

death and there are often anxious moments when it is questionable which will win, yet in only 5 reported cases has death occurred before the operation was completed. A death on the table is always a most distressing occurrence in surgery, but doubly so if the surgeon has in any way to blame himself for delays which might have been prevented by care and forethought.

DISCUSSION.

DR. LAWRENCE LITCHFIELD, Pittsburg, Pa., asked Dr. Harte if he made any blood-pressure records in these cases. Dr. Theodore Janeway has pointed out that the sphygmomanometer is a valuable means of differential diagnosis between hemorrhage and perforation in typhoid fever, particularly if a pressure chart has been kept previous to the emergency. The blood pressure is also at times an important guide in the treatment of these cases. Dr. Litchfield also said that he would like to know if Dr. Harte employs general or local anesthesia in these cases.

DR. CHARLES A. POWERS, Denver, said that in his part of the country such work as Dr. Harte's has stimulated physicians to be on the watch for typhoid perforations and has made it possible to recognize these lesions much earlier than formerly.

DR. MORRIS MANGES, New York, said that he reported 19 cases last year, and in only 3 was there a drop in temperature; in fact, in some cases it rose. He believes that sweating and rigidity are symptoms of considerable value. Dr. Manges thinks that too much attention is paid to percussing the spleen, and that if more attention were paid to the liver and less to the spleen it would be better. He believes that spontaneous recovery is possible. In cases in which there is no perforation, for some reason or other the subsequent course of the case is always improved by operation, and he believes it wise to give the patient the benefit of the operation.

DR. RICHARD HARTE stated, in reply to a question, that he has had no experience with blood pressure, but it is a well-known clinical fact that in peritonitis and in the pre-peritonitic stage there is a disposition for the blood pressure to increase. He has always been in the habit of using ether. Some of his colleagues, he said, have used cocaine, but he thinks, on the whole, that a general anesthetic is much preferable, as the patient's condition usually improves under the anesthetic. In closing the ulcer he uses fine black silk mattress sutures placed parallel to the long axis of the bowel. If the ulcer is very large, sometimes in order to close it stitches will have to be inserted in the reverse way; this has a tendency to shorten the bowel and to make the stitches more liable to tear out. If the condition is very bad he thinks it is safer to establish an artificial anus. There is nothing whatever to be gained by excising the ulcer. He feels confident that in all cases if the temperature is carefully and frequently recorded a distinct fall will be observed, which will assist materially in making a diagnosis. He expressed himself as greatly indebted to the courtesy of his medical colleagues for having allowed him to study their bad typhoid cases with them. This is of great advantage, since these cases so often pass from the hands of the physician to the care of the surgeon, and if the surgeon has been in consultation he may recognize changes which are likely to occur and is thus in a much better position to recognize them when they do occur than if he is seeing the case for the first time.

Consciousness and Its Degrees.—At the recent International Congress of Psychology Dr. Paul Sollier said that consciousness is not an autonomous primordial or independent phenomenon that can be isolated, that has an action proper to itself acting on other psychologic manifestations. There is no consciousness outside of cerebral activity. Consciousness is not even an epiphenomenon, as it exists even when we do not see its manifestations. If every cerebral center, taken individually, contributes to the production of consciousness, it may be said that there exists an indefinite fragmentation of consciousness—according to the number of cerebral centers that are brought into play.—*Journal of Mental Pathology.*

DELAYED UNION AND UNUNITED FRACTURES.*

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Norris has made general and elaborate classifications of these conditions, which are, in substance, as follows:

CLASS 1.—Delayed union, callus forms and union is not rendered complete by ossification.

CLASS 2.—Entire want of union, the ends of the bones are diminished in size, there is motion between the fragments and the limit of this motion is usually small.

CLASS 3.—With fragments small, rounded off, tapering and bound together by fibrous bands.

CLASS 4.—Pseudarthrosis; a dense capsule seems to form around the ends of the bones; on opening this a fluid is found resembling synovial fluid. The ends are eburnated.

By referring to numerous authors along about the fifties, I found a few notes in regard to the causation of ununited fractures. The principal ones correspond very clearly to our present ideas, and I am sure that this quotation from Velpeau places him and his opinion on the causes of ununited fractures among many surgeons of to-day. It is this: "If the fracture, whatever may have been the primitive cause, shall have become reduced to an effect already local and shall have not united, partly because its two fragments have cicatrized separately."

He also quotes the following facts from the "Cyclopedia of the Practice of Surgeons," published about that time, in regard to the result of treatment in these certain cases, which I insert at this point simply as a matter of history.

There were 150 cases recorded, of which 46 were treated with the seton, 36 of which were cured, 3 were partially cured, 5 received no benefit, and 2 died. There were 38 in which resection was tried, 24 were cured, there was 1 partially cured, 7 received no benefit, and 6 died. There were 36 cases in which pressure and rest were employed, 29 were cured, 1 was partially cured, and 6 received no benefit. There were 8 in which caustic was employed, 6 were cured, and 2 received no benefit. There were 11 cases in which friction was employed, and 11 were cured. Eleven cases were treated by the use of iodine injections, hot iron and amputation. Seven were cured, 1 received no benefit, 2 died and 1 remains uncertain.

It is also interesting to note that in 1760 a surgeon by the name of White operated on an ununited fracture of the humerus, in which he parted the two ends of the bone, sawed them off and placed the freshened ends in apposition; and also operated on an ununited fracture of the tibia, in this, however, merely excising the upper end, and in both cases obtained perfect results.

I am sure that these results must seem more or less remarkable to us at the present day, with our extreme ideas of asepsis and the constant fear that exists in our minds lest pus should form in our wounds when operating for these conditions, and our willingness to attribute a failure under these conditions to the presence of such an infection.

Velpeau, in his conclusion in regard to ununited fractures, explains it as his opinion that the seton will only succeed in these cases where the ends of the bone are in actual contact or nearly so, and that in all these cases in which the ends of the bones are not in contact there is no operation that promises better results than resection.

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-sixth Annual Session, July, 1905.

In the American appendix to this treatise of Velpeau, Dr. Blackman has given the details of an operation which I believe was devised by Professor Brainard, of Chicago; it is probably our present drilling operation, and in 1854 Brainard published descriptions of seven cases in which six operations had been successful. This drilling was supposed to be of use by bringing surfaces of bone freshened by the operation into apposition.

Local conditions probably have more to do with ununited fractures than do constitutional states. Though just what these local conditions may be, it is not always easy to tell. For a long time the prevailing opinion was that ununited fractures depend very largely on some interposing substance which interfered with repair, such as muscles, tendons, arteries, nerves and fascia. The prevailing idea of such an interposition, no doubt, depends on one or two reported cases of fracture, in which a bundle of muscular tissue had become incarcerated between the fragments, and particularly one case in which there was a fracture of the clavicle that was firmly united, but in which the callus had been thrown out over and around the muscle so that there was a fenestration through which the muscular fibers passed. The possibility of muscular fibers being interposed is very materially lessened on account of the natural contractility of the muscles. We have all noticed in amputation that when the muscular fibers are severed they retract; we also have noticed when, as the result of the injury, a muscle has been ruptured, that usually if the rupture involves sufficient bundles of fibers, retraction occurs so that a depression may be felt, which depression, of course, depends on the extent of the injury and the length of the muscle, as well as its tonicity.

It has also been noticed that, in an injury in which the tendons have been severed, there is a very decided retraction which at times is very difficult to overcome. In the majority of instances of fracture, the muscle itself is not extensively lacerated, though probably there are very few fractures in which some injury does not occur to the surrounding muscular tissues. Also in fracture there is seen a spasmodic condition of the muscles depending on two acts: First, on Nature's effort to fix the ends of the bone to avoid motion between the proximal ends of the fragments, also to save the patient from pain, and, second, on the irritation of the ends of the fragments of the bone in the muscular tissues—itsself a sufficient cause of this spasmodic state of the muscles. By this action lacerated muscular fibers would, no doubt, be pulled from between the ends of the bone should they have become incarcerated in the place of being allowed to remain in their false position, and hence later to prevent union. So, also, would the treatment, which should be employed in every case of fracture, that is to overcome the strength of the muscle so far as possible by extension in order to enable us properly to reduce the fracture, tend to withdraw all fragments of muscles that might become incarcerated. This, it strikes me, would apply both to the lacerated muscles and to the muscular fibers that were not lacerated, and I believe, in consideration of the above facts, that muscular fibers and tendons only rarely play any part in the causation of ununited fractures. Such instances as may be demonstrated, either by operation or postmortem, to have occurred, are rather only medical curiosities, and many times I fear that the fibrous tissue that has been thrown out to complete the pseudarthrosis has been confounded, at the time of operation, with the muscular tissue. I know that this idea has been advanced more than once.

Considering the subject of ununited fractures, it, of

course, is necessary that we have some idea of the method of repair of ordinary fractures, in which the periosteum is usually lacerated, but not often torn apart. Its fragments are separated from the bone over a greater or less area and theoretically, at any rate, bands of the periosteum after the injury will, no doubt, maintain the continuity of the membrane. There is also a hematoma of varying amount, depending on the character of the bone that is injured and also on the amount of injury to the surrounding bones. Part of this blood is absorbed and part of it finds its way between the layers of muscles and fasciæ to the surface and is thus removed from around the seat of injury.

The process of repair begins simply by granulations spreading from the shreds or non-lacerated portions of the periosteum and by filling the space between the ends of the bone, which goes to form the provisional callus, completely enveloping the seat of injury. Its shape and size and the relation of the bone ends depend on the amount of displacement, so that the callus is formed gradually by a thickening of the periosteum and granulations from the soft parts of the bone ends and the marrow (which is slower in forming) on the thickness of the periosteum and on the granulations from the soft parts of the bone ends.

The major part of the callus, the periosteal part, first becomes cartilaginous and then bony. That coming from the marrow becomes bone directly without the intervention of callus. The slowest part of the callus to develop is that between the bone ends, inasmuch as the circulation is here very poor and because a certain amount of the thin shell along the surface of the bone has been deprived of its nutrition and has to be absorbed, and this portion of the callus only forms from bone granulation. The final stage of this bone formation occurs in the absorption of the exuberant callus. The process is really incomplete until months after the reception of the injury. From the very nature of events it must be granted that compound fractures are more liable to be followed by variation in the normal process of repair than are simple fractures, for there is more disturbance of the surrounding tissues, and such local conditions must of necessity have their effect on the other bones.

In compound fractures, the violence is, of course, more severe. The periosteum is often times completely lacerated and destroyed, in some cases even sloughing off as a direct result of the injury. The violence done the soft tissues by protruding bone may so destroy the vitality of the tissues that there is an increase of possibility of infection, and it may be sufficiently severe to cause sloughing of the soft parts. Since we have seen that the periosteum plays such an important part in the primary, or in point of time first, location of granulation tissue, it is but fair to conclude that those injuries that cause extensive disturbance and retraction of the normal relation of the periosteum would be less liable to be followed by good results, and this the more so if apposition could not be or were not maintained.

Compound fractures are attended with hemorrhage, as a rule, and this probably acts on the part to delay the formation of granulations which we have seen are so essential to callus formation. I recall one or two instances in which a hematoma had existed for some time, had been evacuated, under other conditions, and in neither of these was there any evidence of the formation of granulation.

A colleague, Dr. Yocum, of Tacoma, called my attention to the fact that all cases of ununited fractures that

he had operated on and drained had done well, and that all cases in which drainage had not been used had done poorly, and on account of this he advocates the use of drainage more frequently. In cases that had come to operation, and by way of emphasis of the correctness of this method of procedure, he had made another observation, which was this: Two cases had been operated on without drainage, with the result that both were failures, but on doing a second operation in each case drainage had been used in both with good results. The drainage used in late operations might act as the seton did years ago. Hemorrhage may also act as a complication on account of its amount, producing pressure enough, unless the hematoma would rapidly absorb, to lower the vitality of the surrounding parts.

In compound fractures it is, of course, desirable not to disturb the parts to any greater extent than is absolutely necessary to enable us to cleanse the wound and to endeavor to make proper apposition of the fragments, and that, of course, can not always be done in some cases, nor can we aid much in the relation of the periosteum to the ends of the bone. Malpositions often cause delay in union, or in others lack of union. It is wonderful what measures Nature takes to provide for and to overcome our many imperfections and lack of skill in providing for union of fractures. None are more wonderful than can be seen in many cases of so-called vicieus union where only some small area of the fractured surfaces have been approximated and where the overlapping ends of the bone are firmly united to one another to produce a stiff limb; but it is not always that Nature can throw out enough callus to cover two ends widely separated. It is not an uncommon condition to find the ends of the bones fastened to one another by fibrous tissue and a false joint thus formed, showing more or less motion. At other times the bones may be separated latterly one-half inch or so from one another with overlapping ends. One case that I had the opportunity of examining with the *x*-ray very clearly showed this condition. In it had been a large amount of hemorrhage and, of course, much swelling, and there remains the possibility that the ends of the bones may never have been approximated, in which case Nature never had a fair opportunity to provide callus. The operation showed simply fibrous tissue and the ends of the bones reduced in size. In about three months after the operation there was a small amount of callus being thrown out round one bone and none around the second. Two or three years ago I saw a fracture that had occurred five weeks before, where great violence had been done both to the lower part of the tibia and fibula and to the ankle by being crushed between two logs and, as subsequently proved, there was one fracture in the fibula and two in the tibia, though only one was diagnosed until after amputation. Osteomyelitis started in the ankle bones and in the lower part of the tibia, and there was during the progress of this an evidence of non-union. An operation was done to remove the diseased bone from the ankle and the tibia, followed in a few weeks by the second operation, with consent to amputate if found desirable and agreed to by the consultants, but it was not done at this time on account of the inability of three of us to agree. The pain, fever, chills and sweats returned, and in about two weeks more amputation was done. There never seemed to have been any particular effort at repair excepting in one spicule. This is the only case of the kind that I have seen, and I have not seen mention of another one, but I do not see how the presence of such an extensive disease as existed in this case could have failed to produce delay.

Among other causes for ununited fractures is said to be tight bandaging and the use of the leg too soon after the injury. In all cases in which there has been an injury to the nervous supply there is likely to be delayed union. In no case in which a fracture has occurred in the bone at the seat of a malignant disease is union to be looked for, but should a fracture occur in a subject who is suffering from cancer in some other location, the bones being brittle, union should be expected. Pregnancy and lactation have been assigned as causes of delayed union. Likewise syphilis, and especially so during the chancre period.

After all is said and done, the practical point in these cases is the question what shall be done to make useful limbs for our patients. Medical treatment of ununited fractures has assumed many forms, but it is chiefly dependent on the administration of tonics and the use of such hygienic measures as would tend to improve the general condition of the patient. It, of course, can not be denied that in this state, or in any other below par, the lowered general vitality of the patient decreases the general tone of the body to such an extent that many of the normal functions are not being performed as they should be, so that it would hardly be anticipated that any special call of an unusual nature on the functions of the body for the repair of an injury would be responded to in as satisfactory a manner as it would be with the whole condition up to normal. Otherwise it does not strike me that there is any good to be derived from filling the patient up with medicine under ordinary circumstances. There have been some cases reported, however, in which the administration of thyroid extract is supposed to be of value. This report is based undoubtedly on but few observations which have been made in cases of delayed union, also on a few cases in which there was an absence of a part of the thyroid gland or cases in which that function was interfered with, in which the administration of this material seemed to be of value, and possibly it would also be suggested by the effect of the administration on the gland in producing an increase in the growth of the bones in cretinism. One case is reported in which union was delayed for eighty days, and after the use of thyroid extract, five or six tablets a day, of a grain and a half each, union began and a useful limb resulted. It is not unusual, however, to see cases in which union is delayed such a length of time and a firm limb follow without the administration of any medicine. With its use I have only had one experience, and the result of that was negative. In all cases in which there is a specific infection, treatment for that condition is undoubtedly advisable.

Next to medicinal treatment on the basis of simplicity is to put on the limb a good strong plaster cast and set the patient out with a pair of crutches, with the instructions that he should use his limb, that is, putting a small amount of his weight on it as he walks around from time to time. In many cases this is associated with more or less pain at first, but the patient gradually becomes accustomed to it, so that there is very little inconvenience.

I at present have under observation a patient who had a compound comminuted fracture of both bones of the leg, over eighteen months ago, who is walking around without any support other than a cane. The bones have slipped by one another, and he says that it is with very little inconvenience or pain that he travels. I have seen a number of patients with delayed union, the length of time which has elapsed since the injury varying from two to five months, that have made good recoveries simply by this treatment,

and I believe that before any operating measure of any kind is undertaken that this method of treatment should be adopted and carried out for a period of at least three months, in the hopes that the reactionary effect of the irritation produced by the walking may cause to be thrown out, some inflammatory material or granulation tissue on the surrounding parts, or the periosteum, or between the ends of the bones, or from the medulla that would ultimately be formed into substantial bone. Should this procedure fail, then some operative treatment must be adopted. The simplest of all that is recommended is rubbing the ends of the bones together, but, of course, that would be of no use after the patient had walked around for a number of months, since the bones have undoubtedly had sufficient rubbing. In a case in which the preceding form of treatment has not been adopted, however, this method of making friction might be of use, and this should be followed by the application of a firm cast. The next simplest operation is that of drilling the ends of the bones, which may be done subcutaneously or through an open incision, and this to be followed in turn by fixation in a cast, or by allowing the patient to go around with crutches after fixation, hoping that as before it will excite the formation of a callus and new bone.

The open incision is probably better in some ways, since it gives the surgeon an opportunity to protect the underlying tissues from injury by the drill point, but since it is a fact that ununited fractures more frequently follow compound fractures, I believe that if it were possible to avoid an open incision, it should be done. In many cases it seems that bone operations are necessary, and after all the simpler means have failed, this method should be resorted to, and just exactly the procedures that should be adopted depends on the local conditions. If necrosis exists, all such bone must be removed, and more or less resection becomes a part of the operation so as to bring the fragments into good apposition. One case that I was asked by a colleague to operate on had necrosis of the tibia and of one end of the fibula; all this necrosis was removed, the bones materially shortened and united as an oblique fracture. Infection occurred, but a fairly good result was obtained, and during the progress of this case the wound was treated through a fenestration in the cast. The leg turned in the cast so that the foot described an arc of 90 degrees, the toes pointing inward, and a new cast, after a period of thirty-six hours, was applied, extending above the knee; this held the foot firmly. A good solid leg resulted which he is now using for all practical purposes. Almost any method of treating the ends of the bones can be used that would bring healthy bone tissues in each fragment into apposition. The most common one is to unite the ends of the bones obliquely and use some means of securing fixation.

In some cases, in order to secure this perfect fixation, it might be possible to make a shoulder in each fragment, and so with the two ends of the bone overlapping, as carpenters arrange their heavy timbers, and through this overlapping part to insert some material to maintain the position, either bone pegs, ivory pegs, wire or metal pegs. Silver wire is what I have been accustomed to use. Two or three times it has had to be removed on account of the irritation that it has caused and an existing sinus. I doubt also if silver wire or any more flexible material would produce absolute fixation by itself. Screws and various bracketed metal braces fixing the bone have been devised.

Dr. Leonard Freeman has recently reported a case in

which an ununited fracture of the neck of the femur has been treated by fixation by a screw with good results. Parkhill's apparatus is probably the most commonly used, but the results seem to be the same whether the simplest method of fixation or the most complicated method is used. All of these patients can not recover, no matter how much care and attention may be given to them, no more than we can tell the cause of all ununited fractures.

DISCUSSION.

DR. MARTIN, New Orleans, is convinced that many ununited fractures are caused through improper reduction, or the interposition of soft tissues. After the physician has reduced the fracture he should try to get crepitus, as he will then know that there is bony apposition. Wire does not fix the bones. It is impossible to bring the bony ends in apposition sufficiently tight for wire to hold them there. There will always be a certain amount of union. Dr. Martin has been using a wire staple, made of piano wire. This is very stiff and fixes the ends absolutely. He has very rarely had to remove them, but if suppuration occurs this is a difficult matter. He believes that drainage is necessary when one has to sew the ends of the bones. In any event it is always a safe thing. Dr. Martin operated in one case recently in which the injury was so superficial that he had no trouble and got a perfect result.

DR. THOMAS W. HUNTINGTON, San Francisco, said that, with an extensive experience extending over a period of 25 years, he does not recall a case in which delayed union could not be definitely traced to faulty adjustment and malposition. This opinion is based on a large number of cases in which he has operated for the relief of this unfortunate condition. Interposition of foreign material seems to him a consequence of malposition rather than a direct cause of non-union. The point which should be uppermost in the mind of the surgeon is the correct adjustment of the fracture early in its history. In this particular undertaking the aid of the *x*-ray should be invoked as often as possible, and from time to time after adjustment the status of the fracture should be checked up by the aid of the *x*-ray during the course of treatment. It is not uncommon in his experience to find a week after a careful adjustment that displacement has occurred. This happens particularly in fractures of the shaft of the femur in which the adductors displace the lower fragment internally and the opposite muscles acting on the upper fragment displace it externally. After an honest effort for the correction of the deformity by ordinary means, it has been Dr. Huntington's practice to offer the patient a better result by the use of some artificial means such as wire suture. The maintenance of permanent apposition without such interference is often times extremely difficult if not absolutely impossible.

DR. HARRY M. SHERMAN, San Francisco, said that no one has referred to rupture of the nutrient artery of a bone as a cause of delayed union or non-union. Fractures occur at all ages. In a child so injured, when the nutrient artery is torn off, it is possible to have non-union, and union never occurs when this takes place. The lower fragment is deprived of blood in sufficient quantity and atrophies, and one can thrust a scalpel into it; it is so fragile and soft, while the upper fragment is dense and bone-like. Dr. Sherman has seen this occur in cases in which he has operated to correct a deformity of the tibia, and the line of the section of the bone happened to be across the course of the nutrient artery. Reposition in these cases has never been very difficult to secure, and when the fragments were put in place he felt sure there was no interposition of soft tissue. This tearing off of the nutrient artery can occur in an adult, as well as in a child, and then the upper fragment alone makes effort at repair, the lower fragment does not. Surgeons must count the rupture of the nutrient artery as one of the most important causes of delayed union and of non-union. So far as crepitus is concerned, as testifying to the fact that bone is against bone, Dr. Sherman thinks it should be satisfactory to most of surgeons. He does not mean to detract from the value of the *x*-ray, but surgeons can not have *x*-rays in patients' homes as well as in their offices. The

x-ray should be used to prove or disprove a diagnosis that has been made by the usual clinical methods. A man who does not make an effort to reset his fracture by the old methods, is robbing himself of all his old intelligence. Surgeons must not dull the edges of their senses by the *x*-ray, as it is said the edges of knives were dulled by the discovery of ether.

DR. J. S. HUNKIN, San Francisco, declared that the important point is securing immobility at the seat of injury. The usual failure is not in getting the ends of the bone in apposition, but in making the splint long enough and tight enough to hold them there. Surgeons have been led astray by the idea that swelling would promptly follow if the splint were tightly applied. As a fact, swelling does not take place, provided pressure is evenly graduated, regardless of the tightness. Dr. Hunkin puts all fractures of long bones in a tight, snug-fitting plaster of Paris splint, and he does not see non-union. The splint as usually made is not long enough to secure sufficient leverage. Long leverage and close application spells immobility, and immobility means union.

DR. W. J. MEANS, Columbus, Ohio expressed his surprise at the emphasis placed by Dr. Sharples on the matter of drainage in the operative treatment. It has been Dr. Means' experience that better results follow in cases in which drainage is not used. The question of ambulation is confined chiefly, in his judgment, to cases of transverse fracture in which there is good apposition of the fragments. When the question is only a matter of delayed union due to malnutrition, ambulation produces an irritation that will aid very much toward normal repair. In cases in which the fragments are not in apposition or can be forced out of position, ambulation is of questionable utility. He is fully convinced from an extended experience that the main cause of non-union is a lack of proper apposition. Therefore, the open method of treatment is the proper one in a majority of cases. He suggested that the open treatment should be used in all fractures in which proper apposition of the fragments can not be maintained, and that the treatment should not be delayed for weeks and months to ascertain how much Nature may do toward securing permanent union. This method will not only avoid vicious union, but will save much time to the patient. The method of uniting fragments can not be uniform. It depends on the individual case and the conditions with which one has to deal. One of the happiest results that he has had in several years was in a recent case of non-union of a fractured femur, in which operation was done after a period of ten weeks. He found the fragments over-riding; they were placed in apposition and held there by a notch in the upper fragment and a corresponding projection on the lower fragment. The periosteum was sutured over the ends of the fragments with catgut, and the incision was closed without drainage. The leg was then placed on a double inclined plane without extension. The patient made an uninterrupted recovery, and left the hospital seven weeks later with a perfect recovery. Dr. Means believes that if possible non-absorbable material should be avoided in bone operations. The method he suggests is applicable, he thinks, to a large number of cases of fracture of the long bones.

DR. C. W. SHARPLES demonstrated his method on the black-board. He has used silver wire and has obtained good results, but he is sure silver wire does not secure the best apposition. Wherever the periosteum can be saved it should be done. Whenever it is possible to do so, he believes that the best method is to cut a shoulder on each fragment and to fasten these together with some sort of pegs. Surgeons will thus come nearer getting good results than by any other method. More raw surface will be brought into apposition. Fibrous tissue intervening between the ends of the bones and causing ununited fracture is nothing more than an attempt to heal the parts. This is a part of the formation of an ununited fracture. In fractures of the tibia, one needs very perfect apposition. Many cases of fracture have not united well, and yet the result has not been considered vicious union. The part that the nutrient artery plays is important. Dr. Sharples believes that he has seen a case of ununited fracture due entirely to an injury of the nutrient artery.

A PHILIPPINE FEVER.*

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AND

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We wish to place on record two cases of an infectious disease, occurring in the Philippine Islands, which is characterized by a remittent fever of short duration and the presence in the blood of a motile hemocytzoon. These cases will be of particular interest to medical officers of the U. S. Army in the Philippines, where yearly numerous cases are recorded in the sick and wounded reports from the various posts as "fever, type undetermined," and this in spite of the fact that careful microscopic examinations are almost universal and that the resources of the Division Hospital laboratory are easily accessible for serum diagnoses.

CASE 1.—J. R., private, First Cavalry, Hospital Corps, U. S. Army, admitted to hospital Aug. 1, 1905.

Family History.—Father died of diabetes, mother of cerebral hemorrhage. No brothers or sisters.

Personal History.—Had diseases of childhood. No pneumonia, typhoid, dysentery, malaria or rheumatism. The patient states that during his two years of service in the Philippines he has always been healthy and well. He is 25 years old.

Present Illness.—No premonitory symptoms. Was sick one day previous to admission. Had slight chill, followed by fever, but no sweat. Fever continued to time of admission. Slight headache, no pains in back and limbs.

Condition on Admission.—The patient complained of fever and general malaise. He looked sick. He suffered no actual pain. No cough, no expectoration, no dyspnea, no vertigo, no headache, no cardiac palpitation, no nausea and no vomiting. Appetite was poor and bowels were constipated. Patient stated that he was passing normal amount of urine.

Physical Examination.—The patient was a well-nourished white man. Skin in good condition. There was no rash present. Face was flushed and conjunctivæ injected. The lungs were clear throughout. Heart sounds were clear and of good quality. Area of dullness, lower border third rib, left parasternal line, to the apex beat, which is visible and palpable in the fifth interspace mid-clavicular line. The liver is not enlarged. The spleen is found between the ninth and eleventh ribs and is not palpable. No tenderness in the abdomen, no masses, no distension.

The laboratory reports show a negative diazo reaction, a faint trace of albumin and no sugar and casts in the urine. The red blood count was 5,344,000, the white blood count was 5,200, the hemoglobin 100 per cent. and the differential unimportant. The blood culture and an inoculation into a monkey were followed by negative results.

After the patient had been in the hospital for three days with a fever suggesting typhoid infection, the fever fell by crisis, whether as a result of the hypodermatic administration of quinin or not we can not say. On August 3 the patient vomited a small amount of greenish fluid, and on the 4th he had a sweat for the first time, which was of slight duration and amount.

Without any complications the patient passed through a rapid and uneventful convalescence and was discharged. (Chart of Case 1).

The interesting point in the case was the finding in the red blood cell of a hemocytzoon entirely different from the hemameba of Laveran. It was lying in red blood cell which was uncrenated and free of vacuoles. The cell was of normal size and color. The organism was approximately 2.5 microns long and 1.1 micron broad, was unpigmented and refractive to the same de-

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