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NOSE AND EAR COMPLICATIONS IN DIPHTHERIA, SCARLA- TINA AND MEASLES.*

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It is not intended in this paper to give a comprehensive account of the different complications of the nose and ear that may occur in the acute infectious diseases; brief allusion will be made only to the more frequent ones.

Secondary diphtheria of the nose and of the ear caused by the excursion of the specific organism from the throat to the nasal passages and to the ear through the Eustachian tube occurs very frequently in the course of an attack of the disease. Methods of treatment have a very considerable influence in increasing the prevalence of ear complications in diphtheria.

Primary nasal diphtheria may either be very severe or it may be of a mild type, depending upon the situation of the membrane. If the disease is situated in the posterior nares, there may be great constitutional disturbance. If the condition of the tissues in this locality is borne in mind, it can be understood that the toxin generated is very readily absorbed and causes death from its effects on the heart. Many patients die from unrecognized nasal diphtheria because no membrane is seen and the first indication of serious trouble is rapid action of the heart known as the *bruit de galop*; or, in some instances, there may be a slow pulse and the physician is often unable, if he does not have the idea of nasal diphtheria in

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mind, to explain the symptoms. If the membrane forms in the anterior nares, the probability of absorption is reduced to a minimum and there is usually very little constitutional disturbance. The importance of nasal diphtheria of the latter type is the danger of communicating the disease to others. The history of many serious outbreaks of diphtheria is due to the fact that some member of a family or some inmate of an institution has had a profuse discharge from the nose without any constitutional disturbance and has been the focus from which has arisen many severe cases of diphtheria. This is not a theoretical statement, but is the result of experience. Every profuse discharge from the nose, particularly if there is any excoriation about the nostrils, should be looked upon with suspicion and cultures should be taken. If adenoids are to be removed, cultures should always be taken before the operation is performed, for it very frequently happens that a child who has a profuse discharge from the nose immediately after the removal of adenoids or the ablation of the tonsils, has a severe attack of diphtheria. If the operation for cleft palate is to be performed, it is still more important to take cultures; because, if there are any bacilli of diphtheria in the nasal discharge, this organism is sure to grow upon the cut surfaces of the operative tract, and the patient not only has an attack of diphtheria which may be mild or severe, but also the edges of the wound slough and render a second operation much more difficult.

A chronic rhinitis may follow an attack of diphtheria; and on the other hand a patient with a chronic rhinitis, if exposed to diphtheria, is very likely to contract the disease. Laboratory experiments have shown conclusively that the bacilli of diphtheria will not grow on intact mucous membrane and therefore it is a self-evident proposition that all abnormal conditions of the mucous membrane of the nose should be corrected, if possible, by treatment. It is a well-known fact that diphtheria is prevalent in New England, and it is reasonable to suppose that the frequency of the disease is due to the fact that the mucous membrane of the nose and throat of individuals in this locality is in a morbid condition. The characteristic nasal voice of New England proves the truth of the foregoing statement.

While adenoids may not render an individual particularly susceptible to diphtheria, yet, if he contracts the disease, he is much more likely to have a severe attack than a person without these abnormal growths. The persistence of positive cultures after recovery from the acute symptoms is very frequently due to this condition of the naso-pharynx.

Disease of the middle ear frequently occurs in the course of an attack of diphtheria. Irrigation of the nose in diphtheria is a very important factor in increasing the prevalence of otitis media. Some few years ago it was my custom to irrigate the nose when there was a profuse discharge, but I found that I was having altogether too many instances of inflammation of the middle ear. I have therefore abandoned this practice with gratifying results. Another argument against the use of irrigation is the fact that it frightens the patient, if a child, and the struggling caused by the attempt to do this exhausts the strength of the patient and does more harm than good. Cleansing the nostrils with absorbent cotton and insufflating a little calomel accomplishes much more good, so far as my experience goes, than any other procedure. Irrigating the throat, which can be very easily accomplished with a fountain syringe, does not do any harm, but does give a certain amount of relief to the patient. In the majority of instances the chief reliance must be placed on antitoxin.

Irritant applications to the throat in diphtheria are always to be avoided because the amount of inflammation that these cause is very likely to extend to the Eustachian tube and from thence to the middle ear. If one looks back to the early history of the treatment of diphtheria, one cannot help but be surprised at the various irritants that were applied to the throat with the hope of removing the membrane. With our present knowledge of the etiology of diphtheria the only wonder is that any of the patients recovered.

Feeding through the nose in the case of intubed children frequently causes middle ear disease; and, although in certain rare instances it is advisable, in the majority of cases it is better to resort to esophageal feeding or to the Casselberry method.

Mastoiditis requiring operative interference is somewhat infrequent in diphtheria but it does occur. When there is a profuse discharge from the ear even if there is no tenderness over the mastoid region, it seems to me from the standpoint of the general practitioner that operative interference is advisable. The choice of the operation, whether the Schwartze or the Stacke, or a modified one, a combination of the best principles governing the other two, must be made in each individual case based upon the condition of the patient. The patients at the South Department¹ on whom this operation has been performed have done well. No death has occurred that could be attributed either directly or indirectly to the operation, although one patient died from an intercurrent pneumonia.

¹ The mastoid operations at the South Department have been performed by George Leland, M.D., Visiting Aural Surgeon, Boston City Hospital.

The bacilli of diphtheria frequently remain for a long time in the aural discharge although they may not give rise to any symptoms. In many instances, however, a bacillus morphologically resembling the bacillus of diphtheria is found in this discharge. This organism has been very frequently mistaken for that of diphtheria. I have carefully studied this organism, and its life history is entirely different from that of the bacillus of diphtheria. It is very doubtful, if proper care is taken, if a patient with the bacilli of diphtheria in the ear can communicate the disease to others. The conditions are entirely different when a patient has the bacilli of diphtheria in the nose or in the throat.

The influence of scarlet fever in the causation of otitis media is very great. Downie² in an analysis of 501 cases of chronic inflammation of the middle ear treated in the Children's Hospital, Glasgow, gives the following figures: Of the 501 cases, 63 or 12.6 per cent. were caused by scarlet fever. Finlayson³ says that this symptom was present in 10 per cent, of 4339 cases of scarlet fever observed by him. Caiger⁴ found otitis media in 11 per cent. of 4015 cases. Burekhart⁵ noticed this condition in 33 per cent. of his cases. At the South Department of the Boston City Hospital in 5000 cases of scarlet fever the percentage of middle ear trouble was 18. This condition may appear as early as the fourth day of the disease or it may be delayed until the fortieth day.

When there are severe throat symptoms the rate of involvement of the middle ear may be as high as 50 per cent. In different epidemics of scarlet fever the proportion of middle ear involvement varies greatly. The septic type of scarlet fever characterized by a profuse nasal discharge and marked anginose symptoms is almost always complicated with otitis media. When the trouble with the middle ear appears early in the course of an attack of scarlet fever of a severe type the temperature does not seem to be specially influenced. An attack of otitis media occurring late in the course of scarlet fever or during the convalescent stage is always accompanied by a sharp rise in temperature and severe pain in the ear. In very young children persistent crying without apparent cause and a constant movement of the head to the ear are indications of a commencing otitis media. At the South Department, of 50 cases of middle ear disease the days on which the discharge commenced were as follows: Three on the fourth day; seven on the fifth day; eight on the seventh day; eight on the ninth day; three on the eleventh day;

2 Downie. *Diseases of Infancy and Childhood*. Holt, 1897.

3 Finlayson. *Acute Contagious Diseases*. Welch and Schamberg, 1905.

4 Caiger. *Acute Contagious Diseases*. Welch and Schamberg, 1905.

5 Burekhart. *Acute Contagious Diseases*. Welch and Schamberg, 1905.

four on the thirteenth day; two on the fourteenth day; two on the sixteenth day; two on the nineteenth day; one on the twentieth day; three on the twenty-second day; two on the twenty-third day; one on the thirty-second day; two on the thirty-fifth day; one on the thirty-eighth day; and one on the fortieth day.

Cultures taken from the discharge in a comparatively small proportion of instances showed the presence of the streptococcus pyogenes. The most frequent organisms, however, were the staphylococcus pyogenes aureus and citreus. The micrococcus tetragenus was found in a very small number of cases. The pneumococcus of Fränkel was occasionally found. No prognosis so far as subsequent mastoiditis is concerned can be made, based on the bacteriological findings in otitis media occurring in the course of scarlet fever.

Mastoiditis in scarlet fever is sometimes, although rarely, subsequent to otitis media. Of 5000 cases of scarlet fever at the South Department there was inflammation of the mastoid cells in about .08 of one per cent. An early operation was advised in each case and the results were satisfactory; no deaths having occurred from the operation. In some instances where there was no distinct mastoid tenderness, but a slight unexplained rise in temperature and a profuse aural discharge, opening of the mastoid cells was earnestly advised. In very case where the operation was performed, where the conditions were such as has just been described, the cessation of the discharge and the improvement in the condition of the patient was very marked.

Some physicians have been inclined to postpone operative interference in mastoiditis in scarlet fever on the ground that there was danger of sepsis, if the operation was performed in a scarlet fever ward. Others have been inclined to postpone operation until the process of desquamation was completed. So far as my experience goes, if there is a profuse discharge from the ear, if there is marked mastoid tenderness, there is no reason for postponing the operation. It has been our experience at the South Department that although the symptoms referable to the mastoid region were somewhat vague and indefinite, if there was a profuse discharge from the ear the condition of the mastoid cells and the adjacent structures was much more serious than would have been expected from the symptoms. In no instance has death been caused by the operation, but in each and every case there has been marked improvement in the condition of the patient immediately after the operation.

As illustrating the condition of the mastoid cells and adjacent structures in scarlet fever the history of the following case is of interest. X. Y. a girl seventeen years of age was admitted to the South Department on May 28, 1904, in the desquamative stage of scarlet fever. There was a profuse, foul, greenish discharge from the right ear. The posterior and superior wall of the meatus was swollen. The membrana tympani was reddened and bulging, and had a pin-head perforation in the posterior inferior quadrant. There was a slight amount of tenderness over the mastoid. Incision of the drum-head was immediately done. The condition of the left ear was as follows: a profuse, foul, greenish discharge; posterior and superior walls of the drum membrane were bulging; large perforation in the posterior inferior quadrant; redness and edema extending nearly to the clavicle; the mastoid region was exquisitely tender to the touch; the patient complained of pain, and there was marked hebetude. There were no symptoms referable either to the eye or to the brain. The temperature was 101° . The mastoid operation was performed by Dr. Charles R. C. Borden, Assistant Aural Surgeon, Boston City Hospital. The first incision caused the evacuation of several ounces of pus from the soft tissues. The cortex was perforated and very thin; the cavity filled with pus and granulations; the entire tip of the mastoid was necrosed allowing the finger to be passed into the softened tissues of the neck through the mastoid. Granulations were present everywhere. The dura was exposed, but the sinus was enclosed in hard bone on this side. Her condition improved immediately after the operation, and the temperature fell to the normal point in twenty-four hours. Five days later the temperature became elevated and as there had been a profuse discharge, as already stated, from the right ear although there was no great amount of mastoid tenderness, an operation was advised with a view of saving the hearing. This was performed by Dr. Borden. The first incision through the skin also cut through the cortex, it was so soft. The condition of the tissues was similar to those described in the left ear, except that the necrosis of bone was more extensive. The lateral sinus was exposed for a considerable distance. The tegmen tympani was opened and the dura exposed. The temperature fell immediately after the operation and remained normal. The wound healed rapidly. The patient made a good recovery and was discharged well with a fair amount of hearing. This case is of interest as illustrating the fact that in mastoiditis there may be very severe symptoms with great destruction of tissue as evidenced by the condition of the left mastoid

region of this patient, and on the other hand there may be an extremely serious condition without very marked symptoms as shown by the condition of the right mastoid region in this case.

In cultures from the mastoid cells the usual pus cocci, the streptococcus pyogenes, the pneumococcus, the micrococcus tetragenus and in two instances a bacillus morphologically similar to the bacillus of diphtheria, but with a different life history were found. These different organisms were of no significance so far as prognosis is concerned, as all the patients did well; those in whom streptococci were found as well as those in whom pneumococci were detected. This experience is somewhat at variance with that of others as some observers have laid considerable stress upon the presence of pneumococci, so far as an unfavorable result is concerned.

The result of our experience at the South Department has been that the proportion of middle ear trouble and subsequent mastoiditis is more frequent during an attack of measles than during an attack of scarlet fever. Downie of 501 cases of inflammation of the middle ear treated in the Children's Hospital in Glasgow gives the percentage of middle ear involvement following measles as 26.1. At the South Department the percentage of otitis media of greater or less severity in 1000 cases of measles was 24. In the mixed cases of scarlet fever and diphtheria the percentage was somewhat higher. Mastoiditis occurred also more frequently in measles than in scarlet fever.

The benefits of early operation in mastoiditis are as great in measles as in scarlet fever. The history of the following case is an apt illustration of this statement: F. L., a man twenty-eight years of age was admitted to the South Department on April 5, 1904, with a moderately severe attack of measles. On the 11th he complained of some pain in his ear. Examination showed a large bleb on the posterior half of the drum. Incision of the drum-head was done with relief to the pain. There was no tenderness over the region of the mastoid, but there was a very profuse discharge from the ear. Up to the 25th of the month the discharge increased in quantity to a very considerable extent. There was no marked rise in temperature; at no time was there mastoid tenderness. In view of the fact that the discharge was so profuse and in order to save the man's hearing, mastoid operation was strenuously insisted upon, notwithstanding the objection of the patient. On the 25th, the mastoid cells were opened by Dr. Borden. After making the incision in the skin and pushing back the periosteum, thin greenish-yellow pus was seen exuding through the cortex which was very

thin and easily removed. The entire mastoid cavity was filled with thin pus and soft granulations. These being curetted there was found to be a perforation of the mastoid tip. The lateral sinus was exposed for half an inch. The tegmen was not opened. All granulations and necrotic bone was curetted leaving a mere shell of the mastoid. The wound was not closed but was packed with iodoform gauze in the usual manner. At the time of the first dressing four days later, the gauze wick in the canal was not even stained. From this time until the wound healed there was no discharge. When the patient was seen in May, 1905, the membrana tympani had entirely healed. The entire membrane was thin and glistening in appearance; was freely movable; there was no scar tissue to be seen. The hearing was good although not quite up to the normal standard.

In the treatment of the acute infectious diseases the importance of frequent examinations of the ears is paramount. Statistics show very conclusively that deaf-mutism is very frequently caused by some of the acute infectious diseases. Partial deafness is also caused to a very considerable extent. Early incision of the drum-head as soon as there is any bulging of the drum-head should be the routine practice. If this course was pursued in every case of diphtheria, scarlet fever and measles, deafness would not be as common as it is at the present time. It is beyond the scope of this paper to give explicit directions regarding the operation; this is the province of the aurist rather than that of the general practitioner.

The points that I wish to emphasize in this paper are:

First; the frequency of otitis media in diphtheria, scarlet fever and measles.

Second; the importance of early operation in mastoiditis occurring in these diseases.

Third; the necessity of frequent examination of the ears when there are no symptoms referable to these organs.

Fourth; early incision of the drum-head in the acute infectious diseases.

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