THE SPHERE OF ARTHROPLASTY IN THE TREATMENT OF ANKYLOSIS.

By ALEXIS THOMSON.

The large number of ankylosed joints provided by the present war has suggested to the writer the advisability of revising the sphere of arthroplasty—the indications for and against its employment in relation to the cause of the ankylosis. From the records of my clinic in the Royal Infirmary I have abstracted the following five cases in which the operation was performed sufficiently long ago to enable one to determine the final results.

Case I.—Ankylosis of Elbow Joint following Fracture of Lower End of Humerus; Arthroplasty; Recovery of Mobility.—A motor engineer, aged 23, was sent to the Infirmary by Dr. Mackay of Aberfeldy, owing to stiffness of the right elbow. The history was, that four months before he was thrown from a motor car, and the lower end of the right humerus was "split in three places"; the limb was retained in a splint for six weeks, at the end of which time it was found that flexion and extension were no longer possible; the fractures had united with excessive callus and with displacement of the fragments, the internal condyle being \( \frac{3}{4} \) in. lower than the external—cubitus valgus.

On the 24th November 1911 it was subjected to operation; the bones entering into the elbow joint were exposed by a posterior median incision; the lower end of the humerus, including the condyles, was removed; the wall of the resulting cavity was liberally smeared with vaseline. There was considerable reaction, the temperature rising to 100° F. the evening of the second day without any quickening of the pulse or respiration. Even after healing took place the elbow was swollen and sensitive, and the movement, at first having a range of 90°, gradually disappeared.

I operated again, therefore, on the 5th March 1912, freely removing the callus that was preventing movement and interposing between the bones a flap from the fascia over the triceps muscle; small amounts of the vaseline were found in the tissues round about. There was again a sharp reaction, the temperature rising to 101° F. the second night after the operation. Seven months later movement at the elbow was free, although restricted in range.

Case II.—Ankylosis of Shoulder following upon Injury; Arthroplasty along with Partial Removal of Head of Humerus.—A girl, aged 14, was admitted to my wards in the Royal Infirmary on the 15th August 1914 on account of stiffness of the right shoulder, on the recommendation of Dr. Kennedy of Wick. No history was obtainable.
On the 25th August 1914 the joint was exposed by the usual anterior incision; there was found an old-standing separation of the epiphysis and subcoracoid dislocation of the head of the humerus; the greater part of the head was removed to secure free movement of the upper end of the shaft in the glenoid cavity; a portion of fascia lata, large enough to wrap round the head of the bone, was removed from the right thigh and stitched in position between the bones; the limb was put up in the attitude of right-angled abduction. The object of the operation was attained—a sufficient range of movement at the shoulder joint was secured.

CASE III.—**Comminuted Fracture of Patella followed by Ankylosis to Femur; Bones Separated by Open Operation and Interposition of a Flap of Fascia Lata; Recovery of Movement.**—A man, aged 26, a joiner, was admitted to my wards in the Royal Infirmary on the 27th October 1916, having sustained multiple injuries through falling from the roof of a house—about 25 ft.—the same morning. There was a compound fracture of the shaft of the right femur, a badly comminuted fracture of the right patella, a simple fracture of the left patella, and a fracture of the mandible. There was considerable shock, he bled freely from the nostrils, and he vomited a good deal of blood, both bright red and of the coffee-ground variety. Satisfactory repair took place of all the injuries except in the case of the right patella, which became firmly united to the femur, and all movement at the knee was abolished.

Operation was carried out on the 2nd January 1917; the patella was separated from the femur, and a free flap of fascia lata was inserted between the bones. The temperature rose to 99·4° F. the following evening, but soon subsided, i.e. the reaction was very mild.

Massage was carried out, as usual, from the 1st December (?) onwards.

**Result.**—He attended to-day, the 2nd July 1917, walking without a limp and having free movement at the knee from the position of complete extension to an angle of 45°; from the functional point of view, therefore, the operation was a complete success.

CASE IV.—**Osseous Ankylosis of Hip Joint following upon Gonorrhoeal Arthritis; Arthroplasty by Murphy's Method; Recurrence of the Ankylosis.**—A man, aged 23, a barman by occupation, was admitted to my wards in the Royal Infirmary on the 17th March 1917, on the recommendation of Dr. Murray of Paisley, suffering from bony ankylosis of the right hip joint. He had acquired a gonorrhoeal urethritis in May of the previous year, and three months later he was laid up with an acute infection of the right hip. After a painful illness of sixteen weeks' duration it was found that the joint had become ankylosed; he could only walk with the aid of two sticks, and he was unable to put on the right boot without assistance. Skiagrams showed a complete osseous
ankylosis of the head of the femur and the acetabulum, without evidence of destruction of bone or of new formation of bone in the vicinity of the joint. In view of the evil reputation of ankylosis resulting from gonococcal infection, I was unwilling to attempt to get rid of it by means of an operation, and made it clear to the patient that there was not only a degree of risk attaching to it, but that it might fail to benefit him; he was determined, however, to go through with it, because the existing disability seriously interfered with the conditions of his daily life.

The operation was performed on the 23rd March 1917, and followed as closely as possible the method described and practised by Murphy. The separation of the head of the femur was mainly effected by means of broad, shallow gouges, curved in varying degree, and its dislocation gave good access to the acetabulum. Both articular surfaces were pared until they were reasonably smooth, and a flap of the deep fascia was made to line the socket, and was anchored by a few points of catgut suture. The head of the bone was then replaced, the great trochanter was reapplied and fixed with a steel pin, and the limb steadied between sandbags in the attitude of moderate abduction. The steel pin was removed five weeks later, and the wound being now soundly healed, manipulative treatment was carried out by the masseur. He was sent to the convalescent home on the 31st May 1917, walking with the aid of two sticks and exhibiting limited but quite definite movement at the hip joint. He returned to show himself on the 27th June, when on re-examination it was found that movement had disappeared owing to recurrence of the ankylosis; the condition was not only as bad as it had been before the operation, but there was now shortening of the limb amounting to 1½ in.

If I were to criticise the technique of this operation in the knowledge of its subsequent failure, it would be to suggest that too little bone was removed from the articular surfaces; one had the fear of diminishing the stability of the joint and also of causing shortening of the limb.

Case V.—Osseous Ankylosis of Knee following upon "Acute Arthritis of Infants"; Arthroplasty by Murphy's Method; Recurrence of the Ankylosis.—A schoolboy, aged 13, was admitted to the University Clinical Wards on the 7th March 1917 with a complete osseous ankylosis of the right knee. The history was to the effect that when aged 6 years he fell off a dyke and injured the right knee; it became greatly swollen, and a few days later he was admitted to the Glasgow Western Infirmary, where the leg was put up in plaster; on removal of the plaster at the end of a month the knee joint was found to be quite rigid, all movement being abolished. He was able to go about with the help of crutches. The knee is ankylosed in an attitude of almost
complete extension; there is nothing in the shape of depressed scars to suggest an antecedent suppurative lesion; the X-ray shows no evidence of destruction of bone or of new formation of bone such as would indicate a tuberculous lesion or a staphylococcal osteomyelitis. In the absence of any indication of the nature of the lesion that resulted in the bony ankylosis, we were driven to the conclusion that it had followed upon a mild form—non-suppurative—of the "acute arthritis of infants," and it was therefore regarded as a legitimate subject for the operation of arthroplasty as devised and practised by J. B. Murphy.

The operation was carried out on the 14th May 1917; the bones entering into the knee joint were exposed by an external J incision, and all three—femur, tibia, and patella—were separated from one another by means of osteotomes and gouges; the incision was prolonged upwards to allow of the raising of a large flap of fascia lata which was detached and interposed between the bones, being secured in position at several points by catgut suture. Extension with weight and pulley was applied to the leg.

The operation was followed by a marked reaction, the temperature rising in the evening from 101° to 103° F. on five consecutive days, with considerable pain and swelling of the knee. There was then a return to normal conditions. In spite, however, of skilled massage and persevering efforts to recover movement, bony ankylosis gradually reappeared; the condition is now—two months after the operation—the same as before, save that the affected limb is about \( \frac{3}{4} \) in. shorter than its fellow.

Commentary on the Above Cases.—Of the five operations recorded, three were performed for purely traumatic lesions of the shoulder, elbow, and femur patellar articulations respectively, and it may be said of them that they were not only easy of performance, but the functional results were most satisfactory; that is to say, a definite though limited degree of mobility of the joint was obtained, which greatly added to the usefulness of the limb. If one recalls the results obtained by operations for ankylosis in former days, it is to remember the almost inevitable disappointment owing to recurrence of the ankylosis; it was not uncommon, for example, to see an elbow, in which excision for ankylosis had been performed on three different occasions, each time the ankylosis returning in a more aggravated form than before. We are prepared to support the view, therefore, that the interposition of a flap of fascia and fat represents a definite advance in surgical practice, and advise that it should be had recourse to in all cases of injuries of joints in which ankylosis is likely to occur. We are
prepared to go further, and employ the procedure as a prophylactic measure at the primary operation for fixation of the articular fragments; we believe that by so doing a wider range of movement would be obtained than when it is employed for the "cure" of ankylosis; time would be saved, massage could be employed earlier, and the soft parts in and around the joint would retain to a greater degree their normal functions.

In the two remaining cases arthroplasty was performed for ankylosis resulting from an infective condition—in the case of the knee a staphylococcal infection, and in the case of the hip a gonococcal infection; in both the operation entirely failed in its object, even the limited mobility initially obtained being lost again owing to a recurrence of the ankylosis. Previous experience of the result of attempts to restore mobility to joints stiffened or ankylosed by gonorrhoeal arthritis made me doubtful of the wisdom of performing arthroplasty in the above case, and the result of the operation serves to increase the doubt. The stimulation of the bone-forming tissues in and around the joint by gonorrhoeal infection would appear to contra-indicate any attempt by operation or otherwise to restore mobility when the ankylosis is due to this cause.

I have not considered it advisable to perform arthroplasty in joints that have become ankylosed as a result of the infections that have been so prominently associated with the gunshot injuries sustained in the present war; there would not only be the likelihood of lighting up the original infection, increased in this operation by the insertion of the fascia, but the considerable probability of its being followed by a recurrence of the ankylosis.

Resuming, then, in conclusion, the sphere of arthroplasty, it may be formulated that while it may be brilliantly successful in joints ankylosed by purely traumatic lesions, it is liable to fail in joints ankylosed as a result of bacterial infection. The two great causes of failure are found to be—either a recrudescence of the original infection, e.g. tuberculosis,* and dormant infections of gunshot injuries, interfering with the formation of the false joint, or an increased activity of the bone-forming tissues leading to a return of the ankylosis.

* Mr. J. M. Graham informs me of a case in which he performed arthroplasty at the knee for ankylosis resulting from tuberculous disease, in which failure resulted owing to recrudescence of the tuberculosis.