cocain and resorcin in aqueous solution. The action of the cocain is intensified and prolonged by the resorcin and rendered more readily absorbed.

Dr. SCHEPPEGRELL—As to parasitic myringitis being more a disease of the wealthy than of the poor, my experience has been to the contrary. In hospital work I find many cases, but in private practice they are very rare.

Dr. FREEMAN—Under what head does Dr. Seiss place these cases of myringitis where there is a form of bleb on the membrane?

Dr. SEISS—Hemorrhagic. As to the pain of syringing, I have a large clinic with eight assistants, and when these cases come in two of these assistants attend to them. These two gentlemen can use a syringe with a quart of solution and give relief to the patients; my other six assistants will make the ears of the patients ache. The way the syringe is handled makes the difference. As to the use of cocain, the general surgeon and the ophthalmologist have decided that even moderate solutions in inflammatory conditions are wrong. To use it in active inflammation has made these cases worse.

ACUTE AND CHRONIC CARIES AND NECROSIS OF THE MASTOID; PACHYMENINGITIS EXTERNA; EPIDURAL ABSCESS.

Presented to the Section on Laryngology and Otology, at the Forty-eighth Annual Meeting of the American Medical Association held at Philadelphia, Pa., June 1-4, 1897.

BY HERMAN KNAPP, M.D.

NEW YORK, N. Y.

Of all the ear diseases, I know none that are, on the one hand, so important and dangerous, and on the other, so gratifying and manageable as the group comprehended in the title of this communication. If left alone they prove fatal in a large percentage of cases; if treated understandingly, they nearly all recover. The grippe has made us familiar with acute mastoid caries. In the first or second week of an attack of acute otitis media there is intense pain in ear and head; tympanic membrane red and bulging; in a few days otorrhea, with or without paracentesis of the drumhead; relief of pain for a few days, then return of it with tenderness and swelling of the mastoid, membrana tympani bulging in upper-posterior part, slight fever, loss of appetite, headache, mental depression; hearing greatly impaired. The further course varies greatly. The discharge may be free for a time, then diminish and disappear together with the other symptoms—natural recovery in the first stage. Or the swelling over the mastoid and the other symptoms become more pronounced, the outer table of the bone is perforated, a post-aural abscess forms, breaks, and the patient gets well—recovery in the second stage.

In the third stage a perforation through the medial table takes place, either outside the skull into the digastric fossa, or into the cranial cavity, more frequently the posterior cranial fossa than the middle. Exceptionally the pus travels through the fenestræ into the inner ear and farther through the internal auditory meatus into the cerebellar cavity. The two varieties are frequently combined and terminate fatally by meningitis and sinus thrombosis, rarely by abscess.

After this brief sketch I will illustrate the chief features of the affection by abstracts of some case histories.

Case 1.—Tympo-mastoiditis from grippe. Acute caries of the mastoid. Extensive operation. Rapid and perfect recovery. End of February, 1896, Mr. G. A. St., a healthy, strong man, was attacked with grippe. In the second week, ear and headache; paracentesis of drumhead; copious otorrhea; relief for a few days. Then symptoms were aggravated; fever; no particular swelling of upper-posterior end of ear

canal; drumhead white, moist, perforated. Mastoid slightly swollen and tender, particularly at the tip and posterior border. Gland over the tip swollen. Temperature 100.2 degrees; pulse 64. Two days later symptoms more pronounced; posterior-upper part of canal slightly bulging.

Operation under ether. Large incision down to bone from tip to above the auricle; periosteum scraped aside; bone over antrum discolored. Chiseling at the antrum pit soon gave vent to thin pus. The interior of the mastoid was one mass of brittle bone, pus and granulation tissue. The outer table and the whole tip removed, laying bare the digastric fossa. The head of the muscle was not infiltrated. The mastoid cavity was most carefully scraped with sharp spoon, until the wall appeared clean and glistening. The inner table was not corroded, the operation being done as early as seven or eight days after the onset of the ear affection. The patient's neck felt stiff for a few days, after that he made a rapid and complete recovery, with hearing as good as before, and with a surprisingly small indrawn scar.

The most remarkable feature in this case is the rapid destruction of the interior of the mastoid and the caries of the whole tip, tables and interior. The total removal of the tip in such cases is the best guarantee of a quick, undisturbed and permanent recovery. If the tip is left, the improvement after the operation is only temporary; relapses with headache and other ominous cerebral symptoms are apt to follow until the tip is removed. This was exemplified by a case I published several years ago, and, I fear, by a recent case which terminated fatally. Its history is as follows:

Case 2.—Acute tympo-mastoiditis. Extensive caries. Recovery delayed until necrosed tip was removed. Well three months, then died of typhoid fever. Frank Steinbrugger, aged 59, contracted a cold, end of March, 1896; ear and headache; paracentesis; otorrhea. First seen May 4, 1896. Upper-posterior part depressed; mastoid tender and swollen.

Operation. Large opening of mastoid, striking pus in a depth of three millimeters, through ivory-like hard bone over antrum. Extensive cavity filled with brittle bone, pus and granulation tissue, which was cleanly removed. Left hospital in twelve days; treated at office, occasionally. Went to business. At the last visit he paid me, about two months after the operation, the remnant of the tip of the mastoid was necrosed, yet still immovable. His family physician extracted it a few days later. Patient felt well for three months; attended over-zealously to his business, and died of what his family physician declared to be a case of typhoid fever. I have no reason to doubt this diagnosis, yet the differential diagnosis between typhoid fever and the intracranial complications of mastoid empyema is not always easy.

Case 3.—Acute tympo-mastoiditis, not operated on. Death from epidural abscess and meningitis. In the *Archives of Otology*, 1895, p. 263, I published a similar case under the title: "A healthy man, of 44 years, had an acute purulent otitis media, after the grippe. Under treatment with paracentesis and topical remedies, rapid improvement, so that he resumed his business (piano-teaching). Relapse of otitis with severe cerebral symptoms; no operation; death. Autopsy: suppuration of mastoid, with perforation into posterior cranial and digastric fossæ; meningitis." Two days before the patient's death, the family physician told me that two weeks previously the patient had had great pain in his left ear and head; was unconscious four days; then dragged his right leg; let fall things held with his right hand, and could not speak. Then there was a complete intermission, during which I saw him. He had had similar attacks, with convulsions, before he contracted his ear trouble, and his father had suffered from the same disease. His younger brother was a drunkard and died a few years previously, and our patient also indulged freely. This family history and the complete intermission might well have clouded the diagnosis, yet I felt so sure of the aural origin of the brain symptoms that I told the physician that I had the greatest misgivings, and that an operation should be done as soon as there was the slightest aggravation of the symptoms. The second night there was a sudden, rapid relapse and the patient died in twenty-four hours. We made an autopsy in the afternoon of the same day. The very instructive, well-preserved specimen of the temporal bone shows a small Bezold perforation and a large perforation of the medial table of the mastoid process, through both of

which the pus from the mastoid had made its way into the digastric fossa and the cranial cavity, inducing meningitis, the immediate cause of death.

These cases may suffice to support my statement that acute caries of the mastoid is an important and, if left alone, a dangerous disease. Let me now prove by actual experience that it is a manageable affection. This I shall endeavor to demonstrate by examples in which the onward course of the disease was stopped by the hand of the surgeon.

Case 4.—Acute caries of mastoid, pachymeningitis. Operation. Recovery. Annie Parker, 35 years old, came to me January 6, 1897. Acute purulent otitis media R.; the usual symptoms; temperature 101 to 102 degrees; mastoid tender, especially at tip and posterior border.

Operation. Large opening of the mastoid; outer table removed. The whole cavity, filled with pus, decaying bone and granulations, was cleansed. The medial table, soft, brittle, and granulating, was removed, laying bare the pulsating dura and sigmoid sinus (perisinuitis). Communication with the tympanum was established. Speedy and complete recovery.

Case 5.—Acute mastoid empyema perisinuitis with cerebral symptoms. Operation. Recovery. Louise Lefebvre, age 25. Came to clinic March 7, 1897. *Operation:* Incision the whole length of mastoid; large opening down into the tip; pus, brittle bone, and granulation tissue removed. After the scraping-off of the granulations the lateral sinus lay bare one and one-fourth inch in length; healthy and pulsating. Rapid and complete recovery.

These observations which I have only sketched, may suffice to show how beneficial thorough operations in these cases may be. Thorough, means the removal of all dead material, pus, carious and necrosed bone, and granulation tissue, the constant accompaniment of dead tissue, especially bone. Care must be taken in doing these operations not to injure the lateral sinus, which accident has happened to me five times. It may happen with the chisel, especially one that has sharp angles, but also with a sharp spoon. The accident is mostly without serious consequences, but there are some fatal cases on record (for instance, Kuhn, by entrance of air, Milligan, after an exploratory operation).

Case 6.—Operated on five years ago for mastoid disease. Pain and tenderness in mastoid. Opening. No pus. Injury of sinus. Recovery. Becky Liebermann, came to me March 26, 1897. Five years ago, was operated on in Vienna. Has of late suffered considerably from pain starting from mastoid. Tenderness on pressure, especially on posterior border. No discharge. No swelling or redness of mastoid. Diagnosis: mastoid neuralgia from ossifying mastoiditis. Opening of mastoid; careful chiseling of the hardened and exceedingly vascular mastoid. Finding no pus, I chiseled backward toward the sinus. In scraping the inner table, suddenly a large stream of dark red blood escaped. The wound was tamponed and dressed. The patient made an undisturbed recovery and has lost her pain.

Case 7.—Acute mastoid caries. Pachymeningitis externa. Operation. Recovery. L. Mandelstein, age 50, came to me May 21, 1897. Earache followed by discharge in a few days, ten days ago; mastoid region gradually swollen; doughy, soft over antrum pit.

Operation: Incision from tip to base; the bone, stripped of periosteum, was blackish in the antrum region, from which place pus escaped. Large opening into outer table and tip; very careful scraping removed all dead tissue; the walls of the cavity were hard and shining everywhere except straight backward, where on palpation soft tissue only could be detected. The soft tissue consisted of rather hardened granulations. With the sharp spoon the latter were removed gradually and a gap exposed in the inner mastoid table, which was bordered with the pinkish-white dura mater. Although the dura filled the gap it was possible with the sharp spoon to remove all granulations from it without injury. The wound was tamponed as usual, and May 21, the patient left the hospital to be treated as an out-patient.

In some cases the cerebral symptoms complicating middle-ear disease are so marked that we have to

abide by our diagnosis, although on opening the mastoid we find neither pus nor a fistula to guide us. In such cases we should make an exploratory opening into the cranial cavity. In support of this proposition I will briefly relate a case which I detailed at the meeting of the American Otological Society in 1896.¹

Case 8.—Mastoiditis, epidural abscess, beginning leptomeningitis. Opening of mastoid and cranium. Recovery. Mrs. J., age 52. Chill May 4, temperature, 103 degrees; pulse 106. May 13, chill; severe pain in left ear; great dizziness; temperature 104 degrees; drumhead red and bulging; serous oozing from ear; relief. May 16, discharge suddenly stopped; pulse 84; temperature 103 degrees; projectile vomiting. May 26, nausea, vomiting, delirium; discharge suddenly stopped again; mastoid tender. May 27, cerebral symptoms more pronounced; 6 P.M. decided delirium; great pain in ear; tenderness of mastoid; vomited several times; irrational; muttering delirium.

Operation at 6:30 P.M., ether. I penetrated into the antrum, then the tip; cells lined with thickened mucous membrane; no pus; bone substance very vascular, soft and brittle. The dura mater of the posterior cranial fossa was laid bare two cm. in diameter. No pus being found, I exposed a small patch (7 mm. in diameter) of healthy looking dura mater at the base of the middle cranial fossa, by chiseling forward and upward, directly behind the attic. Then I chiseled from the antrum straight inward and slightly upward, till the probe penetrated into the attic. No pus anywhere, nor a fistula to guide us. Having in this way opened all the cavities which in suppurative inflammations are most liable to transfer infective material into the cranial cavity, I stopped. The patient rapidly improved. Two days after the operation the family physician who conducted the after-treatment, found the dressing soiled with abundant, foul smelling, slightly greenish, purulent secretion which filled the wound completely. This secretion, which in other cases also has been observed to make its appearance one or several days after the operation, must have originated in an epidural abscess, and beginning leptomeningitis.² The patient made an uninterrupted and permanent recovery.

What ravages chronic caries and necrosis in the temporal bone may work, can be seen in a specimen which I exhibit. The whole mastoid and the external half of the petrous bone are honey-combed with caries. The disease must have lasted a long time, with free exit of pus outwardly. I have operated on several persons who had this condition and recovered. In the winter of 1896-7 I operated on a scrofulous child whose ear was in the same condition.

Case 9.—Extensive chronic caries and necrosis in the left temporal bone (the petrous portion included) of a scrofulous girl. Pachymeningitis. Perisinuitis. Operation. Recovery. Flossie Heissenbuettel, 3 years old, admitted Nov. 3, 1896. Had measles February 1896; broncho pneumonia; mumps; suppurating glands of neck; empyema; caries and necrosis of mastoid; fistula. Offensive discharge from left ear; mastoid swollen; fistula in which dead bone is visible. Scrofulous glands of neck discharging pus from long fistulae.

Operation.—Ether; incision from tip up beyond base; periosteum scraped off; dead bone, pus and granulation tissue removed; chiseled the whole osseous wall away, removing all necrosed bone and granulations; at the posterior wall dense, dark granulation tissue, which was carefully removed with a spoon; the dura mater and sinus were extensively laid bare; above and behind the external auditory canal a large mass of carious bone, cheesy pus, and granulation tissue was scooped out; the attic and atrium were gently but carefully scraped till ear-canal, middle-ear, mastoid and adjacent parts of the petrous bone were converted into one large cavity. The child stood the operation well. The ear and glands were dressed with gauze daily for five months, after that more rarely, now every three weeks. There is scarcely any discharge; the cavity is conspicuous, though not half the size as when she was operated upon; it is nicely cuticized; the child has wonderfully improved in general health and can now, seven months after the operation, be considered cured.

¹ Sec. Trans. Am. Otol. Soc., Vol. vi., part iii, p. 290.

² In June 1897, the patient presented herself again. She was in perfect health, but completely deaf in that ear, and complained of a tendency to dizziness which accompanied her ear disease and had never left her. I found the drum membrane totally destroyed, the medial wall of the drum cavity consisting of hard glassy bone, with an irregular surface. All this makes it probable that the inner ear was involved in the suppurative, and the pus which escaped two days after the operation, may have come from the petrous bone.

These nine cases, which I selected from my recent practice, constitute a series of progressive, acute and chronic destruction with extension into the cranial cavity. One case which received no surgical treatment, ended in death by epidural abscess, the other cases, in which timely and sufficient operations were performed, recovered.

THREE CASES OF SUPPURATIVE OTITIS MEDIA; SEVERE SYSTEMIC AND REMOTE DISTURBANCES; RECOVERY AFTER MASTOID OPERATION AND REMOVAL OF POLYPI.

Presented to the Section on Laryngology and Otology at the Forty-eighth Annual Meeting of the American Medical Association, held at Philadelphia, Pa., June 1-4, 1897.

BY HIRAM WOODS, JR., M.D.

CLINICAL PROFESSOR OF EYE AND EAR DISEASES, UNIVERSITY OF MARYLAND, BALTIMORE, MD.

Certain local changes are admitted as indicating need of the mastoid operation. If one or more of the so-called vital indications be present, the demand is emphasized. Apart from these, cases are observed where there is room for legitimate doubt before and after operation; before, because there are no distinctive local signs of pent-up secretion, and yet we see phenomena most easily accounted for by assuming that such a condition exists; after, because no pus is found, and even if the patient recovers, doubt intrudes if operation were really needed to effect cure. The following cases illustrate this fairly well:

Case 1.—John S., age 30, a white laborer, was admitted to the Maryland University Hospital, February 19, 1896. He had been injured the same day by the falling of an embankment. A fractured pelvis was found. He made an uninterrupted recovery for four weeks, when, the evening temperature, normal for three weeks, rose to 102.5 degrees. He had no pain. The next morning, March 11, temperature was 100 degrees. About noon, after a slight chill, there was another rise. Examination did not reveal any cause for the condition observed. During Thursday and Friday the diagnosis of sepsis became clearer, by the occurrence of frequent chilly sensations, fever, increased pulse rate, sweating, loss of appetite, etc. There were no aural symptoms. On Saturday morning the nurse noticed discharge from the right ear. Temperature was 102 degrees; pulse 96. My attention was called to the man about 1 o'clock. There was no history of previous ear disease. I found pus in the canal, large perforation in the lower anterior quadrant of the drum membrane, Eustachian pervious to both the Valsalvan experiment and to Politzerization, and entire absence of pain. The mastoid was neither red, swollen, nor tender. In view of the apparently good drainage from the ear, I decided against operation, believing that it was a case of painless perforation, and the symptoms would now disappear. Treatment consisted in effecting and maintaining cleanliness. For two days, Sunday and Monday, temperature varied from 99 to 101 degrees. Tuesday evening the man had a chill, followed by a temperature of 103.5 degrees, sweat and prostration. Wednesday the same condition persisted, with the addition of a little redness over the tip of the mastoid. The same afternoon, with temperature 102 degrees, pulse 116, I opened the mastoid under chloroform. The cortex was healthy. The cells were deeply injected, but not more than a drop of pus was found though the opening was continued into the tympanic attic, and a stream of water would pass either way from the ear or mastoid to the other. Recovery was immediate and complete. Temperature reached 101 degrees the day following the operation; but this was the only rise, and the man left the hospital well, May 2.

Case 2.—On January 9, 1897, I saw Josephine N., 6 years old, in consultation with Dr. Thomas McCormick of Baltimore. The child had recovered from scarlet fever three weeks previously. There was a history of acute right otorrhea in infancy. Early in the late illness pain had appeared in the

right ear, and had been more or less persistent, though not severe. There had been no discharge. Within the past few days, temperature had become high, after several days of freedom from fever. There was some earache; no more than there had been. Temperature was 100 degrees. The appearance of the canal walls and mastoid was normal. In the drumhead there was the scarred perforation of the former attack. There was, however, no evidence of a tympanic inflammation. Heat was applied for two days, and otorrhea, slight in amount, appeared on the morning of January 11. I did not see the child from the 11th to the 14th. The attending physician noted scant discharge; elevation of temperature; unrelieved pain. On the 15th I found the canal walls edematous, so that a view of the drumhead was impossible. A little inoffensive pus was brought out by the cotton pencil. The mastoid was slightly reddened; more, I thought, from heat than any other cause. Temperature was 101 degrees. I thought we had all necessary indications for operation, and so advised. It was declined, and heat, peroxid of hydrogen and syringing continued until the 17th, when, with temperature 101.6 degrees, pulse 130, local conditions unchanged, operation was accepted. After free incision of the edematous canal walls, and the mastoid periosteum, without finding either pus or a carious point in the cortex, the process was opened, and the opening continued into the attic. No pus was found. Pain was relieved at once; temperature fell to normal, and once during convalescence reached 100 degrees. Otorrhea lasted a few days. The ear hears the watch $1\frac{3}{4}$ s.

In Case 1 there were septic symptoms for five days, when a painless otorrhea called attention to the ear. In Case 2 there was pain in a formerly diseased ear from the commencement of scarlatina four weeks previous. After some days of normal temperature, fever returned, without increase in the aural symptoms. In both the appearance of otorrhea failed to relieve. Both recovered immediately after the mastoid was opened, and nothing short of this helped. Yet no pus was found, certainly in Case 2, and only a drop, if that, in Case 1. Similar constitutional symptoms occur in the cellulitis of general surgery, and disappear when the infected area is drained, without the presence of pus. The existence of a like primary infection in the mastoids of these patients seems the most plausible explanation of their symptoms.

Case 3.—Prof. Samuel C. Chew of Baltimore, called me in consultation on Nov. 4, 1896, in the case of Mr. P., 27 years of age. For a week Mr. P. had suffered from left frontal headache, with slight elevation of temperature. There was a history of old intermittent otorrhea, and it was to determine a possible connection between the head pain and this, that I was called in. The man was in bed, complaining of agonizing left frontal pain; temperature 100.8; pulse 96. History showed suppurative otitis dating back to infancy. No systematic treatment had ever been employed. Occasionally Mr. P. washed the ear himself. For five years these attacks of headache had occurred. They were described as sudden, severe, prostrating, and lasting from a few hours to several days. The ear was free from pain, and neither tapping nor firm pressure of the mastoid was resented. The canal walls showed nothing abnormal. A little pus, bad smelling, was found in the tympanum. The drumhead was destroyed, the malleus standing out prominently, thickened, while, apparently attached to the posterior tympanic wall, small polypoid masses could be made out. The patient's family would not consent to operation of any kind. From the 4th to the 7th the ear was kept as clean as possible by syringing, and the use of peroxid. There was no increase in the discharge, and little decrease in the pain. Temperature ranged from 99 to 101 degrees. On the afternoon of the 7th the condition grew worse. Pain was agonizing, requiring large doses of morphia to keep the man quiet. I now had doubts concerning the adequacy of any operation about the ear. Pain was absolutely localized in the left frontal region. From the beginning nothing had pointed directly to the ear. True, there was a chronic otorrhea, and inspection showed a state of things commonly observed in old suppurating ears; but this was all. That the ear was the primary cause, I had no doubt. That the disturbing factor, whatever it was, had passed beyond the line separating aural from general surgery, I was beginning to believe. Apart from waiting for localizing brain symptoms, two procedures suggested themselves, removal of the polypoid growths, and mastoid operation. I had little faith in the ability of the first to relieve the