GUNSHOT WOUNDS IMPLICATING THE LARGER JOINTS, ESPECIALLY THE KNEE AND SHOULDER.

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Bullet wounds of long bones implicating the neighbouring joints are, perhaps, some of the most anxious cases one has to deal with on field service, and in which, at times, there must arise the greatest difficulty to decide what is best to be done in the interests of the patient.

The importance of the subject of gunshot wounds of the knee is great, when we read that of every 100 joints hit in war twenty-eight are those of the knee (Stevenson).

With the principles of conservative surgery, rigid antiseptic and aseptic precautions before one, the statistics of the results of even badly shattered joints have of late been revolutionised. Unfortunately these measures are not sufficient in every case, and we have left those where alarming constitutional symptoms have set in, or those, again, where, after careful examination, the injured surfaces are greater than can reasonably be expected to undergo repair by mere conservative methods, such as rest, drainage, judicious removal of sequestra, or foreign bodies. Perhaps, again, the case is one where damage has been done to the main vessels, or nerves of the limb, or the shaft has been badly shattered, and possibly the seat of another fracture lower down. In any of such cases one must fall back on the severe operation of amputation through the femur at a suitable level, a procedure which has been practised largely in the military surgery of all nations, though the statistics of its results are not pleasant reading, thus:

In the Crimea the mortality after amputation through the femur was 55 per cent.
In Italy 76
In the war of 1870 95
In the American Wars 55

Occasionally one may have the good fortune to meet with cases which allow of an alternative to amputation being adopted.

In injuries of the knee, where, after thorough exploration, one finds that though the joint has been opened and the articular surfaces shattered, but not beyond an extent that would allow of their removal, and where at the same time the main vessels and nerves have escaped damage, and the patient's general condition
does not contra-indicate, then excision of the joint may be carried out, an operation of some difficulty and one requiring the greatest care and patience in the after-treatment, but surely a most rational one, and far preferable to the patient than one involving the loss of his limb. Unfortunately (in the opinion of the few advocates of excision) the bias of military surgical opinion has been, and still is, decidedly against excision in war in cases of knee-joint injury; its performance has been condemned by such men as the late Sir W. McCormac, who said: "Excision of the knee is unjustifiable in military practice in war"—a very strong statement surely. Ashurst says: "Excision of the knee should be banished from military surgery." Otis has written in the same strain. The objection of such men must be of much weight, but I cannot but think that the chief reason of their dislike for this operation was based on that which all students of military surgery have read of, and been taught as a dogma for years, viz., "that the patient may have to be moved after the operation," possibly a cogent reason for its non-performance in days gone by, but in our time of improved technique in the operation, of excellent transport arrangements, of ingenious splints and appliances for the fixing and proper apposition of the freshly-cut bone surfaces, this often quoted objection should be of much less weight. Possibly it is by reason of the acceptance of the verdict against the operation of excision of the knee-joint in war that I am unable to trace the record of a single case in our military surgical annals, though injuries must at times have occurred where its practicability existed. Have surgeons been deterred from undertaking excision of the knee after study of statistics such as the following:—

### Excision of the Knee-Joint.

<table>
<thead>
<tr>
<th>War</th>
<th>Mortality</th>
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<tr>
<td>American War</td>
<td>81%</td>
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<tr>
<td>&quot; &quot; Austro-Prussian War</td>
<td>86%</td>
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<td>&quot; &quot; Russo-Turkish</td>
<td>100%</td>
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Terrible figures, but all occurring in wars where sepsis was rife, and sepsis of a knee-joint meant death or amputation (Stevenson). I attach the notes of a case of excision of the knee-joint for recent gunshot wound on active service, with a report on the patient's condition (five and a half years after the operation). On December 9th, 1897, at the British Field Hospital, Kohat, North-west Frontier, I operated on No. 4546 Private C., K.O.S.B., for destruction of the right knee-joint, the result of a wound from a large sporting bullet, received in action at Bagh on November 23rd. On admission,
after six days' unavoidable long and trying marches, over rough mountain passes, in a shaky dhoolie, the limb was found to be oedematous, extremely painful and powerless; evidences of sepsis were threatening, high temperature, sleeplessness and pain. The bullet had entered in the middle line 1 inch above the patella, and had passed down, inwards and backwards. The wound of entrance was small but gaping, and a narrow suppurating tract led down towards the bullet, which was afterwards found to be lodged in the internal condyle. For some days general treatment with washing out of the track was adopted, but the patient's condition becoming graver, and the pain agonising, I decided to operate, expecting to have to amputate through the knee-joint if possible, or failing that, through the lower third of the femur. Operation (chloroform anaesthesia): I passed a probe through the entrance wound 4 inches downwards and backwards, but could feel nothing loose in the track. I made two long incisions parallel to each other on either side of the entrance wound, and carried them down to a point on a level with the tubercle of the tibia, cutting through somewhat oedematous tissues. I then joined the lower ends of the two incisions by a transverse one. I raised the flap from below, and with it the patella, and exposed the joint. I found that the bullet had damaged the joint, and passing on had lodged deep in the internal condyle, which was much comminuted. The joint was distended with inflammatory and sanguineous fluid. The lower end of the femur was much splintered; the upper and inner articular surface of the tibia was damaged. I found that by a very free excision I could just remove all the shattered surfaces of the internal condyle, and of the upper part of the inner side of the tibia. This I did, removing about 2\(\frac{3}{4}\) inches of the femur, and 3\(\frac{1}{4}\) inch of the tibia, after division of the lateral and crucial ligaments. The haemorrhage was slight and easily arrested. The bullet, a large sporting one, was extracted.

I removed the patella, after providing for drainage at the four angles of the incisions. I closed the wound and put the limb up on a well-padded back splint, firmly bandaged, with slight elevation. I had no appliances, such as fixation needles, wires, pegs, or screws. The first few nights after the operation the patient's temperature ranged from 101° to 104°, then began to fall, and the pain, which had been agonising, became less. Four nights after the excision the tibial portion slipped backwards in the night, but under an anaesthetic I was luckily able to reset the parts, after which the position was well maintained. On December 20th I was ordered
up the Khyber Pass, and saw the patient no more. Six weeks later he was sent to Rawal Pindi, a long and very trying journey. After a tedious convalescence he arrived at Netley on April 21st, with firm fibrous union; he was then fitted with a special boot and invalided out of the Service.

July 12th, 1903 (five and a half years after operation).—Extracts from a report on this case kindly made by Captain Fleming, D.S.O., R.A.M.C., who traced the patient for me: “The operation of December, 1897, has been a complete success, there is a very strong, firm union. He never has any pain or weakness in the limb, and says he can walk about, or work all day in the pit. He walks best without any boot or artificial aid. The shortening is slight. There is a very slight inclination to inversion of the foot.”

The conditions which led me to adopt this operation in preference to amputation were:

Though under canvas and far from a fixed base hospital, or even railhead, we were in a well-fortified post where, as an exceptional case, I knew this patient could be kept for four to eight weeks. After thorough examination I found that removal of the shattered surfaces would just be possible by a free excision. The knowledge that if my excision failed (as it nearly did four nights after the operation—vide case), I could still fall back on amputation. The prayer of the patient, that while I should do to him what I thought best, yet if any chance at all existed, I was to leave him his leg and foot. Should such a case (where removal of the bullet and bone fragments, and general conservatism, seem unlikely to be sufficient) come under my care again under similar circumstances, I should, despite the bias of statistics, or text-book teaching against excision of the knee-joint in war, certainly adopt that procedure, and could only hope that the result might be as satisfactory to the patient and myself as this case has been.

**Excision of the Shoulder.**

This operation has always been regarded with much favour by surgeons of all nations; Langenbeck, Stromeyer, Larry, spoke well of it abroad, and our own surgeons have been loud in its praise. Since the introduction of conservative methods of treatment, the many cases which formerly would have been considered suitable for excision have now become much fewer, but its place as an alternative to removal of the entire limb in certain cases is as valuable and established as ever. Among suitable cases for excision of the shoulder are: Cases where destruction of the head of the bone has
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occurred, and where, in addition, the upper part of the shaft has been badly shattered. Cases where, in addition to the injury done to the head and upper part of the shaft, the bullet is firmly lodged and cannot be extracted. Cases where conservative efforts to save the head and upper part of the shaft have been unavailing, and the discharge is wearing out the patient. Cases where, in addition, sepsis is threatening.

The mortality after excision of the shoulder is about 29 per cent.

I attach the notes of one of the two cases of excision of the shoulder performed in the Indian Frontier (Tirah) Expedition of 1897-98.

Gunshot wounds of the shoulder form about 15 per cent. of all wounds of joints in war. The modes of treatment one is called on to adopt in these cases are conservativism, amputation, excision.

Conservative Measures.—The shoulder-joint and upper end of the humerus are among the most favourable situations for this line of treatment. In the statistics of the American War furnished by Otis, conservative treatment only failed to save life in 27 per cent. With the introduction of antiseptics and newer methods of operation, improved dressings, appliances, and transport arrangements, this mortality has since been still further reduced. The actual measures to be employed in this treatment cannot well be tabulated, but must vary with the symptoms presented by each individual case, and also depend on the experience gained by the operator in previous cases.

What are thoroughly necessary are: An accurate knowledge of the exact amount of the bone injured, and of its anatomical relations. Strictest asepsis in the operation. Judicious and timely removal of foreign bodies and loose fragments of bone. The provision of suitable drainage and rest by suitable appliances. Careful use of passive motion for the limb as the case improves.

Amputation of the Limb.—A short examination should show one the existence or otherwise of two of the main indications for amputation, viz., severe injury to the principal vessels or nerves of the limb. A large amount of destruction of the soft parts. The mortality after this operation is about 30 per cent.

Private J. N., Devonshire Regiment, was wounded at Mastura, Tirah, on October 29th, 1897, by a Martini-Henry bullet which had entered the front of the left shoulder, half an inch below the acromion. There was no wound of exit, and a probe could be passed 1½ inches down and back, but no bullet could be felt. X-rays (used for the first time in British military surgery in this
campaign) showed a large lineal fissure on the upper surface of the head of the bone, but no bullet. The capsular ligament was ruptured, and I could pass my little finger nearly 2 inches into the head of the humerus. The main vascular and nervous supplies of the limb had escaped injury. Free drainage had been provided, and the wound had been carefully dressed on the long and unavoidable marches towards the base, but in spite of all care, abscesses had formed under pectoralis minor and in the axilla, and also behind the neck of the humerus.

On December 1st, at Kohat, as the patient's condition was not improving and he was suffering intense pain, I made a long incision from the wound of entrance down along the outer lip of the bicipital groove; I turned out the tendon, and evertting the arm divided the subscapularis tendon. I then cut through the muscles attached to the great tuberosity, and opened the capsule. I then found that the head of the humerus had been extremely shattered by a Martini-Henry bullet, which was firmly embedded in it, and the upper 3 inches of the shaft and surgical neck were much splintered.

I excised below the splintered portion of the shaft, and enucleated the head of the bone. Arranging for drainage, I dressed the wound antisepically, placed a pad in the axilla, and raised the elbow, bandaging the arm to the side. Passive motion was commenced after eight days, when the patient got up. Shortly afterwards he went down country, and reached Netley on April 21st, with "a useful arm and good movement."

This case was a most typical one for the performance of excision, primary or secondary. Primary was not feasible, wounded far up in the Afridi Maidan, separated from the nearest fixed hospital by many days of dusty and tedious stages in a shaky dhoolie; it was, doubtless, wiser to transfer the case unoperated on; the fact that the results of secondary excisions of the shoulder are rather more favourable than primary may also have had an influence in sending him down.