

Sexton (S)

CATARRH
OF THE
UPPER AIR-TRACT
ESPECIALLY ITS EFFECTS
ON THE
EAR

WITH SUGGESTIONS AS TO TREATMENT—BOTH HYGIENIC
AND MEDICAL

BY
SAMUEL SEXTON, M.D.

AURAL SURGEON TO THE NEW YORK EYE AND EAR INFIRMARY



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CATARRHAL INFLAMMATION OF THE UPPER AIR-TRACT.¹

It has not been long since inflammation of the mucous tract of the head was simply known as a "gathering" in the head. Of late this has given way to a term less expressive of the trouble, namely, a "cold in the head." Gradually, however, as catarrhal affections of the ear and nose have received greater attention, their importance is more generally recognized, and it now seems time that the entire pneumatic tract of the head should be considered as a whole, in order that the etiology, pathology, and treatment of this region, or any of its parts, may be intelligently considered. It will be profitable to those who have not already given the subject particular attention, to glance at the pneumatic area of the head, as shown in the accompanying diagrammatic view of this region.²



FIG. 1.—Diagram of Upper Respiratory Tract and its Air-chambers (omitting the pharyngeal vault). 1, 1, Nares; 2, 3, 4, superior, middle, and inferior meatus; S, M, L, superior, middle, and inferior turbinated bones; 5, 5, antrum of Highmore; 6, 6, conjunctiva; 7, 7, posterior ethmoidal sinuses; 8, 8, anterior ethmoidal sinuses; 9, 9, sphenoidal sinuses; 10, 10, frontal sinuses; 11, 11, infundibulum; 12, 12, Eustachian tube; 13, 13, tympanum; 14, 14, mastoid antrum; 15, 15, mastoid sinuses.

¹ Read before the Practitioners' Society, June, 1885.

² Drawn by Dr. Robert Barclay at the suggestion of the author.

Greater knowledge of the boundaries and extent of the tract may, however, be obtained by studying the prepared bones of the face and head. The osseous forefront in man will thus be seen to consist of a framework not unlike the bony structure in birds, where extreme lightness is assured without undue loss of strength—a conformation well adapted to the physiological requirements of the special-sense nerve distribution to the ear and nose.

The more important cavities of the head concerned in catarrhal inflammation are: 1, the tympanum, mastoid antrum, and cellules; 2, the turbinated bone interspaces; 3, the frontal sinuses; 4, the ethmoidal cells; 5, the antrum of the superior maxillary bone; 6, the sphenoidal sinuses. The large sockets for the lodgement of the eyes, the oro-pharynx, the pharyngeal vault, and the nasal passages, are also a part of this region. The various cavities have connecting sinuses, and the entire system is everywhere lined by mucous membrane.

It is manifest, then, that no one part of the upper air-tract is liable to catarrhal inflammation altogether independently of the others. Before alluding to causation in a broader sense, however, a passing allusion may be made in this connection to several important local anomalies and affections which sometimes stand in a causative relation to catarrh. Thus, deviations of the nasal system occur often enough to attract attention to their possible influence in causing catarrhal inflammation; where this interferes with free circulation of air and the escape of secretions, it may be not only causative of catarrh, but may also increase its dangers. The relations of deviations of the nasal septum to a high palatal arch are notably frequent, and from a study of a large number of subjects of this defect in catarrhal patients, I cannot believe that it has any other significance than that it seems to pertain to individuals with marked ovoidal conformation of the face, who generally have high-arched palates along with the lengthened facial measur-

ment. Diligent search for an explanation of the high arch, in connection with the development of the teeth, was made of the writer's collection of plaster casts of the jaws, several hundred in number; but it would seem that the teeth have no influence in narrowing the arch. The height of the palatal arch has not, so far as I can discover, any significance in respect to a hereditary catarrhal tendency, nor does it bear an unvarying relation to deviations of the nasal system.

Hypertrophy of the tonsils, turbinated bodies, and the mucous membrane of the pharynx (adynoid vegetations), are very common results of catarrhal inflammation, and when present are to be considered as exercising an influence on the mucous tract in the neighborhood as well as remotely through their nervous connections; but while they require attention at the hands of the otologist, the subject would, if followed out in detail, carry me too far.

My own experience, in observing catarrhal inflammation of the head and elsewhere, leads me to rather regard it as the local manifestation of systemic and climatic influences, than, as some authorities intimate, the result of a purely catarrhal diathesis to the local manifestations of which treatment is mainly to be directed. I can but think it a fallacy to consider even a strong predisposition, manifesting itself in the guise of heredity in persons seldom free of catarrh, as demonstrating the purely local nature of the trouble.

In defining catarrhal inflammation it is well to distinguish between the deterioration in mucous surfaces which evinces the natural retrogradation consequent on gradual but sure decay, and the conditions that hasten the process, and, therefore, call for medical treatment. But while natural retrogression is in a measure irremedial, yet it is much less active in the strong and healthy. Catarrhal inflammation manifests itself very differently in different cases; thus the healthy and strong withstand its influences, while the weak and susceptible yield

readily. The predisponents and excitants of catarrh give coloring to its manifestations; thus, urban and rural environments, respectively, with the diversity in the habits or occupation of individuals, together with climatic differences, produce very different effects, and it will be well to review their peculiarities separately.

Urban peculiarities.—In cities mental strain from overwork, worry, and dissipations of every kind—in a word, civic wear and tear—gives rise to nervous exhaustion, and consequently to mental and physical disability.

To the above should be added the ceaseless noise and the exceedingly deleterious dust and offensive and noxious odors with which metropolitan air is generally laden.

Persons almost exclusively reared in cities are, moreover, deprived of the tone and vigor imparted by country life.

The mucous membrane of the air-passages in all persons is thus exposed to a variety of local excitants, but among clerks and operatives it is especially liable to become inflamed. Perhaps worse than all else is the pernicious system of overheating dwellings, hotels, school-houses, public resorts, factories, railway carriages, and sea-going vessels. Provision is thus made for the comfort of the ailing or indolent on the one hand, and the economical distribution of heat on the other, without due regard for the consequences on health. These unwholesome conditions are the outgrowth of luxurious civic life, the concentration of mercantile and manufacturing interests, the criminal neglect to keep streets and houses clean, and defective drainage. Thus while out-door air has its impurities at all seasons, it is scarcely possible during the winter to live in-doors without experiencing the ill-effects of overheated and impure air, the tendency of which is to deprive persons of the hardihood necessary to resist the unavoidable and natural vicissitudes of out-door life.

The liability to contract catarrhal affections from ex-

posure of the feet, trunk, and head, in street-cars, to draughts of cold air in all seasons is very great.

Rural peculiarities.—Very different from the foregoing are the usual conditions of country life; here physical overwork is more likely to be met with as compared with mental, although worry and grief in various forms are not unknown. Among pioneers in new settlements homesickness often exists, the food-supply frequently is inadequate, and habitations damp, cold, and dark. The statement applies to laborers in public works, and often to men in the frontier military service. In older and improved country places, where extreme exposure is exceptional, catarrhal inflammation is not so severe, yet the causal influences and symptoms differ from those of the city. It may be said that the rural subject presents the sthenic type, with greater temperature disturbance, while in the city patient, if a subject of nervous exhaustion, it is more likely to assume an asthenic form.

The difference in the phenomena observed in what may, for comparison, be designated as two classes of catarrhal disease, serves perhaps to explain some apparent discrepancies in the conclusions arrived at by medical men, who have looked on the same disease from a different point of view, some regarding it as catarrhal inflammation, others as malarial fever.

But this is not so surprising, since catarrhal inflammation often exhibits symptoms commonly, though wrongly, ascribed to malaria; thus fever is often present, being ushered in with chills; there is a tendency to recurrence, malaise, depression of spirits, vertiginous symptoms, and the like. The subsequent debility and typhoidal symptoms, when present, are therefore liable to mislead the observer, especially if he be a believer in the production of typhoid fever from "malarial" influences. One should reflect here on the possibility of these symptoms being due to disturbance of the nervous system wholly.

Malaria has long been a convenient cloak for our ig-

norance in respect to the origin of disease. The writer recollects how the "bilious remittent" fever of the South-west was attributed to this cause in his early experience ; and an outbreak of so-called "typho-malarial" among the soldiers of his regiment while stationed in the Alleghanies, in 1861, occurring after some weeks' exposure in camp, especially to unaccustomed night air, was alleged to be due to this agency. The popular mind to-day gives credence to this mysterious influence, as it always has done for hundreds of years. Says Cooke, in a recent work on Virginia, speaking of the early settlers on the James River in 1607 : "With July came the sultry dog-days of a southern summer, and the marshy banks of the river, sweltering in the sun, sweated a poisonous malaria which entered into the blood of the English. The whole colony was prostrated by a virulent epidemic." Thus, as at tide-water two hundred and fifty-four years before, was the origin of a disease assigned to the same causation in the mountains in 1861. In both of the instances named men were suddenly transferred from civil life to an out-door existence, in which little care was taken to properly habituate themselves ; sometimes they were idle and inactive for weeks and months, until some emergency called forth their utmost exertions, leaving many greatly exhausted. As a class they were without self-restraint in respect to both food and hygiene. Were not physical influences manifestly the cause of whatever affection these people had, rather than mythical ones ? A gentleman competent to give an intelligent opinion, and who has long practised medicine in tropical South America, once said to the writer, in discussing this subject, that it was his belief that their severe fevers might justly be regarded as an aggravated form of catarrhal inflammation.

The confounding of symptoms alleged to arise from so-called malarial poisoning with catarrhal inflammation (inclusive of nervous phenomena so often present) seems

to have for its origin the belief that a malignant miasm exists in the emanations arising from decaying animal or vegetable matter, sewer-gas, stagnant water, etc., or is disseminated by the pollen or effluvium of plants. It is to be regretted that the accumulated literature of this subject, embracing the labors of writers for many centuries, cannot by incontestable evidence establish these tenets; proof of the existence of malarial poison, according to a contemporary authority, lies mainly in the alleged fact that the sickness it causes yields to the administration of quinine.

In accepting the miasmatic origin of disease, it has been found convenient to explain its morbid influence through zymotic action, and more recently the microbic theory has been advanced; but whether the "fermentation" of zymosis and the presence of bacteria in the blood are not a product rather than a cause of disease, may well be believed.

The neglect of cleanliness, or, more broadly, of sanitation, is fraught with much evil; but while fully recognizing the danger to health from decomposition of animal and vegetable matter, would not a healthier sanitation prevail were the popular "fetich of the sewer," to which such quantities of quinine are sacrificed, put aside? How often has house-drainage been laid under unjust suspicion in pursuit of this imaginary evil; the wallpaper of the sick-room even torn down in the search after the sewer-pipe has been overhauled, or the house abandoned entirely? How often have worry, dissipation, and exposure, lowering the tone of the nervous system, overtaxing the stomach with alcoholic drinks and indigestible food taken at all hours, breathing the poisonous air of the ball-room, theatre, and the like—probably continued for a "season"—been the cause of sickness unjustly attributed to defective drainage?

It may be well to consider the causes of catarrh of the head somewhat broadly, since the belief has taken deep

hold on the minds of many that the malady is purely local; when the influences lying behind local manifestations are thus recognized, it is believed a more rational treatment will prevail. Among the causes are :

Meteorological influences. — Lightning stroke, sun-stroke, and congelation are not, of course, in the ordinary sense, to be considered as causal; it is the less or entirely inappreciable, and hence unexpected, variations in meteorological conditions that interest us, more especially because they are liable to be underestimated or overlooked entirely. These changes consist in variations in thermal, electrical, and aqueous vapor tension, inclusive, consequently, of the relative amount of sunlight, oxygen, ozone, etc. The most important of these, and doubtless influencing them all in greater or less degree, is the heat radiated from the sun. Animal and vegetable life upon the earth's crust derive their vitality from this source. It is the struggle against the undue loss of this heat through radiation from the earth's surface, on the one hand, and the avoidance of an excessive supply on the other hand, in order that a healthful equilibrium may be maintained, that concerns the sanitarian. Circumstances have placed man alike in warm and cold climates, as well as in the more favored temperate latitudes; the latter is most favorable, since out-door life may be enjoyed to a greater extent than elsewhere. It behooves one, therefore, in considering the causes of catarrhal inflammation, to take into count weather vicissitudes due to natural causes. A study of meteorological physics, so far as understood, will make known the natural laws regulating heat, electrical and aqueous vapor tension, of the movements of wind and water (trade and anti-trade winds and ocean currents); the proportion of oxygen, ozone, etc., under varying conditions.

The functions of life for the most part must be carried on in an environment of ever-changing physical forces. We may be said to live amidst ceaseless aërial cyclonic

movements of greater or less energy, since the air is ever in motion; these storms—sometimes one following the other, sometimes moving along in an irregular manner together—traverse to a greater or less extent the entire continent, disturbing a varying area of territory. As the cyclone constituting the ordinary thunder-storm advances, there is always a higher temperature in front than in the rear—"the warm air in front," according to Mr. Abercromby (*Nature*, 1885), "having a peculiar, close, muggy character. The cold air in the rear, on the contrary, has a peculiarly exhilarating feeling." These conditions are quite independent of the thermometrical condition.

The following puzzling experience is illustrative of the effect of these influences; it occurred in the writer's early experience in practice. The patient was a man, aged forty-five, whose general health was fair; on entering the sick-room I found him gasping for breath. The heart was beating tumultuously, and his nervousness was painful to witness. He had been attacked with these symptoms on the approach of a thunder-storm which was then prevailing. His wife, who showed no alarm, informed me that he always suffered in this manner during storms, and that recovery was always speedy and complete as soon as the weather cleared.

Sudden and extreme changes in altitude also give rise to peculiar disturbances; persons on arriving in this manner, by rail, at an elevation of some sixteen thousand feet in the Andes, are liable to experience very disagreeable sensations, due to the sudden withdrawal of atmospheric tension. Besides the cardiac failure and pulmonary derangement produced by the transition, congestion and anæsthesia of the skin, cramps, and other nervous disturbances are experienced, known in South America as *aire*. Similar to phenomena occurring in very much *rarefied* air are those witnessed in persons on coming out of the highly *condensed* air of submarine

caissons ; in either the sudden disturbance of equilibrium of density causes undue nervous strain.

It is, however, the much more slight variations associated with storm movements that probably give rise to the nervousness experienced by certain individuals. The writer has been informed by a number of his patients that they cannot long endure a sea side residence in summer, even in so agreeable a place as Newport, R. I., on account of the extreme nervousness apparently produced by an environment affected by wind that has swept rapidly over the ocean for a long distance. Besides the general nervousness experienced, there was irresistible somnolency at one time, and at another a total inability to obtain sleep.

I am not aware of any explanation of these phenomena being given, but I suspect that when the nervous system is impaired by exhaustion, its liability to undue excitation or depression by the causes alluded to is increased.

Thermal changes are yet more important than either electrical or barometrical. The rapid liberation of heat from the body of the strong generally arouses healthful activity, but it depresses the weak ; on the other hand, the acquisition of a relatively great amount of heat is well borne by the former, while prostrating the latter.

Prolonged exertion in extreme summer heat gives rise to nervous prostration or irritability ; this is especially liable to occur during the "dog-days" of late summer, when even slight exercise is fatiguing and attended with perspiration. A draught of air is then, according to the Spaniards, *una facada*, a knife-stab, so dangerous is it regarded. But, as would be expected, exposure to night air when the sun's heat is withdrawn, is particularly dangerous to the susceptible. It is then that *sudden* cooling off, especially in damp clothing, and while the body is overheated, that catarrhal inflammation may occur.

It was long ago shown by Dr. Wells, that when the sun

has set the earth's surface becomes quickly cooled by radiation, and the air immediately above becoming too cold to retain its aqueous vapor in a state of suspension, the moisture is therefore rapidly deposited upon the earth in the form of dew or frost, according to the lowness of temperature. It will be observed that dampness often shows itself upon the turf sometimes before the sun has sunk, and from this on the dampness and chilliness of the under stratum of air increases more and more up to a certain point. The intelligent class of natives of the tropics practise much caution to avoid the deleterious effects of this exposure, but notwithstanding their prudence, catarrhal affections of a severe character prevail. This result is less surprising, however, when the effect of prolonged summer heat in producing apathy and inertia—totally preventing exercise, and thus increasing susceptibility—is considered.

Night air at sea is likewise to be avoided, since even the general bracing effect of ocean air by no means insures immunity from catarrhal trouble.

The more decided catarrhal attacks are, of course, well known to be ushered in by chill, with more or less nervous disturbance; sometimes a local manifestation also occurs, as torticollis or a "crick" in some other region. Usually, however, we have to consider the influence of slight impressions only on the nervous system; these have been distinguished as a "shock" or a "stab," although but a slight immediate effect is experienced. In the end, however, very decided phenomena are produced through the vaso-motor system of nerves. A susceptible person may not remain with uncovered head for many minutes in the dew-laden tropical night air without sneezing or even contracting rhinitis. Greater or long-continued exposure, especially in run-down persons, may be followed by ague, dengue, neuralgia, or rheumatism, according to the patient's idiosyncrasy or susceptibility. Of course, the hardy native "of the soil," so to speak, becomes acclimated to vicissitudes by long residence, and even the

languid and more unstrung resident acquires immunity not to be enjoyed by strangers.

Thermal variations, otherwise inappreciable, visibly affect the system when run down; thus, in a six-days' summer voyage from Suez to Aden, says Medical Director Delavan Bloodgood, U. S. N., in a letter to the writer the temperature was seldom lower than 100° Fahrenheit, day or night; on entering the Gulf of Aden, however, a breeze encountered, only a few degrees lower, produced such a chilling sensation that the passengers found an increase of clothing absolutely necessary. My informant recalls now, after many years, the chattering of his teeth on that occasion, and the discomfort lasted for several hours. It is not unusual under these circumstances to experience an immense increase in urinary secretion, and the ship's surgeon in consequence always receives the visits of a large number of surprised, if not alarmed, passengers. Experiences of practical interest bearing on this point are common enough to travellers. Thus Stanley found, after travelling for some considerable time in the relaxing climate of equatorial Africa, that warm clothing, including an ulster, was comfortable in July, when the minimum temperature was 63° F.; and the draughts of wind sweeping down the gorges, though not decreasing temperature thermometrically, added greatly to the feeling of "miserable chilliness." The catarrhal manifestations which seemed to prevail on the Congo under those circumstances were of the gastric variety. Mr. Crawford, a gentleman engaged in selecting a railway route across the Pampas during the hot months, notes the rapid changes in temperature on La Plata; a sudden fall from great heat to 26° F., freezing ice in the tents on one occasion, and at Mercedes on another, after an intensely cold night, the thermometer registering 34° F., temperature rose to 107° F. in the shade at 4.30 P.M.

Forbes, while travelling in the Eastern Archipelago, found the natives in Sumatra going about, and even sleeping, in all weathers, nearly naked, and enjoying

good health ; but almost at once succumbing to the low temperature of mountain heights, often actually dying before they could descend. Mr. Forbes, in his admirable work "The Wanderings of a Naturalist in the Eastern Archipelago," states that at an elevation of 10,562 feet up the Dempo, the midday sun was almost unendurably hot, the hands, face, and neck being scorched the moment they came into the sunshine, though a cold wind was blowing and the thermometer registered only 63° F. When the sun began to decline, however, the temperature fell rapidly ; at sunset it was 47.2° F., and for comfort he was obliged to put on triple suits of clothes.

"When at four o'clock next morning," says Mr. Forbes, "I went out into the Sawah, though the thermometer registered 47° F. (the lowest reading of the night was 42° F.), the air, which was perfectly still—its silence, indeed, almost overwhelming—felt absolutely free from rawness, in marked contrast to what I had experienced at sunset under almost the same reading of the thermometer."

Mental exhaustion alone, without open-air exposure, is very often a cause of head catarrh ; yet may one sleep in a cold airy apartment, when not overheated, without risk, and patients with high temperature, unless sweating excessively, get on best with such surroundings.

Causative influences like the foregoing finally prevent healthful equipoise between the different organs, and, in consequence of this, elimination is defective. Along with defective nutrition a perverted state of the nervous system obtains : its tension on the one hand is depressed, or on the other hand increased. At either extreme, or in vibrating between them, peculiar phenomena present themselves ; thus periodical disturbances influencing temperature may characterize catarrhal fever, or they may manifest themselves as "nervous explosions" at irregular intervals. Certain subjects become known as "nervous," and are liable to uncontrollable sighing, weeping, outbursts of ill-temper, and other emotional

manifestations. Others thus illy-balanced indulge inordinately in stimulants, or food, or sexual excess. It is a notable fact that such nervous persons are extremely subject to catarrhal inflammation, which is liable to take on nervous characteristics. Thus, with bronchitis appears the suffocating spasm of asthma, and with rhinitis the violent irritation and sneezing of hay-fever. Catarrhal neuroses, once acquired by the more susceptible, increase by long continuance to a degree never experienced by less sensitive persons. These local disturbances of the mucous surface are comparable to neuroses of the skin, as zoster and pruritus, where cutaneous burning and itching are caused by reflex action.

Where the asthmatic habit exists, meteorological disturbances, excessive physical exertion, undue mental excitement or depression, cold winds and dust, excite spasm and cough. The sight of dust, even without inhaling it, will excite spasmodic cough—indeed, almost every asthmatic has his *bête noire*, which may explain the whimsical origin of asthmatic spasm in some cases.

In the disordered olfaction of hay or rose fever, the odor of the rose and other objects is compared to the irritation of pepper applied to the Schneiderian membrane, and as in asthma, various dusts and odors cause distress.

Head catarrh often begins very early in life, and continues a long time before the subject is brought to the physician's notice. In fact, it is usually neglected until marked deafness has occurred. The neglect of nasal catarrh is often due to the indifference to the slight discomfort attending impairment of smell, since at best this function is less perfect from disuse or want of cultivation than that of the other special senses. In a few instances I found the sense of smell most acute, resembling that of many of the lower animals, where its importance in the economy is scarcely second to hearing and seeing.

The rhinitis of hay and rose fever is often found to stand in a causal relation to otitis, affecting the ears

either by extension of the inflammatory process from the naso-pharynx up along the Eustachian tube to the tympanum, or through reflex sympathy of the nerves.

Sympathy of the nerves.—In certain conditions of the system the nerves become exceedingly impressible to excitation ; thus the irritation produced by the introduc-



FIG. 2.—Diagram of the Tympanic Plexus (Rüdinger). 1, Oculo-motor nerve ; 2, trigeminal nerve, with the Gasserian ganglion ; 3, first branch of the trigeminal nerve ; 4, second branch ; 5, entrance of the same into the sphenopalatine fossa ; 6 and 7, superior maxillary nerve ; 8, sphenothymoidal nerve ; 9, descending palatine nerve ; 10, Vidian nerve ; 11, large superior petrosal nerve ; 12, buccinator nerve ; 13 and 14, pterygoid nerve ; 15, chorda tympani ; 16, carotid plexus of the sympathetic ; 17, petrosal ganglion of the glosso-pharyngeal nerve ; 18, 19, and 21, vagus, accessory nerve of Willis, and hypoglossus ; 20, facial nerve ; 22, nervus carotico-tympanicus ; 23, tympanic, or Jacobson's nerve ; 24, small superficial petrosal nerve ; 25, nerve of the tensor tympani ; 26, tympanic plexus ; 27, branch for the oval window ; 28, branch for the round window ; 29, large, deep-seated petrosal nerve ; 30, branch for the Eustachian tube ; 31, division of the Vidian nerve into its two branches ; 32, anastomosis of fasciculus of the Vidian nerve.

tion of a speculum or a probe into the external auditory canal will excite coughing, or a desire to swallow, and various other sensations in the nose, pharynx, or larynx. Many persons can locate the seat of local irritation thus propagated in the ear in some particular spot in these parts, the sensation being described as "burning," "tickling," and the like. *There is very often an increase of*

the secretion of mucus in the spot thus irritated. When the throat is in a diseased condition, the reverse of the above often takes place, and the ear may then become affected. When nerve-tension has been long disturbed in this way, reflex phenomena are easily excited; continuous aural, nasal, or dental irritation, even if imperceptible, may affect one part or another, until nutritive (trophic) changes are brought about; slowly progressive aural catarrh finally producing deafness before the patient himself is aware of any morbid action going on. The tissues involved in catarrhal inflammation of the middle ear "consist of a membrane which performs the double duty of mucous membrane and periosteum. The sensitiveness of this structure is extremely great, for it is not only richly supplied with blood-vessels, but also wonderfully well provided with sensory nerves. These latter compose the tympanic plexus, a diagram of which is here shown. This anastomosis derives supplies from sources most extensive; thus by means of branches from the otic ganglion the inferior maxillary nerve is brought into intimate relations with it, and the petrosal ganglion of the glosso-pharyngeal nerve supplies the tympanic branch, or Jacobson's nerve, which constitutes a large portion of this anastomosis. The carotid plexus of the sympathetic sends a branch to the glosso-pharyngeal, and thus establishes a communication between the ear and the superior cervical ganglion of the sympathetic nerve. Through Meckel's ganglion, by means of the Vidian nerve, the superior maxillary of the fifth pair of nerves also is connected with the tympanic system. Besides these there are other connections which may be seen by consulting the diagram."¹

This extensive nervous connection brings the ear into sympathetic relationship with disturbances in various parts, as the brain, stomach, heart, genito-urinary organs, and cutaneous surface, as well as with other parts already mentioned.

¹ Vide author's paper, *Earache in Children*, MEDICAL RECORD, May, 1883.

Catarrhal affections of the ear.—From an etiological point of view catarrhal affections of the upper air-tract should be considered as a whole, although the ear, olfactory region, and the various cavities and sinuses of the head may become independently affected. Catarrhal affections of the ear are most frequently met with in the chronic form and in connection with continuous head catarrh; recurrent exasperations ("colds") frequently marking a more or less rapid decrease in hearing power. One ear, usually the left, is found to be first affected, and in the end most impaired.

Aural catarrh, especially the subacute variety, beginning as early as the first month of infantile life, may give rise to total deafness, the proliferation of connective tissue about the articular surfaces of the ossicles producing fixation. Acute purulent inflammation at this period, however, usually leaves the hearing less affected, unless the process become subacute or chronic. The purulent variety may prove fatal; unsuspected ear disease, in fact, is frequently shown, by post mortem examination, to have been the cause of death in young infants, when symptoms of brain disturbance only were recognized during life.

The relations of dentition to aural trouble are very important in infancy; before puberty this process is most active, causing often great nervousness, especially in girls overworked in schools or shops. The catarrhal fever, to which this class of persons is subject, may simulate typhoid fever, for which it has been mistaken.

Adolescents sometimes get their wisdom-teeth with difficulty—indeed they are often not cut until the patient is thirty years or more of age. In consequence of the aural irritation excited through nervous sympathy in such cases, subacute and chronic catarrh of the middle ear, giving rise to extreme deafness, is of frequent occurrence; deafness may come on so gradually that the patient is unaware of its existence until its progress has been marked. Dentition is thus liable to be an important

factor in catarrh of the head, and should never be overlooked in treatment. The retention of pulpless teeth should be avoided, especially in persons wanting in nervous tone.

Overworked shop-girls, living under faulty hygienic conditions, having dental irritation, sexual disturbances, and the like, are extremely susceptible to aural catarrh, giving rise to extreme deafness.

Children's catarrh (acute) of the upper air-tract may be ushered in with chill, followed by fever and more or less local irritation, manifested by sneezing, a down-pour of fluid from the nose, and tinnitus aurium as the ear becomes invaded. The fluid profusely secreted by the conjunctival mucous membrane, and that flowing from the anterior nares, often excoriates the cheeks and lips, and later on there is frequently an eczematous eruption at the seat of irritation. The tympanal secretion is sometimes so great that the drumhead gives way and allows the pent-up fluid to escape. The aural discharge also may be the cause of dermatitis, etc., about the external auditory canal and auricle. At first the secretion from the nose and ears may be tinged with blood, but in many cases it soon becomes mucoid, bland, and ropy, and there is a tendency toward a regressive course and spontaneous recovery. In some cases, however, there is a greater tendency to purulency and chronicity; this is especially liable to occur in cachectic, run-down children having chronic head catarrh, difficult dentition, etc.

When serum only, or thin mucus, is poured out into the middle ear, it is frequently carried off into the throat *via* the Eustachian tube, but where the swelling closes the tube, or the mucus is too thick to escape, an accumulation soon takes place, distending the drum-head, and giving rise to earache. When the drum-head has been thickened, and does not give way readily, the distress may become almost unendurable. In the more severe examples of acute aural catarrh the principal seat

of the trouble will be found in the attic of the tympanum, where swelling of the mucous lining prevents drainage either down into the atrium of the tympanum or through the Eustachian tube, the pent-up fluids seeking an outlet through the *membrana flaccida*, which often becomes greatly distended. The secretions, if not liberated, finally burrow along underneath the lining of the superior wall of the external auditory canal, forming a sac of greater or less size, which sometimes entirely conceals the *membrana tympani*. At the same time the *antrum mastoideum* and adjacent cellules are liable to invasion, as well as the periosteum externally.

Subacute aural catarrh, causing great deafness, sometimes occurs consecutive to scarlet fever or measles in children; secretion from the tympanal mucous membrane may be slight, the drum-head may remain intact, and deafness only suspected when the child is found to be backward in learning to talk.

While persons in health quickly rally from head catarrhs, experiencing no harmful result, in delicate children and broken-down and decrepit subjects the disease is liable to assume a chronic form; where the ear is thus affected, recurrent exacerbations are liable to be followed by a decrease in hearing. Concurrent gout, rheumatism, scrofula, consumption, or other constitutional disease increases the gravity of the trouble, and in the two affections last named, as well as in subjects of diabetes mellitus, the tendency to destructive purulent otitis media, with rapid disintegration of the *membrana tympani*, and profuse otorrhœa is marked. In rheumatic and gouty catarrh, however, there is seldom any great amount of pain, the effusion is often serous in character, and no tendency to suppuration exists, the principal seat of inflammation being confined to the attic, involving to some extent the *membrana flaccida* and other neighboring parts rather than the atrium. These cases are characterized by chronicity, and sometimes a collection of straw-colored serum can be seen behind the drum-head,

where it may remain for a long time, displaying air-bubbles when the drum is inflated.

In scrofulo-syphilitic subjects the deeper structures of the ear and nose, including sometimes even the osseous tissue, are liable to be affected; and in syphilitic catarrh, exacerbations are sometimes attended with very pronounced and sudden deafness.

Secretion in catarrhal inflammation is generally characteristic; thus the outpour of fluid from the inflamed mucous membrane of the nose in children, after the feverish stage at the onset, is profuse, as it also is in recurrent rhinitis in adults, notably in hay fever. Incrustations of inspissated mucus in the caverns of the nose, especially where a deviation in the septum exists, are seldom seen before puberty; but in chronic catarrh in cachectic persons, or in advanced life, where the mucous membrane enveloping the erectile tissue of the nose has become atrophied, evaporation of the scanty secretion leaves inspissated crusts, which soon become fetid. There is an intermediate stage when mucous secretions become very tough on drying, and are worked out with difficulty. Secretion may consist of mucus principally, or it may become sero-mucous, sero-sanguinolent, mucopurulent, purulent, or otherwise combined, according to circumstances.

Inflammation of the mucous membrane of the tympanum, mastoid antrum, or pneumatic cellules of the temporal bone, take on secretory processes similar to the above; the presence of tough mucus affords an explanation of deafness through interference with the movements of the transmitting mechanism; and where sudden and extreme deafness takes place, as in some forms of non-purulent aural catarrh, especially in syphilitic subjects, there is probably infiltration of a particularly adhesive nature, causing rapid fixation of the ossicles. The most marked non-syphilitic examples I have seen were in persons residing in the tropics. Two cases among the latter are particularly instructive.

CASE I.—A gentleman, aged forty-five years, came to me a year ago with the following history: He had resided in Rio, Brazil, some thirteen years altogether, having taken in the meantime two vacations of eighteen months each, during which he visited Europe and this country. During his residence in the tropics, he was for some time under severe mental strain, but passing the warm season in the mountains of Petropolis, the summer residence of the court, at an elevation of some three thousand feet. While so run down, the extreme and sudden variations in temperature were very trying; succeeding to intensely hot and dry days, were damp nights some 20° Fahrenheit cooler. Not having learned of the perils of *el sereno*, the fatal night air, he was less prudent, in respect to exposure after sundown, than the natives, who are careful to protect themselves with warmer clothing, and avoid uncovering the head needlessly for a moment even. He finally contracted severe head catarrh. There was, at first, a sense of great heat and discomfort in the nose, perversion of the sense of smell, especially on first rising in the morning, when everything had the odor of burnt meat. There soon was a profuse down-pour of fluid from the head, which was mixed with blood. On the frontal sinuses and other cavities becoming invaded, the head felt "hot and dry." These symptoms continued for some time. The ears were early involved, and as the disease progressed he became *rapidly very deaf*. Distressing tinnitus accompanied the other symptoms. He was for a few days so deaf as to be unable to converse, but before long some improvement took place; there was no marked improvement in the head catarrh, however, until he left the tropics; and when I saw him subsequently, he could converse with difficulty, in an ordinary tone of voice, at a distance of six or eight feet. Under the favorable influences of the climate in New York, he improved very much under treatment.

The next case is similar to the above.

CASE II.—An English gentleman, thirty-five years of age, residing in Venezuela. This patient, a person very much over-worked, in April, 1884, made a three weeks' journey into the interior of the country, during which he was much exposed to an almost continuous rain-storm. He escaped the prevailing fever as he had done hitherto, during twelve years' residence in tropical South America. During his stay with a friend in the country, he sat one morning after breakfast in the corridor of the house *without any coat*. After dinner, the same day, while engaged in conversation he *suddenly* had a most profuse flow of fluid from both nostrils and the eyes, which lasted for some hours. The attack was severe and was accompanied with much coughing. It was feared that this would prove to be a precursor of the "fever" of the country, but the more disagreeable symptoms passed off by the next morning. Head catarrh, however, continued, the tympanum became affected, and there was almost total deafness. A disagreeable sense of fulness in the head, and dryness of the upper air-tract characterized the course of the disease and, in fact, still remained when the writer was consulted.

TREATMENT.—In the treatment of catarrhal inflammation of any particular part of the upper air-tract, attention should be directed to the condition of every other part; aural catarrh, for example, is not unlikely to be associated with rhinitis. Where indigestion and faulty assimilation are provocative of rheumatism or gout, etc., or, in fact, where any disease may stand in the relation of predisponent or excitant, these factors must not be overlooked, and when the patient's interests require it the valuable aid of other practitioners may be sought.

In no affection is attention to hygiene so important etiologically, and hence the questions of food, clothing, bathing, exercise, and ventilation should receive prompt attention. This will be found a most difficult part of the physician's task, especially as regards children and invalids, since the convenience and comfort of parents and

nurses is too often consulted to the detriment of the patient; thus are outings curtailed or prolonged unduly, and heating and ventilation arranged to suit the well rather than the ailing. Open air exercise daily should be insisted upon as far as children are concerned, and when inclement weather prevents going out the nursery may be converted, for the time being, into an open air play-ground by throwing open windows and doors, children (or invalids), being suitably clad. Too often is cloudy, threatening weather an excuse for neglecting exercise.

Out-door life for invalids should be regulated, both as regards preventive and curative treatment, by the patient's tolerance for exercise without undue fatigue.

Protracted in-door life during the dark, damp, cold, short days of winter tends to very much lower the tone of the system; it is after this depressing experience, and on the return of milder weather, that incautious exposure causes catarrhal troubles. Delicate persons, especially when over-heated, should avoid exposure when rapid evaporation of snow and ice occurs during a winter "thaw," since even slight (and usually unconscious) chilling of the body causes mischief then rather than the succeeding cold "snap," the effect of which is to tone up the system. It is said that voyagers returning from high latitudes are extremely susceptible to catarrhal affections on returning suddenly to temperate regions.

Health requires that exercise be taken in very cold weather, provided the proper quantity of food is consumed. Now, the animal heat derived from food with difficulty compensates for the immense quantity lost through the escape of heat into space by radiation. The problem of maintaining an equilibrium between these two diverse processes is therefore difficult of practical solution; thus exercise is impeded in a measure proportionately to the means employed in retaining bodily heat by means of clothing, etc. If the escape of heat is

prevented by non-conducting clothing, impervious rubber-cloth, the skins of fur-bearing animals, and the like, escape of insensible perspiration through evaporation from the body is also interfered with, and the clothing becomes saturated with moisture—an exceedingly disagreeable and unhealthful condition. The very general introduction of rubber-cloth and fur garments in our temperate climate is to be greatly deplored, since the bodily temperature is too much increased by their use. In regard to the maintenance of a proper bodily temperature, it may be said that everyone must, in a measure, regulate this by the changes in wrappings suggested by his own sensitiveness, rather than the readings of the thermometer.

The advantages of travel and change of climate have long been recognized, and it is particularly notable that where catarrhal neuroses affect residents of cities, immunity may be enjoyed during a sojourn in the country, and *vice versa*; asthmatics are even permanently cured in this way. The most striking effects, perhaps, follow changes to pure sea or mountain air, but the writer has known of a number of instances of asthmatics being cured on leaving the great interior valley of the Mississippi to reside in New York City.

The inconsiderate advice sometimes given to patients of delicate constitution while ill, to hurry away from accustomed comforts to some favorite region, may prove exceedingly hurtful. The endurance of patients differs greatly; one may become robust in the Adirondacks, while another cannot endure the exposure of camping out. Patients, therefore, should be well informed in respect to the requirements of the particular spot to which they are sent; for example, they will find that natives of the tropics require thick woollen clothing during their short winter, although the thermometer may register 60° F. only, while those of high latitudes, where the sun's rays during their brief summer are exceedingly oppressive at 60° F., *per contra*, may swim in the ice-cold

water with much pleasure. The native Esquimo through much exposure become inured to the dreadful Arctic winter, *even suffering with heat when the temperature rises above the freezing point*; cold weather and exposure, says Schley, in the narrative of the Greely rescue expedition, have no terror for them.

In the tropics, sensitiveness to sudden exposure to air a few degrees below the customary temperature, has been shown to give rise to chilliness; on the other hand, sensitiveness to moderate heat gives rise to equally painful sensations to persons long inured to Arctic cold; thus a scalding sensation is imparted to the skin by the contact of the warm blood flowing from the whale and walrus when slaughtered.

For the greater number it would seem that a knowledge of their own environment, together with a study of the conditions best suited to their needs, is of much greater importance than the discovery of sanitarium, at best available to but few. Indeed, it is useless to seek a perfect climate where catarrh is not found; we can only recommend the best average climate suited to a particular case. Patients from the North find needed rest in the languid life of the South, while Southerners are benefited by the bracing air of the North. Moreover, it will be found by experience that favorite resorts have their off-seasons; for example, Nassau, usually the most charming of winter climates, was during the past winter (1884-85) so disagreeable from the cold and humidity, that many of our patients sent there for the winter were compelled to leave before the season was over. If the invalid go to tropical climes, aqueous vapor is liable to be found in excess the year round, the humidity of the summer interfering with healthful escape of insensible perspiration, and that of the winter conducting away bodily heat too rapidly.

The influence of aqueous vapor in the air is important: Tyndall, says Stewart (*Nature*, vol. ii., 1885), has called attention to the fact, that aqueous vapor being

transparent for rays of high temperature, does not stop but a small portion of those which come to us from the sun ; but being comparatively opaque for rays of low temperature, it stops the radiation into space from the surface of the earth. In other words, it acts as a cloud in preventing refrigeration which accompanies dew. In regions, however, where the air is very dry, the nights are intensely cold, owing to the uncompensated radiation into space. In Central Asia and in South America, as cited by the writer, water is often frozen after the sun is below the horizon.

The treatment of catarrh of the upper air-tract implies the management, to some extent, of all the troubles about the head, since nearly every affection of the ears, eyes, nose, mouth, and nervous system of this region is generally more or less associated with a departure from the healthful condition of the mucous membrane of this tract. There is too often a demand for an exclusively local treatment, however harsh, which, in attacking a local manifestation, promises to strike down the evil, rather than a rational method which may remove the cause. It is desirable, of course, to get rid of the results of disease, but this will not always affect the cause ; in other words, the root of the evil cannot be reached by local treatment alone.

At the onset of acute catarrhal inflammation of the head, local applications, consisting of weak alkaline solutions in water as hot as can be comfortably borne, are soothing, and answer to cleanse the accessible parts when secretions require removal by mechanical means. More rarely are sedative applications required, but where the tonsillar crypts are the seat of chronic inflammation, they may be touched with solutions of nitrate of silver, tinct. iodine, etc. In the chronic form of catarrh, beyond cleanliness, there is but little need of local applications ; astringents, however, are sometimes beneficial, especially weak solutions of nitrate of silver, sulphate of zinc, acetate of lead, and the like, or vege-

table astringents. These may be applied by means of atomizing apparatus, brushes, or cotton-wool mops; the latter are convenient and have the advantage of being cleanly. Solutions can also be introduced with a syringe, or sniffed up from the hand.

The nasal douche is a most efficacious means of cleansing the naso-pharynx or of applying medicated washes, but it is by far too treacherous to be safely employed by the patient himself. Even sniffing up solutions, or the insufflation of powders, are to some degree open to the same objection, namely: the danger of passing fluids, etc., up through the Eustachian tube into the ear and causing inflammation.

As a rule, I have not often found the nasal mucous membrane to be improved by the application of irritants, which ordinarily give rise to sneezing and coughing when accidentally inhaled, whether employed in dry or humid form, and I believe their indiscriminate use is to be deprecated. The heroic methods often resorted to in treating irremediable, but yet persistent, patients, likewise are usually unjustifiable; the employment of the galvano-cautery, wire snare, *écraseur*, or strong acids for the removal of structures in the nasal region, has brought out some very energetic methods, which, if safe and proper in skilful hands, are certainly liable to much abuse, and are known to have done positive injury to the nose, as well as set up serious trouble in the ear.

Hypertrophied tonsils, whether obstructing respiration by their size or interfering with the action of the muscles of the upper respiratory tract, should generally be removed.

The treatment of rhinitis, which is so important a feature of hay and rose fever, may often, with advantage, include brushing or spraying the irritated or inflamed turbinated bodies once or more daily with a two to four per cent. solution of cocaine. Tolerance, which sooner or later occurs, lessens its effect finally, and in some cases it does no good.

Atropine ointment, rubbed over the bridge of the nose and the frontal sinuses, often affords great relief; care should be taken, however, to prevent its entrance into the eyes.

Catarrh of the head, especially the acute rhinitis of hay and rose fever, which is most liable to come on in late summer or in the beginning of autumn, seems to depend on the excitability of the nervous system frequently following protracted hot weather, and the neglect of exercise, and it rapidly disappears again under the toning-up influence of cold weather. Since worry and depression of spirits are to be regarded as predisponents in the nervous catarrhs, it is well to remember the advantages of pleasurable excitement, which in asthmatics dispel paroxysms like magic. And, moreover, the "habit" sometimes disappears altogether after the more excitable period of life—the patient, so to speak, having "outgrown" the trouble.

The mucous membrane constituting the inner lining, as compared with the dermic layer forming the outer covering of the body, offers but little resistance to impressions through the nervous system; inflammation of either, however, often gives rise to sympathetic fever. Perversion of the sexual sense may, in one instance, cause an abundant display of acne upon the skin of the face, or it may expend itself, so to speak, upon the mucous membrane of the head. Sometimes both dermic and mucous surfaces are affected at the same time.

In the internal treatment of acute catarrh of the head the various forms of mercury are most beneficial, especially in the affluent stage; indeed, so long as there is no tendency to suppuration, but rather an inclination to a regressive course, mercury may be used throughout. There is, however, a choice in the form of this drug; one may use hydrargyrum, rubbed up with sugar of milk, which is somewhat similar to quicksilver treated with chalk, only in the former a much finer division of the drug is made. The hydrg. chlor. cor., hydrg. chlor. mite,

and the hydg. cyanidum, are useful forms of the remedy. I myself usually employ the second or third decimal trituration in powder or tablet form, using the cyanide in smaller doses than the others. With the above, given every two or three hours, bryonia alba is a useful adjunct, or this may be given alone after the mercury has been omitted. Where there is pain or nervous irritability, aconite, gelsemium, belladonna, or pulsatilla, are indicated in minute or small and frequently repeated doses; these are particularly indicated where there is fever. Belladonna alone, or with aconite, is specially indicated where tonsillitis is present; where dryness of the throat or increased temperature are observed, they should be suspended for a time. Pulsatilla having no cumulative tendency, is particularly well adapted to children and infants. Where fever arises from the nervous irritation of catarrh, large doses of quinine are not always so much indicated, as minute doses of aconite, frequently repeated. Where purulency threatens or exists, the calx sulphurata may take the place of mercury. In the employment of medicines a due regard for emergencies requires that their use should be prompt in the acute stages, and omitted, from time to time, in order to ascertain what their effect has been. The more profound anodynes are sometimes indicated by the severity of pain; they should, however, only be employed in a tentative way, since they mask symptoms and interfere with nutrition.

In cases where rheumatic, gouty, or neurotic tendencies exist, the employment of quinine or rhus toxicodendron is advisable, the former in from two- to five-grain doses, repeated once or twice daily for adults at the onset; the latter, largely diluted, may be longer continued. Diathetical treatment in general need not be alluded to here. Under this treatment, and the enforcement of necessary rest and other hygienic measures, I have seen inflammation of the ears, nose, etc., quickly disappear. The ear, however, frequently requires special treatment

after the general subsidence of head catarrh. The aural mucous membrane requires the gentlest management, especially in delicate persons and in children; in the acute stage, more especially in *otitis purulenta acuta*, there is always danger of increasing, rather than abating, the inflammation by vigorous measures. Secretions in the external auditory canal should be only occasionally removed by gentle syringing, but frequently wiped out with absorbent cotton-wool, which takes up serous fluid and brings away the adherent mucus. Decomposition of secretions should thus be prevented, and drainage secured. The moment secretion lessens one should be prompt in introducing dressings of boracic acid and calendula without unduly disturbing the healing drumhead. Later on boracic acid alone is sufficient, especially if chronicity threatens; at this stage it is sometimes advisable to stimulate the parts with calendula alone. When acuity is absent, and no danger of reopening the perforation exists, inflation of the ear is in some cases required.

The question of the evacuation of pent-up secretions in the atrium or attic of the tympanum can only be decided in any particular instance by careful examination, and a consideration of all of the features of the individual case; it is by no means always demanded, even when the parts are bulging or for the relief of that most uncertain of all symptoms, pain.

Since climatal vicissitudes exist wherever susceptible persons are found, catarrhal inflammation is a very general affection. Unfortunately, not until frequent exacerbations have left the ear or nose in an impaired condition, is advice sought, and we must then often content ourselves with preventive measures which will avert further destructive changes. The peculiarities of each and every case require careful consideration, the details of which cannot, of course, be given here.

In general it may be said, that in infancy the activity of the physiological processes concerned in develop-

ment are often exhaustive ; after puberty, the play of the maturing functions, especially the sexual, frequently are excessive ; after adolescence mental and physical strain begins, and from this to middle age and beyond the struggle of existence is less easily borne, and worry becomes perhaps one of the most important factors of the affection under consideration. It is a notable fact that grief is accompanied, in emotional persons, with greatly increased flow of tears and nasal secretion—showing the influence of mental impressions on these parts. Treatment then should be adapted to the temperament and the age of the patient, and should be hygienic as well as medical. In chronic aural catarrh the treatment is necessarily less satisfactory than in the acute form. It is difficult to avoid disappointing the patient whose hopes and expectations are great, since we must often be content with moderate success only. Undue expectations must be met by frankness without discouragement. One's resources may be greatly tested in meeting the various symptoms which alarm the patient in advanced stages of aural catarrh ; thus the greatest alarm is occasioned by the distressing symptoms of autophonia, vertigo, and sudden deafness.

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