STATED MEETING, HELD NOVEMBER 1, 1915

The President, Dr. John H. Gibbon, in the Chair

SURGICAL TUBERCULOSIS TREATED BY THE ROLLIER SUNSHINE METHOD

Dr. A. Bruce Gill presented four children who had been treated for surgical tuberculosis by the Rollier sunshine method. These children have been exposed to the sunshine in Philadelphia and at Longport, which is on the seashore below Atlantic City.

The first case is that of a child who had osteomyelitis of the femur, fibula, and bones of the foot of the right lower extremity, with numerous sinuses discharging. The child was immediately put upon the sunshine treatment. At the end of four months the sinuses are all practically healed. We not only expose the affected part, but the whole body for a short time each day, so that the skin will not blister.

The second case was one of tuberculosis of the hip-joint; winter before last the child was extremely ill. The skin and soft tissues had melted away and exposed the neck of the femur, the great trochanter and three or four inches of the shaft. There was high temperature. In February of last year treatment was begun, at which time the child weighed 41 pounds. The first of June it was sent to the seashore and there the weight came up to 48 pounds. All through last winter the child was exposed to the sunshine whenever there was any and by the end of this summer the weight came up to 61 pounds. The child is now quite well and is going to school for part of the day. Her wound is healed.

The third case is one of Pott's disease. A year ago an Albee's transplant was put in the spine. There was pus present at the time of the operation and the wound did not heal. Three or four weeks after operation there were signs of pulmonary tuberculosis. There were râles, cough and temperature. The child was put into the sunshine and after several months' time the sinuses healed up, after a small part of the transplant had come away.

A fourth child has a tuberculous hip-joint and is still kept in bed. At first the affected part itself is exposed and gradually the entire body.

It is worth while knowing that this treatment can be carried out in this climate. It is valuable in both tuberculosis and infected wounds.

Dr. William J. Taylor said that he was personally very much in favor of this method and had been advising it for some little time. In a tuberculous hip-joint where there was a sinus discharging for many months, under this form of treatment the wound has healed and the general benefit to the patient has been very great. At the Orthopædic Hospital the children are put out on the roof and kept exposed to the sun all day. The benefits are really very great.

REMARKS ON THE SURGERY OF THE EUROPEAN WAR*

WITH A DESCRIPTION OF AN IRRIGATION SYSTEM FOR PERFORATING INFECTED WOUNDS

By Edmund B. Piper, M.D.

of Philadelphia

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On the first of July, 1915, the University of Pennsylvania Unit, headed by Dr. J. William White and Dr. James P. Hutchinson, took over the University Unit of the American Ambulance in Paris from the representatives of the Harvard University.

The American Ambulance was started by the Americans in Paris, especially those connected with the American Hospital, which is situated in Neuilly just outside of the gates of Paris. This little hospital has about fifty beds and is very efficient in every respect. I believe the original idea was to construct a small temporary war hospital within its grounds. However, soon after the war began the French government turned over to the American Hospital the nearly completed school building, known as the Lycée Pasteur in Neuilly, to be used as a War Hospital, and this was where our work was done. At the time the war broke out, in August, 1914, this building was very nearly ready for occupancy. It is a structure which in America would cost from half a million to a million dollars and is built of brick with stone trimmings. There are four floors and a basement. The entire building is open to light, it being constructed in corridors with a front administration building and a central garden or court, so that all parts open within and without. The basement is used for dining halls and storage rooms. The first or ground floor has three large and seven small wards and the second and third floors each have about eighteen or twenty small wards of ten beds each. The dental department is on a wing of the second floor, the main operating room on a wing of the first floor, and the University Unit operating room on a wing of the fourth floor. The ambulance drivers and orderlies sleep on the fourth floor. The building, except for the fact that there are no elevators, is remarkably well adapted for the use of a hospital. The wards are very light, and there is plenty of air. The absence of an elevator, however, is a very great disadvantage, since one operating room is on the first floor and the other on the fourth, also that there are two X-ray plants, one adjacent to each operating room.

* Read before the Philadelphia Academy of Surgery, November 1, 1915.

When I went on duty the services were divided as follows: Dr. Du-Bouchet was Surgeon-in-Chief and had a service of his own of approximately 160 beds; Dr. Blake had a service of 150 beds; Dr. Mignot of the French Army had a service of about 80 beds; and the University Unit had a service of 180 beds, which included the entire third floor with the exception of one ward. This was given over to the treatment of the eye, and was in charge of Dr. Hunter Scarlet.

The question of infection is naturally a very important one, and I feel safe in saying that all the cases, or practically all, were infected at least in a slight degree. The slightly infected wounds were usually in those parts not covered by clothing and in which there was a slight laceration by a piece of shell or a clean puncture by a high velocity bullet. The infections were of all the usual types that we find at home with the addition of the gas bacillus. It seemed to us that the severity of the infection in many instances was increased when the patients gave a history of a great number of different dressings done in different places in the first forty-eight hours following injury. The length of time that the man had worn his clothing, both uniform and underwear, was another important factor in determining the severity of the infection. In many cases, injured in a part covered by clothing, pieces of coat, underwear, socks, etc., were recovered from the wounds for a long period of time following admission to the hospital.

As regards the treatment of these varied types of wounds, I might say that hardly any two cases could be treated alike. Of course, the same general principles applied to all and sometimes the success or failure of a type of apparatus for one case would be of value in treating succeeding similar cases.

In deciding how we should treat a given case, it was necessary first to determine whether amputation would or would not save life. (Of course, all wounds were not of the extremities, but I am speaking of them in that manner because a large proportion were, and because it was mostly in these cases where the question of judgment was of vital importance.) Our attitude was to avoid amputation when possible, not from the idea of the end-result to that particular part, but from the point of view as to whether the patient would throw off the infection and stand later amputation better.

After placing the injured part in that type of apparatus which appeared to be most comfortable, the question of the treatment by dressings came up. These were usually one of three classes: First, wet gauze dressings frequently changed; second, the steady drip of some solution; and third, irrigation.

The solutions most frequently used for wet gauze dressings were the sodium hypochlorite solution of Dr. Carrel, a normal salt solution, boric acid solution, alcohol, and sterile water. Except for the alcohol, these were always used very hot, very well wrung out, and very well covered. Our Service felt that the type of solution used in this manner was a very small determining factor as to the result. For irrigations the solutions used were again the hypochloride, salt, sterile water, and, in addition to these, sometimes weak iodine. Again, in this type of treatment we felt that the determining factor was not the chemical constituency of the solution so much as the mechanical action. Dripping of wounds was done mostly in those widely lacerated superficial wounds where there was very violent infection.

Continuous irrigation was used in some cases of through-and-through perforating wounds, also in some few punctured wounds, but these latter were done more frequently at the time of dressing once or twice a day. There were numerous types of permanent irrigations. Dr. Alexis Carrel recommended one that was apparently the most efficient. The description that was given me of this apparatus was that a tube was placed in a wound of entrance and sealed there with collodion, and a tube placed in a similar manner in the wound of exit. The solution was therefore forced into the wound and out of the wound and the external surface of the limb was kept dry. The disadvantage of this was that it was not applicable in those cases in which the wound of exit was accompanied with terrible lacerations of the skin and soft parts. There was another type of irrigation in which a fenestrated tube was carried through and through the wound which connected above with the irrigating can and below with a waste bucket. Again the disadvantage of this was that the irrigation ended by being mostly of the tube itself and not of the wound. There were many other types. My colleague, Dr. Keating, evolved a very ingenious scheme by which he could irrigate from one main irrigating can multiple wounds of the arm or leg.

There were some cases of through and through wounds in which apparently hot wet dressings did not clear up the infection and some type of continuous irrigation was essential. After seeing some of these irrigations it occurred to me that if an old fundamental principle of hydraulics were used, we could procure an actual forced irrigation of the wound under pressure. This principle which I made use of was that water always flows the easiest way and that the easiest way could not possibly be through a wound unless it was forced through by back pressure, and therefore I worked out the following simple apparatus.

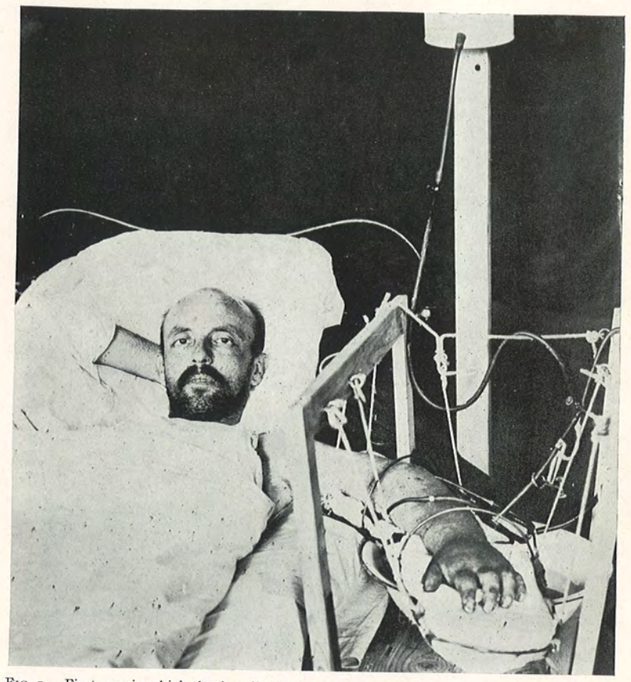

FIG. 1.—First case in which the described irrigation was used; multiple through-and-through wounds of the elbow. The result was satisfactory.

A soft rubber tube of the size necessary for a given wound was used. In the centre of this tube there was a single window cut in the shape of a gutter. This was placed in the wound, usually with the patient under anæsthesia. An irrigating can with a shut-off valve was connected with a glass T-tube. Soft rubber tubes came off of either end of the T, both of these having a shut-off valve either within them or a metal clamp. These were again connected with the tube within the wound at either end, and at the most dependent portion another T-tube was placed to which was attached another rubber tube with a shut-off valve which emptied into a bucket. In this way the water could be carried from the irrigating jar to the T-tube (Fig. 1), and by opening the valve on one side and closing it on the other the flow of the water was directed through the tube in the wound in whichever direction desired. With the valve on the dependent T-tube opened, the water flowed through the tube in the wound directly into the waste bucket, which showed us that the wound itself would not be irrigated in that manner, but when that lowest valve was closed, giving a back pressure, there was only one possible place that the water could escape, namely, through the window in the tube within the wound. In this manner the wound itself was irrigated around the tube and the pus was washed out mechanically. A slight change in the position of the window would determine which end of the wound would be flushed. In this manner we were able to keep up free drainage continuously. The solution coming from the wound was directed into the waste bucket, by rubber sheeting, and thus the bed was protected. This was tried on a number of cases with reasonably satisfactory results. *No irrigation of any type seemed to be of any value unless there was proper and sufficient drainage.*

There has been diversity of opinion in regard to the treatment of the gas bacillus infection. I believe it is generally agreed that where gangrene resulting from this infection has set in, immediate amputation is indicated. There are some men who think that amputation is indicated whenever the diagnosis "gas infection" has been made, even when there is no evidence of gangrene. The feeling of our service was that cures of gas bacillus infection could be brought about without amputation if proper and sufficient drainage were instituted. By this I mean drainage not only of the skin and superficial fascia, but wide-open drainage of the muscles around the seat of infection. It was our policy to open the infected areas freely in many places and to insert through-and-through drainage tubes.

The following case that I will give from memory is typical of gas bacillus cases that are admitted to the American Ambulance.

This man was admitted a few days after he was wounded. He had had both legs amputated below the knee at the Base Hospital. The left leg was a straight amputation without flaps, and not closed. The right leg had been amputated with apparently some post-operative hemorrhage which had been controlled by packing, and a few sutures had brought the flaps together. When this man was dressed and the packing was removed there was no difficulty in making the diagnosis of "gas infection," as the gas bubbled out in abundance. The man was immediately taken to the operating room where all the sutures were removed and the stump was laid wide open. The question of further amputation above the knee was brought up and, with the exception of our chief, Dr. Hutchinson, practically every man present was in favor of further amputation. Dr. Hutchinson decided, however, that he would give the stump very free drainage and wait. The patient was returned to the ward, where the stump was put in a sling, was extended outside of the bed and a continuous drip of a salt solution was commenced. Twice daily the stump was irrigated with peroxide of hydrogen, which was washed off with a weak solution of iodine. At the time this treatment was instituted there was practically not a particle of live tissue visible. The bone was protruding for possibly two inches, all the muscles were gray and absolutely necrotic. I had this man in my ward for two months. When I left, the left stump was entirely healed and the right stump, which at the beginning of the treatment had been at least eight inches in diameter, was healed with the exception of about three-quarters of an inch, and there was a very little bit of bone still showing, but not protruding.

Practically all amputations that came to us from the front were no-flap amputations, and these were all treated in the same manner, namely, an extension put upon the flaps.

The wounded that came to the American Ambulance during our period of service and for some time preceding that were all French or at least of the French Army. There were some Moroccans and Algerians, and some of the French negroes. The attitude of these men was nearly without exception that which made it a pleasure for anyone to work with them. They were always game, courteous, happy when not in actual pain, and full of gratitude for what little we were able to do for them. One case will always stand out in my mind as typical of the French people in this time when their very life is at stake. This case was a violent infection with fracture at about the middle third of

the femur. He was turned over to us by the Harvard Unit, and I was warned by Dr. Coller of that Unit that he was in a serious condition. He was in a plaster cast with the usual reinforced window over his point of infection. About four days after we went on duty, in the night he had a hemorrhage. When I arrived in the Ward he was bleeding rather freely, and, of course, owing to the cast we were unable to use a tourniquet and I did not feel that there was time to remove the cast. With the aid of two candles (no electric lights were allowed after nine o'clock at night on account of the danger of Zeppelin raids) I packed this man's wound of entrance and exit under ethyl chloride general anæsthesia. When the hemorrhage was controlled his first words when he came out of anæsthesia were, "*Merci, Monsieur le Docteur.*" Gentlemen, that typifies the French soldier and his innate courtesy, which supersedes everything else. Another example—during the month of August I was slightly ill for a couple of days, which I spent in the American Hospital. The first day I arrived there I received a large basket of flowers, with a letter written in French by one of my fifty wounded men, and signed by every other one. I hardly believe that any set of ward patients in a home hospital would show that kind of consideration.

There was one man who suffered tortures every time I had to dress him for several weeks. I have seen him stuff a red bandana handkerchief in his mouth so that his groans would not disturb me. I have told him after a dressing that I was very sorry to have to hurt him, and his reply was always the same, "What would you? It is necessary." This same man when he was evacuated later to a less active hospital frequently came back to see us. The last time I saw him he told me that the surgeons in his new hospital wanted to open his arm and drain it. I asked him what he did and he replied that he would not let them do it. Then I said, "But supposing we wanted to do it?" His immediate reply was that that would be all right, and that was the attitude of the French soldier to the American doctors.

In closing there is one point that struck me most forcibly, namely, *War Surgery is distinctly Ward Surgery,* and the results that are attained are much more dependent upon the treatment in the wards, than upon the operations that may be done. Of course, many operations are needed, but that is the smallest factor in determining the end-results. Any man going to serve in a War Hospital with an idea that he will procure a large operative experience I believe will be sadly disappointed, but it seemed to us that the treatment of the cases in the wards was far more interesting and valuable than any operative ex-

perience that might have been acquired, and no member of our Unit will ever regret the trip.

Dr. Charles McDonald and Dr. John F. McCloskey also gave some personal reminiscences of recent experiences with war surgery in Europe.

Dr. Ralph Bromer (of Louisville, Ky.) stated that he served as House Surgeon of the American Ambulance during the months of September and October, 1914. The mortality rate was high owing to the fact that during the retreat from Belgium the ambulance corps of the French and British armies were practically out of commission. Some of the wounded were from six to nine days without treatment. In eighteen deaths occurring on his service four were from tetanus and two from gangrene of the lung. He did not remember the exact number of amputations for gas infection. The cases too sick for operative interference were treated by administering oxygen under the skin in the good tissue around the wound. Quite a number of deaths also occurred because of secondary hemorrhage, this at times being quite sudden in its appearance. One man with a wound of the superior maxilla died quite suddenly on the fourteenth day from severe secondary hemorrhage. The point of hemorrhage could not be found at autopsy.

Dr. D. J. McCarthy (by invitation) also took part in the discussion of these papers.

STRAUS'S METHOD OF FIXING FRACTURES

Dr. John B. Roberts said that surgeons often wished for some way of fixing fractures with something less troublesome than steel or metal bodies. He called attention to a recent paper by Dr. Straus, of Chicago. Straus makes a mattress of catgut to support the line of fracture and puts a plaster-of-Paris bandage outside. It occurred to Dr. Roberts to take a piece of fascia of the subject, coapt the bone, and place the fascia which later would become absorbed. To make the part a little more rigid a drill pointed nail could be used. This method ought to be better than putting in metal flaps. His idea was to modify Straus's original plan by using a piece of fascia from the thigh of the subject.

THE ARTIFICIAL PERIOSTEUM FOR FIXATION OF SHAFT FRACTURES*

By John B. Roberts, M.D.
PROFESSOR OF SURGERY
(Note from the Surgical Laboratory of the Philadelphia Polyclinic.)

The ease with which subperiosteal fractures are cured with little callus and slight deformity is nature's hint as to treatment. Surgeons have been misled into thinking that the essential factor in treatment is absolute immobility of the jagged bone ends. Therefore, prolonged immobility by means of external splints or direct fixation by plates has successively been the vogue.

When the periosteum is little torn or only slightly stripped from the bone's shaft, reduction of the fragments and retention of the broken surfaces in apposition are easy of attainment. Successful reconstruction of the skeleton follows readily. What shall be done, however, under reverse conditions, namely, greatly lacerated periosteum, consequent wide separation of fragments, and, perhaps, entanglement of the jagged pieces of bone in muscles and fasciæ? Inspect the broken bone, repair the periosteum or provide a new periosteum, and give stability and rigidity by means of traction and contour-fitting splints.

The only way to repair the torn periosteum is to expose the broken bone by aseptic incision, adjust the ends of the fragments, and stitch the ruptured fibrous covering around the break. Often a firm repair of the periosteum in this way is not possible. Why not then substitute a graft of the fascia lata, cut from the outer surface of the patient's thigh; and, by wrapping it around the shaft of the bone at the seat of the break, prevent lateral displacement or overriding? The operative wound should then be closed without drainage and a gypsum encasement, with or without continuous traction, be adjusted to the limb.

This method I believe will be found a valuable improvement over the plating of rebellious fractures of the shafts of long bones. I have only experimented with fascial tubes or straps for this purpose on the cadaver.

The success of D. C. Straus[1] with woven catgut rugs or splints in treating experimental fractures in dogs has, however, convinced me of the value of his method of support. The autogenous fascial graft is

* Read before the Philadelphia Academy of Surgery, November 1, 1915.
[1] Surgery, Gynæcology and Obstetrics, October, 1914, p. 410.

founded on the same mechanical principle, which is that a firmly placed tube or wrapping of flexible tissue around a broken rod or bone prevents displacement.

Macewen has insisted that the periosteum does not generate bone, but merely limits its growth. If this be true, placing a new fibrous envelope, instead of the lacerated fibrous periosteum, around the ruptured osseous tissue restores in some degree the normal status of the injured bone. A long piece of fascia lata wrapped twice about the replaced fragments will, if firmly bound by sutures of fascia or of catgut or tied by strings of the same absorbable material, prevent shortening, alteration by rotation and lateral displacement. Later it will either be absorbed or converted into a sheet of fibrous tissue similar, mechanically at least, to periosteum. Normally the periosteum gives toughness and elasticity to the bone. The fascial envelope acts somewhat in a similar manner.

Thus the fascial tube is, I believe, preferable to metal plates. In comminuted fractures of the shaft it would seem to be greatly superior mechanically to plates, screws, nails, inlay grafts, or bone pegs. Straus's catgut mat was absorbed in dogs in three weeks. It is possible that stomach wall or bladder wall of the lower animals or real parchment might be used instead of the patient's own fascia lata. My experience with autoplastic grafts, however, and the ease with which a long strip of fascia lata can be taken aseptically from a patient's thigh, without real risk to him, cause me to prefer its use.

It is possible that other surgeons have suggested fascial tubes or straps for steadying or fixing fractures requiring open or blood-letting treatment. If so, I have not heard of their experiments or experience. I should be glad to hear reports from the Fellows of the Academy, if they adopt the procedure for cases to which it seems applicable.

There have been various endeavors to obtain absorbable fixation appliances instead of plates. This seems to be the simplest.

If there is too much flexibility at the seat of fracture after the fascial binding, one of my fracture drill-pointed nails, described before the British Medical Association at Edinburgh in 1898,[2] may be driven through the fascial tube into the bone ends to steady them and its shaft be allowed to protrude through the closed wound. It may be readily removed at the end of ten days or two weeks without important disturbance of the external dressings.

An artificial periosteum is adapted to fracture thus:

[2] Philadelphia Medical Journal, 1898, and Notes on the Modern Treatment of Fractures, D. Appleton Co., New York, 1899.

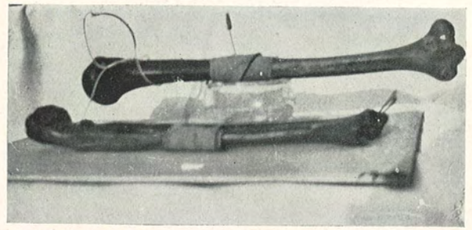

FIG. 1.—Model of fracture of humerus supported by an autogenous tubular sheath of fascia lata acting as an artificial periosteum. At the upper end of the humerus is seen the flat curved needle and catgut thread, by which the sheet of fascia has been carried around the broken bone after the fracture has been made accessible by incision of soft tissues. Bones of forearm showing fracture of ulna supported by a fascial wrapping representing an autogenous artificial periosteum.

The broken bone is exposed and freed from muscles for two or more inches. The fascial graft, cut from the outer aspect of the thigh, should be six or more inches long. One end should be pointed. To this pointed end should be tied, or sewed with catgut or fascia, a cord of thick catgut or Kangaroo tendon or a band of fascia. This cord should be threaded into a very large, flat, curved needle, like that used to carry a Gigli or chain saw around a bone. By means of the needle it is easy to draw the fascial graft around the coapted fragments so as to wrap the bone twice or thrice. The wrapped graft is then smoothed out on the surface of the bone and the cord used to fix it close to the enclosed broken shaft. One or two stitches may be made with the needle into the layers of fascia; or another absorbable thread may be used to stitch down the end and fasten the edges of the wrapping together. The muscles are then allowed to fall into place, the fascia over the muscles is sutured and the wound closed without drainage, as in Lane's method of plating. Outside is applied a gypsum-gauze encasement with or without traction, or a simple form of splint is used to give rigidity and secure protection from injurious motion.

The use of fascia may be varied somewhat. In very oblique fractures, for instance, two quite narrow splints may be wrapped about the bone at a considerable distance from each other and, if continuous traction is used, coaptation of fragments and length of bone will be preserved.

This fascial tube, or artificial periosteum, apparently solves the problem of substituting absorbable for non-absorbable support in shaft fractures. In 1911, I prepared, on invitation from the officers of the French Congress of Surgery, a paper entitled "An American Surgeon's Opinions of the Open or Operative Treatment of Closed Fractures." As I was, however, unable to attend the meeting it was published in *Archives Internationales de Chirurgie,* vol. vi, page 62. I have not since changed my opinion that the bloodless methods of dealing with fractures ought to remain the usual choice, and that they give, in the hands of those who apply them with care, good results. This view was and is the same that was taken by Robert Jones of England in his review of the Report of the Fracture Commission of the British Medical Association, and was that of the late Professor Bardenheuer in Germany, who for years insisted upon the infrequency of blood-letting operations if fractures were treated by permanent extension. Many surgeons in America hold the same opinion. When operative attack, however, is needed I believe the fascial tube or strap will often be found to answer the purpose better than the metal plate for shaft fractures.