NUMEROUS articles in 1944 appeared concerning the use of the sulfonamide drugs, and a few reports were made on the use of penicillin. Foreign publications are still hard to obtain. Some articles are quoted and commented on under several headings. Editorial comments appear in brackets.

**DIAGNOSIS**

Danelius¹ advises the technic of Mayer to show the mastoid antrum, attic and tympanic cavity. This view is valuable in suspected attic cholesteatoma and chronic otitis media. [He has offered the best description I have seen of this technically difficult Mayer position.]

Lindsay² uses the Stenver position to visualize the posterior group of cells in the petrous pyramid except for the small group of cases in which a group of cells lies between the aquaeductus endolymphaticus and the posterior cranial fossa. This group, 5 to 10 per cent of the cases of petrositis, requires an occipital projection. The anterior group of cells, extending from the hypotympanum or the tubal orifice, is best shown by a mentovertical view.

Tamari³ advises diagnostic puncture and aspiration of the mastoid in cases in which the diagnosis of acute mastoiditis is uncertain. He uses a sternal puncture needle which has a stylet and a depth guard. He uses this procedure only in cases in which roentgenologic examination has shown the mastoid to be pneumatic and the position of the lateral sinus to be normal. [It seems to me that an exploration of the mastoid by the usual simple mastoidectomy would be a safer and much more reliable procedure.]

2. Lindsay, J. R.: Recent Progress in Management of Acute Suppuration of the Middle Ear, Arch. Otolaryng. 39:492-497 (June) 1944.
Von Leden and Williams report a case of chronic mastoiditis in which there was an erosion of the horizontal semicircular canal, producing labyrinthitis. The roentgenograms showed little evidence of infection on the diseased side and an apparent cholesteatoma on the normal side. "This case illustrates that a laboratory test, such as a roentgenographic examination, may be misleading, and that when laboratory findings conflict with clinical findings the greater weight should be given to the latter."

**BACTERIOLOGY**

Lothrop reports a case of lateral sinus thrombosis in a man of 25 who had had a discharging ear most of his life. Three cultures of the blood which were positive for Bacillus proteus were obtained after mastoidectomy and ligation of the jugular vein, so the lateral sinus was uncovered and found to be thrombosed to the torcular Herophili. Recovery followed. Large doses of sulfapyridine were used. He had found only 9 cases reported since 1912, all fatal except 1.

McKee reports a case of lateral sinus thrombosis and septicemia due to B. proteus in which the patient was cured by sulfapyridine. In his review of the literature he found that B. proteus could cause virulent otitis media, with necrosis to the dura and lateral sinus in a few days. He observed 21 patients with otitis media, 7 of whom survived. Meningitis and brain abscess were fairly common, and they were usually fatal in a few days.

Sugar reports another case of infection with B. proteus, in a boy of 11. The patient had had a draining ear for a long time. Dizziness began three weeks before operation. A polyp was removed. Results of a fistula test were normal. In thirty-six hours, the meatus was again filled with granulations, and a radical operation was done. Symptoms of meningitis developed rapidly, and death occurred two days later.

B. proteus is a member of the colon group and is found most commonly in urinary infections, usually those of a mild form. It is a secondary invader in chronic otitis media and may become pathogenic.

Collins and Hughes\textsuperscript{8} found this organism in thirteen of twenty-six chronically discharging ears.

Odom, Rodenburg and Schain\textsuperscript{9} report a case of a man of 38 who received a traumatic perforation by a twig while rabbit hunting. When he was seen eleven years later, there was a large perforation of the drum with a slight purulent discharge, in which there were small whitish nodules resembling small, half mothballs, about 1 mm. in diameter. Ten per cent thymol in oil apparently cleared up the infection, but it recurred three weeks later. A roentgenogram of the ear showed partial sclerosis. The chest was normal. Culture showed Streptomyces albus (actinomycosis). In a search of the literature they found only a few cases of the infection involving the ear and none in which the infection had definitely started in the ear. [A few years ago 2 patients with actinomycosis with multiple draining sinuses in the head and neck were treated at the Los Angeles County Hospital with large doses of sulfonamide drugs and were apparently cured. The opinion of our research bacteriologists is that the effect of the sulfonamide compounds may have been on the secondary infections and that any beneficial effect on actinomycosis by the sulfonamide drugs (or penicillin) has not yet been proved.]

CHEMOTHERAPY AND BIOTherAPY

In a symposium on chemotherapy by the Royal Society of Medicine\textsuperscript{10} the fifteen speakers all emphasized the early administration of the sulfonamide compounds (sulfonamides in England). Its misuse was said to be chiefly inadequate dosage and, in otitis media, failure to incise the drum and reliance on the "sulphonamides to produce results under unfavorable local or general conditions. Local: Infection with fluid under tension; General: Ambulatory treatment; and where frequent recurrences of infection have occurred in the same mastoid."

The first speaker, Mr. W. Stirk Adams,\textsuperscript{10} states that while in 1935, the last year before the use of sulfonamide drugs, 63 per cent of 250 patients admitted to the Children's Hospital, Birmingham, England, for acute otitis media required mastoidectomy in 1942 only 32 per cent of 350 patients admitted required operation.

\textsuperscript{8} Collins, E. G., and Hughes, K. E. A.: The Treatment of Chronic Suppurative Otitis Media by Local Application of Penicillin and Other Drugs, J. Laryng. & Otol. 59:81-85 (March) 1944.

\textsuperscript{9} Odom, S. G.; Rodenburg, E. J., and Schain, P.: Streptomyces Albus in Ear, Arch. Otolaryng. 39:137-143 (Feb.) 1944.

In another symposium Cunning \(^{11}\) states:

Penicillin is far superior to any of the sulfonamide compounds in the treatment of Staphylococcus aureus infections with or without bacteremia. . . . It is also extremely effective in the treatment of infections with hemolytic streptococci, pneumococci and gonococci, which are resistant to the sulfonamide compounds. . . .

Penicillin does not enter the meningeal spaces or the spinal fluid after intravenous or intramuscular injections. Therefore, in addition to being injected intramuscularly or intravenously, it must be given directly into the spinal fluid in the treatment of meningitis. . . .

The adequate or the optimum dosage has not been clearly defined to date. . . .

For serious infections due to the hemolytic streptococci . . . with or without bacteremia an initial dose of 15,000 to 20,000 Oxford units should be given, with continuing dosage as follows: 5,000 units every hour injected into the tubing of an inlying intravenous set. There should be constant intravenous injection of a solution at a rate designed to deliver 5,000 to 10,000 units per hour. . . . After the temperature has returned to normal, the total dose in the twenty-four hour period may be reduced one half, but it should be administered for at least seven days after the temperature is normal. . . .

For meningitis 10,000 units of penicillin in isotonic solution of sodium chloride is injected into the subarachnoid space or intracisternally once or twice daily; the solution is also given intravenously or intramuscularly at the same time.

White \(^{11}\) says that he has seen acute otitis media develop in patients at the time they were being treated with penicillin. "The statement made by Dr. Cunning that he felt that in the future penicillin might take the place of sulfonamide compounds I take exception to. . . . The use of penicillin against pneumococcal meningitis has proved to be of limited value . . . it remains to be determined, also, how it should be used in conjunction with the sulfonamide compounds." [The latest opinion is that both the sulfonamide drugs and penicillin should be given in full doses in meningitis, septicemia and other serious infections.]

Kolmer \(^{12}\) advised the use of immune serums in addition to the sulfonamide drugs and penicillin in septicemia and acute suppurative meningitis.

Lindsay \(^{2}\) states that the most effective time for administration of the sulfonamide compounds in acute otitis media is in the invasive or the preinvasive stage. "In the presence of a severe infection of the


upper respiratory tract the first signs of invasion of the middle ear should be the indication for considering such therapy."

Several articles about the local treatment of chronic suppurative otitis media appeared, one dealing with the use of penicillin locally.

Collins and Hughes treated twenty-six ears (23 patients, 3 with bilateral involvement) with penicillin and other drugs and controlled the series with careful bacteriologic study; five hundred and forty cultures and three hundred smears were made. Many organisms, including some of the staphylococci and streptococci, were not sensitive to penicillin. The penicillin was used in a concentration of 800 to 1,000 units per cubic centimeter and was forced through the perforations with a Politzer bag. A wick was then placed in the ear and kept moist by the application of more solution every eight hours. "Our conclusion with regard to the local application of penicillin is that the results are definitely disappointing." In 4 of the 9 patients treated with penicillin a dry ear was obtained. In 12 of the remaining 14 patients a dry ear was achieved by other treatment. A saturated solution of boric acid in 75 per cent alcohol was used in 16 patients and was effective in about half of the patients having diphtheroid or coliform bacilli. Boric acid powder, used in 9 patients, was a little more effective than the boric acid and alcohol drops. Sulfonamide powders were tried, and best results were obtained with a mixture of sulfanilamide powder and 15 per cent Mikraform sulfathiazole. Sulfathiazole administered perorally was given in 10 patients, 39 Gm. over seven days, and apparently helped in 5 patients. Illustrations of the perforations and tables of results are given.

Banham treated 200 patients with chronic suppurative otitis media at one Royal Air Force center. The cases are described in detail, with special reference to the otoscopic appearance. The essentials of the treatment are thorough frequent cleansing and insufflation of powder such as boric acid and sulfathiazole. One hundred per cent of the patients with central perforations were cured. Many ears with granulations cleared up and became dry. Eighty per cent of the 200 patients "responded satisfactorily" to local treatment.

Miller reports that 84 patients with acute otitis media were treated by insufflation of sodium sulfathiazole. The average ear was well in six days, and none drained longer than eighteen days. [It is difficult to believe that a sulfonamide powder would get through the usual small

perforation through which pus was draining continuously in acute otitis media. It is easier to believe that there may have been a mild epidemic in which 84 patients with otitis media might recover spontaneously in an average of six days.]

Boies\(^1^5\) found the use of iodine powders and boric acid as effective as sulfonamide powder. In treatment of chronic otitis media without complications he relies on the local use of powder and the removal of infections and obstructions in the upper respiratory tract.

Two authors report on the use of sulfonamide drugs packed in mastoid wounds.

McDougall\(^1^6\) abstracts 15 cases in which radical mastoidectomies were done, a postaural incision being used. The cavities were then packed firmly with sulfathiazole crystals. Only 1 patient had a mild rash for two days. "It is very important to keep the cavity firmly packed for at least two weeks." He states that the postoperative period of treatment is greatly shortened and the usual painful removal of packing is eliminated. He packs his simple mastoidectomy cases in the same way and considers the results "phenomenal."

Herzig\(^1^7\) has used complete closure in his simple mastoidectomy wounds for many years. He reports 7 cases in which he used equal parts of sulfanilamide and sulfathiazole powder packed into the mastoid cavity. He reports earlier healing than usual and no reactions. [Large amounts of powder may possibly cause irritative reaction in the middle ear, with possible later impairment of hearing.]

Voorhees,\(^1^8\) in describing the technic used during his residency at the New York Eye and Ear Infirmary, said that sulfonamide powders were not used in the wound postoperatively. He had seen such a case in which the wound broke down and required a plastic closure. [The majority of operators dust a small amount of one of the powders into postoperative wounds and use a small rubber drain at the lower edge of the wound.]

In treatment with penicillin or sulfonamide compounds, it must be stressed that when there is a condition existing requiring surgical treatment, operation must be done. When a patient has a bulging


drum, it should be opened and administration of sulfonamide or penicillin drugs continued. In mastoiditis, if there are indications, one should operate and then continue the administration of sulfonamide drugs or penicillin. If chemotherapy is given early, it may prevent surgical lesions. The indications for operative intervention exist today as before the days of chemotherapy and must be acted on accordingly. Serious intracranial complications may develop in spite of sulfonamide or penicillin therapy or may be present when the therapy is started and kept quiescent for a time by the treatment.

MASKING

Lindsay," in commenting on so-called masking, says: "This masking effect is, however, merely an indication of the efficacy of the therapy in inhibiting the extensions of the infection. The patient should not be denied this protection."

Sellers' expressed the opinion that serious masking may occur if sulfonamide compounds are given after suppuration is present.

AERO-OTITIS AND PURULENT OTITIS MEDIA

Major Wright reports that in 6 per cent of 100,000 men who made "routine flights" in the low pressure chamber at Santa Ana Army Air Base aero-otitis developed. Of these 6,000, in 30, or 5 per cent, purulent otitis media developed. One mastoidectomy was done. This is the first report of suppurative otitis media after flight. [Why so little acute suppurative otitis media has developed after aero-otitis has been an unsolved problem.]

ACUTE OTITIS MEDIA AND MASTOIDITIS

Sellers concludes that sulfonamide compounds reduce the incidence of otitis media in acute infection of the upper respiratory tract but "do not lower the incidence of mastoiditis in acute suppurative otitis media if the cases are otherwise properly handled." [Most observers report about a 50 per cent lowering of incidence of mastoiditis in otitis media if the sulfonamide drugs are given in proper dosages.]

Voorhees found that in deciding for or against operation in acute mastoiditis there were numerous important considerations. Profound loss of hearing indicated mastoid involvement. In his opinion, "surgical intervention in mastoiditis following acute purulent otitis media need


not be considered until three weeks after the initial onset of symptoms, which are fulness, pain, loss of hearing, headache, possibly discharge and tinnitus; any mastoidal pain or tenderness observed prior to that time is, I believe, due to edema in the cells of the mastoid process.” Pneumococcus type III is an exception to this rule. [This is a readable article and shows much thought and observation. However, it is unsafe to set an arbitrary limit of three weeks during which a mastoidectomy need not be considered necessary.]

Dean 21 investigated death rates reported from otitis media and comments on their inaccuracy. He urges more care of otitis media in childhood and, while giving chemotherapy credit for its great value, warns against overconfidence in its use. His reports of 2 cases will be commented on later, under their proper headings.

Commander Koebbe and Lieutenant Commander Potter 22 report an unusually high incidence of complications of acute otitis media during a period of six and one-half months at a receiving hospital for a naval district. There was an average daily census of 380. More than one half of these patients had acute aural infections. The total number of cases of otitis media is not given, but one hundred and seventy mastoidectomies were performed. There were sixty-four complications:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cases</th>
<th>Percentage with Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningitis</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Thrombosis of a lateral sinus</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Subperiosteal abscess and Bezold’s abscess</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>Abscess of the brain</td>
<td>3</td>
<td>33.3*</td>
</tr>
<tr>
<td>Paresis of the seventh nerve</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>Paresis of the sixth nerve</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Suppurative labyrinthitis</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Petrositis</td>
<td>1</td>
<td>0*</td>
</tr>
</tbody>
</table>

* One patient who died had a cerebellar abscess and petrositis.

A complete chart is given of the symptoms and treatment of 1 patient with meningitis.

The excellent results obtained are credited largely to penicillin. [Excellent management must have been present also.] No unfavorable reactions to penicillin were seen. Further comment will be made under later headings.

Hallberg and Thornell 23 report a case of a girl of 4½ years who had a cold and transient pain in the ear two weeks before admission. On examination the drum was found to be absolutely normal, and the

mastoid was tender and edematous. Mastoidectomy revealed pus and necrosis. The usual explanation of this phenomenon is that the infection passed through the middle ear to the mastoid followed by a sealing off of the aditus ad antrum, allowing the middle ear to recover while the infection proceeded in the mastoid.

**CHRONIC OTITIS MEDIA AND MASTOIDITIS**

Boies\(^\text{15}\) divides chronic otitis media into four types: Cases of type I have odorless discharge with a central perforation. Cases of type II have a central perforation, mucopurulent secretion and granulations or polypi. In cases of type III there is disease in the attic, the perforation is in Shrapnel's membrane or along the posterior margin and necrotic changes in the bone may be present adjacent to the perforation. The discharge is foul; cholesteatoma may be present. Type IV includes cases in which there are symptoms of intracranial complications or in which there is definite evidence of cholesteatoma.

Treatment of types I and II is conservative, including local antiseptics and powders (he found iodine powder to be as effective as sulfanilamide), minor operation to remove tonsils and adenoids or radiation to remove adenoid remnants. Type III may require mastoidectomy, and type IV always requires it.

Heatly\(^\text{24}\) cautions that the marginal perforation, often concealed by a dry adherent crust, must be considered the most dangerous type because it indicates suppuration in the attic and a strong probability of cholesteatoma. He makes the same statement as Voorhees\(^\text{18}\) and others, that roentgenologic examination is less informative in chronic suppuration than it is in acute otitis media.

Voorhees\(^\text{25}\) (Irving Wilson) reports good results in the treatment of chronic otitis media in which cholesteatoma and necrosis of the bone are absent. He uses a fine copper or aluminum wire with a fused bead of chromic acid for removing granulations in the middle ear. After the granulations are gone, the removal sometimes requiring many visits, a powder is dusted in, containing iodine, potassium iodide and boric acid. He warns his patients that treatments may take months and will not start treatments until the patient agrees to a long series.

**OTITIC MENINGITIS**

The series reported by Commander Koebbe and Lieutenant Commander Potter\(^\text{22}\) of 20 cases of meningitis developing in a period of

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six and one-half months is remarkable. Still more remarkable is their record of 100 per cent recoveries. A combination of the sulfonamide drugs and penicillin was used in treatment. [The authors state that in 7 out of 20 cases of meningitis virulent micro-organisms were grown from the spinal fluid. Presumably the spinal fluid in the other 13 cases was sterile. It has not been customary to report cases as those of true meningitis unless organisms were recovered from the spinal fluid. The authors still have 100 per cent of recovery for meningitis, but only on the basis of 7 cases.]

In most of their cases the aural infection had been present three to five weeks at the time meningitis developed. But in 4 cases the onset came in three to five days after the onset of otitis media.

The series of otitic meningitis reported by Williams 26 in 1942 showed a rise in the recovery rate from 35 to 69 per cent with the advent of sulfonamide drugs.

Dean 21 reports a death from meningitis developing one week after operation for chronic suppurative otitis media and extradural abscess. Chemotherapy was used, without success.

Sugar's 7 patient, a boy of 11, died of meningitis coming on after a radical mastoidectomy. The organism was B. proteus.

Moorhead 27 states that the onset of meningitis is frequently accompanied with vomiting and sudden onset of high temperature.

THROMBOSIS OF THE LATERAL SINUS

Commander Koebbe and Lieutenant Commander Potter 22 did not ligate the internal jugular vein in any of their 14 cases of thrombosis of the lateral sinus, and their recovery rate was 100 per cent.

In the series reported by Hartman and co-workers, the mortality rate dropped from between 25 and 35 per cent to 10 per cent with the use of sulfonamide drugs.

Major McKee's 6 patient with lateral sinus thrombosis caused by B. proteus infection recovered with administration of sulfapyridine and radical operation.

Lothrop 5 ligated the jugular vein in his case of lateral sinus thrombosis caused by B. proteus. Sulfapyridine in large doses was used. [It is possible that with the use of large amounts of penicillin in lateral sinus thrombosis ligation of the jugular vein may be unnecessary. However, occasional cases of sudden death from pulmonary embolism have been reported. Pulmonary abscess and empyema from smaller

emboli certainly occur. Ligation of the jugular vein can do no harm when the circulation is already interrupted and protection from emboli may be afforded.]

Lillie 28 analyzes a series of 23 patients with suppurative labyrinthitis. Labyrinthotomy was done on 12 patients, and labyrinthectomy was done on 11. The former operation was done "when there is no evidence of extension of the disease beyond the confines of the otic capsule... labyrinthectomy... with purposeful wide exposure of the dura over the posterior and middle fossae... is indicated when there is evidence of extension of the infection beyond the confines of the otic capsule."

There were three deaths in the series of 12 cases in which labyrinthotomy was done and none in the 11 cases in which treatment was by labyrinthectomy. Lillie differentiates between cases in which the eighth nerve is destroyed by a petrositis and those in which there is definite infection of the labyrinth. The short duration, sometimes only a few hours, of the dizziness in the nerve involvement helps to set it apart from the prolonged symptoms in the cases of labyrinthine infection.

Temporary facial paralysis occurred in 5 cases. Injury of the dura with escape of spinal fluid was noted in 1 case without development of symptoms of meningitis. [This article deserves study by every otologist, especially the charts contrasting the symptoms of the two types of cases.]

Von Leden and Williams 29 report a case in which perforation of the horizontal semicircular canal produced labyrinthitis. The roentgenograms showed little evidence of infection on the diseased side and an apparent cholesteatoma on the normal side. Roentgenograms were repeated to make certain that the two sides were properly identified. A large cholesteatoma was found on the suspected side, which had eroded into the anterior part of the horizontal semicircular canal and produced a large fistula. The cholesteatoma was removed, but the fistula was not disturbed. Recovery was uneventful, and the vertigo disappeared in ten days.

Altmann and Waltner 30 report a series of 5 cases of labyrinthitis due to Pneumococcus type III in detail, with autopsy findings. There was a deep abscess of the posterior fossa present in each of the 5 cases.

The characteristic picture in infections with the type III Pneumococcus is that of proliferation of the mucosa of the middle ear. There is early and pronounced proliferation of the connective tissue and only moderate swelling and hyperemia. Masses of new connective tissue fill out the recesses of the middle ear and surround the chain of ossicles. This not only causes the typical blocking off of drainage of the mastoid cells, with resulting abscess and necrosis, but also, in patients that recover, may cause the immobilization of the ossicles, producing conduction deafness. [This paper has excellent illustrations of the serial sections of the temporal bones, and the cases are carefully analyzed and compared with cases in other series of reports of labyrinthitis and meningitis due to Pneumococcus. The 5 cases reported by these authors are all described as cases of petrositis in which the mastoid operation did not drain the focus of suppuration in the perilabyrinthine cells. The real importance of this article is in that the undrained focus of suppuration in the petrosal cells (petrositis) was the cause of the fatal complication in these 5 cases. Such a focus is a common cause of labyrinthitis. The authors seem to recognize this in the last paragraph of their summary but fail to bring out this most important point.]

One case of labyrinthitis occurred in the series reported by Commander Koebe and Lieutenant Commander Potter. This was associated with acute pansinusitis and orbital edema and occurred during scarlet fever. Treatment was by intramuscular injection of penicillin until the acute phase was over; then mastoidectomy was performed. Loss of hearing was pronounced on recovery.

**OTITIC ABSCESS OF THE BRAIN**

Dean’s patient died suddenly when an encapsulated abscess of the brain ruptured. The abscess was secondary to cholesteatoma.

Wolfson reports a case of a man of 56 in which iodized poppyseed oil instilled into a temperosphenoidal abscess demonstrated by roentgenogram that rupture into the lateral ventricle had occurred. The patient recovered after drainage of the abscess and with administration of large doses of sulfadiazine. No similar case was found in the literature. The patient had had chronic otitis media since childhood. The abscess of the brain had come on after an infection of the upper respiratory tract. He was admitted to the hospital with facial paralysis. Radical mastoidectomy was done, and five days later the hemiplegia developed.

suddenly along with a sudden rise in temperature. The temperosphenoidal abscess was found and drained.

Weickhardt and Watts\textsuperscript{32} report a fatal case of abscess of the medulla oblongata occurring in a man of 34. He had had an intermittent discharge from the ear since childhood. Symptoms of petrositis developed one month after a radical mastoidectomy. An exploratory operation was done, but nothing was found. He died shortly afterward. Autopsy revealed a definite abscess in the medulla oblongata. His search of the literature revealed 9 cases in all of which the abscesses were due to aural infections. All were fatal.

**PETROSITIS**

Eggston\textsuperscript{33} reports 3 fatal cases of petrositis, with illustrations of sections made through the petrous pyramids. Two of the cases occurred before the sulfonamide compounds were available, and in the third, occurring in 1937, azosulfamide (disodium 4-sulfamidophenyl-2'-azo-7'-acetylamino-1'-hydroxynaphthalene-3', 6'-disulfonate) only was administered. The author states that he had seen 2 other fatal cases of petrositis in which massive doses of sulfonamide drugs had been given, without success. Eggston mentions that it is not necessary that a petrous pyramid be pneumatized in order to become infected. He states that 20 per cent of specimens contain marrow, 35 per cent are pneumatized and the remaining 45 per cent show a mixture of marrow and cells. The pneumatized bones are more liable to be infected. He comments that “Every case of prolonged mastoiditis . . . should be carefully surveyed with petrositis in mind. It is frequently difficult or impossible to locate the infected area either at surgical exploration or at autopsy. This is particularly true if the dura is intact. Serial microscopic sections of the bone are necessary to find and properly evaluate a petrosal infection.” This difficulty in locating the infection was shown in the third case, in which neither operation nor gross examination at autopsy revealed the infection. Serial sections of the petrous bone showed a definite abscess in the petrous apex, which caused the fatal basilar meningitis.

[Serial sections in petrositis of tympanic origin have consistently shown that the infection has had free entrance to the pyramid along pneumatized tracts. In the absence of such tracts the bone marrow of the pyramid is protected from infections of the middle ear by the dense bone of the labyrinthine capsule and carotid canal.]


Lindsay \(^2\) reviews the anatomy of the petrous tip. In 35 per cent of the petrous bones there is pneumatization in the perilabyrinthine region, and in about 20 per cent there is pneumatization of the apex. Petrositis may be posterior or anterior, depending on the route of pneumatization. The posterior type may be drained by a posterior approach after simple mastoidectomy, while the anterior type may require an approach through the middle ear after preliminary radical mastoidectomy.

Moorhead \(^27\) states that petrositis is indicated by paralysis of the sixth nerve, and the longer the interval between simple mastoidectomy and the onset of the petrositis symptoms, the more likely will petrous operation be necessary.

Pastore and Meredith \(^34\) report an interesting case of a woman of 26 who was admitted with a discharging sinus of the left occipital region of seven months' duration. She had had an intermittent left-sided headache for three years. She had had otitis media three years before. Mastoiditis and petrositis developed and were later followed by two attacks of labyrinthitis. A simple mastoidectomy was done two years after the onset of symptoms, and a fistula from an extradural abscess developed in the left occipital region a few weeks later. This drained intermittently. When the drainage was occurring the patient had no headache, and when the drainage stopped the headache recurred. Labyrinthectomy was done, and sequestrums were removed from the petrous pyramid. There was not noted at any time the usual postocular pain associated with petrositis. The spontaneous drainage from the petrous pyramid and extradural abscess escaped through the lambdoidal suture.

Pennybacker \(^35\) reports 3 cases of cholesteatoma of the petrous bone, with gradual facial paralysis. The roentgenogram showed erosion of the petrous bone in each case. Operations showed cholesteatoma. There was no death. One patient recovered facial motion almost completely after operation. Pennybacker found that 11 similar cases had been reported.

**FACIAL PARALYSIS AND OTITIS MEDIA**

Decker \(^36\) reviews 400 cases of facial paralysis occurring in a general hospital and reports 15 per cent to be associated with otitis media. Eight per cent were in acute and 7 per cent in chronic otitis media.


\(^35\) Pennybacker, J.: Cholesteatoma of the Petrous Bone, Brit. J. Surg. 32: 75-78 (July) 1944.

He concludes that paralysis occurring in the first few days of acute otitis media is not an indication for mastoidectomy, but if it occurs after ten days or more it is probably associated with necrosis and operation should be done. Paralysis in chronic otitis is a definite indication for immediate operation.

Tschiassny 37 reviews the literature on acute otitis media associated with facial paralysis. He found differences of opinion; some authorities advised immediate operation even in the first days of acute otitis media if facial paralysis occurred.

He suggested that daily examination with faradic current be done, and if even a slight reaction of degeneration should be noticed this would be an indication for mastoidectomy, without waiting for signs of mastoiditis. [This test should be tried out in a large number of cases before acceptance.]

MISCELLANEOUS

Schugt 38 reports 2 cases of mastoiditis in which there was severe pain referred to the chest and upper part of the arms and in 1 case to the face. The pathways involved are the autonomic nerves which extend along the carotid arteries.

Moulden 39 reports a fatal hemorrhage following radical mastoidectomy. Symptoms of cerebral compression were noticed in the second postoperative day. The patient became comatose within two hours after onset of symptoms. Bleeding had occurred from the inferior petrosal sinus but did not show on the dressing, because of a tight petrolatum gauze pack. Hematoma had stripped up the dura of the middle fossa in the temperoparietal area in which the dura had been exposed. The patient died as the clot was being removed. The author advised that in cases in which there has been an exposure of the dura and tight packing is to be used a short rubber tube drain should be inserted in the region of the dura.

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