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Our Experience of Simple Decompression versus Anterior Submascular Transposition of Ulnar Nerve in the Treatment of Cubital Tunnel Syndrome

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Abstract: ***Background:*** Cubital tunnel syndrome (CuTS) is the second most common entrapment neuropathy in the upper limb, after the entrapment of the median nerve in CTS. In this study, we aim to evaluate clinical and functional results in patients with cubital tunnel syndrome who were treated with submascular anterior transposition vs simple decompression of the ulnar nerve. ***Methods:*** The study included 25 patients that were surgically treated in the orthopedic department at alhekma Hospital – Misurata - between Fibraury 2015 and December 2018. These patients were randomly distributed into two groups. In the first group only simple decompression was performed, while in the second group anterior submascular transposition was supplemented. All cases were followed for at least 3 months using the Bishop Score to assess outcome. A total of 25 procedures were performed with a minimum of 3 months' post-operative follow- up. All cases were operated (Dr. Abuzaid). ***Results:*** In the simple decompression group, (average age 45 years), the average Bishop Score was 11 with an average time to recovery of 8 weeks. Good to excellent results were obtained in 90% and fair results in 10%. In the anterior transposition group (average age 45 years) the average Bishop Score was 10.2 with average time to recovery of 9 weeks Good to excellent results were obtained in 86% and fair results in 13%. Complications included subluxation of the ulnar nerve in two cases, one wound dehiscence and one postoperative hematoma. ***Conclusion:*** These long-term results show that both surgical techniques have a good outcome. Thus, the less invasive simple decompression should be preferred.

Keywords: Syndrome, entrapment, subluxation, nerve.

Research Paper

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INTRODUCTION

Cubital tunnel syndrome is the second most common compressive neuropathy of the peripheral nerves. It results from compression of the ulnar nerve along its course around the elbow.

Several predisposing factors can cause CuTS such as repetitive elbow flexion and extension, habitual leaning on the elbow, as a outcome of elbow trauma, osteoarthritis, and chronic valgus stress. However, it is idiopathic in 20% of cases.

Compression of the nerve may be due to increased contents within Osborne's canal, e.g. lipoma abnormal muscles, tumors or a decrease in size of the cubital tunnel, e.g. in valgus abnormalities, fractures or osteophyte formation. Cubital tunnel syndrome may also be associated with systemic conditions such as diabetes mellitus and rheumatoid arthritis.

The majority of cases, however, remain idiopathic. Neuropathy in CubTS is mostly due to change in the volume and the pressure of the cubital canal with flexion and extension.

The neuropathy of cubital tunnel syndrome stems from alterations in the volume and the pressure of the cubital tunnel due to flexion and extension exerted on the ulnar nerve. Elbow flexion results in traction and excursion of the ulnar nerve and increases intraneural pressure. Prolonged elbow flexion gives rise to neuropathy and demyelination, commonly found in the bulbous swelling proximal to the nerve entry into the cubital tunnel.

At the elbow, there are five anatomical regions wherein ulnar nerve may be compressed: the arcade of Struthers, the proximal epitrochlear region, the epitrochlear–olecranon channel, the fibrous arch between the humeral and ulnar portions of the flexor carpi ulnaris, known as Osborne's arcade, and the vertical fibrous septum that stems from the ulna and separates the ulnar nerve and the ulnar part of the flexor carpi ulnaris from the flexor pronator muscles supplied by the median nerve.

Initial treatment of acute and sub-acute neuropathy is conservative. Conservative treatment should be tried for at least three months before surgical intervention, because symptoms may resolve in up to 50% of cases. Surgical decompression of the ulnar nerve is necessary for patients with unsuccessful conservative treatment, progressive ulnar nerve dysfunction or axonal damage in both sensory and motor conduction studies.

The current surgical techniques for the treatment of cubital tunnel syndrome include simple decompression, medial epicondylectomy and anterior transposition of the ulnar nerve.

There is still no universal consent on the best surgical treatment and technique for CuTS. There are three frequently used surgical treatments and there are proponents for use of each treatment. First type of surgical treatment is simple decompression, by either open or endoscopic release of the Osborne's band. This is reserved for mild cases, with fresh onset of symptoms and mild sensory changes on the nerve studies, anterior transposition (subcutaneous, intramuscular or submuscular), medial epicondylectomy.

AIM OF WORK This study is designed to compare the results of of simple decompression compared to anterior submascular transposition of ulnar nerve in patients with cubital tunnel syndrome (CuTS).

MATERIALS AND METHODS

This prospective study was conducted at the Orthopedic department, in Aljazeera orthopedic Hospital – Misurata –Libya, from February 2015 till December 2018.

Patients were divided into two groups according to surgical technique. Group 1 comprised 10 patients (3 males, 7 females; 6 right hands, 4 left hands; mean age, 45 years; range, 30–60 years) who underwent simple decompression of the ulnar nerve, whereas Group 2 comprised 15 patients (7 males, 8 females; 9 right hands, 7 left hands; mean age, 45 years; range, 30–60 years) who underwent anterior intramuscular transposition of the ulnar nerve. All surgical procedures were performed by the same surgeons (Dr Abuzaid).

Table 1: Age and Sex distribution between both groups

Anterior sub muscular decompression	Simple transposition	
15	10	Total
7	3	Male
8	7	Female
45	45	Average age

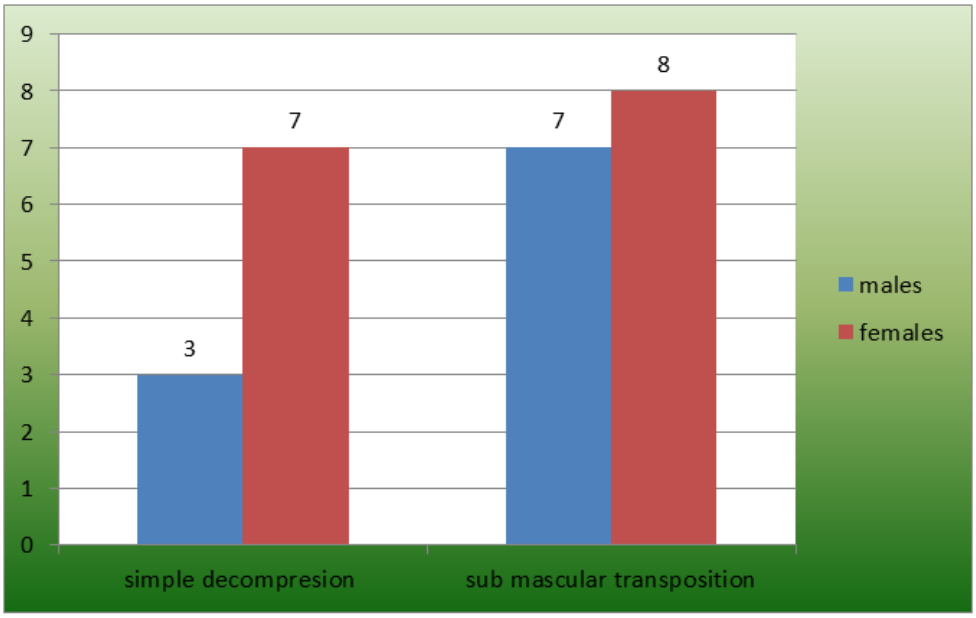


Figure 1: Sex distribution between both groups

Taleb 2: Bishop's score – subjective and objective assessment

1. Satisfaction	
Satisfied	2
Satisfied with reservation	1
Dissatisfied	0
2. Improvement	
Better	2
Unchanged	1
Worse	0
3. Severity of residual symptoms	
Asymptomatic	3
Mild	2
Moderate	1
Severe	0
4. Work status	
Working or able to work at previous job	1
Not working secondary to neuropathy	0
5. Leisure	
Unlimited	2
Limited 0	0
6. Strength	
Both grasp and pinch > 80% of normal side	2
Either grasp or pinch (not both) <80%	1
Both grasp and pinch reduced < 80%	0
7. Sensibility (2 point discrimination)	
Normal <5 mm	1
Abnormal >5 mm	0
Total	13

All patients were operated on by (Dr alsagair – Dr abozaid). The Bishop's score (Table 2) was used to evaluate outcome. A score of 10–13 was classed as excellent, 7–9 as good, 4–6 as fair and 0–3 as poor. Included in the patient questionnaire was the time to recovery in weeks.

The Inclusion Criteria

All patients with sign and symptom of cubital tunnel syndrome and positive NCS of ulnar entrapment at level of elbow, Failure to treat conservatively. Age of patients above 15 yrs, duration of symptoms of at least three months.

Exclusion Criteria

Cervical radiculopathy, previous history of surgical intervention, angular elbow deformity, and neuropathies that had developed due to systemic diseases, Cubital tunnel syndrome was diagnosed according to history and physical examination findings and was supported by electrodiagnostic test results. Particularly, loss of sensation and numbness on the ulnar side in the 4th and 5th fingers, medial elbow pain, weakness in intrinsic muscles, partial atrophy in the primary dorsal interosseous and hypothenar atrophy, and a positive Tinel's sign and two point differentiation test were important criteria for diagnosis. Cervical and elbow x rays were taken from all patients.

Electrodiagnostic tests included nerve conduction studies and needle electromyography (EMG). Motor conduction velocity of less than 47 m/s and sensory conduction velocity of less than 54 m/s were considered abnormal. Pathologic EMG findings were abnormalities in fibrillation activity, reduced exposure and abnormalities in motor unit activation potential.

Surgical Technique

The procedures were performed under general anesthesia.

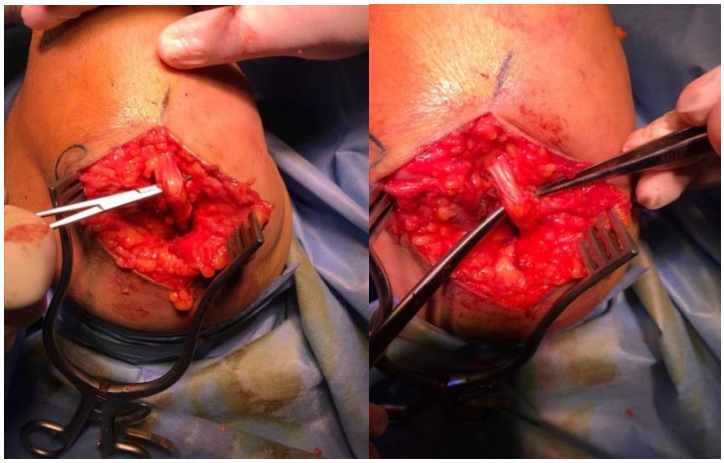
Simple Decompression of Ulnar Nerve

In simple decompression, an incision was made along the course of the ulnar nerve, about 8-10 cm in length, from the tip of the olecranon and midway between the medial epicondyle.

This posterior incision was favored to avoid damage to medial anterior brachial cutaneous and medial brachial nerves. The medial inter muscular septum was cut and a localized decompression of the nerve was established by incising the osborn ligament and by incising the fascia holding the two heads of the flexor carpi ulnaris in order to open the tunnel between them. In addition, the cubital tunnel retinaculum was sharply divided in proximal-to-distal direction.

(2) (3)

Figure 2-3: Site of incision in CubTS



(4) (5)

Figure 4-5: simple decompression of ulnar nerve in CubTS

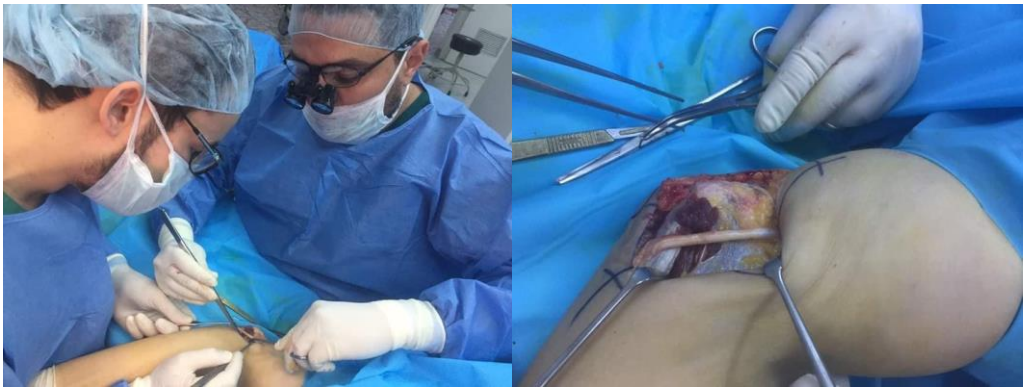
Anterior Sub Muscular Transposition of the Ulnar Nerve

In AST, a 10-cm curved skin incision is made posterior to the condylar groove of the humerus. Attention is taken to identify and protect the posterior branches of the medial antebrachial cutaneous nerve.

The subcutaneous tissues are separated and the nerve is identified at the medial epicondyle immediately proximal to its entry into the cubital tunnel. The cubital tunnel retinaculum or arcuate ligament of Osborne is split and releases the nerve. Proximally, the nerve is followed to divide the intermuscular septum and the Struthers' arcade. Distally, the release is continued as the nerve passes through the two heads of the flexor carpi ulnaris muscle to ascertain complete decompression. The ulnar nerve is subsequently dissected from the ulnar groove bed and transposed to a position anterior to the medial epicondyle.

And the nerve was followed up to the two heads of the flexor carpi ulnaris. Ample division of the confluence of the two heads of the flexor carpi ulnaris and eventual section of the medial head was performed. The nerve was then isolated with soft loops and mobilized preserving the extrinsic vessels as accurately as possible. Then, splitting of the muscular pronator–flexor complex as a new bed for the ulnar nerve was performed. The nerve was transposed into the transected muscular complex near the median nerve and the muscular insertion was sutured above the nerve without traction. To ensure that there was no residual compression of the transposed nerve, the arm was flexed und extended. The superficial tissues were stitched in layers.

Following to surgery, the arm is kept in a long arm dressing with the elbow fixed at 90 degrees and forearm in mid-pronation for a 4 weeks period. Active range of motion starts at 4 weeks with interval splinting. At 6 weeks, a passive range of motion is started, together with a strengthening program.



(6) (7)

Figure 6-7: Release of ulnar nerve in CubTS

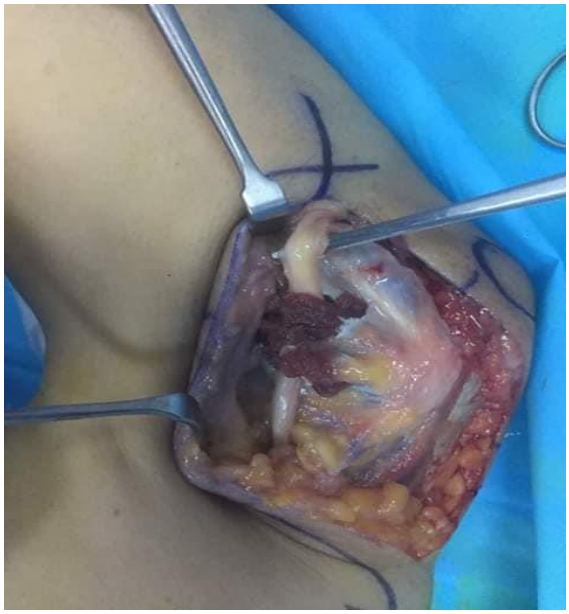


Figure 8: submascular position of ulnar nerve

Figure 9: anterior transposition of ulnar nerve

RESULTS

Twenty five patients underwent surgical decompression. The simple decompression group consisted of 10 cases and the anterior transposition group 15 cases. The minimum post-operative follow-up was 3 months and the longest was 24 months. In the simple decompression group there were 6 (60%) excellent, 3 (30%) good and 1 (10%) fair in the post- operative Bishop's score (Table 2). There were no poor results.

In the anterior submuscular transposition group there were 10 (66%) excellent, 3 (20%) good, 2 (13%) fair and no poor results. The average time to recovery was 8 weeks for the simple decompression group and 9 weeks for the transposition group. A significant number of patients, 8 (80%) in the simple decompression group and 15 (100%) in the transposition group, required 6 – 12 weeks for recovery post-operatively. The time to recovery and the Bishop's score of the two groups was not statistically significant (Table 4). Both groups therefore had similar outcomes (Table 5). Complications included one subluxation of ulnar nerve in the simple decompression group, and one postoperative hematoma and one wound dehiscence in the transposition group.

Table 3: Decompression versus transposition

Decompression versus transposition	
Shorter operative time Less invasive Earlier post-operative mobilization **Bishop's score (average) = 11**	**Simple decompression**
Longer operative time Wider exposure Delayed mobilization **Bishop's score (average) = 10.2**	**Anterior intramuscular transposition**

Table 4: The time of recovery

Anterior submuscular transposition	**Simple decompression**	
0	2	After 3 wks
6	4	After 6 wks
2	2	After 9 wks
2	2	After 12 wks

Table 5: Summary of Bishop's score results for SD and AST

Anterior sub muscular transposition	**Simple decompression**	
10	6	Excellent
3	3	Good
2	1	Fair
0	0	average

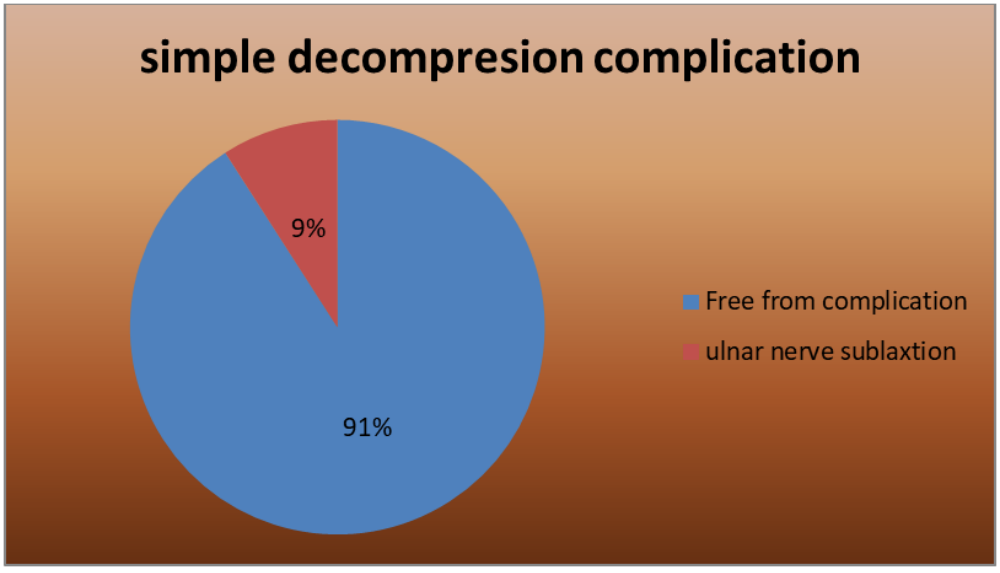


Figure 10: Simple decompression complication

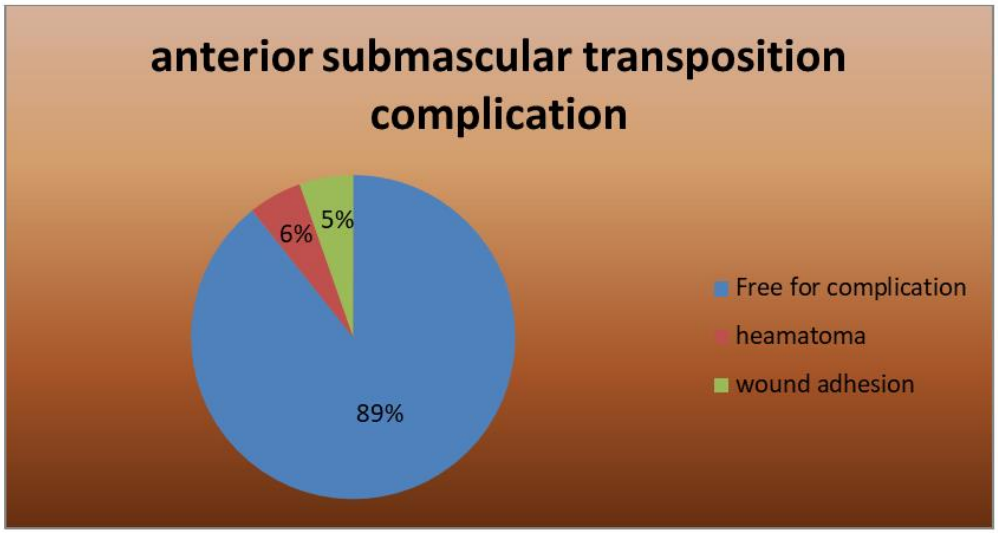


Figure 11: Anterior submascular transposition complication

DISCUSSION

Proponents of the different methods of ulnar nerve decompression in the treatment of cubital tunnel syndrome have reported variable effects. There are limited prospective randomized trials comparing simple decompression (SD) with anterior submascular Transposition of ulnar nerve (AST).

The mean age in our study is 45 years. This is similar to some other reports stating that younger age groups are more commonly affected. This could be recognized to the fact that these age groups are usually more active and more prone to injury and trauma. In our study, we found that females were more commonly affected than males (60%), and this predominance can be attributed to the longer duration of elbow flexion during house actions, and their increased propensity to develop rheumatic illnesses. Thomsen *et al.*, is in agreement with the results.

Ogata *et al.*, have shown in an experimental study that anterior transposition of the ulnar nerve is associated with a decrease in regional blood flow to the ulnar nerve for at least 72 hours after operation. Thus it is speculated if ischemia could contribute to formation of adhesions about the transposed nerve. In simple decompression, the ulnar nerve is left in its position without the risk of segmental ischemia caused by ligation of segmental vessels.

Biggs and Curtis *et al.*, published a randomized, prospective study comparing simple decompression with submuscular transposition in 44 patients. The postoperative outcome assessment was 1 month, 6 months and 1 year after surgery. Each technique led to good results and these authors advocated simple decompression as the procedure with fewer complications.

Gervasio *et al.*, in 2006 compared simple decompression with anterior submuscular transposition in Seventy patients. After follow-up of 48 months, neurological insufficiencies improved in each group and no statistically significant difference was seen—even in patients who showed signs of severe ulnar nerve compression before surgery. Both groups had good results in improvement of neurological deficits.

A comparison of the clinical outcomes in our study demonstrated a statistically significant difference in favor of simple decompression according to modified Bishop scoring. Ulnar nerve function improved in both groups compared with the preoperative period, and ulnar nerve paralysis was not seen in any of our cases. Scar incision was the most significant problem for patient satisfaction in the late post-operative time.

The results of this study reveal that simple decompression and anterior submascular transposition of the ulnar nerve are almost equally effective in the treatment of CuTS, with a slightly better outcome with simple decompression. Simple decompression of the ulnar nerve in our study, because it is an effective and less invasive technique for CuTS.

CONCLUSION

The results of this study reveal that simple decompression and anterior submascular transposition of the ulnar nerve are almost equally effective in the treatment of CuTS, with a slightly better outcome with simple decompression. Simple decompression of the ulnar nerve in our study, because it is an effective and less invasive technique for CuTS.

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