# Comparison Of Simple Decompression And Superficial Transposition In Patients With Advanced Cubital Tunnel Syndrome

## İlerlemiş Kübital Tünel Sendromu olan Hastalarda Basit Dekompresyon ve Yüzeyel Transpozisyon Tekniklerinin Karşılaştırılması

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**Abstract:** This retrospective study investigated the outcomes of surgical therapy in 14 patients with advanced ulnar neuropathy at the elbow. We evaluated patients clinically and electrophysiologically pre- and postoperatively. The mean follow-up was 43.8 months. The gender distribution in the group indicated that females might be affected more frequently than males ($p<0.05$). The most common preoperative complaint was pain (n=12; 86%), followed by motor weakness (n=11; 79%) and paresthesia (n=8; 57%). All patients exhibited varying degrees of muscle atrophy and motor deficits, and 10 individuals (71%) had sensory deficits. Electrophysiological testing demonstrated denervation potentials and slowing of motor and/or sensory nerve conduction in all cases. Simple decompression and superficial transposition techniques were performed in six and eight patients, respectively. Neurological status improved markedly after surgery, and long-term postoperative results were good or very good in 71% of the patients. However, there was no significant difference between the therapeutic effects of the two techniques in this patient group ($p>0.05$).

**Key Words:** cubital tunnel, surgical management, ulnar neuropathy.

**Özet** Bu geriye dönük çalışmada, dirsek düzeyinde ilerlemiş ulnar nöropatisi olan 14 hastamızdaki cerrahi tedavi sonuçlarımızı sunmaktayız. Hastalarımızı operasyon öncesi ve sonrası dönemde klinik ve elektrofizyolojik olarak değerlendirdik. Ortalama takip süremiz 43.8 aydı. Kadınlar erkeklerden daha fazla etkilenmiş göründü ($p<0.05$). Operasyon öncesi en önde gelen şikayet ağrı (12 hasta = 86%) ve bunu izleyen motor güçsüzlük (11 hasta = 79%) ve parestezi (8 hasta = 57%) idi. Hastaların tümünde değişik şiddette atrofi ve motor kayıp gözlenirken duyusal kayıp oranı ise %71 (10 hasta) olarak bulundu. Elektrofizyolojik testler değişmez olarak denervasyon potansiyelleri ile motor ve/veya duyusal sinir iletimlerinde yavaşlama gösterdi. Basit dekompresyon ve süperfisyal transpozisyon teknikleri sırası ile 6 ve 8 hastada uygulanmıştı. Cerrahi tedavi iyi sonuç ile uyum gösterdi ve operasyon sonrası geç sonuçlar hastaların %71'inde iyi ve hatta çok iyi idi. Ancak ilerlemiş nöropatisi olan hastalarımızda her iki teknik arasında tedavi edici etkileri açısından herhangi bir fark gösteremedik ($p>0.05$)

**Anahtar Kelimeler:** cerrahi tedavi, kübital tünel, ulnar nöropati.

## INTRODUCTION

Ulnar nerve entrapment in the cubital tunnel is the fourth most common form of entrapment neuropathy behind carpal tunnel syndrome, thoracic outlet syndrome, and meralgia paresthetica (13). Various pathological conditions, such as congenital defects, trauma, degenerative or inflammatory diseases, iatrogenic or occupational diseases, and metabolic or nutritional disorders, may cause this entrapment (30).

The ulnar nerve travels between the medial belly of the triceps muscle and the medial epicondyle of the humerus. At the elbow, the nerve enters the cubital tunnel, which begins at the condylar groove on the posterior aspect of the medial epicondyle. The roof of this tunnel is an aponeurotic-like band that stretches from the medial epicondyle to the medial border of the olecranon, and this band extends to the two bellies of the flexor carpi ulnaris muscle.

The clinical features of ulnar nerve entrapment neuropathy include paresthesia, pain, and signs of sensory-motor involvement (2,11,21). Electrophysiology is considered invaluable for ruling out other possibilities in the differential diagnosis (7,30). However, the optimal surgical treatment remains a matter of controversy since no prospective randomized study has been performed to date. In this report, we present our experience using simple decompression (SD) and superficial transposition (ST) techniques in a specific and homogeneous group of patients with advanced neuropathy at the elbow.

## MATERIALS and METHODS

Over a 16-year period, 14 patients (3 males and 11 females) underwent surgical treatment for advanced entrapment neuropathy in the cubital tunnel. Patients were clinically and electrophysiologically evaluated pre- and postoperatively. All the individuals exhibited varying degrees of motor impairment and atrophy of the intrinsic hand muscles, and all had an electrophysiologically confirmed diagnosis of cubital tunnel syndrome. The neuroradiological findings were also reviewed. In order to obtain a homogeneous group of patients with advanced ulnar neuropathy caused by compression of the osseofibrous tunnel, we excluded patients who met any of the following criteria:

1. post-traumatic elbow deformity
2. cubitus-valgus deformity
3. bilateral ulnar neuropathy
4. previous operation for ulnar nerve
5. features of double-crush syndrome

The 14 patients were between 28 and 56 years of age, and the mean age was 42.5 years. The duration of elbow neuropathy at the time of surgery ranged from 1 to 8 years, with a mean of 3.6 years. Six individuals (Group I) underwent SD, and eight (Group II) underwent subcutaneous ST.

In Group I, the right ulnar nerve was affected in half of the patients. The subjective symptoms were pain (n=5; 83%), paresthesia (n=4; 67%), and motor weakness (n=5; 83%). Neurological examination revealed muscle atrophy and motor deficits in all patients, and sensory deficits in four cases. Four patients had a positive Tinel's sign (Table I).

In Group II, five of the patients (63%) had ulnar nerve entrapment in the right cubital tunnel. The most common symptom was pain (n=7; 88%), followed by motor weakness (n=6; 75%), and paresthesia (n=4; 50%). All the patients showed muscle atrophy and motor deficits on neurological examination, and six (75%) exhibited sensory deficits. Five patients had a positive Tinel's sign (Table I).

Preoperative testing with electromyography and nerve conduction velocity studies revealed signs of denervation, alteration of intention patterns, and reduction of conduction velocity across the elbow in all 14 patients. The follow-up ranged from 6 to 132 months (mean, 43.8 months), and all patients were examined at least twice postoperatively. Outcome in the late postoperative period was assessed according to the degree of improvement in neural function (Table II), using the system modified by Steiner et al. (29).

*Surgical techniques*:

All patients were treated on an outpatient basis, and surgery was performed under local anesthesia. In the procedure, a 5-7 cm skin incision was centered over the cubital tunnel, and the ulnar nerve was identified at the arcade of Struther. The nerve was then followed distally to the fibro-aponeurotic edge of the flexor carpi ulnaris and released in the cubital tunnel. In SD, the nerve was left in place within the tunnel. In the ST procedure, an 8 to 10 cm length of nerve was mobilized and transposed anteriorly in the subcutaneous tissue. Interfascicular neurolysis was not performed in either technique.

*Statistical analysis:*

The clinical data were assessed using Chi-square and Fisher's exact tests, as appropriate. P values < 0.05 were considered significant.

## RESULTS

Apart from the different surgical techniques that were performed, the two groups were statistically similar based on analysis of the demographic and clinical data. Eleven of the patients were female, indicating a possible gender bias in this condition toward women ($p<0.05$).

After surgery, the majority of patients had a good recovery, with improvement in neurological deficits and resolution of symptoms (Table I). All patients in Group I were pain-free postoperatively. One (17%) continued to complain of motor weakness, and another of paresthesia. Muscle atrophy improved in four cases, but two individuals (33%) still exhibited severe atrophy. One patient (17%) showed persistent sensory deficits, and another had persistent motor deficits. These results represented a marked improvement in neurological status (apart from muscle atrophy) in 67%, and normalization in 33% of Group I patients. Long-term postoperative outcome was very good in two patients (33%), good in two patients, and fair in two patients (Table III).

In Group II, all patients experienced complete pain relief in the postoperative period. Two individuals (25%) continued to complain of motor weakness, and one (13%) of paresthesia. Three patients (38%) still showed muscle atrophy, two (25%) had persistent motor deficits, and one (13%) had persistent sensory deficits. Overall, 75% of Group II showed markedly improved neurological status (apart from muscle atrophy), and 25% normalized during follow-up. Long-term outcome was recorded as fair in two cases (25%), good in four (50%), and very good in two patients (25%) (Table III).

None of the patients' conditions deteriorated after surgery, and there were no major surgical complications. One individual developed a hypertrophic scar with a poor cosmetic result, and another had a superficial infection that lasted a brief period and was successfully treated with systemic antibiotics. All patients showed considerably higher nerve conduction velocity in the postoperative period, but there were still polyphasic motor units of high amplitude, positive waves, and fibrillation potentials in all cases. There was no correlation between electrophysiological improvement and clinical outcome. Both surgical techniques led to significant improvement in terms of complaints and neurological deficits ($p<0.05$); however, there were no significant differences between the two methods regarding the long-term postoperative symptoms and signs associated with advanced ulnar neuropathy ($p>0.05$).

## DISCUSSION

The correct diagnosis and treatment of ulnar nerve entrapment requires careful clinical and electrophysiological evaluation, and surgical planning (1,13,29). The best options for treatment can be derived from comparisons among previously reported studies only when clinical pictures are linked with corresponding anatomical situations. In this way, patients in various homogeneous classes can be assigned appropriate surgical procedures. However, there are no widely accepted grading criteria for these patients, and the therapeutic guidelines remain a matter of debate (1,20). Moreover, disagreement about surgical treatment arises because the relevant literature consists of series reported by individual surgeons, who are most likely accustomed to performing a particular surgical technique (9,12,16,22,31). To date, Artico et al. is the only group to have reported a retrospective study of 290 surgical procedures that involved clinical grading of ulnar nerve functional loss and clinically related therapeutic criteria (1). Even in their study, it was not possible to compare the efficacy of surgical techniques in the range of patients with ulnar neuropathy since no specific methods were used in certain groups of individuals.

In reviewing our cases, we used a revised set of exclusion criteria (29) that allowed us to focus on a specific and homogenous group of patients with advanced neurological signs and major electrophysiological alterations. This clinical picture corresponds to 22% of the surgically treated patient population with this form of neuropathy. As described, we performed SD and ST techniques without neurolysis. These two methods were randomly chosen from the list of possible options because there is little published data that indicates any one technique is superior to the others.

The ideal surgery for ulnar nerve neuropathy at the cubital tunnel should provide adequate decompression and cause no deterioration in neurological function from compromise of the vasa

nervorum (15). Of course, the complication rate must also be acceptable. In 1957, Osborne first introduced decompressive surgery for the ulnar nerve at its entrance to the cubital tunnel (25). Over time, others pioneered the alternative techniques of medial epicondylectomy (14,27), and subcutaneous (16,26) or intramuscular (9,28) anterior transposition with or without neurolysis. However, the latter techniques are used less frequently. Although the simple decompression and transposition methods effectively eliminate nerve compression, several factors that limit success have been identified. Cases of compression neuropathy rarely involve simple compression. Restriction of the nerve's sliding ability and disruption of the gliding surfaces between the inner nerve fascicles play important roles (6,18). When the decompressed ulnar nerve is released but not moved from its original location, as in the case of SD surgery, injury from repetitive microstretching due to nerve strain can result in poor long-term outcome (5,6,7). Although transposition maneuvers prevent this problem, the vasa nervorum may be damaged during circumferential isolation of the ulnar nerve (3,15,25). Other potential problems with transposition include insufficient mobilization and kinking of the ulnar nerve, as well as intraoperative trauma to the medial cutaneous nerve of the forearm (2,29). All of these complications can prevent improvement in neural function. The interfascicular neurolysis technique has largely been abandoned since it is associated with clinical deterioration after surgery due to fibrotic changes and interference with microcirculation (23).

Previous series of ulnar neuropathy patients who have undergone SD have reported good or very good responses in 80-93% of cases (2,17,29). Some authors have claimed that there is no need to transpose the ulnar nerve in cubital tunnel syndrome (3,12). Studies that have investigated transposition surgery for ulnar neuropathy have reported comparable good and very good outcomes in 78-92% of patients (11,24). However, some authors have also reported less favorable results with ST, with frequencies of good or very good outcome ranging from 46-59% (8,19). As a consequence, it has been recommended that ST be used as a follow-up to failed SD procedures (4,28). In a recent meta-analysis of 30 clinical studies, Mowlavi et al. concluded that these two widely used surgical techniques yielded similar degrees of satisfaction in patients with minor clinical and electrophysiological findings (20); however, they found that these therapeutic modalities were not consistently effective in severely affected patients. Other research has also shown that poorer prognoses can be expected in severe cases that exhibit paresis and atrophy preoperatively (1,29).

In the present study, we investigated a sample of such severe cases. There were no doubts about the diagnoses since all the patients' signs, symptoms, and electrophysiological findings were consistent with pure ulnar nerve entrapment. Some authors have questioned the need for electrophysiological testing in the management of ulnar neuropathy, stating that their data did not correlate well with outcome (10,32,33). We used electrophysiological testing in all 14 of our cases. The aim was to support the diagnosis, and also to rule out C8-T1 root involvement due to other pathologies in the differential diagnosis, such as cervical spondylosis, complications of discography, thoracic outlet syndrome, or Pancoast's tumor.

Since the effect of SD is known to depend on the duration of symptomatology and the presence of atrophy, it is recommended that this procedure be performed in patients who are in the early stage of ulnar neuropathy. It has also been suggested that transposition is more effective in patients who have had symptoms for more than 1 year (6,17). However, in our patients with advanced ulnar neuropathy, we found no significant difference in therapeutic outcome with the two surgical techniques. The rates of good or very good results with SD and ST were 67% and 63%, respectively, and these findings were in accordance with the figures reported in the Mowlavi et al. meta-analysis (20).

## CONCLUSION

There is no significant difference between the therapeutic outcomes of SD and ST surgery in the treatment of ulnar neuropathy, regardless of the severity of neuropathy. In patients who do not have an anatomical lesion in the cubital tunnel area, such as a tumor, ganglion, osteophyte, valgus deformity, or subluxation of the nerve, it may be best to perform SD first since the associated complication rate is low. In cases that involve an anatomical problem or in which decompression has failed, transposition surgery is the best option.

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