CASE 2.—J. H. M., aged 4½, of poor physique, anemic, had a family history negative for syphilis and tuberculosis. The patient was first seen May 6, 1914, when he came to secure relief for great pain over the side of the head, which he had had for several days. His temperature was 99. There was no deafness; the drum was normal; when incised, no secretion was found. Pain was the only symptom, except edema over the mastoid, which had been marked for two or three days. Operation, done that afternoon, revealed a subperiosteal abscess, extensive disease of the mastoid cells and frank pus throughout the bone. The wound was healed June 4, again less than a month after operation. At no time was the drum inflamed, nor was there ever any discharge from the middle ear.

The following features are common to all the true cases of idiopathic mastoiditis, and are not consistently present in other forms of the disease: (1) rapidity of convalescence; (2) occurrence of subperiosteal abscess, or exaggerated edema, generally the former; (3) freedom from absorption results, such as malaise, fever (all had less than 99.8), sepsis. This is especially remarkable, as the pus was resting in the soft parts, and not confined exclusively in bony walls.

CONCLUSIONS

It seems, to recapitulate, that the analogies of osteomyelitis and metastatic processes justify the conclusion of hematogenous origin in some cases of idiopathic mastoiditis, and that the passage of pyogenic organisms through one tissue, where they cause no ill effects, into another contiguous structure, where they do cause disease, similarly establishes the claim of entity in opposition to those who cannot grasp the tubotympanic origin of infection; so much for the theoretic considerations of etiology and entity. Again, the stubborn clinical facts I have endeavored to set forth convincingly, as there can be no other reasonable explanation of my two cases, which were peculiarly susceptible of close watch and study of the prodromal signs. In fact, the cases cited of other authors cannot be denied, though it has not been feasible to give all the histories in detail. The accompanying table shows that out of the reports of some 36 observers 47 cases were reported, but only 24 could meet the requirements of my definition, while 2 were doubtful and 21 certainly spurious. My own two cases would make the total of reported cases 26.

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INDICATIONS FOR MASTOID OPERATIONS AS SHOWN IN ONE HUNDRED CASES*

CULLEN F. WELTY, M.D.

SAN FRANCISCO

The indications on which I rely for operative interference have been based on surgical principles, coupled with laboratory findings.

Bacteriology, a knowledge of the original infection, is undoubtedly of value, but the broad experience of clinical observation demonstrates that dogmatic rules for interpreting the meaning of one or the other bacteriologic factor are bad. There is no attempt to belittle bacteriology, but the best conclusions are drawn

with a full knowledge not only of their value, but also of their limitations.

The types of infections are as follows: Streptococci, 50 per cent.; *Staphylococcus aureus* or *albus*, 14 per cent.; pneumococcus, 14 per cent.; *Streptococcus mucosus*, 10 per cent., and the remaining 12 per cent. divided between the proteus group, colon group, diphtheritic bacillus, anaerobic organisms and unidentified bacteria. Twenty per cent. show mixed infections.

Some infections are more prone to produce complications than others. In order of frequency they are the streptococcus, *Streptococcus mucosus* and staphylococcus. The pneumococci very rarely produce complications.

The laboratory findings are of secondary importance in my estimation. Many surgeons of today will depend on one thing or another to turn up, and if present, an operation is imperative.

I was called one night recently to do a mastoid operation. The leukocyte count was 22,000, with an acute otitis of twenty-four hours' duration. The more reliable indications for operative interference were not present, and the following day, everything had subsided.

With an increasing leukocyte count and other symptoms going hand in hand, one is, of course, warranted in going ahead. There are other conditions, however, with associated symptoms; symptoms that will always be present.

Professor Politzer used to say, "Never operate on a single indication; you must have two or more." Many times this has been the deciding factor not to operate.

My ordinary procedure for a mastoiditis of a few days' duration, is the following: free incision of the drum membrane; hot, wet 1:3,000 mercuric chlorid pack, moistened and kept hot for twenty-four hours. The patient must be at least partially relieved of the symptoms (lowered temperature, less pain over, or about, the mastoid region, and above all, less bulging of the posterior, superior wall).

This picture, with an increasing leukocyte count, would not disturb me in the least, but would call for close observation.

If at any time, during the course of this acute mastoiditis, there is an increase in pain, temperature, or tenderness, with an increase in the size of the bulging of the posterior, superior wall and a diminution in the leukocyte count, operation is the safest and most logical procedure.

I am not at all in sympathy with a second incision of the drum membrane. It must be borne in mind that it is not the partially healed incision with retention that accounts for the increase of the symptoms spoken of before, but it is the increased tension put on the individual cells of the mastoid that are overfilled with pus which, from mechanical hindrance, produces the pain, and the increased infection produces the temperature. At times, the temperature will not be increased.

We have, however, a symptom that is more constant and reliable than all others and that is the bulging of the posterior, superior wall, and when this is present, coupled with one or more of the other symptoms, it is proof positive that an operation is indicated, regardless of the laboratory findings.

There are many who do not concur in this and I know full well that in some of the cases the patients

* Read before the Section on Laryngology, Otology and Rhinology at the Sixty-Sixth Annual Session of the American Medical Association, San Francisco, June, 1915.

will recover without operative interference. At the same time, some will pass beyond control and I ask the question, is it not pitiful to have a child besieging you to do something for him in the midst of an active meningitis? If one has been so unfortunate as to have had such a case, I am sure the picture is very vivid. I mean that it is much safer to operate when there is any question of doubt. This delay of twenty-four hours has cost many lives; not only in ear surgery, but in all kinds of acute conditions, such as appendicitis, etc.

There is an operative indication that is overlooked by many and I wish to lay particular stress on it, and that is a pulsating otitis of three weeks' duration. Such a case will always show bulging of the posterior, superior wall, and may, or may not include pain over the mastoid region. Also, pain on pressure over the mastoid region may not be present.

There is still another very insidious infection, that from the *Streptococcus mucosus*. As a rule, this does not produce a sharp, acute infection. The patients have little or no elevation of temperature; a small amount of pain, or no pain—it seems as though the patient might recover within a few days. But it appears the same at the expiration of the few days. They are the forerunners of the more serious complications and must be watched very carefully.

There is another indication for operative interference that is very important, and as I was the first to speak of it some six years ago, I wish again to emphasize it, and that is, that an acute discharge from the ear should not be allowed to continue for more than six or eight weeks at the utmost, because the hearing will more than likely be impaired. Take it for oneself, or one's children, if there is any danger of a permanent impairment of hearing, would it not be better to operate and secure a good ear?

If one stops to reason, in a given case in which one has done an acute mastoid operation, as to why the hearing was so much impaired, it will undoubtedly be found to have resulted because the operation was delayed under the guise of conservative surgery.

Again, if such cases were attended to, we would not have the chronic, suppurative otitis to deal with. This will come some day; but I am convinced that in this community, the chronic cases are accumulating more rapidly than they are being cured by operation.

My assertions may be very dogmatic, but they are meant to be, because they are based on one hundred or more operations, without mortality.

It is in such a series of cases that we can form some conclusions; first, in regard to indications for operation, outcome of the operated cases and many things that are most important.

UNUSUAL COMPLICATIONS

In three cases of multiple furunculosis, that were operated for acute mastoiditis, I exhausted all the means at my command, with the exception of the Roentgen ray, to make a correct diagnosis.

The last patient had a *Streptococcus mucosus* infection, as well, and was under observation for some six or eight weeks. I have seen the same mistake made in Vienna, Berlin and Halle.

Had I used the Roentgen ray in the diagnosis of these cases, the mistake would not have been made. But I am not in sympathy with this particular form of diagnosis for the following reasons: as soon as the mastoid cells contain pus they will show it by

comparison, and many such cases will terminate in recovery. In the cases of furunculosis, the finding would have been negative.

Many ear surgeons will say that the kind of a mastoid one has to deal with, the position of the sinus and the presence or absence of zygomatic cells can be seen from the picture. These latter conditions are of no particular importance to a careful surgeon and should not be considered so.

Ingersoll of Cleveland thinks that in due course of time we shall be able to locate brain abscess by the Roentgen ray and it would aid materially in many a difficult diagnosis.

One patient with hemorrhagic mastoiditis, with facial paralysis from no discoverable reason, made a good recovery. The facial paralysis remained. The patient died of sarcoma of the brain, some months later.

Facial paralysis is unusually rare in acute mastoiditis. I have observed three cases. In one case, it made its appearance the first day of the purulent otitis.

In one case of facial paralysis, induced by operative procedure, the patient had been operated on before by a general surgeon and had a large, pneumatic mastoid with cells extending to the stylomastoid foramen. It was at this place that the nerve was injured with a burr. This is the only case of facial paralysis that I have had in my entire work in mastoid surgery.

One patient, less than a year old, with a fistula of the outer canthus of the eye and purulent discharge from the ear, had facial paralysis and had been operated on three times by others. The antrum had been opened. By opening the antrum and establishing free connection with the tympanic cavity, recovery took place in a short time.

Of repeated acute mastoid operations and radicals, there were five cases.

CASE 1.—A boy, aged 10, had typhoid fever with double pneumonia. An acute mastoid operation was imperative. As time was an important factor, the operation was not so complete as it should have been. In this case, reoperated to the best of my ability, healing would not occur. A radical mastoid was later done, and was followed by a serous labyrinthitis, but the patient made a good recovery.

CASE 2.—S. C., a boy, aged 3, had an acute mastoiditis of a few days duration with early operation. Three months afterward he began to complain of pain on this side of the head. The discharge of pus continued. The acute operation was again done, but the patient did not recover, and had the radical operation, some six months afterward. He made a slow recovery, as regards the discharge. He hears a whisper at 25 feet.

CASE 3.—J. S., a boy, aged 7, had acute otitis and mastoiditis of a few days duration. Operation was early. The patient made a good recovery in the usual course of time. One year after the acute otitis, there was a bulging of the old scar. This subsided for a short time, when it bulged again and was exquisitely sensitive. At operation, I found a cholesteatomatous mass, and completed the work by a radical mastoid. Good hearing has resulted; 25 feet for a whisper.

CASE 4.—Evalyn, aged 2, had double acute otitis and mastoiditis, following scarlet fever. Operation was reasonably early. After treatment for three months, both ears continued to discharge, so both were reoperated. Convalescence was protracted. Her hearing is apparently good. There are no marks on the drum membrane of either ear.

To sum up, there were five reoperations. Of these, three patients had to have the radical operation before they were entirely well.

Nine cases were of fracture of the base of the skull, followed by acute otitis. Of these, three patients had to have the acute mastoid operation; one had a sinus thrombosis.

In this unusual complication, operate at the earliest possible moment, as there is already a direct communication to the skull cavity, with possible injury of the dura mater.

In a chronic, suppurative otitis media, operate at once and without symptoms for operation, for obvious reasons.

In three cases of pneumonia recovery was complicated.

CASE 5.—A boy, aged 12, had typhoid. Reoperation was necessary and finally a radical mastoid operation was done.

CASE 6.—A boy, aged 12, had an ether pneumonia.

CASE 7.—A girl, under 1 year, had double pneumonia, resulting in death. This child had a pint of pus under the periosteum about the ear. The circulation was so disturbed by the neglected mastoid, that the ear was about to drop from the head at the expiration of four or five days, when the child died. This is the only death and the operation had nothing to do with it.

Two cases of erysipelas occurred; they were of no particular interest, except that one was under treatment for some two months before the discharge entirely ceased.

For some three or four years, I have not had to reoperate. I have improved my technic, the improvement lying in a most careful search for every individual cell that will in the least resist a fine, hooked probe. The cavity must be smooth everywhere. Hard bone must be encountered, or the dura, or sinus uncovered, before my operation is complete. This has occurred more than half a dozen times in consultation, when there was only slight pain remaining in the mastoid and a slight elevation of temperature. I cannot urge it too strongly.

I have operated in twelve cases of chronic, suppurative otitis media, by the so-called acute operation. They were all clinical cases, and in children from 7 to 14 years of age. All the patients but one are well and have good hearing. Some of the perforations in the drum membrane healed, others did not.

The only contraindications in the cases have been vertigo, cholesteatoma and destruction of the bony, tympanic wall.

In four of the cases an acute exacerbation of the chronic suppuration occurred, accompanied by the usual symptoms.

The reason for doing this is the following: Schwartz was the first to do this acute operation and remove the cancellous tissue until hard bone was encountered. Many of the patients recovered, some did not. Then Stacke tried to improve this by operation from within the meatus, enlarging from this opening, and Zaufel combined the two, producing the complete, radical mastoid operation.

Schwartz produced cures in the chronic, suppurative otitis media cases by such a procedure, and Jansen did the same operation some fifteen years ago, with a slight modification of cutting down the posterior wall to the annulus tympanicus; this procedure produced cures as well, but they were not entirely satisfactory.

Heath attempted further to modify this procedure by making an incision through the cartilaginous part of the meatus, tamponing this within the mastoid

cavity and closing the posterior incision. This latter procedure, to my mind, is not so good as either of the others.

I concluded that I could do a great deal more by the simple Schwartz or the acute mastoid operation, as it is known today. In such cases, the opening into the tympanic cavity must be kept patent, until all discharge has ceased from the ear. I also irrigate with an intratympanic cannula through the perforation, as well as by the antral route. The patients are dressed daily. Irrigations of mercuric chlorid, 1:3,000, are used every second day, and as soon as the discharge from the ear stops the posterior wound is allowed to heal as rapidly as possible. Should a drop of pus come from the depths of the posterior wound, the fistula is irrigated every other day, and dressed daily, until the wound is entirely healed.

My one patient who did not recover has a partial destruction of the tympanic wall; all of these cases are slow in recovery; some of them require two months.

I am beginning to be of the opinion that every case of chronic suppurative otitis media does not need a radical mastoid operation, and that in doing operative work, it should be left to the judgment of the surgeon as to just what operative procedure is the most desirable. That is, the pathology will determine the kind of operation to be done.

BRAIN COMPLICATIONS

Of purulent meningitis, there were no cases.

Of serous meningitis, there were three cases of the lesser grades but nothing of interest to report.

Of brain abscess, there was one case; one caused by gunshot wound by way of the ear through the tegmen tympani. The abscess was evacuated; the bullet removed. The patient made a complete recovery.

Of extradural abscess, there were sixteen cases. Most of these abscesses were small, with but one exception, this being so large that I will go somewhat into detail.

CASE 8.—A man, aged 45, had acute otitis of eight weeks' duration, with more or less pain most of the time, but not enough to demand serious consideration. There was indefinite pain on the whole side of the head; painful to percussion or deep pressure. The meatus was small; there was so much bulging of the posterior superior wall that the membrane could not be seen at all. The organism was the *Streptococcus mucosus*.

Pus was encountered as soon as the mastoid was opened, as nearly as could be judged, about 16 ounces. After this escaped and in taking away more bone, a granulating mass presented, filling the entire mastoid cavity.

For some time, I did not know with what I had to deal, as the mass was soft but not of the consistency of granulation tissue, with a bony foundation. At this place, I enlarged my incision, going upwards well into healthy bone, retracing my steps until I was again in the mastoid cavity, and from here uncovered granulation tissue until I encountered healthy dura.

This procedure was carried out around the entire mastoid cavity until healthy dura was uncovered. All the carious bone in front was removed.

It was found that this protruding mass was none other than the dura mater, with large granulations, in some places necrotic. Further investigation showed entire destruction of the bone of the middle fossa, as well as the sinus, extending to the petrous portion

of the temporal bone. In other words, the dura mater of this entire area, covered with granulations (as spoken of before), filled the large, pneumatic mastoid. After a few days of anxiety, the patient was out of danger.

Of sinus thrombosis, there were six cases.

CASE 9.—A man, aged 65, had acute otitis of three months duration, with a great deal of pain most of the time. The meatus was so swollen that nothing could be seen. There was no history of chills or fever. The large, pneumatic mastoid was filled with granulation tissue and pus. On further curetting away granulations, another pus cavity was encountered, which on careful examination proved to be within the sinus itself. The proximal, or distal clots were not disturbed, for various reasons. The patient made a good recovery. The infecting organism was the pneumococcus.

CASE 10.—A man, aged 25, had an acute otitis of one month's duration and complained of vertigo. There was some pain on pressure. The patient looked septic. There was no history of chills or fever. A large, pneumatic mastoid was found with granulations and pus. A sinus was accidentally uncovered, which showed a spot, the size of a 5-cent piece, that was discolored. The sinus was incised; a clot an inch long was taken from the sinus. It seemed to be regular in outline at all places. No bleeding occurred. The sinus was packed with iodoform gauze. The patient made an uneventful recovery.

CASE 11.—A man, aged 35, fractured the base of the skull three weeks ago; this was followed by a discharge from his ear that soon became purulent. This patient had a temperature of 103 when examined, but said he never had a chill. There was tenderness over this side of the head and especially of the mastoid. There was bulging of the posterior, superior wall. Operation the following day disclosed a large, pneumatic mastoid with pus and granulation tissue. The fracture could be traced across the cavity by a bloodclot. The sinus was not uncovered. The following day, the characteristic symptoms of sinus thrombosis developed, with a thrombus to the knee joint, requiring it to be opened; there was a great quantity of pus. Jugular ligation was done and the clot removed. No apparent route of communication with the sinus was observed. The infective organism was the *Streptococcus mucosus*. Convalescence was slow.

CASE 12.—An incomplete operation for acute mastoiditis, with occurrence of sinus thrombosis of probably ten days' duration. The jugular was ligated and a clot, as long as the little finger, removed. Thrombus occurred to the hip joint; this infection subsided in the course of three weeks. Convalescence was slow.

CASE 13.—A girl, aged 5, had had an acute mastoid operation eight days before, with injury of the sinus. For eight days the patient had the characteristic temperature curve. No chills were noted. The organism was the *Streptococcus mucosus*. The jugular was ligated and a clot, half as long as the little finger, was removed. There was a slow convalescence, in which a choked disk of 5 diopters developed in both eyes; also a squint of the eye on the same side. No other symptoms were present. In the course of six or eight weeks, the eyes were perfectly normal.

CASE 14.—A man, aged 35, had an acute otitis of six weeks' duration. Chills and fever were present for several days. The temperature at the time of examination was 103. The mastoid operation was done the following day. The jugular was ligated and the clot removed. Convalescence was speedy.

These cases of sinus thrombosis are not reported in full, because they have been reported in full before, with the exception of Cases 11 and 12, which will be taken up at some future time.

Of labyrinthitis, there was one case. A woman, aged 20, a nurse at the city and county hospital, had acute otitis of both ears, of ten days' duration. There was great pain, tenderness, vertigo and vomiting, with

nystagmus to both sides. The temperature was 103. The meatus was so swollen that the drum membrane could not be seen.

Immediate operation was done on both ears. A large, pneumatic mastoid was disclosed with pus and granulation tissue. Convalescence was slow, the temperature falling and nystagmus diminishing from day to day.

My only reason for saying this patient had a purulent labyrinthitis on one side is that later in her convalescence I discovered that she had no hearing in one ear. The other ear was impaired as well. The drum membrane does not show signs of adhesive inflammation.

The full history of this case will be found, with a series of others, in the *California State Journal of Medicine*.¹

The hearing has been universally good. In the great majority of cases, they never realize any difference.

The only cases that show impaired hearing are the ones that have been accompanied by more or less serious complications, or in which the mastoid operation has been so delayed that granulations have developed within the middle ear, with the formation of adhesive processes. The reason the complications were spoken of more or less in detail was to show that in the first place, in nearly all, the primary operation has been delayed. The occasional exception goes to prove the rule.

The mortality, as given by various authors, ranges from 8 to 12 per cent.

In my 106 cases, there was not a single death. Besides, these cases were taken from all walks of life, many of them neglected cases.

In conclusion, my convictions are firmer than ever in regard to the indications for operative interference; because, I have had no mortality and because the result as to hearing has been universally good. The improvement in my own technic has resulted in no necessity for reoperation in a long time.

ABSTRACT OF DISCUSSION

ON PAPERS OF DRS. KYLE, DABNEY AND WELTY

DR. J. HOLINGER, Chicago: The indications for mastoid operation were laid down long ago. I would not undertake, after hearing these papers and reading a great many others, to suggest material changes. We speak here, of course, of uncomplicated mastoid cases without signs of perforation of pus into the deep parts of the neck, or involvement of labyrinth, meninges or the lateral sinus. In the first place, time is an important factor. Schwartze gives ten days as the limit in well-developed mastoid symptoms. It is poor policy to hustle the patient to the operating table at the first signs of mastoid swelling and tenderness. Even in sinus thrombosis we must not forget that we can let several attacks of fever and chills pass in order to ascertain the diagnosis before we come anywhere near a dangerous state. A colleague treated such a patient in whom he had misinterpreted the symptoms a whole winter, with three or four attacks of chills and high fever a week. The diagnosis was verified at the operation. Of course, this is an exceptional occurrence, but it shows that unless the diagnosis is absolutely certain we do not run any risks in waiting. We have to take a different standpoint than the general surgeons. It would be easy for me to mention cases in which they did harm with hasty operations. Nearly every one of our better known

1. Welty, Cullen F.: *California State Jour. Med.*, November, 1913, p. 464.

surgeons in Chicago operates on the ears, and if we want to justify our position as specialists on these organs we have to do more careful and better work than they do. To do the best for our patients and in the easiest way must be our guide.

Much has been said about mastoiditis in general, but comparatively little about the difference in the indications for operation in acute middle ear suppurations and in chronic suppurations. It makes all the difference in the world whether or not the patient had a chronic suppuration before he had his mastoiditis. The condition in chronic suppuration is much more serious if a mastoiditis develops. Dr. Kyle says the time to operate is as soon as the diagnosis is established. This is true in many chronic suppurations, but I do not think I would approve that statement in acute inflammations of the middle ear. If Dr. Kyle has made a great many postmortems he will agree with me that he finds pus and inflammatory conditions in the mastoid in a number of cases without any symptoms during the lifetime, and therefore without any need of an operation. Professor Betzold long ago showed that pus in the mastoid can disappear without leaving any trace whatsoever. That cell obliteration in the mastoid is a regular consequence of mastoid disease is at least very questionable. There is a possibility in old chronic suppurations, but no regularity. Allow me to illustrate a few of the points I brought forth by mentioning some cases: First, a case that gave me a great deal of difficulty, where I had to take a stand against four colleagues. There were many symptoms of mastoiditis, like great pain and swelling, but no signs in the middle ear. I insisted on waiting. Four or five days later the case cleared up as a case of herpes zoster. The herpes pustules appeared around the ear.

The Roentgen ray is all right if you can make use of it. Often it is too cumbersome.

DR. FREDERICK E. FRANCHERE, Sioux City, Iowa: What reason is there for handing down a decision before all the available evidence is in? It is my practice to have in every case a bacteriologic examination made of the pus from a discharging ear, also a blood count, and when possible a Roentgen-ray examination of the mastoid. Streptococcus infection seems to be the most virulent, but I have seen severe cases in which the pneumococcus was the infecting agent. My experience with the Roentgen ray to diagnose mastoiditis has not led me to put much reliance on it. As far as the leukocytosis is concerned, the blood count is of no value, as it may result from sources independent of the aural affection. However, a marked increase of the polynuclear leukocytes is of unquestioned value in establishing the diagnosis of pus in bone. We have been taught that the occurrence of mastoiditis as a complication of suppuration of the middle ear depends on two things—the severity of the infection and the powers of resistance of the patient—but I am led to believe that there is another factor influencing the termination of middle ear suppuration, namely, the size of the mastoid cells. Siebenmann shows that large cells have not the resistance to infection shown by small cells, owing to their having relatively less surface than the small cells. I have no confidence in any treatment of mastoid involvement of any degree, except surgical interference. If these cases do terminate in resolution it is because of mild infection and high powers of resistance. True, some cases seem to recover, but do we know they are well? Appendicitis used to be treated medically, but it would be interesting, if not amusing, to have some one get up before the surgical section of this society and even suggest the medical treatment of appendicitis. A man's hearing is worth something, and I firmly believe that the earlier the mastoid operation is performed, once the diagnosis of mastoiditis is established, the more conservative the operator is. If there is any reason for waiting, I have not found it. Furthermore, as in appendicitis, one never can tell what one will find within the mastoid bone until one comes to operate on it.

DR. GEORGE F. COTT, Buffalo: Operations for acute mastoiditis are largely left to the otologist. There are two

classes—those operated on by the otologist, and those by the general surgeon. In the last year I have treated three patients with mastoid infection who recovered without operation. One patient was suffering eight days with acute middle ear pain and discharge. One of the eminent men of New York City saw the patient during the state meeting at Buffalo, and advised immediate operation. I saw her the next day, and as I knew the family was neurotic I said wait. She had extreme pain, sagging of the posterior walls, pulsating middle ear. She had to be kept under morphin two nights; temperature, 102.5. I determined to wait, and finally in less than two weeks she was able to walk out without operation. There were three other patients who recovered with operation. But here is a case the other way. An old lady had an acute suppuration of the middle ear for eight days. I saw her five different times in five days. She had extreme pain over the mastoid and had to be kept under morphin. On the fifth day I recommended operation, but her son being a physician, thought they had better change physicians, and I thought afterward, it was wise too, for she recovered without operation. There was a case in which any of you would operate. I do not know what Dr. Kyle meant by the mastoid operation, whether going into the mastoid cells or taking in the antrum. When that discharge is lessened, although you have other symptoms of mastoid disease, clean it out and let the antrum alone and they will recover every time. These patients usually recover within two or three days.

DR. HILL HASTINGS, Los Angeles: In talking with a good many of my confreres in southern California, I find there are certainly fewer mastoid cases now than ten years ago. I find that is the opinion of men from the East, so we cannot ascribe it to our good climate. It may be due to the better condition of nose and throat in children. They are growing up now without tonsils and adenoids, they have fewer colds and infections of the ear. Nevertheless it is due also to the fact that we do not operate as quickly as we used to. Also the general practitioner is realizing that an earache is a serious symptom, indicating incision of the drum membrane. Take an acute otitis media with mastoid involvement—and practically every severe otitis media has more or less mastoiditis—what danger is there in the condition? It is compared frequently to appendicitis. I do not think that is a fair comparison. We know these acute cases do not develop into chronic cases nearly so much as we used to believe. Chronic cases come from measles, scarlet fever and tuberculosis, rather than as a result of the usual acute otitis media resulting from an infection of the nose and throat. Then again, what danger is there that acute mastoiditis will carry the patient off before you have time to consider operative indications. They might die of meningitis, sinus thrombosis, or brain abscess. A majority of brain abscess cases and sinus thrombosis cases come from chronic otitis media cases and not from acute cases. I doubt very much whether we save the so-called "fulminating" cases from meningitis by operation. If it is an acute mastoiditis with developing meningitis, I doubt whether a mastoid operation does very much good. I did a mastoid operation on the fifth or sixth day, and the patient died of meningitis some two or three days afterward. I do not think my operation had any bearing on the case at all either for or against, but it would be hard for the people to understand that. We are bound to have some mortality. You cannot prevent this by saying "operate in every case early."

DR. EDWARD C. SEWALL, San Francisco: I would like to call attention to a statement of Dr. Welty with which I am not entirely in accord—a diagnostic matter. I think he made the statement that any discharge, pulsating in the fundus of the ear, after three weeks' time produced a prolapsus of the upper posterior wall. I simply wish to register my opinion contrary to that statement.

DR. H. B. GRAHAM, San Francisco: I want to thank Doctor Dabney for the opportunity he has given me to refute his statement that there is a primary mastoiditis. He says there is possible doubt on the part of some people, and I am one who is thoroughly convinced there is no such thing. That we

can get a hematogenous mastoiditis I think is practically impossible. Practically, I say. Theoretically, we can get it there as well as in any other part of the body, but I do not think we do get it; I think these cases are delayed inflammatory disturbances that have not been detected. I had occasion to look up the literature and hunt for a case of primary mastoiditis. In all the case reports you would find that a primary lesion had taken place. A large number of mastoid cases are delayed lesions after middle ear infection. This may occur a year and a half after the primary lesion in the middle ear. The *Streptococcus mucosus* may remain dormant for many months and produce symptoms that are very obscure and overlooked by the practitioner. They lead on with definite history to mastoiditis or brain complications and are operated on as primary mastoid cases.

DR. GEORGE W. MACKENZIE, Philadelphia: I would sooner trust my life in the hands of the good diagnostic surgeon than in the hands of the good operative surgeon. The discussion has narrowed itself down to, first, when should we operate in mastoiditis when the diagnosis is established, and second, the question of the presence or absence of mastoiditis. Concerning the last subject we may safely concede a mastoiditis to be present in the so-called typical cases, and probably the majority would operate. There is another class of cases which are atypical. In these the outer table of bone is thicker than the average; also those cases are due to infections from the capsulated cocci, where the progress of the disease is rather insidious for a time and then bursts suddenly, so to speak, as it reaches the mastoid. There are other atypical cases in which there is practically no pain at all and little swelling over the upper portion of the canal. The only symptoms manifested may be reduction of hearing, vestibular irritation, and headache, due to the infection working inward rather than outward. We may find atypical cases with the membrane intact. The cases in which the membrane is intact are apparently increasing in proportion to what we originally believed them to be. Where the membrane is intact and mastoiditis is present, there are certain typical signs. The membrane will not glisten like the normal, but will show a dull appearance similar to the cornea in cases of glaucoma. The hammer handle will appear narrow, mentioned by Alexander as characteristic of serous inflammation of the middle ear. The posterior portion of the hammer handle is obscured by the secretion. These are atypical cases, and my experience has been that these atypical cases reach tremendous magnitude before we are aware of it unless we are on the lookout for them. It is up to Doctor Kyle and others who are developing the Roentgen-ray method to push it, because if we cannot make a diagnosis in a certain class of cases in any other way, we must accept it. Concerning the time to operate, I believe as soon as we are sure that a mastoiditis is present it is time to operate, granting that there are cases that recover without operation, I doubt if a conservationist can show 100 per cent. of cures by conservatism as compared with Doctor Welty's 100 per cent. cured by surgery.

DR. JAMES A. PATTEE, Pueblo, Colo.: The discussion has trended into the question when to operate. Inasmuch as the laws guiding us in the presence of a given group of indications have been well established for a number of years, only the physician in charge, who observes the case from day to day, can decide the time of operation. In the discussion some have favored a prompt, radical course, while others advocate conservatism. For my part I am convinced that I operated too frequently ten years ago. With increased observations and experience I reduced the frequency of operations without impairing results. Whether an operator should be conservative or radical depends on so many conditions that none but the surgeon can determine. For instance, one might operate on the tenth day for a complex of symptoms and be regarded radical for his procedure, though no one would consider it so if he operated for about the same condition on the twenty-fifth day. Early in an attack a certain allowance should be made for pain, fever, flow, etc., although these symptoms should be rated at their fullest value in the third or fourth week.

DR. NORVAL H. PIERCE, Chicago: As regards the time of operating a sigmoid sinus thrombosis, there are cases that are obvious; the field is clear; there is no reason for believing that there is anything else to cause the symptoms of sepsis, and I would operate as quickly as anyone else under these circumstances. There are other cases, however, the obscure cases, which may prove to be a great bother even to the most experienced and most skillful, and these are the cases in which we should be conservative and not plunge suddenly in and operate. We should never operate on anybody unless we have a good reason for operating. If we depart from that law we will soon degenerate into quackery. The previous speaker, to my mind, stated the gist of the whole matter of operation in acute mastoiditis. If we are going to operate on every case of mastoiditis we will operate on every case of otitis media. In every case of acute otitis media there is inflammation of the mucous periosteum lining the pneumatic space within the mastoid. We know from experience what occurs in acute otitis media with infection of the mastoid. In the vast majority of cases it takes just about three or four weeks for decalcification to occur in the bone that separates one pneumatic space from another, and when that decalcification begins then the probability is all in favor of the case becoming chronic or taking a long time to recover. The chances are that this decalcification is general within the mastoid process, and then is the time to operate in practically all these cases. Therefore, the indications for mastoid operation are an inflammation, a purulent discharge coming for three weeks from the external auditory canal, whether or not there is pain or swelling over the mastoid. After the third week, we may know there is destruction of bone by softening within the mastoid. In an experience with some thousands of cases at the Illinois Eye and Ear Infirmary and elsewhere in Chicago, I can recall only one case that I operated on in the first week, and that was a case of primary thrombosis of the jugular bulb. Of course in the presence of complications one can operate at any time; but I do not believe one should often operate before the beginning of the third week.

DR. PETER A. JORDON, San José, Calif.: Forty per cent. of my small number of mastoid patients, after proper diagnosis and careful treatment, get well without operation.

DR. WENDELL C. PHILLIPS, New York: A word might be in order arising from my experience in my services at the Manhattan Eye, Ear and Throat Hospital and the Post Graduate Hospital. I have not looked up the statistics recently, but it is my impression that under the modern method of treatment of acute purulent otitis media with mastoid symptoms, the majority of cases we consider serious enough to place in a hospital bed for treatment and care get well without operation.

DR. JOHN J. KYLE, Los Angeles: I think I may claim that my knowledge of the subject of mastoid inflammation and the indications for operation is based on long experience. I am not making the mistakes today that I made ten or fifteen years ago. If I had a mastoiditis and could have the benefit of the knowledge and experience of a man like Dr. Hastings and he should tell me my case would go to recovery without operation, or should tell me the indications were for operation, I would immediately accept his conclusions. Now I am of the firm opinion that if you have a pocket of pus and the indications are such that you can operate and remove the pus without endangering the life of your patient, it is your duty to do so. We know that pus will be absorbed. We know that many cases of mastoiditis go on to spontaneous recovery, and as Dr. Hastings has mentioned, we are operating in very few cases. It would be absurd to say that every case of acute otitis media recovers without operation, but I think that a great majority, 75 per cent., do. If you have a case that shows well marked symptoms of mastoiditis, and the indications are for operation, an operation should be performed at once. The significance and the future effect of an otosclerosis is something that you and I ought to know. Many times I have had cases go to spontaneous recovery, i. e., drums completely healed, and after a month's time have the patient develop another attack of acute otitis media with mastoid abscess. The structural changes found in the mas-

toid at operation must have taken place at the onset of the inflammation. I am a little surprised that the Roentgen ray has been so lightly touched on by the members who have taken part in the discussion, as it is a valuable aid to diagnosis, and it seems to me that as men progressive in our specialty, we ought to take advantage of these opportunities. We have all had many cases of mastoid abscess in which it was impossible to establish a diagnosis without the Roentgen ray. I know I have. That is, in my own mind I knew I had a mastoiditis, but it was impossible for me to convince the consultant, or oftentimes the patient or parents of the patient, that such a condition existed, and the roentgenogram would cinch the diagnosis.

DR. VIRGINIUS DABNEY, Washington, D. C.: Most of our troubles are largely matters of definition, or of opinion. I understood Dr. Graham to say that the *Streptococcus mucosus* can linger dormant for as long as eight months in the tympanum and then set up a disturbance in the mastoid; perhaps; but this would not disprove my theory at all. Moreover, if it were dormant, how would we know it was there?

DR. CULLEN F. WELTY, San Francisco: With a mortality ranging from 8 to 12 per cent. in the acute mastoid operation in hospitals all over the country, does it not attract your attention when more than 100 consecutive patients have been operated on without mortality—cases that were not selected to my own liking, cases with serious complications, all of which were from delayed operative interference? All this must mean something to the one who wishes to see the best; the one who wishes to progress. Doctor Hastings spoke of losing a simple mastoid case from meningitis, saying that the operation did not have anything to do with the death. Of course, the patient would not have died had the operation not been so long delayed. Dr. Cott said he was in the habit of using morphin to quiet the pain. Such medication in acute mastoiditis is, in my opinion, almost malpractice. Dr. MacKenzie spoke of an indication for operative interference that I am very glad to second; in fact, I forgot to speak of it. Some such cases occurred in my series. Dr. Phillips demonstrated beyond question that there were not so many acute mastoid operations at present as formerly. I can verify that, but I will say that the reason lies in a wholly different cause, and that is the early removal of tonsils and adenoids. A given case of acute otitis is not so likely to cause an operative mastoiditis. All cases of acute mastoiditis are less frequent and less severe, or rather much less likely to go on to operative interference, if the tonsils and adenoids are thoroughly removed. I have only had a few cases of acute mastoiditis requiring operation in which the patients have had the tonsils and adenoids thoroughly removed. Dr. Pierce speaks of the three weeks' period. This is the old standard adopted by Professor Politzer some twenty years ago. Every year sees us a little ahead. In my paper I drew definite conclusions from a series of operated cases, and it is these deductions and observations that should be considered, rather than the report of a neglected, or I might say, conservatively treated case. I maintain that a death should not occur from an acute mastoid and its complications, providing the ear surgeon has been in attendance on the case from the early stages of the acute otitis.

Cooperation Needed.—The relationship between the various branches of child welfare work is remarkably intimate but quite often escapes observation and still oftener escapes realization by the very workers themselves. In their enthusiasm for improving conditions they forget such elementary principles as, for instance, that the periods for compulsory attendance at school, for prohibition of child labor and for public relief of children from want must be the same, and if one is extended, the others must be changed to correspond. This applies to other branches of child welfare work with equal force and shows that cooperation is essential to effective reform. Because of the absence of this essential our laws are in confusion and our work is seriously hampered.—Edward N. Clapper, *Secretary National Child Labor Committee.*

VACCINATION AGAINST TYPHOID IN THE UNITED STATES ARMY

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In view of the interest manifested by physicians, and particularly by health officers, in the prevention of typhoid fever in the United States Army by means of vaccination, the following note is presented; data covering the entire period, including the calendar year 1914, are included:

The officers who foresaw the importance of this measure to the Army and secured favorable reception of the idea in the War Department were Gen. George H. Torney, then Surgeon General, and Col. Jefferson R. Kean, Medical Corps, in charge of the Sanitary Division of the Office of the Surgeon General.

During the summer of 1908, Major Frederick F. Russell, Medical Corps, United States Army, was sent to Europe to make a study of the methods in use in England for the prevention and stamping out of typhoid fever epidemics, both in the army and among the civil population. His report and recommendations were submitted to a board of eight medical officers, of which the Surgeon General was president and Major Russell recorder. The members of the board were:

DR. VICTOR C. VAUGHAN, dean of the Department of Medicine and Surgery, University of Michigan.

DR. WILLIAM T. COUNCILMAN, professor of pathology, Howard University, School of Medicine.

DR. JOHN H. MUSSEY, professor of clinical medicine, University of Pennsylvania, School of Medicine.

DR. ALEXANDER LAMBERT, professor of clinical medicine, Cornell University Medical College, New York.

DR. SIMON FLEXNER, director of laboratories, Rockefeller Institute for Medical Research.

DR. WILLIAM S. THAYER, professor of clinical medicine, Johns Hopkins University Medical Department, Baltimore.

The board recommended the immediate introduction of the practical voluntary vaccination against typhoid in the Hospital Corps, Army Nurse Corps, and in any expedition of troops from the Regular Army which is ordered to take the field for active operations; and, further, that an opportunity be given to volunteers from the Army as a whole to be protected by vaccination against typhoid. The recommendations were immediately carried out.

The manufacture of vaccine in large quantities was begun at the Army Medical School, Washington, D. C. This vaccine, as described by Major Eugene R. Whitmore, Medical Corps, now in charge of the Bacteriological Laboratory, Army Medical School, Washington, D. C., is made from a "single strain of the typhoid bacillus. . . . It was chosen because tests have shown that it produces a large amount of antibodies; and it has the advantage that it gives an even emulsion when grown on agar. It seems that virulence alone is not the all important factor in the production of high and lasting immunity." The comparatively few cases of paratyphoid fever occurring annually in the Army have disinclined the makers of the vaccine to include paratyphoid strains in the vaccine, a procedure advocated by Castellani.

The vaccination of volunteers in the city of Washington was begun by March, 1909, and as the immediate results were completely satisfactory, the vaccina-