

ARTHROPLASTY OF THE ELBOW

By J. Francis Silva

It was as late as 1949 that Ceylon saw the beginnings of an orthopaedic service. During the period of growth of this service, which I am sorry to say has been slow, a pressing problem that was always confronting the surgeon was the management of neglected trauma. These were most exacting in the case of the injuries around the elbow, particularly unreduced dislocations and comminuted fractures of the lower end of the humerus. The results of management of these cases by conservative methods were by no means satisfactory and the patients themselves being manual labourers on the various plantations in the country, were anxious to have more done in order to give them a better range of movement. It was under these circumstances that arthroplasty of the elbow was embarked upon.

SOURCE OF MATERIAL

The patients requiring arthroplasty were chiefly those who had been treated by practitioners of the indigenous system of medicine. In Ceylon, this system dates back to the very early times of our history and was at its height around 300 B.C. In this system, the art was taught from father to son and its secrets were very closely guarded, so much so that even the father waited to the bitter end to teach his son and thus departed this life with his knowledge. Hence, the system as it is practised today consists mostly of quackery. Yet, the faith persists and the injured are taken to these practitioners in the first instance. The time that can lapse between injury and the patient's first visit to an orthopaedic service can vary from a few months to years.

In this system, reduction of the fracture dislocation or dislocation is attempted without any anaesthesia and the limb splinted. It was often felt that fractures found associated with dislocations so often were in fact produced by the forceful attempts at reduction of the dislocation.

Incorporated into the splint are preparations of barks of trees like *Cratavea Roxburghii*, *Fiscus Glomerata*, *Morinda Citrifolia* and *Morinda Tinctoria*, which are finely powdered, mixed with coconut kernel and incorporated into the splint. This form of treatment is fol-

lowed by a series of massages using a paste composed of roots of trees like *Gmelia Asiatica*, *Cassia Auriculata* and *Azadirachta Indica*, mixed with alcohol and copper sulphate among other things. This massage is claimed to loosen up the joint and increase its mobility. In point of fact, it is probably the cause of the pathological changes around these joints.

PATHOLOGICAL CHANGES

The years of neglect and continued traumatising of these joints have produced numerous changes in and around the joint. These include myositis ossificans affecting chiefly the lower ends of the biceps and brachialis muscles—Fig. 1. Scattered around the joint is an excessive amount of osteoid tissue particularly in the coronoid and olecranon fossae of the humerus. The upper ends of both the radius and ulna are also surrounded by the same tissue—Fig. 2. There is a complete disappearance of the synovial membrane associated with fibrosis of the joint capsule and shortening of the medial and lateral ligaments—Fig. 3.

TREATMENT

In the earlier cases, open reduction was offered to these patients in the hope that an improvement of function could be obtained. *Table I* shows the results of 25 cases or 36.2 per cent of the present series of patients. There is only one case in Grade I, and one in Grade II, with five in Grade III. The majority are in Grades IV, V and VI. Under these circumstances, the feasibility of arthroplasty was con-



Fig. 1. The lower ends of biceps and brachialis with myositis ossificans.

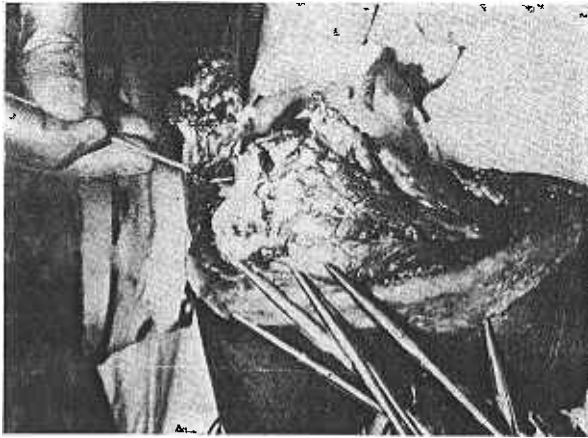


Fig. 2. Osteoid tissue surrounding the upper ends of the radius and ulna.



Fig. 3. Fibrosis of the capsule of the joint with disappearance of the synovial membrane.

sidered. John B. Murphy is credited as the pioneer of arthroplasty, which he investigated by experimenting on dogs in 1905. He was able to produce joint movement after interposition of flaps of muscle and fascia with adipose tissue. A capsule was formed with fluid within, which he called intra-articular collagen fluid. He was interested in operations of hip, knee, elbow and temporo-mandibular joints. He had failures which were attributed to:—

1. insufficient or defective excision of synovial membrane, capsule or ligaments,
2. insufficient interposition of fat and aponeurosis between surfaces,
3. infection,
4. sensitiveness to pain on working post-operatively.

This work was the first systematic effort at the production of new and normal articulation, Loyal Davies⁴.

The first arthroplasty in a human joint is credited to J. Rhea Barton of Philadelphia in 1827, Buxton². Fascial arthroplasty has been

extensively carried out in the States. Forty-five arthroplasties were performed in this Campbell Clinic between 1921 and 1948, of which twenty-five were good results and ten were failures, Knight and Van Zandt⁶. In the United Kingdom, the approach has been more conservative and Buxton² states that he had no cause for dissatisfaction after fascial arthroplasty. However, no detail analysis of the cases is mentioned. In our use of fascia lata to produce an arthroplasty, every precaution was taken to prevent trauma to the tissues and to get close approximation of the fascia to the bone. This was important as the fascia derived its nourishment from lymphatic supply coming to it through the adjacent bone, Gratz⁵. Great care was also necessary as to the amount of bone to be resected. Too wide an excision leaves an unstable and weak elbow while too little is conducive to ankylosis post-operatively. However, in spite of all these precautions, our results were not satisfactory. *Table II* shows the results of arthroplasty with fascia lata, there being no cases in Grades I or II.

These discouraging results made it necessary to evolve an arthroplasty using a prosthesis to replace the lower end of the humerus, which in these cases was the most disorganised component of the joint. The ulna could always be shaped to fit the trochlea notch of the humeral prosthesis. The idea of making the prosthesis of acrylic was planned since the use of this material in the hip by Jean and Robert Judet of Paris. Acrylic resin, methyl polymethacrylate was also known to be inactive in the human body, Nissen⁷. A prosthesis was then turned out in three sizes—large, medium and small—as required for the Ceylonese patient, Silva⁸. It would have been ideal if a prosthesis could be made individually, for each patient but this was not practical owing to lack of facilities.

The approach to the joint is postero-lateral as described by Speed³, 1956—Fig. 4. Reflexion of the skin reveals the shortened and tightened triceps tendon which has to be lengthened in every case, Fig. 5. The ulna nerve which is stretched with each attempt at flexion of the joint has to be carefully dissected and transposed anteriorly, Figs. 6 and 7. The surrounding osteoid and fibro fatty tissue are next dissected away and the joint is gradually flexed—Fig. 8. The lower end of the humerus is next dissected free subperiosteally and resected, Fig. 9, the length resected corresponding to the size of the prosthesis used and too excessive a resection should be

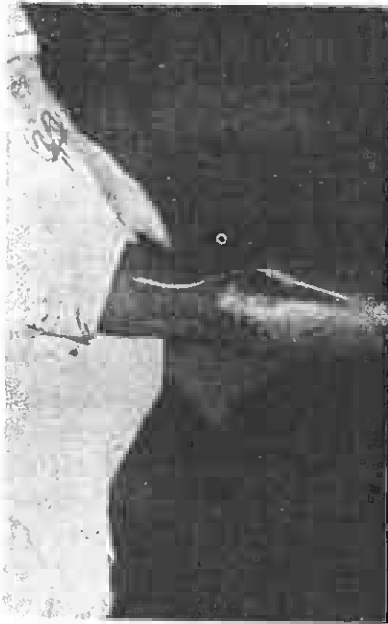


Fig. 4. The incision used for the operation.

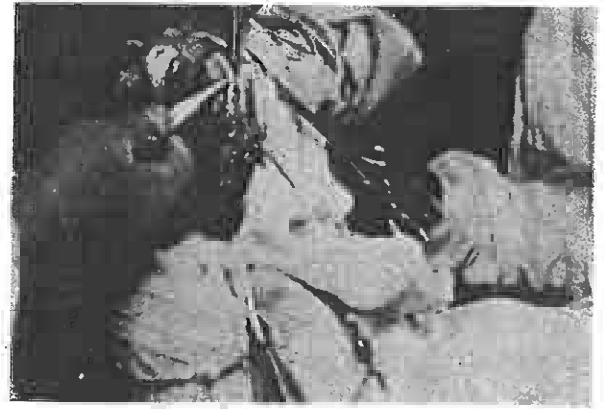


Fig. 7.

Figs. 6 & 7. These figures reveal the stretched ulna nerve which gets taut with flexion of the elbow. The nerve has to be transposed anteriorly in most cases.

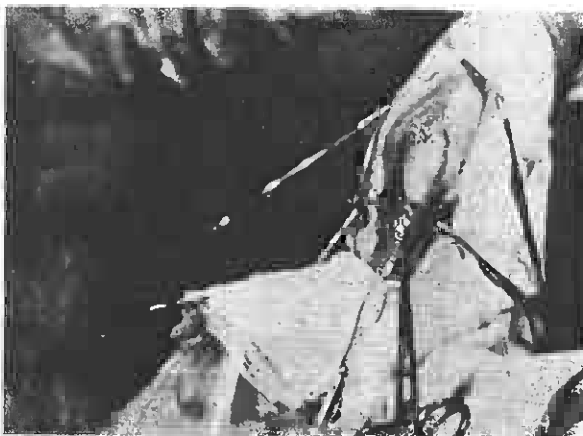


Fig. 5. The contracted and tight tendon of the triceps.

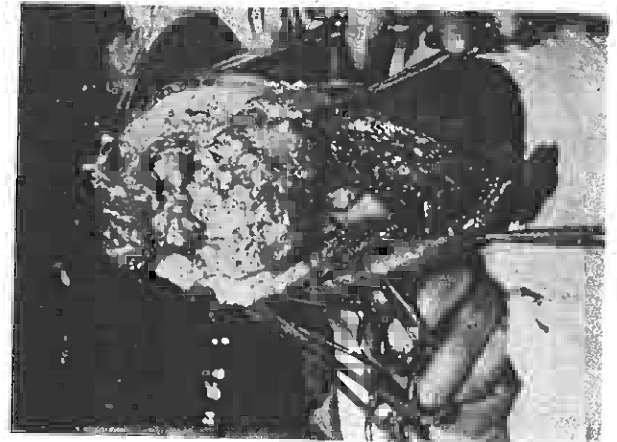


Fig. 8. The elbow is gradually flexed after osteoid tissue has been dissected away. This is an essential step in the operation, in order to free the lower end of the humerus.



Fig. 6.



Fig. 9. The lower end of the humerus after subperiosteal dissection.

TABLE I
RANGE OF MOVEMENT OF CASES
OF OPEN REDUCTION

Grade	I	II	III	IV	V	VI
Range of Movement	0-145°	60-100°	60-90°	40-55°	20-35°	less than 15°
No. of Cases	1	1	5	9	7	2

TABLE II
RANGE OF MOVEMENT OF CASES AFTER
FASCIA LATA ARTHROPLASTY

Grade	I	II	III	IV	V	VI
Range of Movement	0-145°	60-100°	60-90°	40-55°	20-35°	less than 15°
No. of Cases	-	-	3	4	3	1

TABLE III
ANALYSIS OF OPERATIONS

Type of Operation	No. of Cases	Percentage
Open Reduction	25	36.2
Fascia Lata Arthroplasty	11	16.0
Acrylic Arthroplasty	21	30.4
Tafflon Prosthesis Arthroplasty	12	17.4
Total No. of Cases	69	-

TABLE IV
RANGE OF MOVEMENT OF CASES AFTER
ACRYLIC ARTHROPLASTY

Grade	I	II	III	IV	V	VI
Range of Movement	0-145°	60-100°	60-90°	40-55°	20-35°	less than 15°
No. of Cases	6	8	4	2	1	-

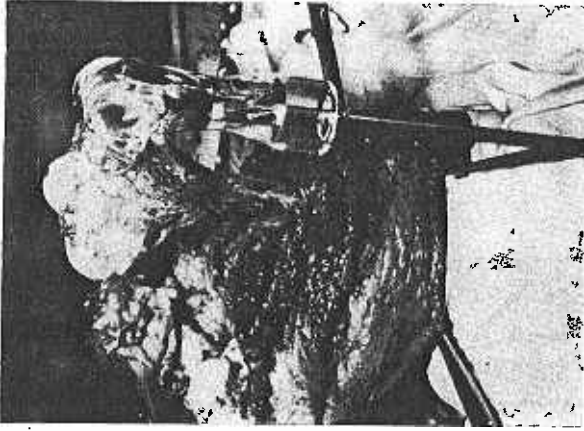


Fig. 10. Reveals the prosthesis against the lower end of the humerus in order to determine the correct length of the humerus to be resected.

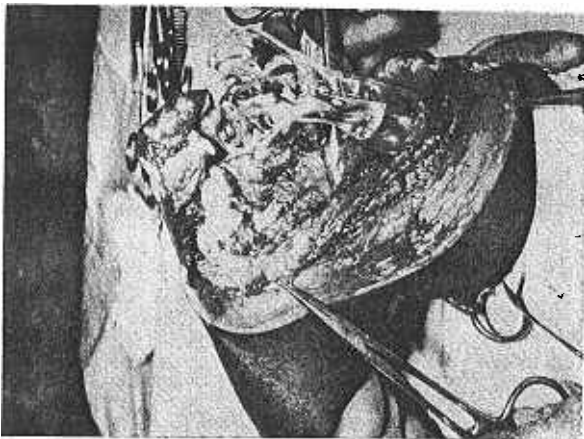


Fig. 11. The prosthesis inserted into the humerus.



Fig. 12.

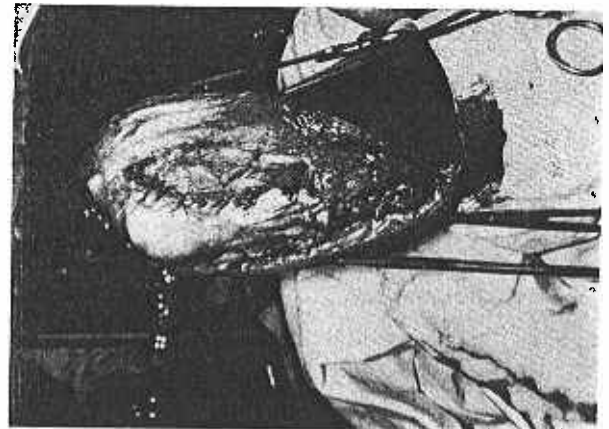


Fig. 13.

Figs. 12 & 13. Show the reduction of the dislocation and the wound closure in stages.

avoided as it leads to instability of the joints, Figs. 10 and 11. The dislocation is reduced and the wound closed with V to Y lengthening of the triceps, Figs. 12 and 13. An above elbow cast is worn for a period of 3 weeks followed by a period of physiotherapy.

During the past 2 years a prosthesis made of Tafflon has been tried and the early results seem to show that the range of movement with the Tafflon prosthesis is better. I was convinced that this would be a more suitable material to work with owing to the soapy feel of its surface, thereby providing a form of self-lubrication to the joint. However, Burrows¹ recently notes that Tafflon in the acetabulum is not without problems after a period of about 3 years. It would be interesting to note whether the same changes and complication would occur in a non-weight-bearing joint. *Table III* shows the analysis of operations of all cases of the elbow including the Tafflon, the detail results of the latter are not included owing to the short follow-up period.

Table IV shows the analysis of cases of acrylic arthroplasty which have been placed in 6 grades according to the range of movement obtained in each case post-operatively. There were 6 cases in Grade I, with 8 cases in Grade II, a percentage of 8.7 and 11.6 respectively. There were 4 cases in Grade III while there were only 2 cases in Grade IV and 1 case in Grade V, a percentage of 5.8, 2.9 and 1.4.

Figs. 14(a) to (d), Figs. 15(a) to (d) and Figs. 16(a) to (d) show the results of some of these cases post-operatively and the results are satisfactory. The most important fact was that the patients were quite pleased with their results when questioned at follow-up clinics and preferred the range of motion they had to no motion at all. This was so even in those cases in Grades IV and V. A problem that has not been satisfactorily solved in this series of cases is the range of pronation and supination. Of the two movements, supination seems to be the movement that was easier to attain. Full pronation was



Fig. 14a.

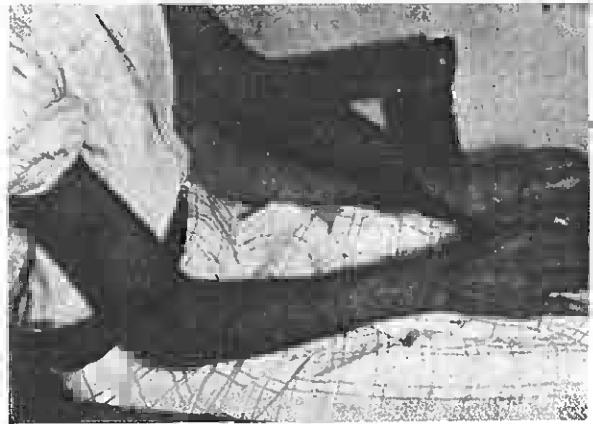


Fig. 14c.

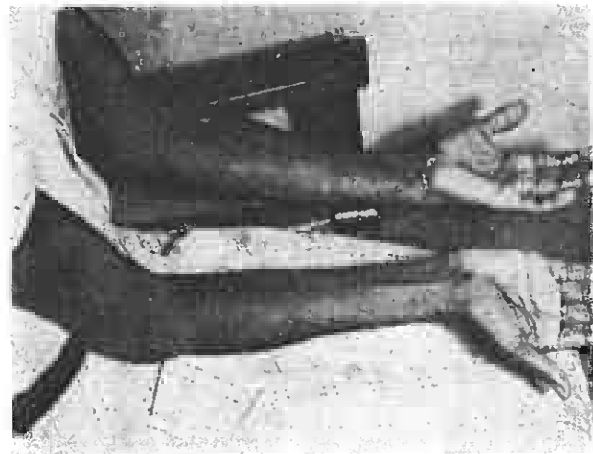


Fig. 14d.

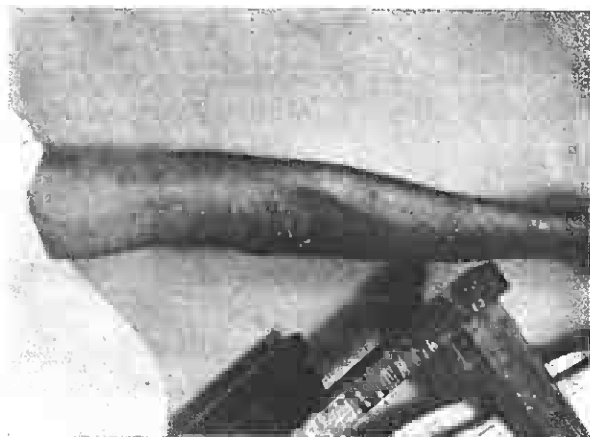


Fig. 14b.

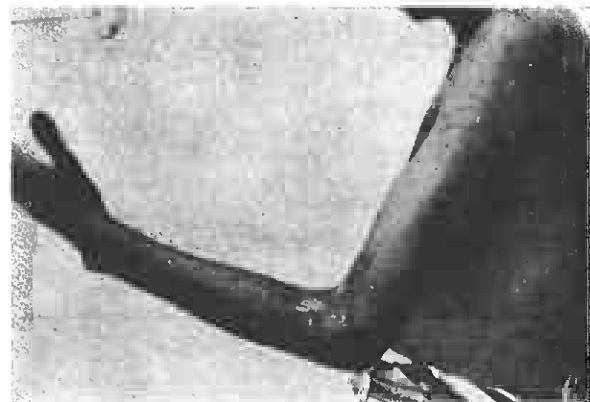


Fig. 15a.

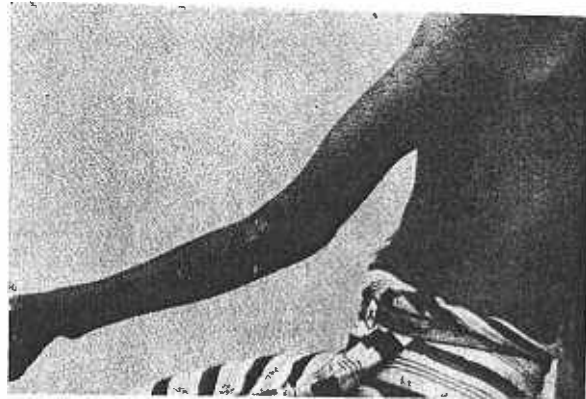


Fig. 15b.



Fig. 15c.



Fig. 15d.

Figs. 14a-14d & 15a-15d. Reveal the range of movement in two patients of the present series after acrylic arthroplasty.

achieved in 7 cases while the remainder had varying ranges from mid-position to full pronation. Supination on the other hand was full in 15 cases while the others ranged from mid-position to full. One case in this series had no pronation or supination which was the only disappointing result in the present series.

DISCUSSION

Mismanagement of injuries to the elbow, particularly dislocations, produce numerous changes in and around the joint which prevents successful conservative treatment. Attempt at open reduction, or an arthroplasty using fascia lata have not produced the desired effect. The results after both these procedures were by no means satisfactory from a functional point of view. The range of movement after simple open reduction was good only in one patient out of 25 so treated, with a fair result in another case which has been placed in Grade II.

Results with arthroplasty with fascia lata have been even more disappointing than open reduction. In this category of 11 patients there were no cases in either Grade I or II and indeed is a most disappointing result. Using a prosthesis to replace the damaged lower end of the humerus was therefore the obvious answer to the problem in the hope that an improvement could be obtained from the hitherto disappointing and discouraging results. In this group there are 6 cases in Grade I and 8 cases in Grade II respectively, out of the total of 21 cases of acrylic arthroplasty and is thus a great improvement on this previous result.

The use of the Tafflon prosthesis has been a recent procedure and its early results are encouraging.

A prosthesis of stainless steel or vitallium has not been tried in this category of patient as

yet. I feel that this too should be tried in a reasonable series with an adequate follow-up to judge which is the most suitable material for use as a lower humeral prosthesis.

SUMMARY

1. Neglected cases of fracture dislocations and dislocations are a common problem in an orthopaedic service in Ceylon.
2. An adequate solution has to be found, as the livelihood of an agricultural worker depends on the unrestricted or partly restricted movement of his elbows.
3. Conservative treatment, open reduction and arthroplasty with fascia lata have not proved the answer to the problem.
4. Acrylic arthroplasty has produced encouraging results with improvement in the range of movement which were pleasing to the patients as well.
5. The Tafflon prosthesis appears to provide even better results than the acrylic prosthesis but the follow-up period is too short to evaluate the actual position and to include it in the present paper.

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