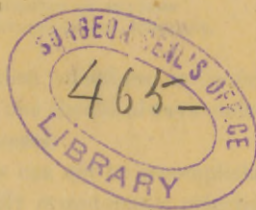


ELIOT (E)

Treatment of acute osteomyelitis.



*Reprinted from the New York Medical Journal
for April 2, 1892.*

TREATMENT OF ACUTE OSTEOMYELITIS.*

BY ELLSWORTH ELIOT, JR., M. D.,
ASSISTANT SURGEON IN THE VANDERBILT CLINIC;
ASSISTANT DEMONSTRATOR OF ANATOMY
IN THE COLLEGE OF PHYSICIANS AND SURGEONS.

In the treatment of surgical affections, as in the treatment of all medical troubles, one should always endeavor to eliminate the cause of the disease.

When for any reason this can not be accomplished, our treatment, conducted on purely symptomatic principles, becomes ineffectual. Nature may come to our assistance and restore the patient to health, with full return of all the patient's functions; but, although this happy result is moderately frequent in certain medical diseases, it must be admitted by all that unskillful treatment in surgery too often leads to a tardy convalescence, temporary, and at times permanent, loss of function or serious deformity, with perhaps the loss of a limb, and occasionally even loss of life itself.

Of no disease is this more true than in acute osteomyelitis, and in calling your attention to its treatment it will

* Read before the Hospital Graduates' Club, December 17, 1891.

COPYRIGHT, 1892, BY D. APPLETON AND COMPANY.



not be inappropriate to consider briefly its cause and the resulting pathological condition.

For years before bacteriology played its present important rôle in pathological surgery, acute osteomyelitis was considered an infectious disease simply from the resemblance of its symptoms to those of diseases whose infectious character was undisputed. Bacteriological investigation has substantiated this fact, and to-day at least two distinct forms of micrococci—namely, the *Staphylococcus aureus* and *Streptococcus albus*—have been found, both separately and together, in osteomyelitic exudations. These have been cultivated in suitable media, and have, by inoculation, reproduced in animals a pathological condition similar to that existing in the primary disease.

Undoubtedly these organisms gain access to bone through the circulation. Why they should attack this structure in preference to other organs is not clearly understood. Various authors mention a "*locus minoris resistentiæ*," indicating by this term that certain portions of the body offer less resistance to the onslaught of germs than others, every part of the body being equally subjected to their attacks. Certainly, whenever the integrity of bone is disturbed by traumatism, that particular portion is more likely to become the seat of an osteomyelitic process than any other part of the bone. Then, too, in children, who are most frequently subject to this disease, the primary foci are found near the epiphyseal line, and surely this part of the bone, being constantly in an active state of development, is less capable of resisting the attack of germs than other more perfectly organized portions, for the blood-vessels in the epiphyseal vicinity are imperfectly developed and afford more abundant facilities for the lodgment and collection of germs than do similar channels in perfectly vascularized bone. When the inflammatory process is once

excited by the presence of these germs its onset is severe and its course is rapid. This is readily accounted for by a consideration of the normal anatomical peculiarities of bone, together with the virulent qualities of the micrococci.

Bone, to fulfill its function of support, must be practically unyielding. Consequently the walls of the cavities that contain the blood-vessels are inexpandible. The exudation resulting from the inflammatory process through the walls of these blood-vessels collects between the bony, unyielding wall of the cavity and the yielding wall of the blood-vessel. The force exerted by this exudation soon overcomes the counter-resistance of the arterial pressure in the nutrient vessel, the lumen of which gradually diminishes in size, until finally the blood ceases to flow through it, and that part of bone to which it imparts nutrition dies. This process of disintegration is still further assisted by the comparatively poor anastomotic circulation that exists in bone. To be sure the vessels in the Haversian canals communicate freely, but this is more of a capillary net-work, and is totally inadequate to supply any particular part of a bone which has been deprived of nutrition by the inflammatory process.

It is not, therefore, surprising that acute osteomyelitis, beginning near the epiphysis, should rapidly involve the major portion of the shaft of a long bone, and, on the other hand, it is very fortunate that the epiphyseal cartilage, owing no doubt to its lack of vascularity, should act as a barrier, and so prevent the inflammatory process from involving by contiguity first the articular extremity, and subsequently the joint structures themselves; and it is also very fortunate that after the soft parts immediately overlying the inflamed bone are involved, the capsular ligament of the different joints attached to the bone within the epiphyseal

line should, in virtue of its strength, resist the disintegrating character of the inflammatory process, now at its height in the soft tissues, and exclude it from the joint proper.

There is one joint in the body, and that a very important one, which proves to be an exception to this general rule. I refer, namely, to the hip; and it is not difficult to explain this exception if we consider the attachment of the capsular ligament and its relationship to the epiphyseal line. In front this ligament is attached to the spiral line running around the inner aspect of the upper extremity above the lesser trochanter, and behind it is attached along a line at the junction of the outer third and inner two thirds of the posterior surface of the neck, including in its attachment, therefore, the head of the femur, the epiphyseal line, the entire neck in front, and posteriorly the inner two thirds of the neck. Hence any inflammatory process near the epiphyseal line, in extending outward, must soon reach the synovial membrane that lines the inner surface of the capsular ligament and the bone itself within the above limit, and necessarily involve the joint in a suppurative, infectious process. The treatment of this, in itself a most serious condition, demands special consideration, and will be discussed subsequently.

But, although, as we see, the involvement of the joint nearest the focus of inflammation does not usually take place by contiguity, yet in a certain number of cases this same joint, or even others more remote, may become swollen, their synovial cavities filled with a serous or at times even with a purulent fluid, and subsequently the whole joint may become seriously involved in destructive inflammation.

This condition is readily explained by the fact that the micrococci, having found a favorable soil for development,

are multiplying rapidly, and are being carried in constantly increasing numbers by the circulation to the different parts of the body. Whether joints, to which by this way they gain access, become involved, depends upon the kind of micrococcus. It can be incited artificially more frequently with the streptococcus than with the staphylococcus, but as an attack of osteomyelitis is usually due to both of these germs acting together, the occurrence of joint inflammation in this disease is not unusual.

If severe cases remain untreated, the occurrence of metastatic abscesses in the different viscera, especially in the kidney, may result from the lodgment of micrococci in these organs.

With this understanding of the cause of osteomyelitis, and of the serious consequences that may result, it is not difficult to formulate a rational method of treatment which may be applied to the great majority of cases.

In the first place, we should endeavor to prevent a possible attack by suitable prophylactic measures. In all exanthemata and other infectious diseases, when convalescence is established the patient should not be allowed to walk until a considerable interval has elapsed subsequent to the fall of the patient's temperature to normal, and afterward, when walking, the patient should be careful not to subject himself to any blows or contusions, either from coming in contact with furniture or from possible falls, from too sudden exertion, or from any cause whatsoever, no matter of how trivial a character.

When, however, prophylactic measures are not successful in preventing an attack of acute osteomyelitis, or when a case presents itself, apparently spontaneously, without known cause, the proper method of treatment may be a subject of dispute. Some advocate the expectant plan of treatment. Applications of poultices are advised, with ab-

solute rest in bed. Usually the administration of a brisk cathartic follows, and then a general waiting-for-development policy is pursued, which usually means waiting for the soft parts to become involved in suppuration.

It must be said, however, that this general plan of treatment is only employed by practitioners in that class of cases where obscure symptoms make the diagnosis difficult, and that, either when the diagnosis is easy or has been made by skillful men, the radical method of treatment is usually preferred. The expectant plan of treatment is the oldest, and was very generally employed in pre-antiseptic times when operations of all kinds were dangerous; superseded by radical measures, it still shows its influence upon the treatment of this disease, in that surgeons are inclined to wait one, two, or three days before proceeding to operative interference. Delays are dangerous, and more especially in acute osteomyelitis, where every additional hour means just so much more necrosis in the early stages and greater liability to general septic infection in the later stages of the disease. Consequently, now that antisepsis has removed the danger of incisions, it would certainly be a rational procedure to perform an exploratory operation at the outset, in place of waiting for the symptoms to become of such a marked character that the diagnosis no longer remains doubtful.

If, after such a procedure, the diagnosis is confirmed, further operative means should be resorted to to prevent the death of the bone and the infection of the system. The main indication for treatment may be expressed in one word—namely, drainage, with, if possible, the removal of the original focus of inflammation.

This is accomplished with either a trephine or a chisel, by means of which, as soon as the periosteum has been

divided and reflected to one side, the medullary cavity, as well as the cancellous spaces between it and the surface of the bone, are thoroughly exposed by an opening at least an inch long and a quarter to half an inch wide, according to the normal dimensions of the bone affected. This opening should be made in that part of the bone where the inflammatory process is most intense, for the reason that the original focus is situated in this part, and it is desirable that this focus should be removed with a Volkmann spoon, or, at all events, that it should have a free exit, and so be enabled to come away with the discharge as soon as the process of ulceration has separated the dead from the healthy bone beneath.

Great care should be taken that this opening is made close to and on the shaft side of the epiphyseal line, but not through it, in order that the natural growth of the bone may not be disturbed, which, as is well known, depends for its increase in length upon the epiphyseal cartilage.

One or more similar openings may be made at some distance from this, the essential one, in the inflammatory area, but the intervening portions of bone need not be removed, as such a procedure might lead to unnecessary weakening of the bone without insuring any better result. The cavities thus exposed should be well irrigated with a strong antiseptic solution, preferably the bichloride of mercury, and packed loosely with iodoform gauze—the wounds being treated openly. After the application of a heavy Lister dressing, the whole limb should be kept absolutely at rest by immobilizing the joints both above and below the bone involved.

By this means the exudation that has collected outside the walls of the blood-vessels, in the Haversian canals,

readily flows into the antiseptic dressing, carrying with it a large number of the micrococci. The blood-vessels, relieved of an enormous pressure, once more are permeable. The bone receives its usual nourishment, and thus practically a "resolution" takes place, except in those portions of bone which, having been deprived too long of their blood supply, are dead and must separate gradually from the healthy bone before granulations can be formed and the process of repair be completed.

The integrity of the epiphyseal cartilage also is preserved by this radical treatment, and the growth of the limb continues undisturbed when convalescence is established. This is of paramount importance, for deformity would surely result if this epiphyseal layer of cartilage were destroyed and the bone ceased to grow. The degree of deformity depends upon the bone inflamed, and also upon which extremity of this bone is involved. In the humerus or femur disintegration of the cartilage causes merely shortening of the corresponding limb. Inasmuch as the growth of these bones depends chiefly upon the epiphyseal cartilage in the upper extremity of the humerus and the lower extremity of the femur, the amount of shortening with destructive inflammations in this vicinity is very much greater than in case of involvement of the opposite ends of these same bones.

In the bones of the forearm and leg the growth of the corresponding limbs depends upon the development of the cartilages in the upper extremities of the tibia and fibula, but the lower ones in the radius and ulna. Consequently, if any portion of these bones entering into formation of elbow and ankle joints, respectively, are involved, the growth of the limb is but slightly retarded; but if the opposite extremities to those above mentioned are involved

simultaneously, the growth of the limb is seriously curtailed. If one extremity alone is involved, and this is the rule, the unaffected bone continues to grow, and very marked lateral deformities of wrist joint, especially, may render the hand useless and demand surgical interference for its relief.

After the primary operation the subsequent treatment of the wound is conducted on ordinary surgical principles. If the disintegrating process has been so extensive as to result in a fracture of the bone, the limb must be immobilized until, after the subsidence of the disease, new bone is formed and firm union takes place between the broken fragments. With the destruction of a large portion of the shaft of a long bone, immobilization must surely be enforced until sufficient new bone is formed to enable the part to resume its normal function without danger of fracture. Ordinarily an interval of from several weeks to as many months must elapse before the bone in which the inflammatory process has occurred can resume its normal function.

In addition to the surgical treatment that we have just described are several indications that demand medical means for their relief. In the earliest stage of the disease pain is not only a very prominent symptom, but also a very disagreeable one, which requires the exhibition of an anodyne, preferably morphine. The patient should naturally be in bed, on a fluid diet, and some benefit may follow the use of various antiphlogistic remedies.

After operative measures have relieved the condition of tension in the bone, the subsequent discharge from the wound is most profuse. Large dressings, with abundant absorbent cotton, are usually well soaked at the end of thirty-six to forty-eight hours. Such a drain upon the patient's system, especially if it exists for any time, must

necessarily be followed by rapid progressive emaciation, and demands some supportive treatment, preferably the administration of malt and sherry, in generous amounts, several times daily. The dose can gradually be decreased as the discharge becomes less abundant, and finally stopped altogether when the patient fully regains his lost strength.

In no place in the body is the importance of early operative interference more clearly demonstrated than in the treatment of acute osteomyelitis of the neck of the femur, near the epiphyseal line. I have previously alluded to the anatomical reasons which render the involvement of the hip joint an absolute certainty, and it is only by an early operation that this can be prevented.

In this class of cases we endeavor to remove the inflammatory focus before the destructive process incited by it has reached the surface of the bone. If this can be accomplished, the periosteum may be preserved, while the inflammatory area is removed *en masse*, and, after new bone is formed, the joint will resume its normal function of support, with, in all probability, a certain amount of stiffness, the operation consisting practically in a subperiosteal resection of the head of the bone. If, however, the periosteum is found in a necrotic condition and bathed in pus, the most thorough removal of the dead bone, with subsequent drainage and irrigation, combined with rest, will alone save the limb, and, after a tardy convalescence, the head of the femur, if not actually dislocated, will be held in place by the comparatively weak support of strong bands of connective tissue, the result of the process of repair.

Unfortunately, in neglected cases, when septic symptoms have developed, our treatment can only be supportive. Large doses of stimulants, with antipyretics, are administered, and certain patients, especially those with a strong

constitution, may eventually recover. Such a fortunate termination is very exceptional, and, inasmuch as death does occur from a general infection of the system, certainly that plan of treatment should be followed that has for its purpose the elimination of the micro-organisms that cause the trouble, when these are localized and before they have an opportunity, after great increase in number and under undue tension, of entering the general circulation and terminating the life of the patient.

