A STUDY OF THE AURAL COMPLICATIONS OF THE RECENT INFLUENZA EPIDEMIC WITH SPECIAL REFERENCE TO THE CLINICAL PICTURE.

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The recent epidemic of influenza has shown certain very interesting features from an otological standpoint. Otitis media was not a very frequent complication, but those cases in which it did develop were of perfectly characteristic type and showed the clinical picture we had come to consider as influenza. There were, however, some unique features which are well worth considering.

Out of a series of 6,870 cases of influenza occurring at the U. S. A. General Hospital, No. 14, there were only 120 cases of acute suppurative otitis media. There were 1,600 cases of pneumonia in this series and 66 of the cases of otitis media occurred among these. Of the 120 cases, 17 were bilateral, 16 of these occurring in the pneumonias; 21 cases developed mastoids, 2 of these being bilateral; one case developed otitic meningitis and died. The percentage of influenza which developed acute, suppurative otitis media as a complication was 1.75. About 50 per cent of these occurred in cases having pneumonia, the percentage of these being 4.12. The percentage occurring in cases uncomplicated by pneumonia was 1.02. Of the series of 6,789 cases, there were 6 cases of acute frontal sinusitis and 3 of ethmoiditis. No maxillary sinusitis was noted. There were 16 cases of acute laryngitis, 16 cases of acute follicular tonsillitis and one of peritonsillar abscess. There was a small number of acute catarrhal otitis media reported. For acute respiratory diseases this seemed to be a small percentage of aural complications. It is safe to say that none of these were overlooked, as these cases were under constant observation and there are always competent otologists available to examine suspected cases. Each case was seen early and immediate treatment instituted. However, there are certain grounds for error in these figures as on the day they were compiled, there were 173 cases of influenza still in the hospital and potential subjects of aural complications. We must conclude from these figures that the percentage of otitis media occurring in influenza is comparatively small, the greater proportion occurring in those cases complicated by pneumonia.

However, those cases of otitis media which did develop as a result of influenza, showed certain very interesting, if not unique

features. In practically every case the type ran true to form. This seemed to show distinct pathology, so that it was necessary for us to revise our old symptomatology. This pathology seems to be best described as acute hyperplasia, or hyperplastic edema of the mucous membrane of the middle ear. The onset was quite sudden, generally occurring in from the first to the third day of the disease. A certain number of cases of otitis media showed clinical pictures identical with those in the influenza cases but had absolutely no other manifestation of the disease. They reported to the hospital showing what we came to regard as influenzal otitis media and were treated as such, but of course were never diagnosed as influenza.

The first symptoms were intense pain in the infected ear together with, or sometimes preceded by, a feeling of fullness. The headache and malaise occurring in these cases must be attributed to the general affect of the influenza and the temperature, which ran from 101 to 104, must be considered in the same way. The otitis media of this type, but occurring in otherwise non-influenza cases, ran a normal temperature. Otoscopic examination of the case within two or three hours after the onset of pain would show distinctive changes in the membrana tympani, always of a vesicular type. In almost every case there was marked redness and some bulging of Shrapnell's membrane. There was injection along the handle of the malleus. The light reflex was usually present and often the anterior portion of the membrana tympani quite normal. The superior, posterior quadrant showed the greatest change. There was frequently a large hemorrhagic bleb bulging outward even for two or three millimeters. The short process often could be seen. This was the typical early case seen within two or three hours after the onset.

The cases seen later showed more swelling, especially of the superior posterior portion, diffuse reddening of the membrana tympani and loss of all normal landmarks. The distinctive feature was a bleb formation. Often there were two or three of these, always superior, either anteriorly or posteriorly and often dissected marginward beyond the annulus end to the wall of the external auditory meatus. They were of considerable size, often being five or six mms. in diameter, obscuring a good view of the membrana tympani. The eccentric layer of the squamous cell epithelium making up the stratum cutaneum of the membrana tympani readily explains this travelling of the blebs laterally to the canal wall. There was no tenderness over the mastoid process at this stage. Incision of the blebs evacuated a small amount of bloody serum. In the older cases this could be expressed from the vesicles only with some effort, as

if some clotting or organization was taking place. These blebs were true vesicles beneath the stratum cutaneum of the membrana tympani. After evacuation of these, the drum appeared red and swollen with the marked involvement of Shrapnell's membrane previously mentioned, the degree or extent depending upon the time involved. Incision of the membrana tympani in the earlier cases gave relief to increased pressure within the middle ear, followed by considerable bleeding. Later, this became a profuse, sero-sanguineous discharge. In the cases seen at a more advanced stage, incision evacuated this sero-sanguineous discharge immediately.

The pain generally subsided about two hours after the incision of the membrana tympani. The sero-sanguineous discharge continued rather profusely for several days then gradually changed in character to a thin purulent discharge which later became of thicker consistency, apparently due to secondary infection.

The nose and throat examination of these cases showed considerable congestion of the mucous membrane throughout, with more or less purulent secretion in the epipharynx, and a diffuse, acute pharyngitis. As epistaxis was a fairly frequent incident with influenza, occasional excoriations and scabs were seen on the nasal septum, anteriorly in Kisselbach's area.

Occasionally there was laryngeal involvement, a diffuse, inflammatory process involving the false cords and epiglottis with varying degrees of swelling and redness of the true cords and consequent limitations of motion. In some cases it was quite impossible to see the cords. Two cases showed hemorrhagic vesicles of the true cords. These were unilateral and situated about the junction of the anterior and middle third. Later these ruptured and gave the appearance of superficial ulcerations about 3 mms. in diameter. These healed up with treatment in about ten to twelve days.

Presumably we had a very acute, suppurative otitis media, rapid in onset, of naso-pharyngeal origin. Almost from the outset a marked epitympanic involvement became noted. An outstanding feature was the early obliteration of the superior angle of the external auditory canal and membrana tympani, sometimes seen on the second day of the disease. With this there was increased swelling of the membrana tympani itself, and often further bleb or vesicle formation, though after incision of the drum, no new extra-marginal blebs were seen. With the obliteration of the superior angle, Shrapnell's membrane became pushed downward. The line of incision frequently was depressed inward by the increased thickness or swelling of the membrana tympani. Often a bleb or vesicle would protrude out through the incision.

One case showed a large bleb in the upper limit of a right angle incision of the membrana tympani. The process was apparently a subsiding one and this was not disturbed. The next day this incision was smaller and the bleb had a balloon-like appearance. This became a pedunculated sac of considerable length, but narrow pedicle, which gradually became choked off altogether with a final closure of the opening. This was removed and gave the microscopic appearance of mucous membrane.

Generally there was what seemed to be a hyperplasia of the mucous membrane of the middle ear. Sometimes this protruding through the opening in the membrana tympani would give the appearance of granulation tissue, except that it did not bleed so easily. In case this hyperplastic tissue coming through the membrana tympani high up dissected away the superior angle of the drum, it gave the appearance of a polypoid mass. This was freely movable without discomfort to the patient and did not bleed. Upon subsiding, this gave a rough, bubbly appearance to the membrana tympani. The serous discharge showed considerable tendency to coagulate, especially over the incision, and it was frequently necessary to remove this to allow drainage. Frequently secondary incisions were required. Mastoid tenderness or edema was not evidenced at this stage. In certain of the cases, the process now began to subside and go on to an uneventful convalescence. The discharge ceased and the middle ear began to resolve with reappearance of the normal landmarks and the obliteration of the incision. The last remaining sign of the infection was the irregular thickening and swelling of the superior posterior quadrant of the membrana tympani, giving it an uneven, bubbly appearance.

In other cases, in from ten to twelve days from the onset, the whole superior canal wall would become flattened. This was so marked as to be an absolute drooping and occurred in practically every case with occasional pushing forward of the posterior canal wall at its innermost portion. By this time the discharge had changed to a thin purulent character. Thus, the typical clinical picture would be, a suppurative otitis media of ten to twelve days duration, showing a thin purulent discharge and absolutely flat superior canal wall, the membrana tympani red and swollen, especially in the superior portion, with or without bleb formation, and all normal landmarks obliterated. Usually there was no mastoid tenderness or edema.

Hitherto, the flattened superior canal wall has been considered one of the most reliable signs of a suppurative mastoiditis and frequently an indication for operation. In these cases we found the reverse to

be true, both by clinical observation and x-ray and also by operation, disclosing in one case a normal mastoid and moderately congested ones in two cases.

X-Ray examinations of cases at this stage, showed simply a slight obscuring of the mastoid, as well as a cloudiness about the antrum or a normal cell picture. Destruction of the cell walls was not shown. Cultures carefully taken and planted upon blood agar showed growths of streptococci in practically every case. Occasionally an admixture of staphylococci was also found.

From this point the cases varied somewhat. In many there was a lessening of the discharge which, however, persisted in smaller degree for a week or ten days. The middle ear gradually resolved and landmarks appeared. About the last sign to disappear was the flattened superior canal wall. Even after the membrana tympani had regained almost normal appearance and color, a certain percentage ran along for several days without showing much change, and then, with some increase in the discharge, there was a distinct thickening of the mastoid periosteum with occasional slight tenderness and edema over the tip. Sometimes these showed a slight rise in temperature and the patient complained of pain at night. They were diagnosed as mastoiditis and operation confirmed it. Some cases, notably in the pneumonias, showed a thick, creamy, purulent discharge, increased in amount, and a definite boggy appearance of the membrana tympani. There was no mastoid tenderness, but always a thickening of the periosteum. These also came to operation as mastoiditis.

Of the 21 cases which came to mastoid operation, one showed a normal mastoid, two simply a congestion of the mucous membrane of the cells, while the rest were pretty much of a characteristic type. They showed a hemorrhagic cortex which, upon removal, revealed more or less free pus. The bone was not broken down. In all cases the cell structure was preserved, though somewhat softened. Often there were granulations in the cells. Frequently there was considerable involvement of the zygomatic cells. In some cases the bone over the lateral sinus was rather soft but not broken down. In two cases there was erosion of the tegmen antri. For the most part, the cases had uneventful convalescence, the middle ear becoming dry within two or three days and the wound healing nicely. One of the cases mentioned above, with erosion of the tegmen, developed a plastic leptomeningitis and died. This was complicated by a severe pneumonic process involving both lungs.

Blood cultures were taken in some of these cases and were sterile except in one which showed a growth of streptococcus. This was a

double mastoiditis in a severe case of lobular pneumonia, followed by a fibrinous pleurisy. This case was admitted to the hospital October 10, 1918, with a diagnosis of bronchial pneumonia, influenza type. He had a severe course of pulmonary involvement. On October 26, he complained of pain in both ears. Otoscopic examination showed both membrana tympani bulging and considerable redness of Shrapnell's membrane and injection of the handle. Incision evacuated sero-pus. Two days later he developed a fibrinous pleurisy of the right lower lobe, and on the 20th, 20 ccs. of turbid fluid were withdrawn from the plural cavity. His otitis media ran the usual course until about the tenth day after onset, when the discharge was increased and it became purulent in character. The superior canal walls were flat, the membrana tympani swollen and boggy and there was tenderness and some edema over the mastoids. His temperature averaged about 101 P. M. and his lungs showed considerable involvement. Two days later it was deemed necessary to operate and a double mastoid operation was performed under nitrous gas and oxygen anesthesia. Both mastoids showed a hemorrhagic cortex with some free pus. The cells were not broken down but were somewhat softened. The mastoids were completely exenterated with no exposure of the sinus or dura. Two days later both middle ears were dry and the wounds clean. On the third day the temperature rose to 104 in the afternoon. There was no history of any chill. White blood count 38,000; differential, polymorphonuclear 92, small mononuclear 5, large mononuclear 3. Examination of fundi negative. Throat negative. Examination of lungs showed: "total absence of breath sounds right lower lobe, posteriorly dull to sixth rib." The next day he was somewhat better and two days later his white blood count was 10,000; differential, polymorphonuclear 84, small mononuclear 12, large mononuclear 3, transitional, 1. Blood culture taken 48 hours previously showed a growth of streptococci. The next day, white blood count was 7,000, polymorphonuclear 74, small mononuclear 18, large mononuclear 7, transitional 1. His temperature gradually came down by lysis and was normal on the fourth day. There was a question as to whether this temperature was due to the involvement of either one of the sinuses or to the pulmonary condition. The medical consultants felt that all these cases of influenza-pneumonia were bacteremias and that the blood picture might be due to this. The patient was studied very carefully. Further operative procedure was of course unnecessary.

Here we had a very acute type of otitis media. The only organism obtained was streptococcus. The onset was sudden and marked with intense pain. The otoscopic picture was of the influenzal

type: vesicular condition of the membrana tympani, with intense ballooning and large blebs travelling beyond the margins of the drum to the canal wall. At first the process was confined to the superior posterior portion of the membrana tympani and Shrapnell's membrane, but soon the whole drum became involved. The discharge was sero-sanguineous, later purulent. The swelling of the upper part of the membrana tympani with later protrusion of the mucous membrane. The upper portion of the middle ear contains considerably more mucous membrane than the lower. We have the anterior and posterior pouches of the drum. We have the chorda tympani nerve, the stapedius and tensor tympani muscles over which is reflected the mucous membrane, and the fold of the mucous membrane running from the promontory to the long process of the incus. We have the external and internal spaces of the attic divided by a fold of mucous membrane; the upper incudo-malleolar fold. The outer segment of the attic is again divided into a upper and lower incudo-malleolar space by a fold of mucous membrane running horizontally from the anterior ligament of the malleus to the short process of the incus and attached to the head of the malleus and body of the incus and to the osseous wall of the attic laterally. Then we have the mucous membrane reflected over the external ligament of the malleus, separating this lower space from Prussek's space. This gives a preponderance of mucous membrane in the upper portion of the middle ear and hyperplasia of this would account for the marked epitympanic involvement seen in these cases. Another noteworthy feature was the flattened superior canal wall, seen first as an obliteration of the inner superior angle of the membrana tympani and canal. Ballinger considers this a sign of marked suppuration in the border cells of the mastoid and usually a sign for operative interference. Our experience did not bear this out. One case which showed absolute flattening and no signs of external otitis, revealed at operation a perfectly normal mastoid. Other cases which showed similarly drooping canal walls, recovered without operation, this sign persisting to the last. While there may have been a certain degree of mastoiditis which healed, it certainly was not a marked suppuration.

The inner portion of the upper posterior, osseous, external canal contains numerous fine canaliculi. This probably explains the canal wall edema. May not this drooping be simply an extension laterally of the epitympanic process, already mentioned and seen first as an obliteration of the upper angle? The membranous canal is less firmly attached to the osseous in this plane. This may be aggravated

by an inflammatory process extending from the epitympanic space and possibly aditus, via. the canaliculi. This drooping canal wall was repeatedly seen in cases that otherwise were not clinically typical of suppurative mastoiditis. External otitis was ruled out in every case. This sign was very persistent, but about the last to disappear and remaining sometimes for about two or three weeks. That this sign was not indicative for operative interference was evident.

X-Ray examination of these cases showed cloudiness or obscuring of the cells of varying degree, depending upon the duration of the process. No case showed complete destruction. Operative findings bore this out. Many cases which showed a flattened superior canal wall and a cloudy X-Ray of the mastoid, cleared up without operation. The lining of the mastoid cells and of the antrum is flattened epithelium continuous through the aditus with that of the tegmen tympani. Presumably a hyperplasia or at least a hyperemia existed here, modified somewhat from that seen in the middle ear. The epithelial cells are cuboidal on the inner side of the membrana tympani and over the promontory and cylindrical on the floor and posterior wall. This would account for the slight clouding of the X-Ray picture in the cases in clinically suppurative mastoiditis. Indeed all these probably were cases of mastoiditis but not necessarily suppurative mastoiditis which we may generally consider as the type requiring operation. The distinction must be kept clear.

The course of this disease at first showed a very acute hyperemia of the middle ear, of sudden onset, with redness, bulging and vesicular formation on the membrana tympani. This soon became a cellulitis, with an acute hyperplasia of the mucous membrane. The same course of events proceeded in varying degree into the mastoid cells, although not evidenced by subjective symptoms, being only shown by the x-ray findings. There was a sero-sanguineous discharge, redness and swelling of the upper portion of the drum, obliteration of the superior angle of the canal and protrusion of the mucous membrane of the middle ear through openings in the membrana tympani. This was mainly an epitympanic involvement because of the anatomy of the epitympanum. Further extension resulted in the flattening and drooping of the superior and superoposterior canal wall.

The original infecting organism, whatever it was, was not suppurative in its action and pus formation did not occur until we had a secondary infection, following a breaking down in the protective qualities of the mucosa. This was presumably streptococcus. At this purulent discharge now resulted but the drooping canal wall was

independent of these for this sign was seen in cases which never went on to a purulent discharge.

The picture at this stage was that of a true suppurative otitis media and one of two things took place. Either this subsided and became convalescent in a varying degree of time, or the suppuration extended to the mastoid cells and resulted in true suppurative (operative), mastoiditis. This was evidenced sometimes by a bogginess of the membrana tympani and slight tenderness and edema over the mastoid, but most constantly by an increase in the amount of the discharge and the thickening of the mastoid periosteum, giving a velvety feeling on gentle palpation, especially upon comparison with the other, presumably normal, side. This stage was reached in from eight to fifteen days.

From this we may conclude that the signs indicative of operation for suppurative mastoiditis following influenzal otitis media are: a history of otitis media with discharge for from eight days to three weeks, often quieting down and then starting up again; an increased discharge of purulent character; a thickened mastoid periosteum and possible mastoid tenderness and edema and a boggy membrana tympani. The drooping superior canal wall is not reliable.

Some otologists take the view that every case of suppurative otitis media, going on for over three weeks, should be operated on, if for no other purpose than to preserve hearing. This of course is of great importance, but we also must consider the length of time involved before putting men back to duty as effectuals. Some of these cases which ran on for longer than three weeks but which did not show the findings indicative for operation mentioned above, subsided and were discharged as cured from four to six weeks after the onset. Hearing upon discharge was considerably lowered but prognosis was good for improvement. Subsequent examination, in cases which were possible to follow, showed practically normal hearing in from two to three weeks after discharge from hospital.

In two cases it was possible to remove the tissue protruding through the opening in the membrana tympani and subject it to microscopic examination. The pathological work was done by Major Robert A. Keilty, M. C., who reports as follows:

Case A. "The tissue is that of a small piece of mucous membrane taken from the middle ear in which the submucosa is the seat of an acute exudate characterized by a diffuse polynuclear infiltration, some fibrin and edematous fluid. There is a hyperplasia of endothelial cells, many from the perivascular lymph spaces of the small capillaries, while the blood vessels are markedly congested.

The protoplasm of the epidermal epithelium is granular and shows some structural reduction."

Case B. "The section is a small piece of mucous membrane taken from the middle ear. The process is primarily an exudate one in the submucosal positions. This is characterized by a diffuse polymorphonuclear leucocyte infiltration and some fibrin with edematous fluid. In addition there is hyperplasia of endothelial cells arising from the perivascular lymph spaces of the small capillaries. The vessels are congested. The mucosal epidermis shows granular protoplasm, suggesting a reduction in its integrity."

The plan of treatment followed out was early examination of all suspected cases and prompt incision of the drum when indicated. Insertion into the canal of dry gauze wicks which were frequently changed, was employed on all cases in the initial stages and in most cases, throughout the course of the disease. A certain number of cases in the later stages, were put upon irrigation but the best results obtained were with the dry wick treatment. It was necessary to carefully clear out the canal and remove any coagulated serum from the incision daily, for the first few days, during the course of the sero-sanguineous discharge.

From this series we have selected five cases as typical and presenting features of interest:

Case 1. The patient entered the hospital October 2, 1918. Age, 23; previous occupation farmer; family history negative; past history measles, mumps and pneumonia. Complained of general malaise, headache and sore throat. Diagnosis, influenza. Physical examination negative. Temperature averaged 102 for six days. On the third day complained of pain in the left ear. Otoscopic examination showed large vesicle on the posterior canal wall, almost obscuring view of the drum, with bleb on the posterior superior quadrant. Incision evacuated sero-sanguineous discharge. Ran a usual course of suppurative otitis media until the tenth day; the discharge became purulent in character with some edema of the posterior canal wall. Five days later this wall was distinctly flat. There was no mastoid tenderness or edema; hearing 4-20. Two days later or twenty days after onset, the discharge had almost subsided and the middle ear was almost resolving but the canal remained flat. Five days later the middle ear was dry, membrana tympani almost normal color but the canal flat; hearing 4-20. Sent to duty. X-Ray showed an obscured mastoid.

Case 2. Admitted to hospital October 12, 1918. Age 21; family history negative; past history measles, whooping cough, pneumonia,

malaria three years previous. Complained of headache, malaise and cough. Diagnosis influenza. Two days later complained of pain in right ear. Otoscopic examination showed bulging membrana tympani with vesicles in the anterior and posterior superior quadrant, extending up to the canal wall. Incision evacuated sero-sanguineous discharge. Discharge remained serous and slight in amount for eight days when he again had pain in the ear, and the drum seemed to be bulging. This was incised again. Four days later the drum was again bulging and the superior canal wall was flat. Membrana tympani incised. The next day discharge was purulent, the canal wall flat and membrana tympani red and swollen. Simple mastoid operation was performed disclosing a normal mastoid. Uneventful convalescence.

Case 3. Admitted to hospital October 6, 1918. Age, 22; previous occupation laborer. Family history negative. Past history negative. Complained of headache, malaise, pain in the left ear. Physical examination showed few coarse rales in the lungs. Diagnosis influenza. Otoscopic examination showed vesicles on the canal wall and membrana tympani bulging. Incision evacuated sero-purulent discharge. Otitis media improved somewhat and his lungs cleared up. There was slight discharge up to the tenth day, when the membrana tympani was swollen and bulging posteriorly. This was incised again. Two days later the superior canal wall was drooping. The membrana tympani was swollen and bulging. Again incised. The next day the discharge was thin, purulent in character. There was no mastoid tenderness or edema. There was no change in the canal although the middle ear improved until seven days later, the light reflex could be seen. Soon a tit-like process in the posterior quadrant, apparently the hyperplastic mucous membrane through the incision, was seen. There was uneventful convalescence. He was sent to duty November 16, 1918. X-Ray showed "left mastoiditis." Hearing on discharge; left ear 1-20, upper limit normal limit 1-28 rinne 6-6. Hearing two weeks later 20-20.

Case 4. Admitted to hospital October 9, 1918. Age 30; previous occupation farmer; family history negative, except that mother died of tuberculosis at age of 65. Past history; measles, mumps, and whooping cough in childhood; suppurative otitis media right ear ten years ago. Following "cold" one year ago, became very deaf; treatment was of no benefit. Deafness has not increased in the last few months. Present history: had "cold" three weeks previous to admission; sore throat for one day; complained of malaise and headache. Temperature on admission 100. General physical condition negative.

Otoscopic examination showed on the right some congestion along the margin of the membrana tympani which was retracted. The short process was unduly prominent and the light reflex distorted. Left ear showed similar condition. Heard only loud conversation with the left ear, nothing with the right. Rinne negative. Galton whistle only heard with the left ear. Diagnosis: influenza, nerve deafness on the right. Wassermann was negative.

The patient ran the usual course of influenza until on the seventh day, he developed a lobular pneumonia; temperature 104. Medical examination as follows: "dry rales right, dullness over right back, harsh breathing, mucous rales corresponding to base of lower lobes. Slow increase in whispered voice. Few mucous rales and dry crackles over right posterior axillary region." He complained of no pain in the ears but the following day, October 17, 1918, his right ear was discharging quite profusely. This discharge was seropurulent in character. The next day, examination showed a small mass resembling granulation tissue at the junction of the superior canal wall and membrana tympani. There was no pus exuding from this. With a probe, one could feel denuded bone and a tract leading to the epitympanum. There was little change the next day. This mass was about the size of a small pea and covered the short process. There was some exudate on its anterior portion. There was considerable protusion of Shrapnell's membrane. October 20, the patient's temperature was normal, and on the following day medical examination showed: "lungs clearing up, very few rales at right base." October 22, otoscopic examination showed a moderately thin, purulent discharge, the superior angle of the canal and membrana tympani dissected downward, with the mass previously mentioned apparently hyperplastic mucous membrane. There was a large irregular perforation on the inferior portion of the membrana tympani. No mastoid tenderness or edema. October 23, examination showed the lungs to be clear, no rales. The discharge from the ear was increased both in amount and consistency and was pulsating. There was thickening of the mastoid periosteum. X-Ray examination showed: "right mastoiditis, all cells obscured." Culture from the ear showed both streptococcus and staphylococcus. October 24, simple mastoid operation was performed revealing the usual type of influenzal mastoid. Culture taken at operation showed streptococcus. Uneventful convalescence.

Case 5. The patient was admitted to the hospital October 9, 1918, Age 23. Previous occupation, coal miner. Family history negative. Past history, negative except for severe contusion of left occipital

region from a fall fourteen years ago following which he was unconscious for an hour. Complains of weakness, malaise, and cough. Diagnosis: influenza, lobular pneumonia. October 12, complained of pain in right ear. Examination showed the drum to be red and bulging with land-marks obliterated. Incised with resulting purulent discharge. October 15, complained of pain in left ear. Examination showed drum to be red and bulging. Incision evacuated pus. His pulmonary condition greatly improved and he was transferred to the ear department. October 21, otoscopic examination: right ear profuse, purulent discharge, the superior canal was slightly flattened; membrana tympani red and swollen; good drainage; no mastoid tenderness or edema. Left ear: profuse muco-purulent discharge membrana tympani red and swollen, slight periosteal thickening over the mastoid. Irrigations ordered for both ears. November 1, drainage from the right ear was insufficient and the drum was again incised. Left ear showed no change. X-Ray showed slight obscuring of both mastoids. November 2, left simple mastoid operation, disclosing a large diploic mastoid containing granulations and free pus. Mastoid was exenterated without exposing the sinus or dura. Temperature had been normal since transfer to the ear department. November 3, temperature rose to 102.8; considerable discharge from right ear, the superior canal wall showed marked flattening and there was some thickening of the mastoid periosteum. November 4, right simple mastoid operation disclosing large diploic mastoid containing pus and granulations. There was a small perforation off the tip. Small area of dura exposed above antrum. November 5, he was in good condition, both wounds clean, very little discharge from middle ear. There was some tenderness and swelling of the neck on the right side. That night his temperature was 100. The next day medical examination showed "lungs not completely cleared up, still a few signs in the right base. Indeterminate rales and increased voice sounds. Temperature 102, no chills, some headache, especially on right side, cerabration slow. Voice somewhat thickened; neck was tender and swollen especially on right side. No retraction and stiffness seemed to be accounted for by cellulitis. No spontaneous myastagmus; knee jerks present; no Kernig or ankle clonus. Plantar reflex normal. Slight discharge from right middle ear; left ear dry; both wounds clean. Fundi normal. The temperature that afternoon was 104. Dressing taken down and packing removed from wounds, both of which were clean. Hearing preserved in both ears; medical examination showed "voice sound decreased, axilla and posteriorly, probable fluid or massive pneumonia."

Aspirated and no fluid obtained. White count 23,600; differential; polymorphonuclears 91, small mononuclear 9. November 7: blood culture negative after forty-eight hours. Medical examination showed marked activity in his pulmonary condition. Both mastoid wounds clean and did not seem to be the cause of temperature. Temperature that afternoon 104.6, some vomiting, not projectile in character. Fundi negative. November 8: neurological examination by Major Coleman, negative except for slight easily exhausted ankle clonus on the right. November 9, epistaxis similar to that commonly seen in influenza. November 10, patient considerably worse; cloudy sensorium; neck stiff; positive Kernig and ankle clonus. Examination of lungs showed "extensive pulmonary involvement, massive consolidation in left lower lobe." Lumbar puncture; fluid not under increased pressure but thickened and cloudy. Smear showed streptococci. Fundi negative. Condition precluded any thought of operative interference. Failed rapidly and died November 11, 1918.

Necropsy showed a marked pasty lepto-meningitis, undoubtedly extending from erosion of tagmen antri on the right. There was an obliteration of the left lateral sinus, evidently of some duration and probably dating back to the old injury fourteen years ago.

Lungs showed extensive lobular pneumonia.

Here our intra-cranial situation was overshadowed by the marked picture of pulmonary involvement. We were unable to make a definite diagnosis of meningitis until the day before he died.

CONCLUSIONS.

1. In our experience during the recent epidemic, otitis media was an infrequent complication of influenza and occurred more frequently in cases developing pneumonia.

2. This type of otitis media shows first a hyperemia and then an acute hyperplasia or hyperplastic edema of the mucous membrane of the middle ear.

3. This gives a certain definite and characteristic picture including a drooping of the canal wall. This last sign is not indicative of a suppurative mastoiditis.

4. The operative signs indicative of suppurative mastoiditis are: increased purulent discharge and thickened mastoid periosteum, Mastoid tenderness and edema, if present, together with these signs, are added arguments.