CUBITAL TUNNEL RECONSTRUCTION FOR ULNAR NEUROPATHY IN OSTEOARTHRITIC ELBOWS

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We operated on 16 patients for ulnar neuropathy associated with osteoarthritis of the elbow. They were all male manual workers, with an average age of 51 years at the time of surgery. The severity of the symptoms was McGowan grade 1 in five patients, grade 2 in nine and grade 3 in two. The mean follow-up was 36 months.

The operation consists of resecting the osteophytes around the postcondylar groove. The shallow and narrow cubital tunnel is made deep and wide and the ulnar nerve is replaced with its surrounding soft tissues in the enlarged groove.

All patients were relieved of discomfort and all showed some improvement or full recovery of motor and sensory function. The ulnar nerve showed no evidence of irritation or adhesion. This procedure also allows early movement of the elbow after operation, because the subcutaneous tissues and muscles have not been detached.


Ulnar neuropathy at the elbow usually results from compression, repetitive traction, or subluxation of the nerve. The cubital tunnel syndrome may be secondary to post-traumatic skeletal deformities or to disorders of the elbow.

Operative treatment for this syndrome includes simple decompression, medial epicondylectomy, and anterior transposition of the ulnar nerve into a subcutaneous or submuscular bed. Tardy ulnar neuropathy may require removal of the nerve from its groove and anterior transposition. Despite many reports of the treatment of this condition, there is little to guide the choice of one surgical technique rather than another; this suggests that no one method is markedly better.

In early osteoarthritis, the elbow shows no abnormality of alignment as is seen in cubitus valgus. Associated neuropathy is due to compression caused by narrowing of the cubital tunnel: the essential treatment is not transposition but decompression. Transposition is one method of decompression, but why transpose the nerve? We have treated ulnar neuropathy associated with osteoarthritis of the elbow by reconstruction of the cubital tunnel.

PATIENTS AND METHODS

We operated on 16 patients with ulnar neuropathy associated with osteoarthritis of the elbow. All were male manual workers, with a mean age at operation of 51 years (29 to 70). There were no significant abnormalities of alignment such as cubitus valgus.

Symptoms included pain in the elbow and a limited range of movement. All had a positive Tinel sign near the medial epicondyle, with paraesthesiae in the ring and small fingers. There was hypoesthesia to light touch in eight patients, with absence of ulnar nerve sensation in two (Table I). Weakness of the intrinsic muscles was present in two patients and visible atrophy in seven. Two patients had clawing of the ring and little fingers. According to McGowan’s classification of the severity of symptoms, five patients were in grade 1 (minor lesions with no detectable motor weakness), nine in grade 2 (intermediate lesions, two with muscle weakness and seven with muscle atrophy), and two in grade 3 (severe lesions with paralysis of the ulnar intrinsic muscles). The duration of symptoms was less than ten months in patients with grade-1 lesions and more than ten months in those with grades 2 and 3.

The motor-conduction velocity (MCV) of the ulnar nerve across the elbow was measured in four patients with grade-2 symptoms and intrinsic atrophy (Table II).

Radiographs of the affected elbow showed degenerative changes or ectopic ossification (Fig. 1). CT showed shallow ulnar grooves in all patients (Fig. 2).

The mean period of follow-up was 36 months (24 to 48). Operative technique. An incision is made midway between the olecranon and the medial epicondyle, extending 5 cm proximally and 4 cm distally. The superficial fascia covering the ulnar nerve is sectioned at the side of
the olecranon, including the roof of the cubital tunnel (Osborne’s fascia). The nerve is displaced from the floor of the tunnel (Fig. 3a). It must be mobilised with the accompanying venous plexus and surrounding tissues which form the cubital sheath. Feeder vessels entering the joint capsule are coagulated. Pseudoneuromas and adhesions of the ulnar nerve are often found in the cubital tunnel. Epineurotomy is performed only when the nerve sheath shows fibrotic changes.

The osteophytes around the postcondylar groove are then resected. After removing the fanlike portion of the medial collateral ligament (MCL) which forms the floor of the cubital tunnel, osteophytes under the cordlike portion of the MCL are resected with the elbow flexed; the olecranon and its fossa are cleared with the elbow extended. After removal of the osteophytes (Fig. 1b), raw cancellous surfaces are covered with bone wax. The aim is to make what was a shallow and narrow cubital tunnel both deep and wide (Fig. 2b). The ulnar nerve with its surrounding tissues is then replaced. The nerve is seen to be decompressed and confirmed to be stable through the full range of elbow movement (Fig. 3b). Over the ulnar nerve, only the superficial fascia is sutured.

A soft dressing is applied, and the patient begins active movement of the elbow after two or three days.

## RESULTS

All patients were relieved of discomfort and all had partial or complete recovery of motor and sensory function. The ulnar nerve showed no evidence of irritation or adhesion in

### Table I.

Details and results in 16 patients with ulnar nerve neuropathy

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (yr)</th>
<th>Duration of symptoms (mth)</th>
<th>Follow-up period (mth)</th>
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<th>Postoperative</th>
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* par, paraesthesiae; hypo, hypoesthesia; absent, absent sensation; cold, in cold conditions  
† see text

### Table II.

Motor-nerve conduction velocity (m/s) in four patients with grade-2 symptoms

<table>
<thead>
<tr>
<th>Case</th>
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<th>Postoperative</th>
<th>Follow-up (mth)</th>
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<tr>
<td>11</td>
<td>20.9</td>
<td>53.0</td>
<td>12</td>
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Fig. 1a

Radiographs of an elbow associated with ulnar neuropathy. Figure 1a – Before operation there are osteophytes from both the olecranon and the medial epicondyle (arrow) causing narrowing of the cubital tunnel. Figure 1b – After operation the osteophytes have been removed and the cubital tunnel enlarged.

Fig. 1b
Fig. 2a
CT of the same elbow before (a) and after (b) operation. The arrows show the osteophytes and decompression of the tunnel is seen.

Fig. 2b

Fig. 3a
Operative findings. Figure 3a – Before reconstruction of the cubital tunnel, the nerve is displaced from the floor of the tunnel. Figure 3b – After resection of the osteophytes from the postcondylar groove, the nerve is repositioned and seen to be decompressed and in a stable position (mec, medial epicondyle; tri, triceps).
the groove, and in all cases the range of elbow movement increased.

In patients with grade-1 symptoms, pain at the elbow and paraesthesiae or numbness of the fingers were relieved within a few days of operation. The sensory disturbance in grade-2 patients recovered within a few months, except that two had some paraesthesiae in cold conditions. Both had atrophy of the intrinsic muscles and their symptoms had persisted for more than two years. Even complete absence of ulnar sensation showed some recovery after one month. Grade-2 patients with intrinsic muscle weakness regained normal power within one month and those with intrinsic muscle atrophy had improved by six months after operation. Two of the seven then had normal power; the others continued to improve over several years.

One of the patients with grade-3 symptoms and absence of sensation continued to have hypoaesthesia; and another became normal after one year. Clawing of the ring and little fingers recovered after one and six months respectively, and intrinsic muscle bulk improved.

Of the four patients with reduced MCV before operation (Table II), two returned to a normal range after operation, and two showed no change although symptoms were relieved.

DISCUSSION

It has been suggested that the prognosis for ulnar neuropathy at the elbow depends more on the duration of symptoms than the operative procedure undertaken.\(^7\) Dellon\(^8\) reviewed 50 published reports and noted that the results varied greatly. The treatment chosen, however, may not have been determined by the cause of the neuropathy in individual patients. Ulnar neuropathy associated with osteoarthrosis of the elbow is mainly due to compression by narrowing of the cubital tunnel.

The excursion of the ulnar nerve during elbow movement is an important factor. A small amount is advantageous in preventing adhesions, tractions and friction, but excessive movement may produce neuritis. The ulnar nerve may become entrapped in scar tissue after anterior transposition.\(^9,10\) Paraesthesiae occurring only when straightening the elbow have been reported after subcutaneous transposition.\(^11\) Presumably because the nerve is stretched in extension. We have previously noted that the ulnar nerve moved less during flexion in the normal anatomical situation and after epicondylectomy than after submuscular or subcutaneous transposition,\(^12\) with no significant difference between normal and postepicondylectomy. This supports the conclusions of a recent prospective study which indicated that epicondylectomy is superior to anterior transposition.\(^13\) Insufficiency of the MCL may follow removal of an excessive amount of the epicondyle,\(^14\) but when resection is insufficient, the residual part may produce friction on the nerve. Kinking on flexion and vulnerability to external trauma may also result. The least disturbance to the nerve would be expected in the anatomical position, posterior to the epicondyle and we believe that this is the optimum position for the nerve. Simple decompression,\(^7\) without enlarging the space, may allow subluxation of the nerve especially in osteoarthrosis of the elbow; reconstruction and enlargement of the groove are also necessary.

We have treated stiff elbows for a number of years\(^15\) by resection of thickened fibrous and ossified tissue around the postcondylar groove. The same procedure has been used for pain and a limited range due to osteoarthrosis. Most of these osteoarthritic patients were elderly and retired or had changed jobs from their usual heavy manual work; none had an obvious recurrence of osteophytes up to over five years after the operation. This experience encouraged us to replace the ulnar nerve in the reconstructed groove even when neuropathy was present. A correctly replaced nerve will not form adhesions in the reconstructed groove, because it is surrounded by loose areolar tissue. We used bone wax to control bleeding from the raw bony surfaces exposed by resection. This does not resorb, but did not appear to affect the nerves. Another advantage of the procedure is that it allows early elbow movement because subcutaneous tissues and muscles have not been detached.

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No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES