SOME REMARKS ON BEZOLD'S MASTOIDITIS WITH A REPORT OF THREE CASES.

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The presence of pus in the cervical tissues following either acute or chronic mastoiditis, as has been pointed out by Fougerey, may occur in three ways either by direct irruption from the mastoid cells; by way of the venous channels, or by traversing the lymphatic system of this region. It is, however, with the first of these only that we are here concerned, and it is desired to report three cases of this form of mastoiditis and to emphasize especially the results obtained by radical treatment.

Occurring usually as a result of acute purulent otitis, perforation of the medial plate of the mastoid also takes place in long standing cases of pus collections in this portion of the temporal bone, and as a result of its construction, such cases seem to be unusual under the age of six years, although Lermoyez reports a case successfully operated, in a child of but two and one half years. While these sub-facial consecutive abscesses occur in but a small proportion of mastoid inflammations, yet Collinet was able to collate two hundred reported cases and it seems probable that such cases are more frequent than the literature would lead one to believe. The extension of the purulent inflammation to the soft tissues below the mastoid process, indicates that the pus in the bone has escaped either through a pathological opening or by way of a congenital defect, the former being practically the usual method. This is especially liable to occur when the inner wall of the mastoid tip is very thin and rapidly disintegrates, allowing the pus to discharge into the digastric groove and also in those mastoids in which the lower group of cells consists of large thin walled osseous bulla, or where the pneumatic spaces situated inferiorly and medially are covered by an extremely thin layer of osseous tissue. At the same time the tendency of the pus to extend in this direction is also enhanced if the cortical layer of the mastoid be thick and solid.

If the mastoid empyema be neglected, the pus will find its exit in various directions, through the cortex; into the cranial cavity; into the lateral sinus; or into the sheath of the muscles that are inserted into the mastoid tip, but it is the latter form which Bezold charac-

CASE I.

CASE 11.

CSE III.

terized, and the term Bezold's mastoiditis should be restricted to this variety alone. In some cases, the perforation in the bone shows only as a small opening in the lower medial wall of the tip, while in others, which are much more grave in character, there is also a tendency towards intra-cranial complications. Knapp has especially noted this factor of additional danger, as shown in a case reported by Luc, where the disease terminated fatally with symptoms of encephalic abscess, and, in another instance recorded by Day, there was ulceration and loss of both eyes, probably due to thrombosis of the cavernous sinus, while Moure states that the perforation of the point of the mastoid with burrowing of pus into the soft tissues of the neck does not always exist alone, as whenever he found the point of the mastoid perforated or about to perforate, there was also necrosis of bone in other portions of the cavity. In 76 mastoid cases operated by him, he found in 16 that Bezold's variety was accompanied with perforation of the internal table usually at the level of the sinus, but sometimes it was near the upper part of the antrum or towards the osseous auditory canal, and, whenever he has found this condition, the exposed part of the meninges was always bathed in pus and covered with fungous granulations. While the presence of other and more serious complications is shown in a case of Tissot's where the mastoid and sterno-mastoid regions showed edematous swelling, redness, fluctuation and pus appeared in the external auditory canal when pressure was made over the swelling. Radical operation was performed, with death six days later, and autopsy showed the presence of a diffuse meningo-encephalitis and a subdural abscess of the temporal fossa. While in a case reported by Lewis, with a successful termination, operation revealed a cholesteatoma of the entire mastoid, with an eroded area in the floor of the middle cerebral fossa, another in the wall of the sigmoid fossa and an opening along the digastric groove leading into the abscess in the neck.

Of the cases of Bezold's mastoiditis, which I here wish to report, the following presented other complicating factors besides the cervical pus collection:

Case I. J. E., male, age 31 years. No trouble with ears previous to eleven weeks ago when following epidemic influenza there was acute suppuration in the left ear with but little discharge. At no time during this period was he free from pain, and, after nine weeks from its inception, the pain over the mastoid diminished to some extent and a swelling was noticed on the same side of the neck; he then came under my observation, and examination showed a perforation in the upper anterior segment of the membrana tympani with con-

siderable pus in the canal. The posterior canal wall was bulging, the auricle was prominent, and, in addition to the usual symptoms of an extensive mastoiditis, there was considerable swelling at the apex of the mastoid under the sterno-mastoid muscle. This was tender to the touch and light pressure upon it would cause pus to flow from the perforation in the membrana tympani. There was considerable pain over the entire side of the head, but no recognizable symptoms of any intra-cranial complication. He had lost 12 pounds in weight, had little appetite, suffered from insomnia and, in general, he presented the appearances of septicemia.

Radical operation was advised, and, under ether anæsthesia, the usual mastoid incision was made extending, however, well out to the tip of process. The bone was completely disintegrated, filled with pus and debris, while a large ragged sinus was found opening into the digastric fossa and communicating with the abscess in the neck. The mastoid was entirely cleaned out and with the antrum and middle ear, was thrown into one large cavity; at this time, additional pus welled up in the field of operation and the dura over the internal wall was exposed, covered with purulent material. After the necrosed bone had been removed, an incision was made in the neck over the most prominent part of the swelling and about a half ounce of pus was evacuated deep under the sterno-mastoid. The wound was irrigated with a 1:5000 bichlorid solution, which flowed out through the external canal, and the parts were then packed with iodoform gauze and the usual dressings applied. The course of the case was uneventful subsequently and the results of the evacuation of pus and removal of necrosed bone was seen in the complete restoration of health with but slight impairment of hearing.

When the pus escapes through the spontaneous opening in the medial plate of the mastoid, it is poured out in the digastric fossa under the insertion of the muscle; it may then find its way, as is usually the case, down along the sterno-mastoid at the same time infiltrating it as may be seen in some operated cases, when after the muscle has been detached from the bone, pus will ooze from its upper end when it is stroked from below upwards. Or it may find its way forwards along the tract of the digastric muscle and point in the pharynx, or backwards towards the nucha and spinous processes of the cervical vertebra, but always remaining beneath the deep fascia of the neck. An interesting case being reported by Dun, with purulent mastoiditis, epidural, subpetrous and postoesophageal abscesses, with death from presumably internal hemorrhage. Pain in the ear had lasted for five weeks but there was no discharge at any time. Ten days after the mastoid operation, there was swelling at

the upper end of the sterno-mastoid muscle, but incision showed no pus. Further operation revealed intra-cranial complications, but there remained great pain on swallowing and when the neck was moved and the swelling under the sterno-mastoid muscle increased in size and pressure over it caused pus to flow from the antrum. This abscess was then opened, but two weeks later the abscess in the neck burst into the œsophagus. Burnett also reports a case where the pus extended in the pharynx behind the superior constrictor muscle and was evacuated through an incision beneath the jaw; the mastoid operation being first performed.

After the pus has escaped into the neck, it shows no tendency towards spontaneous evacuation, but forces the insertion of the mastoid muscle outwards and on account of the resistance of the deep cervical fascia, there exists a constant tendency to burrow inwards, with the development of septicemia or pyemia especially if it discharges into the lung or pharynx. It may also extend to the lateral regions of the neck or "depression abscesses" arise, which may hasten a fatal termination from the development of pyothorax or compression of the trachea, the former condition resulting from the extension of the pus along the muscles to the clavicle and into the anterior or posterior mediastinal spaces. As in general the pus follows the planes of the cervical fascia, it is apt to extend between the muscles and along the sheaths of the larger vessels, while in rare cases there is a tendency to extend backwards towards the region of the splenius muscle, a case being reported by Swain, in which a trapezius abscess was formed, complete recovery following trepanation of the mastoid and drainage of the abscess by counter openings.

The second case, which it is desired to report, occurred as the result of an acute purulent otitis and seems of special interest both on account of the rapidity of the morbid process and the promptness of recovery following evacuation of the purulent material.

Case II. G. B., male, age 20 years. No previous trouble with ears and apparently in good health until after an attack of coryza, pain in the left ear developed. This was treated with various home remedies with more or less relief for a week, when the acute pain subsided and a feeling of discomfort ensued over the mastoid region. This condition remained in statu quo for two weeks longer without any treatment, when a small swelling occurred at the tip of the mastoid and co-incident with its appearance all uncomfortable sensation disappeared for three days, when intense pain developed, being localized over the tumor. I saw him then for the first time and found a fairly robust man with his head inclined towards the affected side and at the top of the

sterno-mastoid muscle there was a small swelling in intimate connection with the tip of the mastoid process, while the muscle itself seemed somewhat swollen in its upper third. Pressure upon the tumor was extremely painful, while over the mastoid firm pressure produced no ill symptoms except at the tip and over the antrum. The membrana tympani was congested but not perforated and appeared to be much thickened and bulging slightly in the lower segment. He was advised that an operation was necessary, but he refused and would allow only a paracentesis of the drum which allowed a few drops of thick pus to escape, but was productive of no relief. He was then not seen again for five days when he returned and agreed to operation, as he had used poultices over the swelling in the neck since his last visit with an increase in the size of the swelling and augmentation of the pain.

The usual mastoid incision was first made and the cortex was found to be extremely hard but apparently normal. No pus was found until the antrum was reached, when a few drops were removed and the parts cleansed, but little necrosed bone being found. The operation on the mastoid was temporarily discontinued at this point and a two-inch incision was made in the neck over the tumor, the sterno-mastoid being detached in part from its insertion. The muscle at its upper end was found to be partially infiltrated with a semi-purulent fluid, while underneath it in the digastric fossa, a dram of pus was evacuated and a small sinus was found in the bone. This was enlarged and the pneumatic spaces in the mastoid were broken down until a free opening was established in the antrum communicating with the aditus and middle ear. The mastoid wound was packed with iodoform gauze and the neck incision was closed excepting a small space at its inferior border, into which a gauze drain was inserted. The usual dressings were applied, and, as there was complete relief from all the symptoms the drain was removed from the neck on the fourth day, while the mastoid wound rapidly healed without any untoward symptom.

The pathognomonic signs of the extension of pus into the digastric fossa are usually well marked and fairly characteristic. After the pain in an acute otitis has lasted for several days or even longer with varying intensity, there usually occurs a sudden diminution or perhaps an entire cessation; the otorrhœa continuing in some cases while in others it diminishes considerably in amount. Within a day or so following this apparent improvement, a swelling becomes evident at the apex of the mastoid under the insertion of the muscle, this shows a tendency to increase in size and extends backwards towards the nucha or downwards along the course of the sterno-mastoid mus-

cle. During its inception examination may show no apparent difference between the two sides of the neck but later the diffuse, brawny swelling involves the entire insertion of the muscle and often the adjacent areas, while its limits are not usually well defined. Occasionally the symptoms bear a close resemblance to the early stages of sigmoid sinus thrombosis, but the swelling develops rather rapidly as a semi-flat tumor, while the skin over it is normal at first, later becomes infiltrated, red and firmly attached to the underlying tissues.

The head may or may not be inclined towards the affected side depending upon the degree of involvement of the muscle, while pain again becomes marked and is usually exaggerated by even slight pressure upon the cervical enlargement. As Dench has stated, in some cases where the pain is not marked, deep pressure over the tip of the mastoid will elicit this symptom, but in the early stages it is apt to be considered neuralgic in character and dependent upon the tympanic lesion. The most characteristic phenomena, however, is that when pressure is made over the swelling in a considerable number of the cases, the pus can be forced through the opening in the digastric fossa, through the mastoid cells, antrum and tympanic cavity and out into the external auditory canal. Mendel records a case in which this symptom was well marked, while in a case seen by Guye, pressure over the cervical swelling brought forth pus from a fistula in the posterior meatal wall and in a case of Waggett's a jet of pus could be forced through the perforation in the membrana tympani by such pressure.

The third case of Bezold's mastoiditis, which it is here desired to report, is as follows:

Miss K. T., age 23 years, had scarlet fever at 8 years, followed by chronic suppurative otitis media. The right ear discharged to a much less extent than the left and for the past few years has seemed to be entirely well. The left ear has always discharged an offensive pus, which has been more or less relieved by treatment at irregular intervals. She stated that six months ago the discharge ceased entirely and at the same time considerable pain developed over the mastoid region; this was followed in one week by a return of the discharge and the pain became merely a "soreness." This phenomena appeared and disappeared off and on until three weeks ago, when the discharge from the ear entirely ceased, the pain also disappeared and within twenty-four hours a swelling in the upper part of the neck made its appearance, which was slightly tender at first but rapidly became exceedingly painful. Examination at this time showed a

large swelling at the tip of the mastoid and extending down along the sterno-mastoid muscle for at least half its length, it was extremely sensitive to pressure and the skin over it was red and œdematous. The mastoid was also sensitive to pressure but in a much less degree, while the tympanic cavity was filled with a thick caseous pus, but the membrana tympani and ossicles had been destroyed by the long continued suppuration. Her general condition was decidedly poor evidently from pus absorption, but no evidence of extension of the infection to the cranial contents could be elicited.

She was advised to have an operation, and, under ether anaesthesia, a Stacke operation was done which showed extensive disorganization of the mastoid cells with a large opening into the digastric groove. Pressure on the neck over the upper part of the sterno-mastoid muscle at this stage, forcing considerable quantities of pus out of the mastoid wound. After the necrosed bone had been removed and the mastoid operation completed, an incision was made in the neck and about an ounce of offensive pus evacuated; the sterno-mastoid muscle was, however, infiltrated with pus. The mastoid was then packed in the usual manner, and, on account of the extensive infection of the cervical tissues, a large opening was left in the lower part of the incision here to provide for free drainage, after the parts had been thoroughly cleansed with a 1.5000 bichlorid solution. The patient reacted well after the operation and the temperature remained below 99 degrees with both the mastoid and cervical wounds looking healthy until the sixth day, when there was a rise in the temperature to 102 degrees and she complained of considerable pain in the neck. While there was a free discharge from the wound, there was some bulging deep down in its lower third, and, after etherization, it was found that the cause of the trouble was a pocket containing about a dram of purulent material and disintegrated muscle tissue, well beneath the sterno-mastoid; this was evacuated, cleansed and packed, and in two weeks the drain was entirely removed from the neck with a perfectly satisfactory result, the mastoid also healing without any trouble.

As has been previously pointed out, the recognition of this complication of mastoid empyema presents but little difficulty in its later stages, the probability of this condition being present being enhanced if the characteristic tumor forms at the head of the sterno-mastoid muscle, while the integument over the mastoid itself shows little or no evidence of infiltration. Should pressure over the tumor cause pus to flow from the middle ear, of course, its recognition becomes at once possible; fluctuation of the cervical abscess owing to

its deep location and the small amount of pus usually present, can rarely be felt, and is, therefore, of practically no value as a diagnostic sign. Difficulties may, however, arise in its recognition, as in a case reported by Menière, where the perforation in the digastic fossa was not recognized until the mastoid operation was performed, while in an unusual case seen by Brieger, the primary mastoiditis present was ten days later complicated by aural symptoms and a cervical abscess. It is important, however, to recognize the condition early, that prompt surgical relief may be obtained, and, also, on account of the concurrent tendency towards the development of intra-cranial complications in these cases.

In the study of the literature relating to the treatment of this complication, three methods of treatment have been recommended, first, by evacuating the abscess in the neck and ignoring the mastoid; secondly, by opening the cervical abscess and then performing a mastoid operation and thirdly, by reversing this procedure and performing the mastoid operation primarily and following the course of the pus through the bone fistula into the neck. This latter method being far preferable, as it possesses all the advantages of removing the entire diseased area in a thoroughly scientific manner, and further, is compatible with modern surgical procedures.

Burnett records a case in which the swelling extended down the sterno-mastoid muscle for about three inches and was most prominent towards the nucha, while pressure over it would force pus from the middle ear. An incision was made into the abscess and a dram of pus evacuated, while a probe showed a sinus leading from the abscess to an opening in the mastoid bone and which passed into the pneumatic spaces. Fluid syringed into the incision passed out through the external auditory canal, but the case recovered without operation on the mastoid. He further states that he has found in all cases after free incision in the soft parts with release of the pus, especially if fluid syringed either through the ear or wound escapes at the opposite end of the suppurating tract, that healing takes place promptly under a daily syringing of the tract with a 1 in 5000 bichlorid solution, without the necessity of opening the mastoid. One can hardly advise such a measure when necrosed bone must of necessity be present in the mastoid, and, in spite of a favorable result now and then, such cases must sooner or later present, even more serious symptoms of the remaining tympanic and mastoid disease requiring a further operation than that which should have been performed originally.

Lichtwitz reports an instructive case illustrating the second method, in which the cervical abscess was first opened and then followed by

opening the antrum and mastoid cells, with a successful result. When such a procedure is adopted, an incision is made into the lower part of the neck abscess and the source of the pus is followed backwards to its source, when the mastoid is then opened at the supra-meatal triangle, the necrosed tissue removed and a tampon and iodoform dressings complete the procedure. While no serious objections can be offered against this method, yet it appears to have the disadvantage of reversing what seems to be the natural order of procedure and from my experience I would strongly emphasize the importance of opening the mastoid as a primary procedure and then evacuate the cervical abscess as the location of the pus could be traced through the infected mastoid.

The technic of the operation consists in opening the mastoid cortex in the usual manner, and after exposing the antrum, removing the infected pneumatic cells and the passageway of the pus through the medial plate. At this point, the sinus should be sought for in the neck with a probe and a counter opening made at the lowest point of the pus collection; while in an occasional case where the cervical region is infected down to or near the clavicle, the incision should be made sufficiently extensive to allow of free removal of the pus. Besides the removal of the mastoid cortex, it is always good singly to remove the cells at the tip and detach the insertion of the sterno-mastoid muscle so as to allow thorough examination of the medial plate of the bone in the digastric groove. It is also necessary, especially in those cases where obscure symptoms are present possibly indicative of suspected intra-cranial infection, to carefully examine such suspected areas of infection in the bone and after the parts have been curetted and all necrosed tissue and debris removed, the affected areas may be cleansed with bichlorid or well mopped out with a zinc chlorid solution, especially the incision in the cervical region and then packed with cyanid or iodoform gauze, preferably the latter. Unless the cervical incision has been unusually extensive, when it should be packed with gauze in its entirety, it should be almost completely closed and a small gauze drain inserted into the fistulous tract. The dressings rarely require change before the third day and then the drain may from day to day be rapidly lessened, while this method is carried out in the usual uncomplicated case and the after treatment, as indicated, is based on general antiseptic surgical principles, the course of the after treatment will be materially shortened and entire recovery will ensue within a few weeks.

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