the pillars of the fauces, over the right half of the soft palate, and to the edges of the posterior teeth. The nose bled this morning, and a little thin sanious fluid has continued to ooze from it. Has no pain anywhere except in the throat; experiences pain and difficulty in swallowing, but can manage to take fluids. No cough or difficulty of breathing. Bowels opened yesterday.

‘*March 26, two P.M.*—Slept pretty well, but is much worse than he was. Skin cold, without trace of rash. Pulse quite imperceptible. Throat more swollen, hard, painful on pressure, and studded on the right side with small congested points. Tongue dryish, but not much furred. The breath has a faint, gangrenous odour. There is no appreciable change in the condition of the interior of the throat. Is quite sensible, but very restless. No cough, or embarrassment in breathing. He continued to sink, and died at half-past five, p.m., remaining sensible to the last.’

The following were the *post-mortem* appearances:—

‘The front and sides of the throat were thick and brawny; and the parotid and submaxillary regions were much swollen and hardened, especially on the right side, where also the integuments were studded with congested and livid spots. On cutting into the neck, its muscular and cellular tissues, from the integuments to the vertebræ, and from the

ears and root of the tongue to the upper opening of the thorax, were found indurated and brawny, and so infiltrated with blood as to be everywhere almost black. There were no circumscribed fluid or clotted collections, but the blood was uniformly diffused throughout the tissues. There was no appearance of pus, and no visible indication of inflammatory deposit.

‘The soft palate and uvula, the tonsils and pillars of the fauces, the œsophagus and larynx, were all intensely and deeply congested, tumid, brawny, and covered in many places by toughish, adherent, ashy, false membrane, or by pultaceous puriform exudation. The soft palate was quite half an inch thick, infiltrated with blood, and studded with shreds of false membrane. The tonsils were swelled, but at the same time presented deep fissures and excavations, and were covered pretty completely by greyish-yellow false membrane. This was in parts thick, tough, and pretty firmly adherent; but over the convexity of the tonsils became changed into a soft, pultaceous deposit, which seemed partly pus, and partly superficial slough. On incising the left tonsil it was found softened, deeply congested, partly infiltrated with blood, and studded with distinct pus-holding cavities; and the surfaces of the fissures passing into it from the surface were soft, greenish, and slightly gangrenous. The right tonsil was generally in the same condition as the left, but presented several deep, distinctly gangrenous, fœtid excavations. The mucous surface of the base of the tongue and back of the pharynx was congested, and presented here and there shreds of adherent membrane. The mucous investment of the epiglottis, and indeed that of the whole larynx, were thickened, indurated, and deeply congested. The epiglottis was covered pretty extensively by a toughish adherent membrane, about half a line thick; and a similar formation, in less abundance, was studded over the rest of the laryngeal surface, and accumulated along the vocal cords. The trachea was congested, but otherwise healthy; the œsophagus also was healthy; but the tissues immediately surrounding them, like those of the rest of the neck, were infiltrated with blood. Several portions of the hard palate, and septum nasi, were removed, and their mucous covering was found congested, and lined by adherent false membrane.

‘Pericardium healthy. Heart small, firmly contracted, and nearly empty, its auricle and right ventricle containing a little fibrinous clot only. The valves were healthy. The muscular tissue was generally pale; but almost all the muscoli papillares and carneæ columnæ of the left ventricle, and the walls of the apical half in nearly their whole area, and to a depth varying irregularly from a quarter of an inch downwards, were almost black from sanguineous infiltration. The same condition was observed in the right ventricle, but to a less extent, the papillary muscles and the parietes being studded irregularly and thickly

with black, blood-infiltrated patches of various sizes; some so thick as to reach the external surface of the organ, and some dotted with white spots and patches, which looked at first sight like suppurating points.

‘Pleuræ healthy. Lungs crepitant throughout, and not materially congested. They presented, however, on their external surface, a few dark-red, almost black spots, about a quarter of an inch in diameter, which were found to correspond to small subjacent patches of solid, dark-coloured, granular lung tissue. The bronchial tubes contained much secretion.

‘Peritoneum healthy. Liver of usual size, generally of normal colour and consistence; its surface and substance, however, were thinly studded with petechial spots. Spleen of usual size, pale, and of moderate consistence. There was a little effusion of blood in the sub-mucous and cellular tissues around the pancreas and supra-renal capsules; and the latter organs presented patches of extravasated blood in the interior, though apparently in other respects healthy. The cellular tissue of the mesentery was studded pretty thickly with small, and not very intensely coloured patches of congestion and extravasation. The stomach and intestines were healthy, but the ilium contained two lumbrici. The kidneys were of the usual size, pale and apparently perfectly healthy. Aorta and vena cava healthy.

‘The false membrane about the fauces and neighbouring parts was made up chiefly of a net-work of fibrillated lymph. The fibrillæ were very irregular in outline and dimensions, but generally comparatively thick; and they coalesced with one another in all directions, so as to leave irregular spaces between them, which were small, and often not larger in diameter than the fibrillæ themselves. When seen in thickness, the tissue above described presented a pebbly character, like that afforded by an accumulation of nuclei; but the fallacious nature of this appearance was recognised on looking at the thin edge of a section; or by adding acetic acid, which rendered the whole transparent, at the same time expanding it, and bringing into view an exceedingly delicate and irregular network of well and sharply defined, occasionally bulging, fibres, which appeared to be, so to speak, the skeleton of the original network. In some places the false membrane consisted of an apparently uniform layer composed of an extremely fine and indistinctly fibrillated tissue, studded with molecular matter, and presenting something of a ground-glass character. Imperfect epithelium was entangled here and there in the substance of the membrane, but was most abundant on the superficial surface.

‘The pus-like fluid in the tonsils consisted of well-marked pus-cells characteristically affected by acetic acid. Some of the muscular tissue from the small muscles of the larynx and from those of the neck was examined, and found to be striated and healthy-looking; but the spaces between the fibres were loaded with blood-corpuscles. The cellular tissue

in front of the epiglottis presented a net-work of fibrillated tissue like that constituting the false membrane itself; but the meshes were larger and more distinct. The muscular tissue of the heart was found to be generally in an early stage of fatty degeneration, the transverse markings being nearly absent, and the fibres studded with minute molecules. But in the portions infiltrated with blood the degeneration was more advanced than elsewhere, the striæ were wholly deficient, the fibres crowded, and in some cases opaque, with beads of oil many of which were of considerable size. The white pus-like spots in the right ventricle consisted simply of muscular fibres extremely degenerated.

'The kidneys, though looking healthy to the naked eye, were really much diseased. The Malpighian bodies were generally healthy, but a few presented accumulations of oily granules between the capsule, and contained tufts of vessels. The epithelium of the tubes was generally opaque and granular. In many instances the peripheral surface of the cylinder of cells presented numerous oily globules; and not infrequently the tubes appeared filled with separated and irregularly clustered epithelial cells, loaded with oil so as to be almost opaque. In a few cases, tubes were filled with recently extravasated blood; and occasionally transparent casts were seen floating about the field of the microscope. The contents of the medullary tubules were more generally unhealthy even than those of the cortical ones. Many contained transparent fibrinous casts, and the majority presented oily, breaking-down, epithelial contents.'

I am indebted to Dr. Bristowe for the following report of a case, which recently proved fatal in St. Thomas's Hospital. I had not the opportunity of seeing the patient during life, but carefully examined the affected organs after death.

E. T., a girl, aged eleven years, suffering from club-foot, had been in St. Thomas's Hospital, under Mr. Solly's treatment, since May 22, 1860. On the evening of June 23, she first complained of sore-throat. This increased in severity during the next few days; pain and difficulty of swallowing came on, and on the afternoon of the 27th she was placed under the care of Dr. Bristowe. There had been no marked febrile symptoms, no shivering, headache, or pains in the limbs. Neither in the ward nor among the child's friends had there been any cases of scarlet fever or diphtheria; but a little girl in an adjoining bed had been attacked, much about the same time, with a sore throat, which had disappeared in a day or two, and presented no unusual character.

'June 27.—Is perfectly sensible and composed, having by no means the aspect of a person seriously ill. Has no head-ache, or pains about the limbs; complains of a little thirst and loss of appetite, but no sickness, cough, or difficulty of breathing. Pulse 124. The pupils are natural. The skin is warm, but not dry, and without trace of rash.

The external fauces on the right side are much swollen, very tense and tender, but not discoloured. On looking into the throat the right tonsil is seen to be so much enlarged as to appear almost to close the passage, and is covered in nearly its whole extent by a thick, greyish, false membrane. The uvula is pushed over to the left side, and almost concealed; is somewhat thickened, and a little false membrane adheres to it. The left tonsil is hidden, and apparently not enlarged. The tongue is covered with a whitish-brown fur, and its papillæ are not prominent.

Hirudines ij. faucibus externis. Catapl. lini postea.
 ℞ Chlorat. potass. gr. iv.
 Acid. hydrochl. ℥j.
 Aquæ dist. ℥ ss.
 4tis horis.

Milk diet. Strong beef tea. Two eggs. Wine three glasses.

'28th.—Passed a comfortable night, and has taken all her wine and nourishment. The leeches have given her great relief. There is little appreciable change in either her general health, or in the condition of the throat, except that the right side is less tense and tender than it was. The bowels are confined.

Wine 4 glasses.
 Pulv. rhæi c. hydrarg ℥j. statim.

'29th.—Was very restless during the night. The bowels have been relieved, and she has been very sick. The skin is hot, and rather dry. No rash. Pulse 128. No pains anywhere, excepting in the throat; no cough or difficulty of breathing. Great pain and difficulty of swallowing. There is copious discharge from the nostrils. Tongue clean. The right side of the throat is in the same condition as yesterday; but the left side also is now distinctly swelled and painful. The right tonsil is about as large as it was; but the membrane, which is thick and tough, is detached and curled up at the margins. The left tonsil is somewhat increased in size, and also presents a distinct false membrane. The uvula is seen with difficulty, but has a few patches on its surface. The lungs are resonant in front; but the respiratory sounds are masked by the noise produced in the throat. Urine albuminous. Sp. gr. 1015. Wine twelve glasses.

'Towards the evening she grew considerably worse, and became very restless. The pulse rose to 152; a troublesome cough, at times a little croupy in character, came on; the breathing became rapid (40 in the minute), and more noisy than it had been. She continued perfectly sensible.

'30th, nine a. m.—Has been very restless all night, and has taken very little wine and nourishment in consequence of inability and disin-

clination to swallow. Is now manifestly sinking; is scarcely sensible, but can be roused; breathing rapid, accompanied by loud rattle and frequent moans; pulse imperceptible; lips dry. Died at 10 a. m.

'*Autopsy.*—The body was in fair condition. There were no traces of eruption or of desquamation. The right submaxillary region was much swelled and indurated; the left also, and the intervening parts, were swelled, though in a less degree.

'*Chest.*—Pericardium healthy. Heart of natural size, and for the most part healthy. Its external surface presented numerous petechial spots, and its cavities contained partly decolorized coagula. The pleuræ were free from adhesions, but the upper lobe of the left lung was covered by a very thin film of recent granular lymph. The lungs were rather large, heavier than natural, and presented, when handled, the irregularly solidified character distinctive of lobular pneumonia. On section, the upper lobes of both lungs were found to furnish well-marked specimens of the condition just named. They were studded thickly with smallish solid masses, running to some extent into one another, and separated by an imperfect network of still crepitant, though congested, lung tissue. The solid masses varied in character; in some instances were distinctly apoplectic, in others had the appearance of being due to simple carnification, and in others presented various degrees of the brick-red tint and granular condition belonging to red hæpatisation. The lower lobes were, in many respects, in the same condition as the upper; but they presented a greater degree of simple collapse, and, consequently, a less amount of crepitant tissue; the hepaticized and apoplectic patches, too, were larger, and presented less of the lobular arrangement. The bronchial tubes were congested, and contained much frothy mucus.

'The larynx, trachea, and adjacent parts, were now removed and examined. The right tonsil was found to be very large, though scarcely so large as during life; the left also was enlarged, but in a less degree than its fellow; and the uvula and soft palate were somewhat thickened. The tonsils, soft palate, uvula, base of tongue, and posterior and lateral part of pharynx were covered, more or less completely, with tough, somewhat elastic, whitish false membrane. On the base of the tongue and uvula it formed merely thin, scattered patches. But over the tonsils, pillars of the fauces, and rest of the pharynx, it formed layers of considerable extent, and often more than half a line thick. The membrane had become generally more or less detached at the edges; and that portion connected with the right tonsil had separated in nearly its whole extent, and hung as a loose, discoloured mass, backwards into the pharynx. On peeling the membrane off, it was found pretty firmly attached, and accurately moulded to the inequalities of the subjacent mucous surface, which was congested, but not ulcerated. On section,

the tonsils were seen to be deeply congested throughout, somewhat softened, and studded thickly with small patches of yellowish (but not distinctly purulent) inflammatory deposit. The tissue of the soft palate and uvula was a little brawny.

‘The mucous membrane of the upper part of the larynx was congested, and somewhat thickened; and a thin false membrane covered the epiglottis, extended into the aryteno-epiglottidean folds, and down to the superior vocal cords. False membrane also extended into the sacculi laryngis, and was scattered in small patches over the mucous membrane for about an inch below. The greater part of the trachea was healthy.

‘*Abdomen.*—Peritoneum healthy. Liver healthy, but studded with a few pallid patches. Spleen, pancreas, and supra-renal capsules healthy. The mucous membrane of the stomach presented numerous petechial spots; and Peyer’s patches in the lower three feet of the ileum were remarkably distinct and prominent; in other respects the alimentary canal displayed nothing unusual. The kidneys did not look unhealthy; but exhibited, in their cortical substances, alternate pallid and congested vertical streaks. Uterus and ovaries healthy. Larger blood-vessels natural.

‘*Microscopic Examination.*—The false membrane was identical in its intimate structure with those which I had formerly examined and described.* The only unnatural character exhibited by the kidneys was, general great granularity of the epithelium, and consequent opacity of the undenuded tubules. It seemed, too, as though the individual cells were abnormally large. There was no trace of effused blood, and no casts. The Malpighian bodies were normal.’

* *Transactions of the Pathological Society of London.* Vol. x. *Medical Times and Gazette.* 1859.

CHAPTER XII.

SUGGESTIONS FOR TREATMENT.

In the management of a disease so rarely attended by febrile excitement, and so rapidly producing marked depression as diphtheria, it is not surprising that there should have been great unanimity among medical practitioners as to the necessity for the adoption of a supporting plan of treatment, and the avoidance of blood-letting and other antiphlogistic measures. And it is well worthy of note that this unanimity has not been confined to our own time, the physicians who treated the earlier epidemics having agreed very nearly with ourselves on this point; and, however they might differ in details, followed a mode of treatment similar in principle to that which has been almost universally adopted during recent epidemics. Diphtheria is, indeed, in this respect in exact accordance with other severe epidemic diseases; patients suffering from influenza, for example, rarely, if ever, bear depletion, and almost always require a liberal amount of support. Seeing that scarcely any two cases are precisely similar, it would be impossible to define rules of treatment applicable to every variety of diphtheria, or even to each of its principal complications and sequelæ. No specific remedy has been discovered suitable to a majority of cases, as quinine is to the treatment of ague; therefore each case requires to be carefully studied, and the treatment modified to suit its peculiar features. The varying intensity of the disease has also tended much to prevent a just estimate of the usefulness of remedies the dissimilar value of which, in different hands, has probably often arisen from the different nature of the cases with which they have had to deal. Hence there has, perhaps, sometimes appeared a tendency, on the part of their proposers, to over-estimate the usefulness of remedies which have proved less valuable when employed by other and equally competent practitioners.

I do not propose to recapitulate the numerous remedies which have been suggested for the treatment of diphtheria, much less do I intend to offer suggestions which could be supposed to supersede the exercise of the practitioner's independent judgment. The method of treatment which I have found most useful, and which has received the largest share of professional approbation, may probably be, in a great measure,

gathered from the cases detailed in the preceding pages. I shall, therefore, in the few observations which I think it desirable to offer on this branch of my subject, restrict myself to a very brief sketch of the system of management which I have found most useful in the treatment of this disease; again premising that it will probably require to be greatly modified in order to suit the requirements of different cases.

With regard to external local treatment, it may be well to say that I have in no instance deemed it advisable to apply leeches to the swollen throat—a proceeding which has been sometimes recommended; but the inutility, not to say danger of which may, perhaps, be estimated by the unfavourable result which so often follows their application in severe cases of scarlet fever. Neither have I, generally, directed the application of hot poultices or fomentations to the neck, such applications having seemed to me to afford little or no relief, and their frequent renewal being troublesome to the patient. Blisters to the throat appeared to be perfectly useless in the few cases in which I saw them tried; and are, moreover, objectionable from the probability of the abraded surface assuming a diphtheritic character, and thus adding to the depression which forms so dangerous a feature of this disease. In fact, after trying both plans, and seeing them extensively tried by other practitioners, I arrived at the conclusion, that applications externally to the throat are entirely useless to the patient. Slight cases do very well without them; and in severe cases they prove valueless, and do but serve to distract the attention of the nurse from really important duties.

Local treatment applied to the throat internally has been almost universally adopted in the treatment of diphtheria; and—though I by no means deny its value when judiciously employed—I am sure much mischief has been produced by its indiscriminate use, especially by the frequent tearing away of the exudation by probangs, or similar contrivances for the application of nitrate of silver, or of strong caustic solutions. Observing that removal of the exudation, and the application of remedies to the subjacent surface, neither shortened the duration, nor sensibly modified the progress of the complaint, but that the false membrane rarely failed to be renewed in a few hours, I very soon discontinued this rough local medication to the tender and already enfeebled mucous membrane. The propriety of this course became evident at the very first post-mortem examination I had the opportunity of witnessing, and has been confirmed by all my subsequent experience. In the first place, the application can but rarely extend to the entire diseased surface; and, in the next, the subjacent tissues are so deeply involved in cases of really malignant diphtheria, that any application to the surface of the mucous membrane could apparently exercise no beneficial influence upon the disease. The same observation applies with even greater force

to the indiscriminate use of strong solutions of chloride of zinc, or of Beaufoy's solution of chloride of soda.

The only instance in which much benefit can be expected to arise from the local application of escharotics, is when the patient is seen at a very early stage of the illness while the throat is simply inflamed, or the exudation, if it be already present, is circumscribed, fully in view, and surrounded by healthy tissue. In the former of these cases I have seen much benefit derived from pencilling the throat gently, two or three times within the first twenty-four hours, with slightly diluted tincture of the sesquichloride of iron. This application, softly laid on with a camel's-hair pencil, appears to have checked the local affection, and the patient has sometimes rapidly recovered under its use. In a still more diluted form, as in the proportion of a drachm of the tincture to seven drachms of water sweetened with honey, the same medicine forms a most useful gargle in the milder kinds of sore-throat which so commonly occur during the existence of an epidemic of diphtheria. When even though there be exudation, the diseased part is entirely in view and surrounded by healthy tissue, it would certainly be proper to pencil the affected part thoroughly with solid lunar caustic, or probably, in preference, with hydrochloric or nitric acid. It is just possible that this treatment might in such cases check the progress of the complaint, and lead to a rapid recovery; but, unfortunately, the disease is rarely seen under such peculiarly favourable circumstances, and the opportunity of trying this experiment has not occurred to me in any but the mildest cases, in which so severe a form of treatment appeared unadvisable.

Whilst, however, the severer kinds of local treatment should thus be very cautiously employed, much benefit will generally be derived from the use of milder and soothing detergent applications. Simple gargles of borax or alum dissolved in water, or of solution of chloride of soda, in the proportion of half a drachm of the solution to the ounce of water, in either case sweetened with honey, bring away the foul secretions and loose flakes of exudation, and thus both by cleansing the mouth, and lessening the obstruction about the fauces, very materially facilitate the administration of remedies and nutriment. Such gargles may be used either cold or tepid, as is most agreeable to the patient, and in very young children, or whenever patients are unable to gargle, they may be injected into the throat with a syringe, the patient's face being held over a basin immediately afterwards, so as to facilitate the return of the liquid together with the secretions and debris of the exudation which it may have detached. Probably in many cases, a simple injection of tepid water might answer the purpose equally well; and I have seen little benefit derived from the use of the chlorinated gargle, except where the breath was fœtid from the decomposition of the exudation within the fauces. When the concretion has cleared away, and the

throat is free from ulceration or excoriation, it is well to discontinue all local treatment, time being usually the best remedy. Sometimes the throat remains slightly congested or relaxed, or very sensitive to changes of weather for long after an attack of diphtheria. In the former of these cases the gargle, with the tincture of sesquichloride of iron already mentioned, has been the most useful application in my experience. In the latter I am accustomed to trust to constitutional treatment, gargling the throat with cold water, and—especially when the advice can be followed—to recommend change of air.

It rarely happens that the practitioner is consulted sufficiently early to undertake the treatment at the very outset; but when the patient is seen before depression has commenced, provided the pulse be firm, and the patient tolerably vigorous, an emetic of sulphate of zinc and ipecacuanha is a useful prelude to other treatment. It is difficult to estimate accurately the probable severity of an attack of diphtheria at this early stage; but it has appeared to me that the use of an emetic at the beginning has sometimes mitigated the subsequent illness. After the operation of the emetic, the following have been found the most efficient remedies:—The *mist. chlorinei*, prepared after the form given by Dr. Watson in his classical work on the *Principles and Practice of Physic*; a simple solution of chlorate of potass in syrup and water, with a minim of diluted hydrochloric acid for each grain of the salt; and the tincture of sesquichloride of iron; the dose in each case being proportioned to the age and condition of the patient. The tincture of sesquichloride of iron, first recommended in the treatment of diphtheria by Dr. Heslop, of Birmingham, has been so generally adopted by the profession, as to afford a guarantee that it has in the main been equally useful in the hands of others as it proved in his own. There are, nevertheless, cases in which I have found chlorate of potass more useful, and there are others in which the combination of the latter with the tincture of iron is a better remedy than either of them separately.

In cases unattended by immediately urgent symptoms, where the concretion is firm, and there is apparently no tendency to hæmorrhage or purpura, I prefer the above-mentioned mixture with the chlorate of potass given at intervals of three, four, or six hours. When the exudation is surrounded by deeply injected, softened membrane, which abrades and bleeds on the slightest touch, or whenever there is albuminuria, then the tincture of sesquichloride of iron in full and frequent doses is the proper remedy. If, in such cases, there be a tendency to purpura, from five to ten or twelve minims of diluted hydrochloric acid may be advantageously combined with the iron. When the hæmorrhagic tendency co-exists with great fœtor of breath, the tincture of sesquichloride of iron will be best administered in conjunction with *mist. chlorinei*.

Whatever medicines be prescribed, it is essential to their success that

they should be administered regularly at stated intervals, and that the necessary sustenance be systematically given with equal regularity intermediately between the doses of medicine. To insure this it is well to require the nurse to note upon paper the exact time when each dose of medicine or article of diet has been given, together with the quantity of each taken by the patient. Of course, the same system is applicable to the administration of wine when this is found necessary. A glance at this record at each visit shows the practitioner at once how far his instructions have been carried out, and secures a degree of accuracy scarcely otherwise attainable. It very often happens that patients suffering from diphtheria are said to be unable to swallow food, and it is quite possible that lives have been sacrificed to this belief, which is, nevertheless, frequently erroneous, the power of swallowing often remaining undiminished, even in the severest cases, to the last moments of life. In such cases it is well for the medical man to test the correctness of the assertion by causing food to be administered in his presence. It will then sometimes be found that patients who, being disinclined to be disturbed, have refused food or wine, can yet swallow without difficulty, thus showing that the real obstacle lay rather in the want of method and perseverance on the part of the attendant than in the inability of the patient to swallow.

When diphtheria is attended by much depression from the beginning of the illness, the sesquicarbonate of ammonia given in decoction of cinchona is sometimes very useful, but is subordinate to alcoholic stimulants, such as wine or egg and brandy, which are indispensable, the chance of recovery in such cases depending much more upon the alcoholic stimulant than the medicine. But although this be true, it is by no means advisable to employ stimulants indiscriminately in diphtheria, many of the milder cases doing quite as well without. Neither when they are required, is it necessary to give the very large quantity of wine that is sometimes supposed, especially in children, proper nutriment often answering a better purpose. In order to insure stimulants being given only at the proper time and in the right quantity, the state of the pulse should be carefully watched, and wine administered as soon as it begins to flag, the quantity being regulated by its effect on the circulation. On this account it is best to begin with small doses, repeated at regular intervals of four or six hours, and to increase either the quantity or the frequency of its administration as occasion may require, remembering that whenever wine is absolutely necessary, its regular exhibition is equally essential by night as by day.

The chief danger in one form of diphtheria arises from the extension of the disease into the larynx and trachea, producing croup. Such cases are often very unmanageable, and are best treated on similar principles to idiopathic croup, but modified an account of their diph-

theritic character. If the patient's strength will admit, it is well to administer an emetic of sulphate of zinc and ipecacuanha, as soon as croupy symptoms manifest themselves, and this, provided there be no special reason to the contrary, should be at once followed up by small but frequent doses of calomel or hydrarg. c. cretâ, with the object of modifying the quality of the exudation. At the same time, nutriment, and stimulants if necessary, should be freely and regularly given so as to sustain the patient's strength.

Failing the success of other treatment in diphtheritic croup, the question will very properly arise whether, when dyspnœa is very urgent, the operation of tracheotomy should be performed. Upon this subject I have no personal experience, but the operation has, in this country, been almost always unsuccessful. On the other hand, I have had the opportunity, in two instances, of observing, in *post-mortem* examinations, that the false membrane extended a very short distance down the trachea, and, in one of these, death appeared to have been caused by the partially separated membrane acting as an obstruction to the admission of air. Perhaps, in this instance, the performance of tracheotomy might have saved the patient; and, when the case appears to be otherwise hopeless, it would probably be right to give the patient the chance afforded by the operation, provided there should be no evidence of the extension of the disease to the bronchial tubes, or of the existence of pneumonia, either of which would manifestly contra-indicate the performance of an operation, which must, under such circumstances, prove unavailing.

The best nutriment, during what may be termed the acute stage of the complaint, consists of good beef-tea or chicken-broth, arrow-root, new milk (of which patients may advantageously take a quart or more during the day), cream, and eggs either lightly boiled or beaten up with milk or with wine or brandy when the latter are requisite. As convalescence becomes established, fish, chicken, or other solid food should be given as early as possible, the patient's strength meanwhile being maintained by the liquid nutriment just mentioned.

However the strictly medical treatment may be modified in order to suit particular cases, it is of paramount importance in the management of diphtheria to husband the patient's strength, to avoid every depressing influence, and especially to caution the patient against over-exertion, the disease as it advances being attended by such extreme anæmia, that a very slight effort has sometimes appeared sufficient to cause death. As has already been stated, this danger continues, even when the more urgent symptoms have disappeared, and convalescence would seem to have set in; patients having sometimes expired suddenly under such circumstances, after trifling muscular exertion. In order to guard against this, it is proper to confine the patient to bed from the begin-

ning of his illness, and to keep him in a recumbent position until convalescence be confirmed. It is also prudent for some time after recovery to give a little light nutriment or wine before allowing convalescents to exert themselves. It would perhaps be too much to assert that patients have been saved by attention to these apparently trifling matters; but it may at least be safely affirmed, that many have been sacrificed to the neglect of them.

The same general principles are applicable to the treatment of the complications and sequelæ of diphtheria. When this disease is complicated with bronchitis or pneumonia, these affections must be treated in the ordinary manner, save that the patients will probably require a liberal allowance of wine and nourishment. Bismuth and hyoseyamus with bland nourishment, especially new milk, eggs, cream, and farinaceous articles of food, are the treatment best suited to cases in which the disease, creeping downwards along the œsophagus, has caused gastrodynia or vomiting. Small doses of calomel or hydrarg. c. cretà with opium or Dover's powder, followed by castor oil, afford the best prospect of success in the treatment of diphtheritic as of ordinary dysentery.

Time is the most important agent towards recovery from the several forms of nervous affection which follow diphtheria; but the cure is often accelerated by judicious change of air and scene, by good nourishment and tonic medicines. In the selection of the latter, regard should be had to the age and condition of the patient. Sometimes diluted nitromuriatic acid in combination with a light bitter, such as the infusion of gentian or calumba, has been found to suit patients better than more potent medicines. Citrate of iron and quinine is often very useful; and when there has been albuminuria or purpura, or there is extreme anæmia, the tincture of sesquichloride of iron, with or without a few minims of diluted hydrochloric acid, or a grain or two of quinine to each dose according to circumstances, is oftentimes serviceable. Occasionally sulphate of quinine in combination with diluted sulphuric acid, administered in any proper vehicle, will be found the best tonic. Minute doses of strychnia are said to have been sometimes useful in cases where diphtheria has been followed by paraplegia; but I have no personal experience of their value. On the whole, though convalescence is usually much protracted, patients for the most part recover perfectly from the anæmia and purely nervous sequelæ of diphtheria, provided they survive the sixteenth or seventeenth day of their illness; and though tonics should certainly be persevered in, if they appear useful, there can be no doubt that they ought to be discontinued, if they do not agree with the patient nor appear to accelerate his recovery, seeing that time and good nursing will, in all probability, restore him to his pristine health.

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