



Original Article

Surgery for Cubital Tunnel Syndrome: A Comparative Study of Small Incision with Classic Anterior Nerve Transposition

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ABSTRACT

Objective: To evaluate the clinical outcomes of ulnar neuropathy, and cubital tunnel syndrome (CuTS) surgery via a small incision with that of anterior transposition of the ulnar nerve.

Materials & Methods: In this comparative cross-sectional study, 108 patients were recruited from the Neurosurgery Department of Qazi Hussain Ahmad Medical Complex, Nowshera. Two Groups were made. Group A patients undergo either ulnar nerve anterior transposition or simple decompression via a small skin incision, while Group B patients undergo ulnar nerve subcutaneous anterior transposition through a classic skin incision.

Results: Totally 108 patients were enrolled. Males were 67 and females were 41 with a mean age of 45.6 ± 12.97 years. During follow-up visits, an increase in clinical outcome measures was noted, but no statistically significant difference was seen in both groups. Nevertheless, in comparison to the two groups, complications were more in group B, in terms of superficial infection, numbness of skin at the medial elbow, revision surgery, and painful scar.

Conclusion: It is concluded that keeping in view the stability/anatomical position of the ulnar nerve to undergo either simple decompression or anterior transposition through small skin incision is effective and an excellent procedure as compared to classic incision procedure in treating patients suffering from cubital tunnel syndrome.

Keywords: Classic Anterior Nerve Transposition, Ulnar nerve, Cubital Tunnel Syndrome, Disability of Arm, Shoulder, and Hand.

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INTRODUCTION

Cubital tunnel syndrome (CuTS) is the second most common peripheral nerve entrapment pathology of upper limbs after carpal tunnel syndrome.¹⁻³ This syndrome for the first time was described in 1878.⁴ The prevalence of CuTS is found to be 2 – 6%, with an annual incidence of 24.3 cases / 100,000 population.^{5,6}

Apart from intrinsic hand muscle atrophy (which may or may not be present), patients with cubital tunnel syndrome usually present with little and ring finger numbness. CuTS are also characterized by a lack of ability to perform fine motor activity. This progressive course ultimately leads to impaired daily activities of life, which results in compromised quality of life. The high prevalence of CuTS causes a significant burden on economic and social life.^{5,6} CuTS is entrapment neuropathy, which occurs in the vicinity of the cubital tunnel. The common sites responsible for this ulnar neuropathy are the intermuscular septum (medial), cubital tunnel, arcade of struthers, and medial epicondyle.⁵

For the treatment of CuTS, surgeons mostly prefer the conservative treatment approach. However, in patients with failed conservative treatment, the surgeon then used the operative treatment.⁷ In the case of conservative treatment about 50% of the symptoms resolve. It has been recommended to use medical treatment for three months before the surgical approach.⁸ If surgery is required in CuTS, three types of surgical procedures should be practiced. These procedures are; (1) medial epicondylectomy of the humerus, (2) simple decompression, and (3) ulnar nerve anterior transposition.⁹ Literature mentioned good – excellent results in about 70 – 90% of the cases if ulnar nerve anterior subcutaneous transposition is performed.¹⁰

The purpose of the present study was to evaluate the clinical outcomes of cubital tunnel syndrome (CuTS) surgery for ulnar neuropathy, through a small skin incision with that of ulnar

nerve anterior transposition via a conventional classic approach. The data will aid in the decision-making for the optimum surgical treatment of patients with CuTS.

MATERIALS AND METHODS

Study Design & Setting

A comparative study was conducted at the Department of Neurosurgery, Qazi Hussain Ahmad Medical Complex, Nowshera Medical College, Nowshera, in six months duration (June 2022 – Jan 2023).

After the approval obtained from the institute's ethical committee, a total of 108 patients, meeting the inclusion criteria were included in the study. After explaining the research to the patients, informed consent was taken. A predesigned questionnaire was used for data collection, after clinical examination of the patients.

Inclusion Criteria

All the diagnosed patients of cubital tunnel syndrome, of 20 – 70 years of age, of either gender and willing to participate in the study, were included.

Exclusion Criteria

While, patients having unremarkable NCS + EMG for CuTS, having cubitus valgus, any other bony abnormalities of the elbow joint (due to trauma or degeneration), recurrent CuTS, associated other peripheral neuropathies, thoracic outlet syndrome and/or cervical spine pathology and having co-morbidities; like hypertension, hypothyroidism, diabetes mellitus, ischemic heart disease were excluded from the study.

Patient Groups

All the participants were divided into two groups (Group A and Group B). Group A patients undergo surgery for the ulnar nerve through a small incision (undergone either simple decompression or anterior transposition), while the other hand; Group B patients underwent ulnar nerve decompression and anterior transposition through classic incision.

Grading of Ulnar Nerve Neuropathy Severity

To grade the ulnar nerve neuropathy severity pre-operatively, the Dellon staging system was used (Table 2). Based on this system, the patients were classified as; "Grade I = patients with subjective weakness and intermittent paresthesia, Grade II = patients with moderate compression and manifests measurable weakness in grip and pinch strength and intermittent paresthesia, while Grade III = patients with abnormal two-point discrimination, persistent paresthesia and weakness in grip and pinch strength with intrinsic muscle atrophy." Patients were observed in terms of different factors, like; two-point discrimination (2PD), pinch strength, and grip. Pre-operatively and at follow-up visits, the DASH (disability of arm, shoulder, and hand) survey was also assessed.⁷

Measurement of Grip and Pinch Strength

Hydraulic grip and pinch dynamometer were used to measure grip and pinch strength. Bishop rating system was used for assessing clinical outcomes, "which evaluates objective and subjective factors, objective factors were grip strength in comparison with the normal side (a score of 1 was given if it is $\geq 80\%$, while 0 is given in case of $< 80\%$), another factor was two-point discrimination (score 1 for ≤ 6 and score 0 for > 6 mm). On the other hand, subjective factors included; residual symptoms (severe = 0,

moderate = 1, mild = 2, no symptoms = 3), improvement from pre-operative period (worse = 0, unchanged = 1, better = 2), post-operative work status (not working = 0, job changed = 1, working previous job = 2). The overall score interpretation was as; poor = 0 – 2, fair = 3 – 4, good = 5 – 7, excellent = 8 – 9".⁷ General anesthesia with endotracheal intubation was used to perform the surgical procedure.

Statistical Analysis

For data analysis, computer software SPSS (version 23.0) was used. Results were presented in the form of tables. Chi-square and T-test were used to calculate p-values for qualitative and quantitative data respectively. Furthermore, a p-value less than 0.05 were considered statistically significant.

RESULTS

Number of Patients and Age Distribution

In this study, we enrolled 108 patients equally divided into two groups and mean age of 45.67 ± 12.97 years (Table 1).

Table 1: Distribution of patients with respect to gender and mean age (n = 108).

Variable	Mean	SD
Age (Years)	45.67	12.97
Gender (n %)	N	%
Male	67	62.0
Female	41	38.0

Clinical Characteristics and Demographics

The baseline clinical characteristics and

demographics of patients are presented in Table 2.

Clinical Outcome

In group A, mean preoperative grip strength was 17.20 ± 1.7 kg which increased during the last follow-up to 29.8 ± 2.6 kg ($p < 0.001$) while in patients of group B, it improved from 19.03 ± 2.6 kg to 29.5 ± 2.5 kg during the last follow-up. In group A, mean preoperative pinch strength was 3.05 ± 0.76 kg which increased during the last follow-up to 4.11 ± 0.9 kg while in Group B it increased from 2.90 ± 0.86 to 3.96 ± 0.8 kg during the last follow-up visit. There was increased mean two-point discrimination from 5.90 ± 0.9 to 3.18 ± 0.8 in Group A, whereas it increased from 5.77 ± 0.9 to 3.09 ± 0.8 in Group B. Mean DASH score of preoperative patients of group A was 35.07 ± 1.2 which was improved to 11.14 ± 2.4 while that of Group B patients improved from 31.05 ± 4.3 to 10.25 ± 1.5 . The outcomes were mentioned in terms of excellent, good, and fair (Table 3). In Group A, it was 26 (48.1%), 23 (42.6%), and 5 (9.3%) while in Group B it was 29 (53.7%), 21 (38.9%), and 4 (7.4%) respectively.

Complications

In Group A, only 1 patient had a superficial infection and 1 patient had numbness at the medial elbow as a complication while in group B total of 8 patients had complications (Table 4). Group B had more complications as compared to Group A.

Table 2: Demographic and clinical features of the patients (n = 108).

Variable	Group A	Group B	P-Value
Gender: n (%)			
Male	35 (64.81)	32 (59.25)	0.40
Female	19 (35.18)	22 (40.74)	
Duration of symptoms (month)	22.7 $\pm$ 2.76	22.3 $\pm$ 2.68	0.43
Preoperative stability of the ulnar nerve: n (%)			
Stable	38 (70.37)	40 (74.07)	0.66
Unstable	16 (29.62)	14 (25.92)	
Dellon grade: n (%)			
Grade I	8 (14.81)	11 (20.37)	0.75
Grade II	30 (55.55)	28 (51.85)	
Grade III	16 (29.62)	15 (27.77)	
MCV at elbow segment (m/s)	39.3 $\pm$ 3.5	39.4 $\pm$ 2.71	0.88
Mean follow-up post-operative (month)	30.5 $\pm$ 4.6	33.7 $\pm$ 1.3	0.00 (significant result)

Table 3: Clinical outcome at the last follow-up (n = 108).

	Group A	Group B	P-Value
Grip Strength (kg)			
Preoperative	17.20 $\pm$ 1.7	19.03 $\pm$ 2.6	0.00
Last Follow-up	29.8 $\pm$ 2.6	29.5 $\pm$ 2.5	(significant result)
Pinch Strength (kg)			
Preoperative	3.05 $\pm$ 0.76	2.90 $\pm$ 0.86	0.34
Last Follow-up	4.11 $\pm$ 0.9	3.96 $\pm$ 0.8	
*2PD			
Preoperative	5.90 $\pm$ 0.9	5.77 $\pm$ 0.9	0.43
Last Follow-up	3.18 $\pm$ 0.8	3.09 $\pm$ 0.8	
**DASH Score			
Preoperative	35.07 $\pm$ 1.2	31.05 $\pm$ 4.3	0.00 (significant result)
Last Follow-up	11.14 $\pm$ 2.4	10.25 $\pm$ 1.5	
Final Outcome			
Excellent	26 (48.1%)	29 (53.7%)	0.832
Good	23 (42.6%)	21 (38.9%)	
Fair	5 (9.3%)	4 (7.4%)	

*2PD: two-point discrimination, **DASH: disability of arm, shoulder, and hand

^Grip strength & DASH score are statistically significant, as the p-value is < 0.05 "

Table 4: Post-operative complications (n = 108).

Complication	Group A n (%)	Group B n (%)
Wound superficial infection	1 (1.85)	2 (3.70)
Painful scar	0 (0)	1 (1.85)
Revision surgery	0 (0)	1 (1.85)
Numbness at the medial elbow	1 (1.85)	4 (7.40)

DISCUSSION

Management of CuTS ranges from conservative treatment to medical to surgical treatment. McGowan et al devised a grading system for CuTS and these are mild, moderate, and severe. Conservative and medical treatment is beneficial for mild and moderate grades, while surgery is the mainstay treatment modality in severe grades.³

Several surgical procedures have been introduced nowadays but still; it is unclear which one is best for treating ulnar neuropathy caused by CuTS. Though most commonly used and effective procedure is anterior transposition; because it relieves stress on the ulnar nerve while performing elbow flexion.^{9, 11-15}

The dissection of the ulnar nerve deems compulsory to transpose, this would compromise the vascular supply of the nerve and sometimes inadvertent damage of medial antebrachial cutaneous nerve.^{3,7,16} While compared with anterior transposition, in-situ decompression takes the lead in effectively treating the CuTS. The sad fact is true because simple decompression has a short operative time, is cost-effective, prevents injury to the vascular supply of the ulnar nerve, and has shorter operative and rehabilitation times.^{7, 17} Carlton et al stated good – excellent outcomes of this procedure in the range of 65 – 100%.¹⁸ Studies done by Nabhan et al and Bartels et al documented that there is no disparity in outcomes between two procedures (subcutaneous anterior transposition and simple decompression) for CuTS.³ Furthermore, studies also documented no significant difference between submuscular anterior transposition and simple decompression.^{19,20} On the other hand, a meta-analysis and systemic review showed that simple decompression is more beneficial in terms of clinical outcomes after CuTS surgery.^{21,22} Another very noteworthy paper on CuTS suggested that there is vast evidence in the

literature that anterior transposition is not superior to simple decompression for CuTS.³

Elbow flexion and subluxation of the ulnar nerve decide which approach is suitable to relieve neuropathy associated with CuTS.^{23,24} The results of our study (small incision) are compatible with the Keith and Wollstein²⁵ (anterior transposition) in terms of DASH, modified bishop score, grip strength, and two-point discrimination. The complication is a part of the surgery, and patients in our study face complications too, these were post-surgery complications such as superficial infection, revision surgery, painful scar, and numbness at the medial elbow. In our study, the group A, patients had a total of two complications while group 2 patients had a total of 8 complications. Painful scarring was observed in only one patient of group B. In group B, numbness at the medial elbow was observed in 4 patients and 1 patient in Group A. The patients suffered from these complications, due to inadvertent injury of the medial antebrachial cutaneous nerve. So, there is no trauma of medial antebrachial cutaneous nerve, in patients who operated through a small incision, while patients who operated through anterior transposition had this complication. Literature suggested that anterior transposition is linked with a noteworthy number of complications including wound infection (superficial and deep), increase re-operation rate, and symptom recurrence.^{19,21,22}

Based on this difference ulnar nerve surgery through small and modified skin incisions is considered reliable and excellent. During the small incision, less amount of tissue is dissected as compared to the conventional surgical method for anterior transposition of the ulnar nerve, which leads to injury of the medial antebrachial nerve.⁷

LIMITATIONS AND RECOMMENDATIONS

This was a single center-based study conducted in a public sector tertiary care hospital; thus, results cannot be generalized.

Apart from these limitations, this research will result in knowledge about common peripheral entrapment neuropathy (CuTS) and will further lay down the foundation of research in this field.

CONCLUSION

It is concluded that keeping in view the stability/anatomical position of the ulnar nerve to undergo either anterior transposition or simple decompression through small skin incision is effective and an excellent procedure as compared to classic incision procedure in treating patients suffering from cubital tunnel syndrome.

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Additional Information

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Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Naseer Hassan	Study design and methodology.
2.	Raza Hassan	Data collection and quality insurer.
3.	Muhammad Usman	Data analysis, calculations, and Paper writing.
4.	Mumtaz Ali	Interpretation of results and quality insurer.
5.	Farooq Azam	Literature review and referencing.
6.	Momina Saleem	Editing and quality insurer.