

3. If, on the other hand, a further operation is proposed, as was originally intended, we find that after all they have gone through the men are naturally not always ready to submit to another operation. When a further operation is agreed to, it is not always easy to decide upon the best procedure, or always possible to get a good result. If the less severe process of clearing an inch or two of the bone and sawing it off is adopted the process of healing is still slow and the cicatrix is not by any means always satisfactory.

4. If a more formal re-amputation is performed in the thigh or upper arm the result means often a serious addition to the difficulties of fitting an artificial limb, and may make it almost impossible to give the patient useful mobility in the stump and control over the appliance provided.

5. Additional troubles arise in some instances. In one of our patients the section was made low down in the leg, leaving a long stump which is exceedingly awkward as it is. Re-amputation at the "seat of election" would, no doubt, give a good result, but in this instance further operation is declined. In another man amputation has been done in both legs, but so close to the knee that kneeling stumps are impossible, and probably re-amputation through both thighs will be ultimately required.

Unless there are really some other great advantages to balance the disadvantages, ease and speed alone are not sufficient recommendations. As regards a free outlet for discharge, either a flap operation or oblique section—i.e., the "elliptical incision" ("oblique circular of Hardie")—provides quite as free vent if the wound is kept open till danger is past. If desired, it would be easy to fasten back the flaps and fix them open for a time, and then bring them together when it was safe to do so.

THE RADICAL TREATMENT OF SEPTIC COMPOUND FRACTURES.

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COMPOUND fractures are on the whole relatively uncommon in civil practice. Since the advent of the present war, however, they have become almost as frequent as the simple fracture so commonly attending the out-patient department of our large civil hospitals.

The prevailing opinion on their treatment to date has been one of "Render the wound free from sepsis, place the fragments in as good a position as possible on an external splint—and wait." That is, first clean the wound, let it heal—with the fragments almost always in a poor position, in which position callus is formed and union commenced. Afterwards—months afterwards often—more radical treatment may be contemplated, generally when the muscles have undergone much shortening and a bone-lengthening operation is almost useless, if possible at all.

For some time it has been held inadvisable to attempt anything in the nature of plating a compound fracture in civil life until the wounds have healed, and much more has this been condemned when any suppuration is present. The reputed reasons for this, I believe, are:—

(a) The danger of opening up new channels of infection.

(b) If sepsis takes place a foreign body of the nature of a plate will tend to keep up a discharge and will eventually have to be removed, no union having taken place and two operations having been performed.

(c) Callus formation and union will not take place when sepsis is present.

(d) A septic foreign body is not tolerated by the tissues.

This reasoning does not seem to me entirely sound for the following considerations:—

(a) There is little or no danger of opening up new channels of infection.

(b) Two operations, where the plate is inserted and removed, are better than numerous anæsthetics for the "putting up" of fractures on various external splints.

(c) Union does often take place before sepsis has cleared up, generally with the bones in bad position.

(d) Much septic shrapnel has been embedded in the human body since the war began, and has neither been extruded nor extracted, the wounds having healed entirely under active antiseptic treatment, proving the tolerance of a septic foreign body.

Since the commencement of the war I have had the opportunity of seeing fractures in all conditions, from the front, in Clearing, Base, and Territorial hospitals, and have been struck by the rather invertebrate treatment meted out to them, whilst sister wounds of the soft parts receive such very adequate radical treatment. In several cases I have seen a large incision made over the site of the fracture for the purpose of evacuating pus and providing efficient drainage, yet the bone fragments have been left severely *in statu quo ante operationem*.

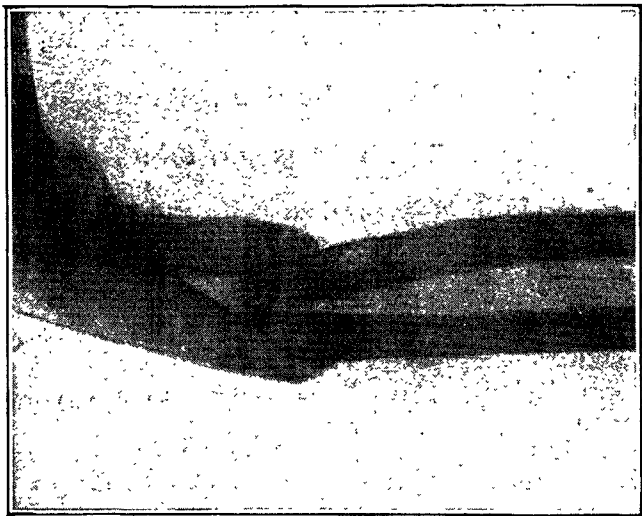
It was the unsatisfactory condition of so many old compound fractures—with union—which I have seen in England that encouraged me to embark on a rather more radical treatment of these cases. I am now strongly of opinion that some means of internal splinting should be carried out in all compound fractures where: (a) An incision is needed for ample drainage and efficient cleansing; (b) where skiagraphy shows malposition with conservative treatment.

I have seen fractures as early as two hours, and as late as four months, after infliction, and the difficulty of providing a good functional limb in the later cases has convinced me of the necessity of radical treatment being undertaken as early as possible. I have operated on a fair number of compound fractures now, but have only been able to follow up those cases which have been under my care at Reading, and in no case have I had cause to regret the rather radical treatment of open reduction.

The method of treatment I adopt is to make a large incision over the site of the fracture, define the ends of bone, remove any small detached portions of bone and shrapnel, and after placing the two or more main fragments in position, either fix them with a Lane's plate, suture them with silkworm gut, or, as in one case I had in France where there was much loss of bone, transpose a graft from the tibia or fibula.

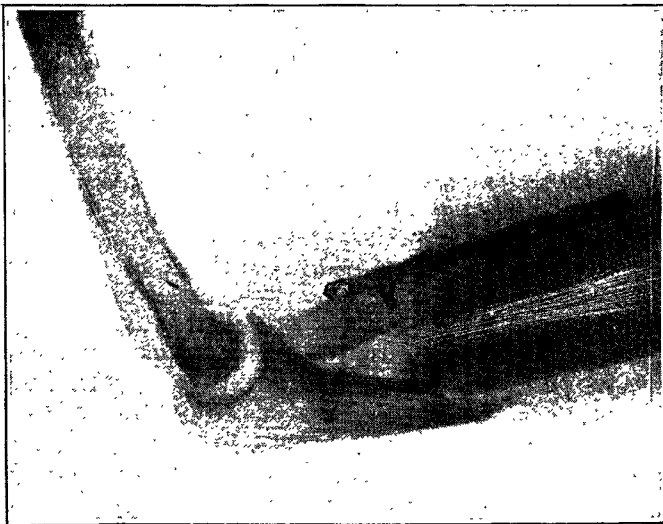
If the condition is fairly clean I sew up the muscle and fasciæ, leaving only a small rubber drain down to the plate. If it is very septic I make no attempt to "bury" the plate or fixing apparatus. Active antiseptic treatment is, of course, called for. Even if there is much pus, callus is

FIG. 1.



Case 1. Comminuted compound fracture of right radius and transverse fracture of ulna.

FIG. 2.



Case 1 after plating.

rapidly thrown out from the bone fragments in position. Pus even seems on occasion to stimulate this condition, just as in septic wounds of the soft tissues exuberant masses of granulation are commonly seen round a sinus, which pout and sprout uncontrolled by frequent applications of AgNO_3 .

Callus is quickly formed (three to four weeks in my series) and, even if a troublesome sinus persists which necessitates the removal of the plate, the bone will be found to have acquired sufficient supporting callus to retain it in its (plated) position. So far I have not had to remove a single plate. The results are most gratifying, the most striking point being an almost complete absence of pain during the dressings.

I append a few cases illustrative of the above conditions:—

CASE 1.—Corporal; badly comminuted compound fracture of right radius with transverse fracture of ulna. (Fig. 1.) Operation ten days after infliction. The radius was defined and found to be in six fragments. The upper and lower main fragments were united by a long (femur) plate. The intervening pieces were united by silkworm-gut stitches and “lashed” to the plate. (Fig. 2.) Profuse suppuration in two days’ time necessitated removal of all the stitches. Union of the radius took place in five weeks, but the ulna remained ununited for two weeks more.

The patient can now use this arm well; he can unlock a stiff lock and open and shut doors. Flexion and extension

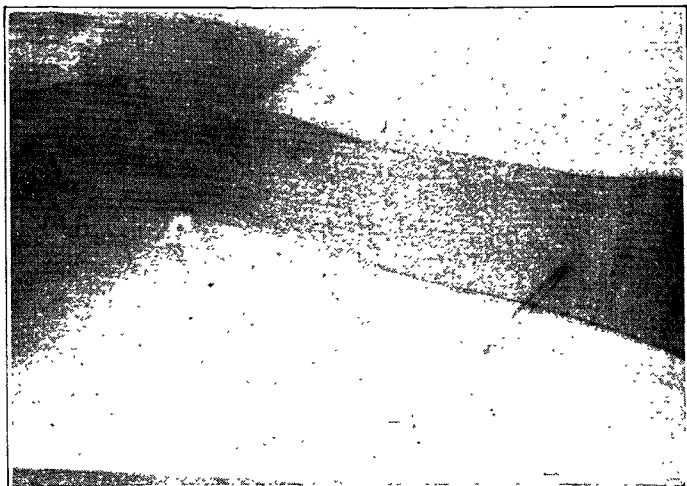
of the elbow are not affected; pronation and supination are almost as good as before the wound. For a long time the soft parts, though clean, would not unite, but scarlet red ointment of Parke, Davis, and Co. rapidly cleared up this condition of inertia.

CASE 2.—Private; badly septic comminuted fracture of right mandible about the angle; complete separation of fragments and mouth fixed open. Operation five days after infliction. The angle and horizontal process were exposed by an incision along the lower border. The three posterior teeth were extracted and small fragments of shrapnel and bone were removed. The two main fragments were manipulated into position and a short three-screw plate applied. A mouth-wash of H_2O_2 was irrigated from the mouth through the original wound to the exterior for two days, when the wound in the mucous membrane healed. The incision healed in ten days. Good union now and movements fair; improving; much callus formation.

CASE 3.—Private; compound comminuted fracture of right radius just below pronator radii teres insertion; position not good. No union after three weeks in France. Still very septic and painful, with 1 inch gap between the fragments. Opened up on admission to Reading. Pus was evacuated, and the ends of the bone were sewn in position with silkworm-gut through holes drilled in the ends of the bones. Cleaned up rapidly with complete absence of pain. Callus was seen skiagraphically after ten days. There is union now, but the wound is not quite healed.

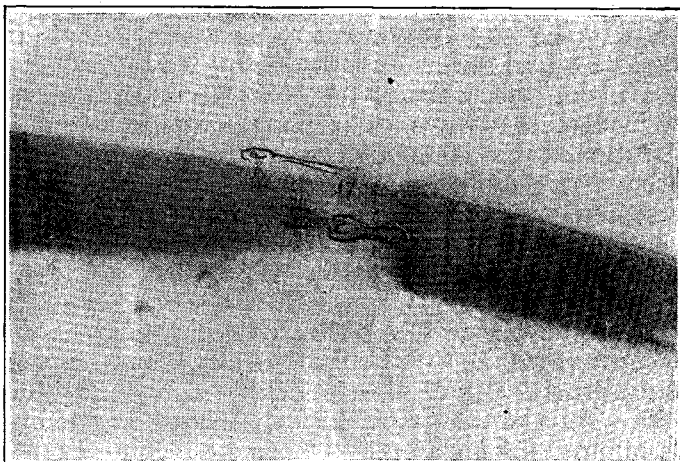
CASE 4.—Private; admitted with fractured femur in bad position (Fig. 3); 3 inches of shortening. There was a laterally

FIG. 3.



Case 4. Fractured femur. A, flake of bone accidentally detached.

FIG. 4.



Case 4. Plates on inner surface of femur and in medullary cavity.

coursing septic bullet wound from the outer to the inner side of the thigh 7 inches above the knee-joint. Operation five weeks after infliction. A median anterior incision 8 inches in length was made. The bone was defined, and three fragments, after much difficulty owing to rigidity of the muscles, were manipulated into place. The middle flake accidentally was now detached in moving a retractor and fell on the floor. Two short plates were then placed on (1) the inner side of the shaft of the femur; and (2) the outer aspect of the inner side of the compact bone of femoral shaft—i.e., in the medullary cavity. (Fig. 4.) The incision healed *per primam*, but the bullet track still discharges, a sinus 8 inches long still being present after six weeks.

There is good union with much callus. The plates in this case may yet need removal, but in the last few days the sinus has become somewhat smaller, and I shall continue conservative treatment for 14 days more before removal of the plates, if then necessary. The position is as good as before the fracture.

CASE 5.—Private; comminuted fracture of lower third of tibia. The fracture was exposed and the fragments were sewn in position with silkworm gut. Union took place in four weeks in perfect position.

CASE 6.—Private; Alpine Chasseurs; 6 inches blown away from the middle of the shaft of the femur by a bullet at short range. Six weeks after infliction, the wounds being fairly clean, 8 inches of the fibula were resected from the same leg and placed in the gap by forcing it into the medullary cavity of the upper and lower fragments. A good deal of suppuration took place after the operation, but the fibular fragment was not extruded. Eventually the wounds healed and there was 2 inches' shortening of that limb. The patient was discharged from hospital in plaster-of-Paris. I was quite unable to follow this case after he had been sent to his (French) *dépôt*.

Conclusions.—1. Time is saved by the above method if early fixation of bone is undertaken, one or at the most two operations are necessary, and union generally takes place as in a simple fracture, though somewhat delayed by open wounds. 2. Almost complete absence of pain. 3. Callus formation in spite of suppuration; in some cases it even seems to be stimulated to exuberance by it. 4. Foreign bodies—i.e., plates and shrapnel—even when septic, can be rendered sterile and tolerated by the tissues. 5. Position is almost as good as a simple fracture treated by plating. 6. Where a large wound in the soft parts is necessary for cleaning and drainage, rationally the bone fragments should be manipulated into position. 7. Dressing is facilitated by a "fixed" fracture, even if this fixation be but partial. 8. Function is better than by other methods.

My thanks are due to Lieutenant-Colonel Maurice, R.A.M.C. (T.F.), for valuable advice and permission to deal with the above cases (except Case 6), and to Captain Foster, R.A.M.C. (T.F.), for the originals of the radiographs.

UNIVERSITY OF LONDON: UNIVERSITY COLLEGE.

—The following elections to scholarships have been made:—Bucknill scholarship (135 guineas), J. P. Padshah. Medical entrance exhibitions (55 guineas each), H. L. Heimann and A. B. Saunders. Epsom free medical scholarship, D. C. Corry.

MEMORIAL TO THE LATE MR. EDGAR JOHN DONBAVAND, L.R.C.P., M.R.C.S.—A stained-glass window, erected to the memory of the late Mr. E. J. Donbavand, was unveiled last week at Arlesey Church, Bedfordshire. The window is a good specimen of fourteenth century style and contains a representation of St. Luke as the central piece. Mr. Donbavand, who died at Plymstock (Devon) in 1914, was formerly in practice at Arlesey.

INTESTINAL DRAINAGE IN SEPTIC PERITONITIS.

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THE examination after death of a large series of cases of septic peritonitis reveals two fairly distinct pathological types: (1) that in which there is abundance of fluid free in the abdomen but little actual peritonitis; and (2) that in which there is little or no free fluid but extensive peritonitis. In conformity with custom the term "septic peritonitis" is here employed to refer to either type, but it is to be clearly understood that this expression must be regarded as clinical and provisional rather than as the name of a definite pathological entity sufficient in itself to account for death. Although pathologically the two types differ so markedly, they agree in having intestinal paralysis as a great clinical feature. In the one type this apparently results from infective inflammation of the intestinal peritoneum; in the other it seems to be due to toxic fluid free in the abdomen acting on the intestinal nerves, and inhibiting peristalsis. Be the explanation of the acute stasis what it may, the deterioration and death of the patient is unquestionably due—in many cases largely, and in others almost entirely—to resulting intestinal toxæmia. The rational treatment of this toxæmia is the removal of unabsorbed intestinal toxin and the prevention of its further production. Both these ends may be secured by intestinal drainage—provided that the peritoneal cavity is not charged with excessive poison and that the focal factor is eliminated.

As all the cases described in this article followed on abdominal operations, it will be well to indicate the main points in the diagnosis of post-operative septic peritonitis. Progressive deterioration is the great outstanding feature, the downward process usually beginning 12 to 24 hours after operation. The patient rapidly loses strength, and finally looks so very ill as to suggest the work of some virulent poison. Both pulse and respiration rate quickly reach a high grade, while the blood pressure markedly falls. Abdominal pain is not a constant symptom, the patient perhaps making no complaint whatever, merely being very restless. When the pain is due to actual inflammation there is coincident marked tenderness to pressure, while when due to distension it is liable to be more colicky. Although, as a rule, the abdomen is distended, this sign may be absent, and some of the worst cases of septic peritonitis may show a scaphoid abdomen. Abdominal movement is diminished or practically lost. Vomiting is in the majority of instances a striking feature and may actually become fæcal, but in some cases it is comparatively slight, the diagnosis then depending on the rapid general deterioration. When the deterioration is fully established the passage of gas and fæces usually ceases, although enemata may bring away both fæces and flatus. In other instances there may be actual diarrhoea. Here, again, the diagnosis hinges largely on the rapid general deterioration.

In the Perth Hospital, Australia, my last six cases of post-operative septic peritonitis have been treated by intestinal drainage, and all the cases have recovered, a result which I am convinced could not have been achieved by any other known