rific physical exertion they were called on to undergo. They gave a history of having been forced to march up to 40 kilometers a day in the advance toward and the retreat from the Marne with insufficient nourishment and sleep, and burdened with heavy packs. This resulted in symptoms of breathlessness and precordial pain, inability to sleep, and a soft systolic murmur at the apex which we believe of little significance, and this very slight bulging of the left and right auricle shadows of the heart. The orthodiagraphic work was done by a man who helped to develop orthodiagraphy with Mortiz and who has done this work in an extremely careful way in thousands of cases. There was no question of there being a slight rounding of the figure of the heart, and there was no question about many of these cases showing a slightly depressed Q R S group in Lead I and a high Q R S group in Lead III, all indicative of a period when myocardial insufficiency had been present with regurgitation back through the mitral orifice. Under proper treatment many of these men apparently recovered full myocardial efficiency. It is interesting to note that there was no change in the orthodiagrams or electrocardiograms after the return of apparently good function.

There are a few cases of tachycardia that cannot be classed as hyperthyroidism because the other symptoms of this condition are not to be found. Neither can they be classed as neurocirculatory asthenia, for the typical history and precordial pain is not present. Usually the pulse rate does not go down as far in recumbency as it does in the typical cases of irritable heart. We classify such cases as persistent tachycardia if it is present at repeated examination, and then discharge the men; for it is evident that such hearts "will not stand the gaff." Evans demonstrated some years ago that a heart consumed more energy doing the same amount of work per minute when the pulse rate is rapid than it consumes when the rate is slow. For this reason a heart working at a rapid rate becomes exhausted more rapidly than a heart doing the same circulatory work, but at a slower rate. A slow rate is the characteristic of the well trained athlete's heart. It is a rule that men with persistent tachycardia cannot hold out, other things being equal. The possessor of a heart rate persistently above 100 should be discharged or given deferred classification.

CONCLUSIONS

1. The incidence of aortic insufficiency in Texas and Oklahoma is about 0.1 per cent. between the ages of 21 and 31.
2. Uncomplicated mitral insufficiency of endocarditic origin is comparatively rare, being probably not much greater than 0.1 per cent. for men between 21 and 31.
3. Accidental systolic murmurs at the apex are very common, about 3 per cent. of all men showing them, and they are of practically no significance, unless accompanied by signs of hypertrophy and increased pulmonic pressure.
4. Neurocirculatory asthenia is the most important cardiovascular disease in our army. At least 0.5 per cent. of all the drafted men should be rejected for this condition before the various divisions sail for France.
5. The incidence of mitral stenosis is about 0.02 per cent.; of idiopathic hypertrophy, about 0.01 per cent.; of hypertension, 0.02 per cent., and of hyperthyroidism, 0.015 per cent.

BLOOD-CLOT DRESSING IN MASTOIDECTOMY

MODIFIED TECHNIC WHICH ASSURES PRIMARY
PAINLESS HEALING WITHOUT DEFORMITY—PRELIMINARY REPORT

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I wish to add my observations and experience to those of Blake, Reik, Holmes and others in perfecting the technic of the blood-clot dressing in mastoidectomy, a method, I feel, that is destined to revolutionize the after-treatment of mastoiditis.

Recently in a historical review of the institutes of surgery, Sir Berkeley Moynihan¹ observed that "a discovery is rarely the work of one mind. It is one observation added to another that makes the supersaturated solution from which the crystal of truth at last precipitates." This observation was evoked by an allusion to the respective share or credit of Lister and Pasteur for the discovery of the antiseptic system. Moynihan added that "Lister never ceased to give credit to Pasteur for his share in the work that led finally to the development of the antiseptic method."

The foregoing citation is peculiarly apropos to the theme of my text, since the key to the successful employment of the blood-clot dressing in mastoidectomy is wholly dependent on a perfect antiseptic technic, especially as we are dealing always with an infected wound in mastoiditis. The value of the "organized blood-clot" in the healing process was discovered by the greatest of original observers of pathologic conditions, the immortal John Hunter. Long afterward the technic of the blood-clot as a dressing was exploited and made practical use of in surgery on the continent by Schede and subsequently, in this country, by Halsted, Senn, Ochsner and others.

Credit is due Blake of Boston, who, at the suggestion of Sprague of Providence, R. I., first employed it in mastoidectomy. But especially to Reik of Baltimore must be ascribed the most credit for the development or popularizing the blood-clot dressing in mastoidectomy.

Briefly, the technic of the blood-clot dressing as originally practiced in mastoidectomy was to eradicate as thoroughly as possible all diseased tissues, observing strict asepsis, and the blood-clot was admitted at the time of the operation.

The cardinal error of this technic was brought home to me by an observation and experience I had in a radical frontal sinus case which I reported, with the presentation of the patient, to the New York Academy of Medicine in March, 1918, and, by the way, the first and only case on record, so far as I know, in which the blood-clot method was used in this location—the frontal sinus.

In this case a radical Killian operation was done. After removal of the anterior sinus wall, it was observed that the entire sinus floor was necrosed and that there was the complication of a foul postorbital abscess. The necrosis extended so far into the orbital arch that it was necessary to remove this also. The postorbital abscess cavity and the sinus cavity were packed with a continuous strip of iodoform wool and the wound closed, one end of the packing being left protrud-

1. Moynihan, Sir Berkeley: *Brit. Medicine in the War, 1914-1917*, Tr. Brit. Med. Assn., 1917.

ing from the temporal angle of the wound and the other end coming out through the nose. In twenty-four hours this strip of wool (gauze will answer same purpose) was withdrawn by traction on the nasal end till it was taut to the temporal end, when it was cut at the nasal end, this single strand being left to block the escape of the blood (occasioned by the removal of the rest of the packing) which filled the sinus cavity, preserving the contour of the orbital arch and sinus wall.

Twenty-four hours later the remaining strand of wool was removed. No further treatment was made save an oil spray in the nose during the week the patient remained in the hospital, when he went home healed without deformity and without discharge.

The operation was performed Nov. 9, 1917, and the patient remains well.

It occurred to me that the blood-clot dressing proved a success in this case simply for the reason that the infected wound cavity was first made aseptic by antiseptics at the time of the operation and the iodoform packing preceding the admission of the blood-clot. Therefore the deduction was natural that if an infected frontal sinus wound could be made sterile by antiseptic dressings preliminary to the introduction of the blood-clot, the same could be accomplished in an infected mastoid wound.

From that date I decided to modify the technic of the blood-clot dressing in mastoidectomy, for I was convinced that the incomplete success of the blood-clot dressing as originally adapted and practiced must be charged to a cardinal error in surgical technic: introduction of the blood-clot into an infected wound.

Holmes,² in an address on this topic before the Ninth International Otological Congress at Boston in 1912, said that "the success of the blood-clot method in a wound like the mastoid, which can never be made entirely aseptic, depends primarily on eliminating as nearly as possible all infective matter, and secondly on the bactericidal properties of the blood."

From the operative standpoint, therefore, the most expert surgeon may not hope to remove all diseased tissue and bone. He may attain such a degree of success in some cases that the antiseptic properties of the blood may resist any infection that remains, but not so in all cases.

Physiologically considered, the blood-clot dressing as originally conceived was based on the principle that if blood is admitted into a sterile wound of the soft or bony tissues, the clot will organize and facilitate healing, with obliteration of the dead space.

Reik's³ review of this method from a physiologic point of view probably is familiar to most otologists. Unfortunately the application of this technic in mastoidectomy was not so happy as its conception, nor altogether a rational surgical procedure. While we were admonished that strict sterility of the wound preliminary to the admission of the blood-clot was essential to success, we were advised to do the impossible—to eradicate thoroughly all infected and diseased tissue. Moreover, antiseptics were tabued, only asepsis being allowed.

Therefore, without the aid of the rather marked inherent antiseptic principle contained in the blood-clot, even the best operators with perfect hospital facilities, trained attendants, etc., could not have attained the limited success they did.

What I consider to be a perfected technic that renders the mastoid wound entirely aseptic is the thorough sterilization of the wound with antiseptics at the time of operation, followed by a packing of iodoform gauze that is permitted to remain for twenty-four hours before the blood-clot is admitted.

My technic is as simple as it is effective:

All infected and diseased tissue possible consistent with safety is exenterated. In simple mastoidectomy after thorough exenteration of the mastoid and the establishing of free communication from the antrum into the tympanum, a free incision of the membrana tympani is made and with a piston syringe the tympanum is flushed from the mastoid through the canal with 3 per cent. iodine solution and then with warm alcohol followed with warm sterile physiologic sodium chlorid solution. Then the mastoid is packed with iodoform gauze and closed to the lower angle save for a space that will permit one end of the gauze to protrude.

In twenty-four hours the packing is withdrawn and the bleeding occasioned by its withdrawal allowed to fill the wound cavity. If enough blood is not forthcoming, a nick or cut with a knife or the scissors is made in the angle or margin of the flap to supply sufficient blood to fill the cavity.

The subsequent treatment after turning in the clot in simple mastoidectomy is to close the lower angle of the wound with adhesive plaster with removal of the sutures on the second or third day.

Silkworm gut is used for suture material in this work, and before removal a 3 per cent. solution of iodine is applied to prevent possible infection of the blood clot. The postauricular wound heals in a few days, and as the blood clot supports the soft tissues, there results little or no depression or deformity. The middle ear usually ceases to discharge in a week or ten days, though the time occasionally may be longer.

Following exenteration in radical mastoidectomy, the postauricular wound is closed completely and the mastoid cavity, tympanum and canal are packed with iodoform gauze through the enlarged meatus. The next day the gauze packing is removed and the entire cavity, to the level of the meatus, allowed to fill with blood occasioned by its removal. If sufficient blood is not thus obtained, the tragus is nicked or cut for the balance. The meatus is covered with a film of cotton or layer of sterile gauze, over this sterile petrolatum or other lubricant, and over all adjust an outer dressing which is changed daily. Sutures are removed on the second or third day. Before removing sutures I always apply 3 per cent. iodine along the wound margin and over the sutures, to avoid infecting the deeper tissues and clot as they are being drawn out.

The clot begins to disintegrate in three or four days. The disintegration may be encouraged by the insertion of small gauze or cotton wick-drains saturated with a 10 per cent. solution of phenol in glycerin.

Usually the absorption or disintegration of the clot is complete in two or three weeks, when the bony cavity should be covered with a thin, pink, granular membrane which later becomes smooth, lustrous and fibrous. Should exuberant granulations appear on the median tympanic wall over the oval and round windows, 50 per cent. silver nitrate solution is applied, after the surface has been dried.

I wish to emphasize the importance of thoroughly drying the granulation surface before applying strong silver solutions. This little point in technic prevents pain and reaction, as moisture is essential to conduction of sensation unless undue pressure is made.

The support furnished by the blood-clot before it disintegrates prevents sagging and deformity of the postauricular wound; and as healing is primary, no long, painful packing after-treatment must be endured to wreck the patient's nerves, body and purse.

A short time ago a woman from a neighboring city, who had undergone a simple mastoidectomy nearly three months previous to a visit to New York, was

2. Holmes, C. R.: The Value of the Blood-Clot in Operations for Acute and Chronic Mastoiditis, *Lancet-Clinic* 109: 64, 1913.

3. Reik, H. O.: The Blood-Clot Dressing in Mastoidectomy Considered Physiologically, *J. A. M. A.* 56: 935 (March 31) 1906.

referred to me by a confrère for further packing while here, as there was still discharge posteriorly from the mastoid and also from the tympanum through the canal. She informed me that she had lost much weight and was a nervous wreck under the care of a nerve specialist, all because of the torturing packing after-treatment. Often she was in bed for a day following a dressing.

The advantages of the modified technic of the blood-clot dressing are:

1. The opportunity to sterilize the wound with antiseptics at the time of operation.
2. The completion and maintenance of this sterility by the iodoform gauze packing of the wound for twenty-four hours, which prevents the infection from the deeper tissues that may occur from the operative reaction drainage when the clot is inducted at the time of the operation.
3. Its simplicity and effectiveness, which enables the average surgeon to use it successfully in or out of hospitals.

REPORT OF CASES

Numerically, the cases in this initial report are far too few to permit sweeping deductions. But with practically a hundred per cent. of primary healing without deformity, quick convalescence, no painful after-treatment, and marked improvement of hearing, even in this very limited series of both acute and chronic cases, with the exception of one acute case complicated with large subperiosteal and perisinuous abscesses, plus a sinus thrombosis in an alcoholic and syphilitic that healed with but slight deformity at the lower angle of the wound where the clot broke down, I am prompted to make this early report, at what seems to be an opportune time, as mastoiditis is prevalent among our soldiers in camp and field. Excepting the acute case with the sinus complication when, as in brain and meningeal complications, the advocates of the blood-clot method advise leaving the wound open, my percentage is perfect in eight consecutive cases from May 19 to August 15.

CASE 1.—M. L., aged 30 years, underwent simple mastoidectomy, May 19, at the New York State Hospital, Central Islip, L. I., for acute mastoiditis complicated with a large cervical glandular abscess. The mastoid wound was packed with iodoform gauze and closed to the lower angle. The dressing was removed in twenty-four hours and the mastoid cavity allowed to fill with blood and the lower angle of the wound closed. The mastoid wound completely healed and there was no discharge from the ear at the end of seven days.

CASE 2.—B. H., girl, aged 11 years, was admitted to the Polyclinic Hospital, June 5, on account of reinfection following an acute mastoidectomy about six months before. A simple mastoidectomy was performed. The tympanum was flushed with alcohol followed by salt solution. The mastoid wound was packed with iodoform gauze and closed to the lower angle. The gauze was removed next day, the wound was allowed to fill with blood, and the lower angle was closed. The postauricular wound healed in six days, but the ear was not dry until two weeks later.

CASE 3.—L. C., boy, aged 9 years, admitted to the Polyclinic Hospital, July 3, had a radical mastoidectomy following incomplete operation five months before. The postauricular wound healed in five days. As the eustachian tube failed to close, some mucous discharge remains at the tympanic orifice.

CASE 4.—J. C., girl, aged 5 years, admitted to the Polyclinic Hospital, July 4, was operated on the following day. A simple mastoidectomy was performed, the tympanum was flushed with alcohol followed with physiologic sodium chlorid

solution, and the mastoid wound was packed with iodoform gauze and closed to the lower angle. Next day the packing was removed, the clot admitted, and the lower angle of the wound closed. The mastoid wound was healed in five days, and the ear was dry in two weeks.

CASE 5.—C. G., man, aged 38, admitted to the Polyclinic Hospital, July 19, had acute mastoiditis complicated with a large subperiosteal abscess and a large perisinuous abscess exposing it over a large area, plus a sinus thrombosis. A simple mastoidectomy was performed, the tympanum was flushed with alcohol and salt solution, the sinus incised and the clot above and below turned out until free bleeding occurred. The sinus and mastoid wounds were packed with iodoform gauze and the upper half and posterior extension of the wound closed. In this case the gauze was allowed to remain four days, when it was removed and the wound inspected and packed again for twenty-four hours. Then the packing was removed and the clot inducted, the blood being obtained by means of a deep nick or cut with scissors in the lower end of the anterior wound flap. The lower half of the mastoid wound was then closed by means of adhesive strips, an outer dressing applied, and this changed daily. Six days later, or on the eleventh day following the operation, the ear was absolutely dry and the mastoid wound apparently sound, as the surface was healed. At this stage, however, the lower angle of the wound with that portion of the clot broke down, and after ten days finally healed with only a slight depression. In the meantime the ear remained dry.

This case is unique, and I regard it phenomenal, in that all operators who have employed the blood-clot dressing are agreed that in sinus, brain and meningeal complications the cases should be treated by the open method and packed. Moreover, this patient was alcoholic and syphilitic.

CASE 6.—S. H., woman, aged 28, admitted to the Polyclinic Hospital, July 30, and discharged, August 7, had a secondary radical mastoid operation. The posterior wound healed in five days, and the ear was dry in seventeen days.

CASE 7.—M. V., man, aged 26, admitted to the Polyclinic Hospital, August 2, and discharged, August 6, had a radical mastoid operation nineteen years previously, but the wound never healed. Moreover, there was a large opening the size of a dime behind the ear. A secondary radical operation, plus a plastic operation to close the postauricular opening, was performed and the mastoid wound cavity packed with iodoform gauze through the external meatus. The following day the iodoform gauze was removed and the clot inducted. The posterior wound healed in five days, when the patient left the hospital. One week later with the disintegration of the clot and the lack of its support, the posterior wound in this case broke at one point on account of the lack of vascularity of the scar tissue in the flaps from the first operation. Under local anesthesia the scar tissue was trimmed out and the margins of the flaps sutured. Healing occurred in five days but with slight depression.

CASE 8.—E. N., woman, aged 28, had a classic radical mastoid operation at the New York State Hospital, August 4. The wound cavity was packed with iodoform gauze, which was removed next day and the clot admitted. The wound healed by primary intention and the ear was dry in fifteen days.

CASE 9.—J. H., man, aged 26, was operated on at the New York State Hospital, Central Islip, L. I., August 15, secondary to a radical operation ten years before, which never healed or ceased to discharge. During the operation the sinus was injured and on this account the iodoform packing was left in for three days, when it was removed and the clot inducted. Primary healing of the wound occurred, and the ear was dry in twenty days.

42 West Seventy-Seventh Street.

Tuberculosis and War Risk Claims of Soldiers.—According to Col. Charles E. Banks, chief medical adviser of the War Risk Insurance Commission, approximately 50 per cent. of all claims for war risk compensation are based on tuberculosis. In about 50 per cent. of the soldiers discharged from the Army for disability, tuberculosis is the cause.