Dench (E. B.)

THE AURAL COMPLICATIONS OF INFLUENZA.

BY

EDWARD B. DENCH, M. D.

Professor of Otology, Bellevue Hospital Medical College; Consulting Otologist to St. Luke's Hospital; Attending Aural Surgeon, N. Y. Eye and Ear Infirmary; Fellow of the American Otological Society; of the N. Y. Otological Society, etc.

REPRINTED FROM

Transactions of New York Academy of Medicine

FOR 1895.

THE AURAL COMPLICATIONS OF INFLUENZA.

BY

EDWARD B. DENCH, M. D.

PROFESSOR OF OTOLOGY, BELLEVUE HOSPITAL MEDICAL COLLEGE; CONSULTING OTOLOGIST TO ST. LUKE'S HOSPITAL; ATTENDING AURAL SURGEON, N. Y. EYE AND EAR INFIRMARY; FELLOW OF THE AMERICAN OTOLOGICAL SOCIETY; OF THE N. Y. OTOLOGICAL SOCIETY, ETC.

[*Reprinted from Transactions of the New York Academy of Medicine.*]

CONCORD, N. H.:
THE RUMFORD PRESS.
1898.

THE AURAL COMPLICATIONS OF INFLUENZA.

In considering this subject we have first to remember that epidemic influenza belongs to the class of acute infectious diseases. The constitutional poison effects certain general changes common to all acute infectious diseases, and therefore the influence of this malady upon any particular organ of the body resembles that of any other acute systemic infection. According as the toxic principles expend themselves either upon the upper air passages or upon the nerve centers, the aural complications usually manifest themselves as affections of the conducting mechanism or of the perceptive tract. It is still a mooted question whether the effect produced upon this organ of special sense is due to the action of the specific germ of the disease, or whether the development of certain toxines in the blood renders the tissues more vulnerable to the action of certain micro-organisms found in similar local conditions, not depending upon influenza. When the nervous system is principally involved the action upon the organ of hearing may be indirect; some disturbance of the vaso-motor center so affecting the circulation in either the external or middle ear, or in the labyrinth, as to impair or pervert audition without causing an inflammation.

For convenience of classification we may consider the effects of this disease upon the external auditory meatus, upon the middle ear and the Eustachian tube, and upon the labyrinth and trunk of the auditory nerve. Why in certain cases aural complications play so prominent a part, while in others the ear remains unaffected, undoubtedly depends upon some pre-existing local condition. The same

cause is often operative in determining the particular part of the auditory apparatus affected.

It is probable that an external otitis either of the circumscribed or diffuse variety directly complicating epidemic influenza, is rather rare. Such complications can usually be explained upon the theory that the intense congestion of the vessels of the head which the disease causes, renders the tissues of the canal especially susceptible to infection.

In one instance which came under my own observation, there was an extensive growth of aspergillus in either external auditory meatus, following a severe attack of influenza. No doubt the spores had been present in the canal for an indefinite period, but the intense local congestion which the constitutional disease caused constituted a condition that accelerated their growth sufficiently to produce severe symptoms.

The development of vesicles upon the walls of the meatus and upon the surface of the drum membrane has also been observed in cases of this constitutional malady and may, I think, be considered as trophoneurotic in origin and of the sáme nature as herpes. These vesicles are sometimes filled with clear serum, while in other instances they are filled with blood.

When we come to consider the middle ear and the Eustachian tube the importance of a previous pathological condition of the upper air-passages must be borne in mind. Adenoid growths in the nasopharynx, nasal obstruction, enlarged faucial tonsils, etc., are all operative in causing involvement of the middle ear. The complications vary in severity from a simple closure of the Eustachian tube on the one hand, to a severe suppurative otitis media with mastoid involvement upon the other. Why, in one instance, the patient should escape with a simple tubal congestion, and in another case should suffer from acute suppuration, is still a matter of conjecture. The most

plausible explanation is that the intensity of the local complication depends upon the degree of systemic infection. It is also probable that some pre-existing local condition may have rendered the parts particularly susceptible to infection. It is doubtful whether the disturbance is ever caused by the local action of the specific microbe of influenza. Thus in a simple tubal catarrh we have a relaxation of the vessels of the Eustachian tube and an intense congestion and œdema of its lining membrane completely occluding the canal. The effect upon the middle ear depends entirely upon the reduction of atmospheric pressure in the tympanum. This constitutes the mild type of middle-ear complication in influenza. Carried one step further, the vessels within the middle ear dilate and there is transudation of serum into the tympanic cavity. This fluid forms an exceedingly good culture medium for the development of bacteria which may find their way into the cavity through the tube. In the more virulent cases the connective tissue structures lying in the upper part of the tympanic cavity become susceptible to the action of pyogenic bacteria, and then we have a severe inflammation of this connective tissue, or an acute purulent otitis. The middle ear then will be the site of a simple transudation, a mild catarrhal inflammation, or a purulent inflammation according as the power of resistance of the tissues is diminished by the action of the poison circulating in the blood.

The aural complications observed during the various epidemics seem rather to bear out this view. In the first epidemic in this country, the aural complications were far more grave than in the epidemics of the last two years. The involvement of the mastoid process was exceedingly common and usually so rapid in progress as to necessitate operative interference. During the past two years simple tubal congestion or a congestion of the tube and middle ear with an effusion of serum into the tympanic cavity,

has been more common than an acute purulent inflammation.

The symptoms to which these various conditions give rise are so well known as to scarcely demand remark here. It is well to remember, however, certain appearances which enable us to decide between an acute purulent process and simple catarrhal inflammation or tubal and tubo-tympanic congestion. An acute purulent inflammation within the tympanum must of necessity involve the connective tissue structures lying within the tympanic vault, hence otoscopic examination reveals in the early stages an intense congestion of that portion of the membrane lying above the short process of the malleus, while the remainder of the membrane may be perfectly normal in color. This may be the only deviation from the normal standard and yet the patient may complain of intense pain in the ear. Viewed a few hours later we find the upper portion of the drum membrane bulging into the canal, frequently to such an extent as to hide the short process, while the superior wall of the meatus seems to be continuous with this red, bulging portion. The tumefaction may be so great as to partially hide the part of the membrane below the processus brevis, and the inflammation may advance so rapidly as to cause but little deviation from the normal standard of color in the inferior portion of the visible drum membrane. An inflammation here is exceedingly prone to be followed by mastoid inflammation unless dealt with promptly. It is always wise to incise this tumefied tissue immediately, the knife being inserted close behind the short process of the malleus, carried backward to the periphery of the drum membrane, and then outward upon the canal wall. The object of this incision is to deplete the tissues of the tympanic vault and thus to abort the inflammation. If instituted early this plan seldom fails to prevent extension to the mastoid process. Even after disintegration has taken place within the tympanum, and

pus is evacuated upon incision, the free use of the knife as described not infrequently prevents extension to the mastoid process.

The picture presented by a simple tubal catarrh, tubotympanic congestion, or an acute catarrhal inflammation is very different. In tubal catarrh the changes seen upon speculum examination depend simply upon the rarefaction of the air within the tympanum. The drum membrane is drawn inward, the short process of the malleus is prominent, the long process fore-shortened, and the transverse diameter of the fundus of the canal is apparently increased, owing to the displacement inward of the posterior segment of the membrane. There is no congestion of the membrane and no increased vascularity of the canal, the tissues above the short process of the malleus appearing perfectly normal.

Where both the tube and middle ear are congested we have, in addition to a displacement of the drum membrane inward, a turgescence of this structure itself limited to its periphery and to the manubrial plexus. If there has been a transudation of serum into the cavity we may recognize either the fluid line if the membrane is sufficiently thin, or air bubbles may be seen in the fluid appearing as bright points which change their position upon forcing air into the middle ear. A sign of practical importance is that the region of increased vascularity is confined to the region of the larger blood vessels,—in other words, it is limited to the periphery of the membrane and to the manubrial plexus. There is no injection of the membrane itself, but simply a dilatation of the normal venous channels.

In an acute catarrhal inflammation, the lower portion of the tympanic cavity alone is involved; the drum membrane is uniformly reddened, and presents an appearance very different from that seen when the process is of an acute purulent character. In this last condition we have

already stated, that the parts first affected were situated above the short process of the malleus. In an acute catarrhal inflammation the entire tympanic membrane, particularly the membrana vibrans or that part lying below the short process of the malleus, at first appears pinkish, and then of a deeper red color. The membrane bulges into the canal as the fluid accumulates behind it, and this fluid is sero-mucous in character, and not purulent. It is seldom that the increased vascularity reaches such a stage as to completely obscure the short process of the malleus, and often the entire outline of the manubrium can be made out.

Here also an early and free incision is demanded to prevent a subsequent extension to the cellular tissue in the tympanic vault. When the effusion is not excessive it may be absorbed, the process being aided by inflation. If there is a large quantity of fluid it must be evacuated by a free incision. Paracentesis or simple puncture of the membrane is not sufficient to evacuate the fluid in these cases. The incision should lie in the posterior segment, should be free, and should follow the periphery of the membrane, extending from the lower and posterior portion of the membrane upward to the posterior fold. This not only evacuates the inflammatory products, but also thoroughly depletes the tissues and favors a rapid return to the normal condition. It is well in making this incision to carry the knife inward until the internal tympanic wall is encountered, and to divide the mucous membrane covering this, as well as the drum membrane, in order to more completely empty the engorged vessels.

Where we have to deal with tubal obstruction, or with a tubo-tympanic congestion, catheterization is usually sufficient to relieve the condition; if, however, there has been an extensive effusion it may be necessary to evacuate this by incision as in the cases of acute catarrhal inflammation.

To recapitulate, the gravity of the middle-ear complication

depends upon the portion of the tympanic cavity involved, and this in turn is determined by the appearance of the parts upon otoscopic examination. Those cases in which the tympanic vault is affected are of a grave nature, rapid in progress, and frequently extend to the mastoid; they are characterized by redness and bulging of the membrana tympani above the short process of the malleus, the superior wall of the canal appearing to sink downward so as to partially hide the drum membrane, and thus reduce the vertical diameter of the fundus of the canal.

Those cases involving simply the Eustachian tube, or the tube and lower portion of the middle-ear cavity, are of a less serious nature and are not as a rule followed by mastoid inflammation. Here the speculum shows no diminution in the vertical diameter of the drum membrane and that portion of the membrane above the short process of the malleus is not involved, the lower portion of the tympanic cavity being alone affected.

So far we have considered those cases seen in the early stages and before perforation of the drum membrane has taken place. When the drum membrane has ruptured spontaneously, the perforation is usually small and must be enlarged in order to effect free drainage. An investigation of the discharge from the middle ear in these cases has shown the presence of the ordinary bacteria of suppuration, and according to Scheibe[1] a bacillus of a particular form which is found only in cases following influenza, and which seems to be identical with the influenza microbe observed by Pfeiffer, Kitasato, and Canon. As the clinical history of these cases differs only in degree from that of an acute otitis media arising from other causes, it seems more probable that this particular bacillus is not the cause of the inflammation, but that by its action the tissues are rendered more susceptible to the ordinary bacilli of suppuration.

[1]München. med. Wochenschrift, 1892, No. 14.

The treatment of the discharge from the ear which appears either after spontaneous rupture, or after incision, is a matter of importance, to prevent either mastoid inflammation, or the infection of the external auditory meatus. The parts must be kept thoroughly cleansed, and this can best be done by frequent irrigation. Boiled water, or a mild antiseptic solution, is to be employed, the ear being irrigated twice or more times daily according to the amount of discharge. Where early incision has been employed the discharge seldom lasts more than a few days. Where spontaneous rupture has taken place the discharge disappears only after a considerable period and is much more profuse. In the catarrhal cases cleanliness is of the utmost importance in order to prevent infection of the discharge in the canal and the subsequent development of a purulent inflammation. It is also necessary in cases where an incision is to be made to thoroughly sterilize the canal before operating, in order to prevent infection. This is best done by wiping out the meatus with an alcoholic solution of the bicholoride of mercury (1-3000). All instruments should be sterilized by boiling. Too much cannot be said in favor of an early free incision in all cases when the tympanic vault is involved, and in cases of acute catarrhal otitis which threaten to perforate spontaneously. Evacuation of the fluid by surgical means is always to be preferred to evacuation by spontaneous perforation.

Where the mastoid is involved, the early application of cold by means of the aural icebag, or the Leiter coil, may abort the inflammation. In regard to the particular part of the mastoid affected in these cases Politzer[1] has observed that the superficial cells are more frequently involved, while the antrum escapes, being shut off from the purulent focus by the swelling of the mucous membrane; he therefore deems it unnecessary in operating upon such cases to

[1]Archiv. für Ohrenheilkunde, Vol. XXX, p. 252.

enter the antrum and limits his operative interference to the superficial cells. In cases which have come under my own observation where the mastoid has been involved, the process has not limited itself to the superficial cells and I have found it necessary to perfórm the ordinary radical operation. There is no harm in opening the antrum and if it is not done a purulent focus may be overlooked. From the extreme rapidity with which the mastoid inflammation progresses early operation in these cases is to be advised. If cold is used, in the hope of aborting the inflammation, it should not be continued longer than forty-eight hours. It is true that the tenderness may disappear temporarily after the local application of cold for a longer period than that mentioned, but it has always been my experience, that operative interference was required at a later period, if cold applications had failed to obliterate local tenderness in forty-eight hours. The prolonged application of the ice-coil simply holds the mastoid inflammation in check, but does not cause it to disappear.

In cases demanding operation, either on account of the attempt to abort the mastoid inflammation having been unsuccessful, or because the patient was seen after the osseous tissue was so involved as to render all other treatment useless, the writer has been impressed with the amount of destruction which had taken place even in acute cases. Often the entire mastoid has been found to be filled with granulation tissue, although the disease was of but short duration. For this reason therefore a complete and thorough operation is always advisable, the entire mastoid process being converted into one large cavity by the free use of the curette and chisel, and free communication being established between this cavity and the middle ear in all cases.

The involvement of the perceptive apparatus as the result of epidemic influenza is much less common than involvement of the middle ear. It is sometimes impossi-

ble to determine whether the lesion is located in the nerve-trunk or in the labyrinth. A diagnosis of the involvement of the perceptive tract is made chiefly by exclusion, the cases not presenting upon functional examination the characteristic evidences of an affection of the conducting mechanism. Functional examination where the middle ear is involved, shows an increase in bone conduction, an elevation of the lower tone limit, that is, an impaired perception for tuning-forks of low pitch, while the perception for the highest sounds of the musical register is unimpaired. We occasionally find in cases where the hearing has become impaired after an attack of influenza that these symptoms are wanting, and that there is no evidence of any inflammation present or previous, in the Eustachian tube, or middle ear, to explain the condition. We find that the lowest notes of the musical scale are heard perfectly, that bone conduction is diminished, and that the upper notes are usually perceived poorly, although the upper-tone limit may be normal. Here we are compelled to believe that the labyrinth, or in some cases the auditory nerve-trunk, is the part affected. The changes which have taken place can only be surmised, but when we remember the circulatory disturbance which epidemic influenza causes it will not seem strange that the labyrinthine circulation should suffer. It seems probable that in many cases these circulatory disturbances may be angioneurotic in character.

The result of treatment in some of these cases would indicate that there had been an effusion into the bony labyrinth, increasing the labyrinthine pressure, and thus impairing audition. In one instance—that of a young man aged fifteen years—there was tinnitus and marked impairment of hearing. The audition was greatly interfered with by loud noises, the patient hearing better in a quiet place than in a noise. Examination showed a great diminution in bone conduction, while the low notes of the musical

scale were heard perfectly. Inspection and auscultation gave negative results. Under the administration of pilocarpine, and later of strychnia, all these symptoms disappeared completely and the hearing became normal. In some of these cases the presence of vertigo aids us in the diagnosis, while in others we must depend entirely upon the functional examination and the absence of any physical evidence of inflammation of the middle ear, in order to decide upon the location of the lesion.

There is one condition which deserves attention, and that is the ease with which the auditory apparatus is fatigued in certain cases of aural involvement after influenza. The hearing may be surprisingly good at the beginning of the examination, but as this is prolonged the power of audition gradually diminishes. These patients also complain that the effort to hear for any length of time causes great fatigue. This auditory fatigue not infrequently complicates an affection of the middle ear, and unless recognized, efforts at treatment are disappointing; the middle ear condition may yield entirely to treatment, and yet the power of audition will remain far below the normal standard. The use of strychnia in large doses seems to be the most successful means of overcoming this phenomenon. It is scarcely probable that this symptom depends upon any labyrinthine disturbance, and it is more than likely that it is due to certain changes in the auditory nerve-trunk. Gradnigo[1] reports an instance in which in addition to the fact that the auditory nerve became easily fatigued, there was also faulty perception for the middle notes of the musical register, a condition which he considers indicative of involvement of the nerve-trunk.

[1]Archiv. für Ohrenheilkunde, Vol. XXVI, p. 141