NEGLECTED POSTERIOR DISLOCATION OF THE ELBOW

A RECONSTRUCTION OPERATION

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A new technique for repair of neglected posterior dislocation of the elbow is described, consisting of open reduction with tendon graft stabilisation to create a medial collateral and an intra-articular "cruciate" ligament. This allows flexion-extension exercises to start six days after operation.

Eleven cases are reported in which the average range of movement improved from 38° before operation to 105° after a minimum follow-up of two years, with a mean valgus-varus instability of only 13°. One patient had a postoperative infection but all the others were satisfied with the functional result.

Open reduction or arthroplasty for neglected posterior dislocation of the elbow often leads to mediolateral instability, particularly in cases which achieve a good range of flexion-extension movement (Shahriaree et al. 1979; Calandruccio 1980; Naidoo 1982; Fowles, Kassab and Douik 1984). This instability is clearly due to failure to reconstruct the collateral ligaments or failure of tissue healing. However, greater efforts at gaining stability, either by prolonged immobilisation or by ligament reconstruction, may result in a stable but stiff elbow. If immediate ligamentous stability could be provided this would allow early unrestricted movement and there would be a better chance of avoiding both instability and stiffness.

This paper reports the results of a technique which is based on this concept.

PATIENTS AND METHODS

Eleven patients aged from 15 to 54 years, with posterior dislocations of the elbow untreated for from one to 48 months (average nine months) were operated on at the Philippine General Hospital in 1981 and 1982 and followed-up for at least two years. There were five women and six men, with five right-sided and six left-sided dislocations. Four patients showed peri-articular calcification, three had subperiosteal ossification about the distal humerus and two had avulsion of the medial epicondyle. Three patients had impaired sensation in the distribution of the ulnar nerve, one showing wasting of the first dorsal interosseous muscle.

The mean range of flexion-extension before operation was 38°. Lateral instability averaged 32° when tested with the elbow at 15° to 20° flexion; side-to-side movement of more than 5° was considered evidence of instability.

Technique of operation. The tendon of palmaris longus is used as a graft or, if this is absent, the tendon of extensor carpi radialis longus. The graft is taken in the usual manner through proximal and distal incisions, using a tendon stripper. The graft must be at least 19 cm long, and preferably 22 cm so that its ends can be tied in a square knot to enhance the strength of the repair. Additional length can be gained by dissecting the tendon both proximally into muscle and distally towards the palm.

The elbow is approached through a straight 14 cm posterior incision, centred at the olecranon (Fig. 1). The ulnar nerve is taped and retracted; it may be transposed

Fig. 1

Position of the patient, incision and exposure of the elbow. Scar and fibrous tissue are excised. The line of incision for tricepsplasty, which may be needed to facilitate exposure, is indicated by a broken line.

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Fig. 2

Fig. 3

Figure 2 - The slot in the trochlea and the lines of drill holes A to D are shown, with the course of the tendon graft (see text for details).
Figure 3 - Anteroposterior and lateral views of the completed repair. Note the intact forearm flexor origin.

if this is indicated. The triceps aponeurosis is exposed and the joint approached by incisions on either side of this muscle, and laterally along the supracondylar ridge, with care to avoid injury to the radial nerve where it crosses the ridge about 8 cm above the epicondyle. The trochlear notch of the ulna is then freed of all fibrous tissue taking care to preserve the articular cartilage, and the distal humerus is freed from soft-tissue attachments on all except the medial aspect, where the common flexor attachment is left intact. All other tissues about the joint, including a displaced medial epicondyle when present, are excised.

The elbow is reduced and its range of movement tested. If this is limited by triceps contracture, a V-Y tricepsplasty is done. This may be useful at an earlier stage to improve exposure, leaving a tongue-shaped flap attached to the olecranon (Figs 1 and 2).

A slot is then cut in the lower humerus (Fig. 2). This is 4 to 5 mm wide, starting at the trochlear sulcus and extending 2 to 3 mm above the imagined axis of rotation of the joint. It is cut with an oscillating saw and a narrow rongeur. Two 4.5 to 5 mm drill holes are then made in the distal humerus and two in the ulna (Fig. 2).

The first hole in the humerus (A) is from the medial supracondylar ridge just above the condyle to the centre of the new trochlear slot. The second hole (B) is made through the base of the medial condyle adjacent to the medial surface of the common flexor muscle attachment, directing the drill bit at 45° to the long axis of the humerus.

The first hole in the ulna (C) runs through the bone from the middle of the trochlear notch. This is filled with a smaller diameter drill bit or Steinman pin, so that the next hole cannot encroach upon it. The second hole in the ulna (D) begins at the medial side of the coronoid process, at the attachment of the anterior oblique part of the medial collateral ligament, and is directed to the posterolateral aspect of the olecranon, crossing anterior to the first ulnar hole.

The tendon graft is then threaded through the drill holes as follows: from the slot in the humerus, emerging at the medial supracondylar ridge, then down through the hole in the base of the medial epicondyle. The end of the graft at the slot in the humerus is passed through the hole in the trochlear notch to form the intra-articular ligament, and the other end of the graft is led into the medial side of the coronoid process to form the new medial ligament (Fig. 3). The insertion of the graft is made easier by using a wire loop to pull the graft through each hole.

A few non-absorbable sutures are used to fix the graft to the flexor muscle origin, and the ends of the graft where they emerge near to each other on the posterior surface of the ulna are clamped temporarily while the range of movement at the elbow is tested. The tendon should be as tight as possible while still allowing a full range of flexion and extension, with 5° to 10° of side-to-side instability. When the correct tension has been decided, one suture is inserted to secure the crossed tendon ends at the correct tension. These ends are then, if long enough, themselves tied in a square knot, more sutures being inserted to hold it. The extensor muscle origin is not reattached, but if a tricepsplasty had been necessary this is now repaired.

Suction drains are inserted, the wound is closed, and an elastic compression dressing and a sling are applied. Drains are removed on the second day and flexion-extension exercises are started as early as the sixth day, using analgesics and anti-inflammatory drugs as indicated.

RESULTS

These are given in detail in Table I, and one case is shown in Figures 4 to 8. The repair operation took up to three hours in the first few cases, but only two hours subsequently.

Table I. Details of 11 cases of elbow reconstruction giving ranges of movement in degrees

Case	Age (years)	Sex	Duration of dislocation (months)	Before operation				Follow-up (months)	After operation				Comments
				Flexion-extension	Pronation	Supination	Valgus-varus		Flexion-extension	Pronation	Supination	Valgus-varus	
1	54	F	4	80 (0 80)	70	80	55 (20 35)	36	130 (0 130)	70	80	15 (5 10)	Triceps intact
2	44	F	5	50 (0 50)	60	80	40 (25 15)	24	135 (0 135)	70	80	13 (5 8)	Triceps intact
3	28	M	3	35 (10 45)	0	40	40 (8 32)	39	55 (45 100)	0	30	15 (5 10)	Postop. infection
4	20	M	7	35 (0 35)	70	80	40 (30 10)	48	80 (60 140)	65	70	5 (0 5)	ECRL
5	37	F	3	15 (0 15)	40	70	25 (15 10)	27	120 (10 130)	40	70	10 (5 5)	Triceps intact
6	16	M	2	5 (10 15)	60	70	10 (5 5)	24	110 (20 130)	55	70	10 (5 5)	
7	18	F	12	15 (0 15)	70	80	15 (5 10)	26	80 (40 120)	60	80	5 (0 5)	Poor rehabilitation, ECRL used
8	17	M	1	70 (10 80)	70	45	45 (15 30)	31	125 (10 135)	70	40	15 (5 10)	Triceps intact, ECRL used
9	49	M	8	60 (15 75)	10	40	50 (15 35)	37	115 (25 140)	15	40	23 (8 15)	
10	16	M	48	30 (0 30)	40	70	15 (10 5)	34	100 (20 120)	40	60	18 (5 13)	
11	15	F	12	20 (20 40)	60	80	15 (5 10)	24	110 (0 110)	60	80	12 (5 7)	Triceps intact

ECRL, Extensor carpi radialis longus tendon used as graft

The average range of movement after mean follow-up of 32 months was 105° with eight of the 11 patients having a range of 100° or more. Total valgus-varus instability averaged 13°. Where tricepsplasty had been done, excluding one infected case, flexion contracture averaged 33°, while in the five cases in which the triceps aponeurosis remained intact the mean flexion contracture was only 4°.

The single infected case had a draining sinus which closed after six months, but 33 months later his range of

movement was only 55°. Another patient (Case 7) was initially lost from rehabilitation and follow-up and had only 80° movement after 26 months. One other patient had a difficult rehabilitation because of pain and had a 60° flexion contracture at follow-up. Impairment of ulnar nerve sensation persisted in two cases, but improved in one. There was numbness of ulnar nerve distribution in Case 4 for eight months after operation, but this has almost completely recovered.

All the patients except the one with infection were

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Case 2. Figures 4 and 5 - Radiographs of the right elbow of a 44-year-old woman five months after dislocation in a fall. The range of movement was 0° to 50° with valgus-varus instability of 40°. Figures 6, 7 and 8 - Radiographs taken two years after reconstruction. In extension the head of the radius is subluxated. Some of the tendon tunnels can be seen. Flexion-extension was 0° to 135° with 13° of passive valgus-varus movement.

Fig. 8

satisfied with their result. Four patients (Cases 1,4,7,10) complained of occasional pain on first moving the elbow in the morning and on activity. Radiographically, all cases showed small irregularities of the joint surfaces with some lack of congruity between the radial head and capitellum. Subluxation at this joint, seen in seven cases, did not appear to restrict either flexion-extension (Figs 6 to 8) or pronation-supination. Minor loss of pronation or supination as a result of the operation, never exceeding 10°, was seen in six patients.

DISCUSSION

Repair of the collateral ligaments in a neglected elbow dislocation results in fibrosis around the joint which eventually restricts movement. This repair at the time of open reduction is therefore not advocated (Fowles et al. 1984). The resulting lateral instability, however, may preclude early movement so that joint stiffness is present before physiotherapy can begin.

The procedure described above provides stability and allows early unrestricted movement in the plane of the hinge, since joint congruence is maintained by the new ligaments in all positions of flexion-extension. Varus stability is not specifically treated because the lateral collateral ligament is not repaired or replaced. However, the new "cruciate" ligament does help to stabilise against varus angulation and biomechanical studies have shown that the functional effects of varus instability due to inadequacy of the lateral collateral ligament are less important than stabilisation in the other direction by the medial collateral ligament (Schwab et al. 1980).

There has been no evidence of rupture of the new intra-articular ligament in these cases; none of the joints can be manually dislocated, and it seems that this ligament can prevent anteroposterior subluxation without inhibiting hinge movement. The line of this ligament can be seen as increased density about the tunnel in the ulna (Figs 7 and 8).

In long-standing dislocations and those with very limited range of flexion-extension before operation, triceps contracture may render the operation more difficult and postoperative adhesions more likely (Naidoo 1982; Fowles et al. 1984). It appears, however, that

tricepsplasty itself may contribute to this complication. In all six of the patients in whom this was performed, there was more postoperative pain, greater difficulty with rehabilitation and a significant flexion contracture. Results were better when the triceps was left intact. Myositis ossificans was not seen in either group despite the early intensive physiotherapy.

Anterior transposition of the ulnar nerve was required only in the three cases with pre-operative symptoms. Fowles et al. (1984) also found that transposition is needed in other cases only if the nerve is seen to be stretched by the reduction.

Because of the original injury to the joint, the repeated trauma of unsuccessful manipulation by bone setters, and the delay in reduction, post-traumatic osteoarthritis may be expected after open reduction by any method. However, the stability provided by ligament reconstruction may well help to minimise these changes, while the restoration of congruence and movement may favour repair of the articular cartilage. Although newly developed external fixators may allow early movement after reduction, the regeneration of collateral ligaments under these circumstances may not be adequate to provide stability once the fixator is removed.

The described arthroplasty achieves a "functional" (Morrey et al. 1981) range of 100° or more in most cases; this seems to result from providing immediate bony and ligamentous stability, so allowing unrestricted movement to be started soon after operation.

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