Staff Meeting Bulletin Hospitals of the » » » University of Minnesota

Petrositis

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INDEX

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William A. O'Brien, M.D.

I. LAST WEEK

Date: November 19, 1937

Place: Recreation Room
Nurses' Hall

Time: 12:15 to 1:20 P.M.

Program: Movie: "How to be a Detective"

Announcements

Typhoid Fever
Karl d'A. Andresen

Discussion: Henry L. Ulrich
Orianna McDaniel
Lucy Heathman
Gaylord Anderson
H. S. Diehl
Wesley Spink
J. H. Daniels
V. J. Hawkins
O. H. Wangensteen
W. A. O'Brien
Karl d'A. Andresen

Present: 125

- - - -

Date: November 26, 1937

Place: Recreation Room
Nurses' Hall

Time: 12:15 to 1:05

Program: Movie:

"Highlights of 1937
Minnesota Football
Season"

Commentator: Phil Brain, Jr.

Present: 105

No Bulletin published.

- - - -

Gertrude Gunn,
Record Librarian

II. MOVIE

Title: Autumn Leaves

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III. GOSSIP

At the preview of "The Birth of a Baby" in Northrop Memorial Auditorium Monday, Nov. 29th, over 4000 guests saw the picture. In the voting by ballot which followed the exhibition more than two-thirds of the audience returned their slips and the majority included their signature. Less than 2% of the audience voted "no" on showing the picture to the general public. A study of types of occupation revealed that all were represented in this negative vote (physicians, medical students, nurses, nursing students, medical technologists, medical technology students, medical social workers, faculty members, etc.). There were many interesting comments both on and off the record. The nurses wondered at the high-heeled shoes on the office nurse. The wives wondered at the doctor calling his nurse "Julia". One woman wished that her husband had cultivated the same bedside manner as the doctor in the picture, for then she would not have to be worrying about wearing her old coat another year. Another noted that the doctor looked like one of our staff members, but the worst was the suggestion that he looked like an escaped convict. Best suggestion was that the picture should be shown to women only and a rough, tough one made for the men. Many of the comments concerned themselves with movie blunders. The majority considered the picture excellent, well done, in good taste, and acceptable to all audiences, including those of high school age. It is planned to show it in theaters as a sponsored production by the local medical society and other organizations. We thank you all for turning out and helping make the preview a success. It was the second largest showing of the picture in the United States, the largest being at Atlantic City at the meetin of the American Medical Association.

IV. PETROSITIS

Lawrence R. Boies
Fritz D. Hurd
Jerome A. Hilger

Introduction

The most important contribution in the field of Otology during recent years is the recognition and management of a clinical entity caused by infection of the petrous pyramid.

The infection in the majority of cases is the result of middle ear inflammation extending through pneumatic cell structure bordering on the middle ear and mastoid.

The increase of knowledge regarding petrositis has resulted in a better appreciation of the possibilities of middle ear suppuration. Attention has been focused on the need of a more thorough management of surgical mastoiditis, and in cases of petrositis presenting certain signs or symptoms, the fact that surgical drainage prevents an extension of the infection intracranially.

The Structure of the Petrosa

The petrous portion of the temporal bone "houses" within its capsule more anatomic detail than any equivalent space elsewhere in the body. For the purpose of this discussion, and for brevity, the following anatomic facts of practical importance are listed:

1. The petrous portion of the temporal bone is a truncated pyramid with its base adjacent to and articulating with the mastoid and squama and the tympanic bone, and at its smaller end (referred to as the apex) with the body of the occipital bone and with the posterior angle of the greater wing of the sphenoid bone. It is separated from the body of the sphenoid bone by the contents of the foramen lacerum.

2. More than one half of the total surface of the petrous pyramid is covered by dura mater, about evenly divided between that of the middle and posterior cranial fossae. Inferiorly, the petrous pyramid is very near to the lateral part of the vault of the nasopharynx.

3. The trunks or the roots of the trigeminal, abducens, facial, acoustic, glossopharyngeal, vagus and spinal accessory nerves are in close relation to one or another part of the pyramid. In relation to it are, also, the superior and inferior petrosal sinuses, and the carotid artery and jugular bulb.

4. A central structure or "core" of the entire petrous mastoid portion of the temporal bone varies little in size through physical growth of the bone from birth to adult life. This "core" is the inner ear, the otic capsule, consisting of the cochlea and semi-circular canals. Around it, depending on the degree of pneumatization, develops the cell structure extending into the pyramid. This pneumatization originates in the middle ear space.

5. The framework of the petrous pyramid exclusive of the optic capsule usually consists of so-called cancellous (or spongy) bone with a cortical or surfacing layer of varying thickness. This cancellous bone has irregular trabeculae and septa which form the boundary of irregularly shaped spaces just in other parts of the body where cancellous bone is normally present.

The irregular spaces are filled with one or the other of four things: hematopoietic (red) marrow, fatty marrow, a mixture of red and fatty marrow, or air containing cavities.

The air containing cavities are indistinguishable histologically from those of the mastoid region.

6. The type of cellular bony structure of the petrous pyramid may be classed as pneumatic (probably 10 to 15 per cent) of cases, diploic (another 10 per cent), and mixed in probably 75 per cent. The anatomic type determines to a considerable extent the character of the pathology, whether it is an osteitis or an osteomyelitis, and the presence and position of the pneumatic cells obviously influence the develop-

ment of an abscess or empyema.

General Considerations in the Pathology of Petrositis

In the great majority of cases, infection of the petrous pyramid results from an extension of the inflammatory process directly through cell leads from the middle ear (a common pathway) or through leads through mastoid cells and then into the pyramid (also a common pathway). An uncommon method of spread is by vascular channels alone without an extension from cell to cell. Osteomyelitis of the petrous pyramid has been reported without middle ear disease. The infection in these cases is obviously by a hematogenous route.

It is reasonable to believe that infection of the petrous pyramid is a common concomitant of middle ear and mastoid disease, and heals in the majority of cases when adequate drainage is provided. When adequate drainage is not provided, the extension of the suppurative process in the petrous usually culminates in meningitis. It is believed that in most cases of meningitis originating in otitis media that petrositis is intermediate in the pathway of the intracranial extension.

The essential pathology in petrositis consists of osteomyelitis and to a lesser extent osteitis. This distinction explains to some extent the rationale of treatment. In a mastoiditis the pathologic process is an osteitis and a thorough exenteration of the diseased cell structure is usually a certain cure. An incomplete operation often leaves behind a smoldering focus of trouble characterized by delayed healing and tendency to complication. In the petrous pyramid, however, the presence of marrow establishes the process as a true osteomyelitis. Simple drainage, because of the specific reparative properties inherent within its reticulo-histocytic (macrophage) system, is adequate.

The Manifestations of Petrositis

The diagnosis of infection in the petrous pyramid is usually based on the presence of one or more of five symptoms or signs:

1. Purulent aural discharge
2. Characteristic head pain
3. Abducens paresis or paralysis
4. Low grade sepsis
5. Radiographic evidence

Additional signs may be the occurrence of a facial paresis or paralysis and oculomotor paralysis, vertigo, and a retropharyngeal swelling.

Purulent Aural Discharge

The otologist attaches considerable significance to the character and amount of the aural discharge in the diagnosis of mastoiditis. This sign in itself is not of special value to him in diagnosing petrositis unless a mastoidectomy has been done. If a complete mastoidectomy has been done, and in the postoperative period the discharge is profuse and persists, or after the mastoidectomy there is a period of scant or absent middle ear discharge followed by a rather profuse flow, the possibility that deeper cell tracts in the petrosa are infected must be considered.

Characteristic Head Pain

The symptom of pain or headache occurring in petrositis is a very definite one. It is situated in, behind, or around the eye on the involved side. Our knowledge of the exact nerves participating in the occurrence of this pain is uncertain. Reflex irritation of the ophthalmic nerve (1st division of the trigeminal) through the recurrent meningeal branch of this nerve is the commonly accepted explanation of the origin of this pain. Its presence points definitely to a petrositis.

Low Grade Sepsis

When the mastoidectomy has adequately drained a suppurative process and an adequate time interval has elapsed to allow the subsidence of the febrile

state accompanying the mastoiditis (usually a postoperative interval of about 4 to 7 days), the persistence of a fever of 100° or more is indicative of an inflammatory process outside of the middle ear space and the mastoid. Other sources of this fever outside the temporal bone having been ruled out, attention centers on the petrous pyramid as a source of infection responsible for the fever.

Abducens Paralysis

The occurrence of a 6th nerve palsy in the presence of an otitis media is suggestive of an extension of the inflammation through the petrosa to its tip where the 6th nerve passes through a canal bridged across by the petro-sphenoid ligament (Dorello's Canal).

Radiographic Evidence

The anatomic structure of the petrous pyramid is so complex and variable that x-ray studies are technically difficult, but when clear films are obtained helpful information may be had in the individual case. This assistance is obtained by knowing the extent of pneumatization, and the comparison between the side in which disease is suspected as compared with the healthy side. In some instances actual erosion through to the surface of the pyramid may be detected. If plates of the pyramids were taken with a first mastoid x-ray and then petrositis is suspected in the postoperative period, secondary studies may reveal significant changes.

Additional signs or symptoms less prominent than those just discussed may occur and when present localize in some instances the infection to a definite part of the pyramid. A transient facial palsy suggests the possibility of extension of infection into the pyramid. Likewise a transient attack of vertigo, nausea and vomiting, particularly in the postoperative period suggests the extension of infection into the pyramid. A retropharyngeal swelling in the course of a suspected petrositis, indicates a petrosal suppuration with retropharyngeal extension down through the foramen lacerum. The occurrence of oculomotor paralysis (rare) in the course of a petrositis indicates a definite extension to the apex of the pyramid.

A. Classification of Petrositis

The classification of Eagleton is accepted by otologists as broadly outlining the different types of lesions which may be present:

1. Reactive and reparative osteitis.
2. Non-suppurative congestive cases--symptoms due to venous stasis.
3. Chronic bone sepsis cases (without macroscopic pus).
4. Abscess of the apex:
   a. Without a tract.
   b. With a tract.
5. Acute septicemia cases, associated with a continuous positive blood culture and meningitis.

The Surgical Management of Petrosis

The majority of cases tend to heal spontaneously if a complete mastoidectomy is performed. When symptoms of petrositis develop in a case after a mastoidectomy has been done, re-exploration of the mastoid structure with a search for cell tracts is indicated. In a majority of the cases a tract can be found and explored. If one cannot be located, a radical mastoidectomy exposure is needed to search for cell tracts in front of the labyrinth. These extend from the middle ear along the site of the eustachian tube.

If the pyramid cannot be drained through such cell tracts, a surgical exposure of the apex of the pyramid by an extrapetrosal route, or the making of an intrapetrosal tract to the tip by artificial means is indicated. When Kopetzky in 1930 first stimulated an interest in petrous pyramid infection in this country, he advocated surgical technic consisting first of a radical mastoidectomy, and then the introduction of a burr through the zygomatic

root to drain the pyramid between the carotid artery, the cochlea and the surface of the pyramid. Eagleton in the same year advocated a technic in which he did wide decompression by removing the bone about the zygomatic root and the bone over the sigmoid.

With the bone over the temporal fossa removed, the temporal lobe could be elevated and the apex opened. This procedure was characterized as unlocking the petrous pyramid. The majority of operators in this country have adopted Eagleton's method of approach or some modification of it.

In 1933 Ramodier suggested an approach to the pyramid beneath the knee of the carotid artery after flattening out the tympanic bone and exposing the ascending limb of the carotid artery.

Analysis of Cases of Petrositis Listed in the records of the University of Minnesota Hospitals

From 1932 to the present, there have been 9 cases of petrositis listed in the records.

The first 2 cases were not treated by drainage of the pyramid and died from meningitis. An autopsy in each case revealed similar lesions. The case history of the first is typical of the disease:

Case 1 - Male, Age 10

10-28-32, Bilateral myringotomy for drainage of middle ear suppuration. Fever, malaise, etc. for 12 days. Drainage ceased.

11-21-32, Returned to school.

11-23-32, Febrile again with left frontal headache and photophobia.

12-3-32, Vomited several times.

12-4-32, Admitted to University of Minnesota Hospitals, complaining of pain around the left eye, diplopia, and photophobia. No discharge from either ear. Temperature 102°, leukocyte count 21,400. Lumbar puncture revealed a negative spinal fluid except for cell count of 20.

A left simple mastoidectomy was done. No unusual findings recorded except mastoid destruction and that a small area of middle fossa dura was exposed.

12-5-32 to 12-22-32, No definite improvement in symptoms. X-rays of petrous pyramids on 12-22-32 reported destruction at the apex.

12-23-32, Meningitis. Hemolytic streptococci in the spinal fluid.

12-26-32, Death (9 weeks after onset of infection).

Autopsy revealed a meningitis caused by an abscess of the apex of the left petrous pyramid with erosion through the cortex.

Case 2 -

Also a 6 year old child (female) developed earache, then discharge, then fever and severe headaches around the left eye, and then left abducens paralysis. Admitted to the University of Minnesota Hospitals 6 weeks after onset of illness. Simple mastoidectomy performed. Improvement and then recurrence of headache and fever; vomited 2½ weeks later. Developed meningitis (hemolytic streptococci). Death (3 months after beginning of otitis). Autopsy revealed meningitis from an abscess of the left petrous apex eroding through to the dura. The succeeding 7 cases have all survived following drainage of the pyramid. The case history of the third illustrates a method of surgical treatment:

Case 3 - Male, Age 8

3-2-34 - Spontaneous discharge from right ear following several days of earache.

4-1-34, Diplopia.

4-2-34, Dizziness - then severe headache around and behind the right eye.

4-13-34, Admitted to the University of Minnesota Hospitals with discharging right ear; temperature of 100° and a right abducens paralysis.

4-14-34, Right simple mastoidectomy. No unusual findings recorded.

4-15-34 to 6-5-36, Intermittent fever, profuse discharge, continued right abducens paralysis and severe headache around right eye particularly at night.

6-6-36, Re-exploration of mastoid wound. Soft area below labyrinth found and a cell tract located which when enlarged released a flow of pus.

6-7-36, Improved.

6-8-36 to 9-5-34, Continued improvement in abducens paralysis and headache. A low grade fever continued for several weeks. Kept in hospital because of this. Recovery complete.

The next case illustrates the surgical treatment through another approach. The case history:

Case 4 - Male, Age 18.

2-6-35, Right earache with spontaneous discharge.

2-21-35, Admitted to University of Minnesota Hospitals with diagnosis of mastoiditis. Temperature 103°. Complaining of pain around ear and in lower jaw where a molar tooth is erupting. X-ray revealed a large mastoid without definite destruction.

2-25-35, Mastoidectomy. Moderate amount of cell destruction found. Postoperatively continued to have a profuse purulent discharge and a low grade fever.

3-6-35, Headache around right eye - intermittent. This continued and the postaural wound healed poorly.

3-19-35, Diplopia. Paresis right external rectus noted.

3-20-35, X-ray evidence of petrositis.

3-21-35, Right mastoid reopened. Lateral sinus plate and tegment of mastoid removed. A soft area was found posterior to the labyrinth which lead to the pyramid. A considerable amount of the overlying squama was removed, and the temporal lobe elevated, allowing the pyramid to be uncapped along its posterior superior border. This exploration was carried to the level of the internal auditory meatus. The post labyrinthine cell structure was prominent This was soft and contained a thin serous fluid. No frank pus was encountered. The dura was packed away from this area by use of rubber dam. The wound was packed open.

3-22-35 to 3-27-35, Prompt improvement in symptoms with definite improvement in diplopia, headache and discharge.

4-12-35, Discharged from hospital after an uneventful convalescence.

Cases 5, 6, 7 and 8 did not have an abducens paralysis. The diagnosis of petrositis was based on the symptoms of discharge and the characteristic eye pain, and on the x-ray and operative findings.

Case 9, a 7 year old boy, was admitted with definite meningitis with non-hemolytic streptococci in the spinal fluid. The case recovered after surgical drainage supplemented with drug treatment. The diagnosis in this case was based on the characteristic eye pain, the fact that the patient had developed a meningitis, on the presence of symptoms of vestibular irritation and on radiographic and operative findings.

Comment

The first 2 cases represent instances of suppuration with abscess formation at the petrous apex. If surgical treatment for drainage had been instituted and an intracapsular cell tract could not have been found, the more formidable technic for exploration of the petrous apex would have been necessary. The 7 cases that were operated on and recovered were all managed by the more conservative method of drainage within the capsule of the pyramid, except for the one case de-

scribed in which a partial uncapping of the roof of the pyramid to the level of the internal auditory meatus was done.

Summary

1. The petrous portion of the temporal bone often shares, to a variable degree, in suppurations of the middle ear and mastoid.

2. The contents of the pyramid, the marrow and pneumatised cell structure, determine the basic pathologic process - an osteomyelitis or an osteitis. In most instances, it is a combination of both.

3. Cell tracts whose anatomical characteristics are undistinguishable histologically from those of the mastoid structure, may extend into the pyramid in 2 main groups. The larger group consists of cells above, behind, and below the labyrinth and these are continuous with the mastoid cells. The other group is along the eustachian tube and is continuous with the middle ear.

4. There is evidence that in a majority of cases of otogenic meningitis, infection of the cell tracts and marrow is intermediate in the spread of the infection from the middle ear or mastoid to the meninges.

5. The diagnosis of petrositis is based on an interpretation of one or more of the following symptoms or signs in the presence of evidence of a suppurative otitis media, a low grade sepsis, and usually a mastoiditis:

(1) Retro-ocular pain or headache
(2) Radiographic evidence of pathology in the suspected pyramid
(3) Abducens paralysis
(4) Transient facial palsy or transient labyrinthine irritation

Rarely, an oculomotor paralysis.

6. Surgical drainage of the suppurative process in the pyramid before there is an extension through the capsule of the pyramid offers a high percentage of cures.

References

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