GUNSHOT FRACTURES.

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THE surgery of fractures and dislocations requires revision in the light of modern methods. Our knowledge of the process of repair has advanced much, and enabled us to understand the reasons for variations of conduct on the part of fractures occurring under different conditions, or occurring in individuals of varying types; but a matter of much greater importance, from a surgical standpoint, is the control we can with safety exercise over fractures some time ago supposed to be beyond the reach of surgery. In this, as in most departments of surgery, those who have kept pace with the times have long since given up the expectant in favour of the vigorous and exact methods which now prevail. Intra-capsular fractures of humerus and femur, fractured patella, fracture of the os calcis or olecranon, and fractures disposed to remain ununited, all come under the category of affections rapidly and certainly cured by surgical intervention.

This is due in great part to our thoroughness in dealing with the products of the original injury, and our insistence on retaining the bones in such apposition that formative material may be undisturbed during the early days of repair. The fear of converting a simple into a compound fracture has long since disappeared from the minds of those who carry out surgery according to modern ideas. We are now so certain of our capacity for protecting the tissues during operative procedures that all the hidden surgery of old has vanished. The subcutaneous suture for hernia, the subcutaneous teno-

tomies, the valvular incision of abscess, the subcutaneous section of veins, all these, with their uncertainty and their high mortality, have given place to methods based on scientific foundations, the outcome of modern research. The change as regards mortality has been in direct proportion to the vigour displayed in making these procedures open and above board.

Referring to this aspect of the subject, Wharton and Curtis, 505 (1898), says:—"In view of the greater safety with which operations can now be undertaken, we think the time is not far distant when it will be considered the proper treatment, in simple fractures with great deformity, or in those in which it is difficult to retain the parts in position after reduction, to cut down upon the fragments and secure primary fixation by the use of sutures."

In no department of bone surgery is this thoroughness more to be encouraged than in the treatment of gunshot wounds involving bone. This is my excuse for troubling this Section of the Academy with this communication. I would now read brief notes of a case bearing on the question, and hope the details may not weary you.

The case to which I desire to allude occupied No. 19 bed in St. Patrick's Ward, St. Vincent's Hospital. Dr. Mackay, of Stepaside, saw this lad, J. S., aged nineteen years, immediately after an accident which took place in the following way:—The lad was trailing a gun (of his own making) after him, holding it by the barrel; something struck the trigger, and the entire of the charge entered the arm above the bend of the elbow, shattering the shaft of the humerus into fragments.

Dr. Mackay immediately put the arm in proper position, arrested hæmorrhage, and brought the patient to St. Vincent's, as he knew operative interference would be necessary. I saw the patient in consultation with Dr. Mackay at 10 30 that

night; we had him put under chloroform at once, the dressings removed, and the limb thoroughly sterilised by washing with soap and water, then ether, and afterwards with warm corrosive sublimate solution, 1-500. The wound was now flushed out with warm corrosive, and introducing my finger through it I ascertained that the charge had passed *en masse* between the brachial artery and the tendon of the biceps. The artery stood out very rigid and quite bare, and to me it seemed strange how it was not torn. My finger passed readily through the fragments of the humerus towards the back of the arm, where embedded in the substance of the triceps I found spread out the contents of the gun. The skin over the back of the arm was sound. I laid the back of the arm freely open by a long vertical incision, which going through the triceps muscle exposed a cavity containing a part of the patient's coat the size of a crown piece, masses of brown paper, and almost an ounce of shot, hardly a pellet of which was normal in shape.

It was strange that so many of the grains were battered into all sorts of figures, many of them being quite flattened. How so much material got through between the artery and tendon without injury to the vessel can only be explained by the complete covering of the shot by the piece of coat and the abundant wad of paper which I extracted. Free flushing of the track of the charge caused most of the debris to come through the posterior aperture which I had made; but, as will be seen from the accompanying radiograph, a few pellets remained behind. A large drainage tube was now inserted through the arm, a loose dressing applied, and the arm fixed on an angular splint, such as I exhibit.

For some time there was copious sero-purulent discharge, and the patient had much pain. Thorough irrigation with warm corrosive sublimate solution, and plugging of the

wound with gauze saturated with a solution of acetate of aluminium soon reduced this, so that healing occurred with fair rapidity. During this process the parts were kept at rest by an L-shaped bracketed splint which was applied to the outer side of the arm and forearm, while a somewhat similar one supported it on the inner side, so that irrigation, dressing, &c., could be carried out without disturbance of the parts injured.

Now the difficulty I had in this case was to keep the parts in apposition; and in order not to disturb them during repair I was obliged to avoid passive or any other motion of the elbow, and so when at last I was satisfied that union was sound, I found the elbow-joint fixed, and so firmly that I feared bony ankylosis, and not wishing to attempt vigorous extension of the arm, fearing to reproduce in part the original fracture, I took this picture, which I think very instructive, and which I found to be of great assistance, as I now had no hesitation in putting the patient under chloroform, and forcibly moving the forearm or the arm.

From this onward passive motion was carried out, and now you see the appearance of the limb, and that the movements are perfectly free.

The lesson to be learned from this case is that, contrary to most of the teaching on the subject, there is a fair prospect of preserving limbs shattered by gunshot accidents if there is no serious disturbance of the blood supply. And the points I would lay stress upon in the treatment of such cases are—

- (a) The first dressing must be thorough, however collapsed the patient is.
- (b) That fixation of the limb must be ensured.
- (c) That before applying the dressings the circulation in the limb should be restored, either by immersion in saline solution at a temperature of 100°–101° F., or irrigation with the same solution at 103°–104°. It

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is extraordinary how this local application of heat restores not alone local vitality, but also the general circulation.

- (*d*) That all these early procedures be carried out under chloroform, as nothing serves to confirm the patient's depression like watching every move we make. Besides, he cannot well bear solutions at the temperature necessary for the restoration of vitality.

To Dr. Mackay's promptitude is due the favourable result in this case; and to my assistant, Dr. Kennedy, this boy owes a deep debt of gratitude for his unceasing attention during his time in hospital.

The radiograph, which I have shown you, makes clear the position of—(*a*), the pellets we could not extract; (*b*), the situation and extent of the fracture; (*c*), the complete freedom of the elbow-joint; (*d*), the amount of repair material laid down at the seat of fracture.

One word, in conclusion, in reference to the value of hot water in the treatment of such injuries. It cannot be too forcibly accentuated that nothing restores the vitality of a contused part like heat; and when the heat is applied by immersing the limb in saline solution, which (1) raises the temperature, (2) prevents evaporation, and (3) is capable of absorption, one sees within a brief period signs of local and general reaction. This I have frequently demonstrated to my class in cases of stasis in the intestine, and also in cases of strangulation of the omentum, where the slightest change in the vascular condition can be readily observed. Of course you cannot so quickly appreciate the local change when moist heat is applied for external injuries, such as in our case; but the change of pulse, the improvement in aspect, and the rise of general body-heat, which are soon noticeable, afford ample proof of the great value of this treatment. Believe me, the many merits of boiled neutral saline solutions

are yet little understood. When their application becomes more general and methodical much suffering will be avoided, tedious delays in healing prevented, and many valuable lives preserved.

SIR W. THOMSON in the course of some remarks, said that in dealing with recent simple fractures by operative methods he would certainly be in favour of such proceeding in cases where the deformity was likely to be very great, or where the use of the limb was likely to be interfered with. He thought it would be perfectly justifiable to cut down on such fractures, and suture them in proper position.

MR. TOBIN thought that the discovery of the X-rays would compel surgeons to be very careful in their setting of fractures. He thought that they would yet be compelled to cut down upon ordinary simple fractures, and unite them by wire suture in a position that would do them credit.

MR. T. MYLES said with regard to the question of exposing the broken ends of bone, and keeping them in position by means of wire, therein, he thought, lay a possibility of error. There was no method, he said, yet devised for keeping the broken ends of a bone in position where the deformity was due to muscular action. The wiring produced limitation of movement, but would not bring the fragments well together. When a fracture was cut down upon there was no guarantee that the angular deformity was corrected, and if wiring were carried out, even then there was no guarantee that union would take place. In an ordinary fracture—say of the leg—he maintained that although the fragments did overlap slightly, for practical purposes it was just as good a leg, and was able to perform all the functions of a leg.

MR. G. J. JOHNSTON agreed with Mr. M'Ardle in his preliminary treatment of fractures—that was, very rigorous antiseptic treatment, and also as regards chloroform. What was his opinion regarding Mr. Arbuthnot Lane's treatment of wiring fractures? Mr. Lane seemed to recommend, not wire suturing, but screwing the bones together, which he (Mr. Johnston) thought got out of the difficulty as regards subsequent displacement. He (Mr. Johnston) thought the treatment very good for oblique fractures.

MR. E. H. BENNETT thought that all surgeons who abstained

from the use of anæsthetics in the immediate treatment of fractures were well advised. A fracture was reduced with the greatest ease under the anæsthetic; but as the patient comes out of the anæsthetic he struggles just as badly as when going under, especially when the patient had received a recent injury. He related a case where the olecranon was exposed and united by thick silver sutures, but the patient, on coming out of the anæsthetic, burst everything with a movement of the arm.

MR. LENTAIGNE related a case of rupture of the extensor muscle of the thigh, where the patient burst the sutures on coming out of the anæsthetic. A second attempt was successful. Much was learned from skiagraphs taken before and after the setting of a fracture. He took it for granted that gunshot fractures should be treated the same as other compound fractures. It was his custom to inject the cavity of the wound with one in twenty carbolic lotion. Afterwards he used sterilised water to wash away the strong poisonous antiseptic introduced; then, a thing which he considered most important, he put the patient up in plaster of Paris, whether compound or simple. In the case of a compound fracture he cut a fenestrum through the plaster immediately, and then cut one through the antiseptic dressings, and got down to the wound; a tampon of gauze was a most essential thing. The use of plaster of Paris absolutely prevented any possibility of injury when the patient was recovering from an anæsthetic. He thought that even formerly it would have been wrong to amputate in Mr. M'Ardle's case, seeing that the artery was untouched. It might have been a different thing if the nerves were destroyed.

MR. M'ARDLE, in reply, said it was sixteen years since he had screwed bone in a case of ununited fracture of the collar-bone. He then utilised two varieties of screw. He now adopted the wire suture always, and had fixed bone with such means even in very strong patients. There was no muscle which could not be temporarily paralysed. For instance, in the leg, if one wished to keep the bone in place, the tendo-Achilles must be cut. In the thigh the hamstring muscles must be cut, and there was no subsequent trouble whatever. In answer to Mr. Johnston, for all bones that overlapped he thought that the screw was preferable where the fracture was oblique. Such, of course, could not be carried out in the case of transverse fractures. As regards Mr. Bennett's remarks about the struggling of a patient after operation, he (Mr. M'Ardle),

after having the patient thoroughly dressed, applied a splint that prevented the action of the intolerant muscles, or he cut through the tendon that was likely to do harm. For instance, in wiring the olecranon he cut the more important fibres of the triceps muscle. This did not interfere with the subsequent usefulness of the arm. The struggling was easily prevented by a preliminary hypodermic injection of morphin, which would begin to act by the time that the operation was over. He thought that raising the heel and flexing the thigh on the abdomen would have prevented the rupture of the extensor of the thigh in Mr. Lentaigne's case.