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EXPERIENCE OF ARTHROPLASTY OF THE ELBOW

By

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Limitation of movement and pain in one or both elbow joints is an extremely disabling condition, involving difficulty in working, eating, and in managing one's personal simple duties, etc. Very naturally, therefore, surgical procedures have been devised in the attempt to improve these conditions which mainly attend rheumatoid arthritis and fractures of the elbow joints.

The common features of the arthroplasty procedures described by *Payr* (1934), *Putti* (1921) *McAusland* (1921), *Albee* (1931), and *Ryerson* (1944) are that by resection an attempt is made to make the new joint resemble the old one, to create good stability and mobility, and to relieve pain. The methods differ mainly in the choice of the interposed material and in the way of making the incisions.

In contrast, *Julius Hass* (1944) has suggested a method involving a more radical transformation of the joint surfaces. This method creates a new joint in which the contact between the bony ends is reduced as far as at all possible.

TECHNIQUE

A U-shaped posterior incision with the convexity downward, extending from epicondyle to epicondyle (Fig. 1). The ulnar nerve is freed and held aside. The olecranon is chiselled off and carried proximad with the triceps tendon. Thereafter, the ulna and radius are formed into a wide trough in which the posterior margin of the ulna stands up a bit higher. From the trochlea and capitulum humeri a transverse wedge is formed by the chisel. Both surfaces of this wedge reach to the olecranon fossa and the coronoid fossa. An effort is made to preserve the collateral ligaments. If a synostosis is present between the radius and ulna, it is

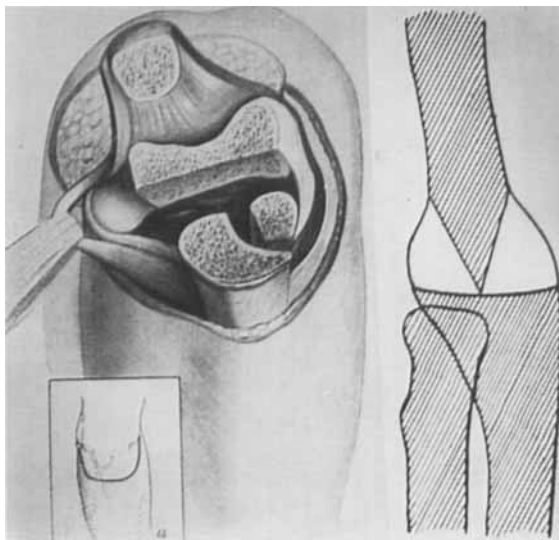


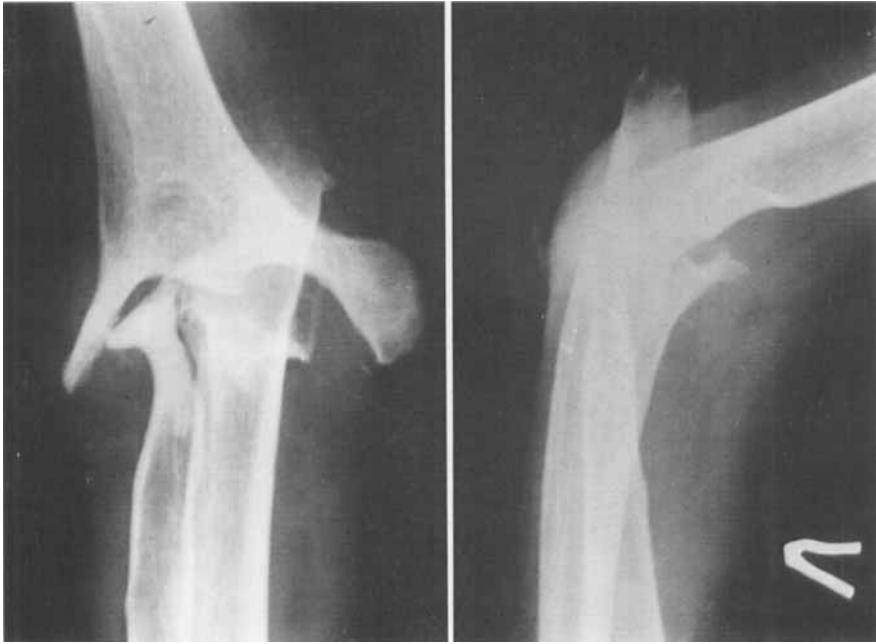
Fig. 1.

From Julius Hass (1944).

divided, and the ulnar aspect of the radius is chiselled into wedge shape. The head of the radius may be resected entirely or partially. *Hass* does not feel that an interposed material is needed, but if it is used, he recommends a fat graft from *e.g.* the thigh. Some surgeons recommend fascia lata or skin. We have used fat. The graft is fastened to the pointed end of the humerus, either by transosseous sutures or to the fibrous joint capsule which, unlike the synovial joint capsule, should not be included in the resection. Possibly, the most important function of the graft is to fill the dead spaces in the anterior and posterior joint and thus prevent the formation of haematoma.

That part of the olecranon which is attached to the triceps tendon is extirpated, wholly or partially. Thereafter, the triceps tendon is fixed to the ulna by strong catgut sutures through burr holes. The ulnar nerve is transposed to the anterior joint. The skin is sutured. Previously, we immobilized the arm in extension, but have now changed our practice to immobilizing it in 90° flexion for two weeks. At the end of this period, active exercises of flexion and extension are instituted.

Frequently, there is a tendency to instability in the elbow joint. In that event, the patients are provided with an elbow bandage for some time. It would seem wise to prescribe an elbow bandage in all cases showing a tendency to annoying instability. It is of the utmost importance to



2 a

2 b

Figs. 2-4.

Radiograms about two years after operation.
The patients suffered from rheumatoid arthritis.

enjoin upon the patient an intensive training of the arm muscles. This training should be started even before the operation; in complete ankylosis this means of course only contraction of the muscles.

In the further course, the joint undergoes a functional adaptation, the distal, transverse trough on the ulna deepening, and the straight transverse end of the humerus getting rounded and smoothed in the centre, so that it acquires a fork-like shape (Figs. 2-4). At times, an olecranon-like projection develops on the ulna.

MATERIAL

Nineteen patients have been treated by the named method. Fifteen were suffering from rheumatoid arthritis and 4 from post-traumatic osteoarthritis. Their age distribution and sex ratio are shown in Table 1. Out of the rheumatoid cases 11 had ankylosis or almost complete ankylosis, while 4 had fairly good, but painful mobility in the joint. All the post-traumatic cases had considerable limitation of movement. The excursion before and after the operation is recorded in Tables 2 and 3. In one



3a



3b



4a



4b

case no improvement of movement was obtained. This patient was in an extremely poor general condition and had weak muscles. All the others obtained a fairly good or good mobility. Two patients, both of whom had primarily had satisfactory, but very painful movements, complained of pain or approximately the same type after the operation. In three cases there was considerable instability. These patients were later provided with an articulated elbow brace with which they were completely satisfied. The muscular strength in the elbow joints has been tested and found to be approximately corresponding to the patients' strength in other joints.

TABLE 1
Age and Sex Distribution in the Present Series.

	Men	Women
10-20	—	3
21-30	1	3
31-40	3	1
41-50	—	1
51-60	2	3
61-70	—	2
	6	13

TABLE 2
Extension-Flexion Mobility before and after Arthroplasty in Cases of Rheumatoid Arthritis.

Before operation	Follow up in months	After operation
160	5	140-90
90	4	100-90
90	144	140-25
135	144	180-65
100	108	150-105
90	6	145-95
110-90	4	180-40
140-75	48	120-80
100-90	144	165-50
160-40	12	170-30
180-90	6	180-60
90	6	140-40
90	3	140-80
140-80	12	170-40
90	12	170-60

TABLE 3

Extension-Flexion Mobility before and after Arthroplasty in Traumatic Cases.

Before operation	Follow up in months	After operation
150	24	180-80
120-90	20	180-90
100-90	6	180-60
100-90	6	140-60

The patients' working ability has varied, and they have not been enabled to perform heavy work. In cases the symptoms from other joints were so severe that the patients were unable to do any work, but their social situation was appreciably improved by the operation. The remaining 14 patients are capable of working.

DISCUSSION

Hass has reported on 15 cases with a follow-up period ranging from 3 to 12 years. Out of this series 8 were classified as excellent, 3 as good, 1 as fair, and 3 as poor. All three failures had a history of osteomyelitis, and the ankylosis persisted despite the operation. None of our cases was post-infectious, and we have also not had any infections in connection with the operation. According to *Hass*, the best results are obtained by operations on ankylotic elbow joints.

During the period 1921-1948 a total of 93 arthroplasties were performed in the Campbell Clinic. Of the 45 patients who were followed 56 per cent had obtained good, 22 per cent fair, and 2 per cent poor results, while 20 per cent were considered failures. In a report on this material *Knight & van Saint* (1952) point out that "the greatest proportion of good results was found among the patients in whom ankylosis followed closed fracture or fracture dislocation", but they also state that "in 50 per cent of the patients in whom ankylosis followed open fracture or fracture dislocation, arthroplasty was a failure. With antibiotic therapy this high incidence of failure should be greatly diminished". As far as we can see, patients with a good, but painful mobility in the elbow joint do not appear to be suited for this type of arthroplasty, as also pointed out by *Vainio* (1962) and *Harvey* (1963).

Harvey (1963) has reported 15 cases 10 of whom had been followed up for one year or longer. All these patients had rheumatoid arthritis. *Harvey* emphasizes that in general young patients obtain better results than older patients, and he goes on to state that "a fibrous or bony ankylosis is best for operation with least likely recurrence of the disease".

CONCLUSION

Previous and present experience appears to indicate that elbow joints with greatly limited mobility or complete ankylosis in patients with rheumatoid arthritis or post-traumatic conditions are best suited for arthroplasty. Post-infectious conditions of the elbow joint do not appear to be suited for arthroplasty, as this involves a risk of a flare-up of the infectious process. Another type of case which does not appear to be suited is that of a good, but painful mobility.

SUMMARY

Nineteen patients with greatly limited mobility or severely painful movements in the elbow joint were submitted to arthroplasty. The results, assessed at follow-up from 3 to 144 months after the operation, were found to be good in 15 cases.

RESUME

19 cas avec mobilité considérablement réduite ou douleurs prononcées au mouvement dans l'articulation du coude ont été l'objet d'une arthroplastie. Le résultat de l'intervention a été étudié entre 3 et 144 mois après l'opération et a été jugé bon dans 15 cas.

ZUSAMMENFASSUNG

19 Fälle von bedeutend eingeschränkter Beweglichkeit oder ausgesprochenen Bewegungsschmerzen im Ellbogengelenk waren der Gegenstand einer Arthroplastik. Das Ergebnis wurde von 3 bis 144 Monaten nach der Operation studiert und wurde in 15 Fällen als gut angesehen.

REFERENCES

- Albee, F. H.*: The principles of arthroplasty. *J. Amer. med. Ass.* 96: 245, 1931.
Campbell, W.: Arthroplasty of the Elbow. *Amer. Surg.* 76: 615, 1922.
Harvey, P.: Symposiums présentés au IX^e congrès de SICOT, 1963.
Hass, J.: Functional arthroplasty of elbow and knee. *Amer. Acad. Orthop. Surg.* 1944, s. 340, Ann Arbor, Michigan.
Knight, R. A. & van Saint, I. L.: Arthroplasty of the elbow and end-result study. *J. Bone Jt Surg.* 34-A: 610, 1952.

- Lange, F.:* Das Beweglichmachen versteifter Gelenke. *Zbl. Chir.* 44: 1, 1917.
- Mac Ausland, W. R.:* The mobilisation of Elbow by free transplantation with report of 31 cases. *Surg. Gynec. Obstet.* 33: 223, 1921.
- Payr, E.:* Gelenksteifen und Gelenkplastik. Julius Springe, Berlin, 1934.
- Putti, V.:* Arthroplasty. *J. Orthop. Surg.* 3: 421, 1921.
- Ryerson, E.:* Arthroplasty of the elbow joint. *Amer. Acad. Orthop. Surg. Reconstruction Surgery of the extrem.* Ann Arbor, Michigan, 1944.
- Vainio, K.:* Personal communication, 1962.