ORIGINAL ARTICLE

Outcome of neurolysis combined with anterior submuscular transfer of ulnar nerve in McGowan Grade II and III tardy ulnar nerve palsy

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Abstract

Objective: To see the impact of combined neurolysis and submuscular transposition approach in patients with tardy ulnar nerve palsy of Mc Gowan grades II and III.

Methods: The descriptive case series was conducted at King Edward Medical University, Mayo Hospital, Lahore, between January 2013 and January 2014, and comprised patients with positive nerve conduction study and electromyography, aged above 14 years with McGowan grades II and III tardy ulnar nerve palsy of any aetiology. They were treated by a single surgeon and his team. Anterior submuscular transposition with internal neurolysis under loupes was performed. Improvement in hand function was determined with Quick Disabilities of the Arm, Shoulder and Handscore 6 months postoperatively. Data was analysed using SPSS 16.

Results: Of the 20 consecutive patients in the study, 14(70%) were males and 6(30%) were females with a standard deviation of 16.35(range: 14-60 years). Six-month postoperatively, Quick Disabilities of the Arm, Shoulder and Handscore had a mean improvement from 43 to 21 (standard deviation from 6.46 to 7.51) supporting the evidence that 18(90%) patients had significant improvement in hand function. There was 1(5%) excellent, 13(65%) good, 4(20%) fair and 2(10%) poor functional outcomes.

Conclusion: Patients with Mc Gowan grades II and III tardy ulnar nerve palsy showed good functional outcome when internal neurolysis was combined with submuscular transposition.

Keywords: Cubital tunnel syndrome, Quick DASHscore, Submuscular transposition neurolysis.

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Introduction

Feindel and Stratford in 1958 introduced the term Cubital Tunnel Syndrome (CuTS) which refers to the symptoms of ulnar nerve compression or entrapment in the area of fibro osseous tunnel along the ulnar groove of the medial epicondyle of the humerus.[1-3] It is the second most common entrapment neuropathy of upper extremity after carpal tunnel syndrome.[4-7] It is estimated at 25 cases per 100,000 person-years or 75000 cases annually in the United States of America with an increasing trend.[8] Previous injury to the elbow is assumed to be a frequent cause for ulnar neuropathy, but in the majority of patients the aetiology is unknown. Other than factors related with overuse, some anatomical predisposition such as the arcade of Struthers, cubital tunnel retinaculum, the humeroulnaraponeurotic arcade (HUA), the epitrochleoanconeus muscle, subluxation of ulnar nerve and the ligament of Osborne may also be present in CuTS.[4]

McGowan in 1950 created the scale to grade CuTs and till now it's the most often used scale to grade CuTS.[9] It depends on the clinical severity of the symptoms of tardy ulnar nerve palsy and is categorised into gradesI, II and III depending on mild, moderate and severe lesions respectively (Table-1).[4]

In literature, the selection of surgical techniques to treat CuTS is discussed controversially. Surgical options include simple in situ decompression, anterior submuscular, intramuscular or subcutaneous ulnar nerve transposition, endoscopic in situ cubital tunnel release and in situ decompression with medial epicondylectomy. While some surgeons have advocated particular surgical procedures dependent upon the severity of nerve compression, the overall selection of the operative procedure for primary surgery appears to be dependent upon surgeon preference.[10]

In an electronic survey conducted in 2009 amongst 154 hand surgeons, factors that influenced the selection of operative procedure included the degree of nerve compression (60%), medical comorbidities (30%), patient's occupation (28%), and obesity (22%).[11] Most surgeons (n=133) selected more than one operative procedure. Only 21 surgeons selected a single surgery and the most frequent single surgery was the subcutaneous anterior transposition (10 surgeons), followed by the simple decompression (three surgeons), Learmonth (three surgeons), and Z-

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plasty/submuscular/transmuscular transposition (three surgeons).[10]

A study in 2011 comprising 278 patients with ulnar entrapment at elbow with grades II and III disease concluded that modified submuscular transposition was associated with significantly greater improvements compared with subcutaneous transposition.[12]

In 2004 a study performed neurolysis for failed anterior submuscular transposition of the ulnar nerve at the elbow. It found good results in 45% patients with complete resolution of the symptoms, 45% patients had fair results and only 10% had poor outcome. It concluded that simple neurolysis is effective treatment in case of failed anterior submuscular transposition of the ulnar nerve[13].

Ulnar neurolysis and transposition have been described as isolated procedures for CuTS of various causes, but there is no study currently available on the results of neurolysis combined with transposition. It is widely thought that in advanced lesions with intrinsic muscle wasting, the prognosis for recovery of the nerve is poor, so combining neurolysis using loupes and micro scissors can markedly improve the results upto 37%.[13] The current study was planned to see the effect of combined neurolysis and submuscular transposition in patients with tardy ulnar nerve palsy.

Patients and Methods

The descriptive case series was conducted at the Department of Orthopaedics, Spine Surgery and Traumatology (DOST-1), King Edward Medical University, Mayo Hospital, Lahore, between January 2013 and January 2014, and comprised CuTS patients with positive nerve conduction study and electromyography (EMG), aged above 14 years with McGowan grades II and III tardy ulnar nerve palsy of any aetiology (Annexure-1).

After informed consent, all patients were operated upon for anterior submuscular transfer and neurolysis for ulnar nerve by a single hand surgeon and his team. Under tourniquet control in general anaesthesia, patient's limb was prepped and the patient was placed in supine position with the affected arm on the side hand trolley. A 10-12cm incision was made posterior to the medial epicondyle. The retro-condylar groove, Osborne's ligament and ulnar nerve were identified. Proximally, the nerve was exposed up to the medial intermuscular (IM) septum which was divided to avoid a possible future site of compression. Distally, the cubital tunnel retinaculum and Osborne's ligament were divided, 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 the medial head was performed. The nerve was isolated with soft loupes and mobilised, preserving the extrinsic vessels as accurately as possible. The nerve fascicles were separated under loops with micro scissors to ensure effective neurolysis. Then Zplasty of the muscular pronator-flexor mass was done to form a new bed for the transposed ulnar nerve (Figures-1-4). To ensure that there was no residual compression of the transposed nerve, the arm

Annexure-1: Mc Gowan grading for tardy Ulnar nerve palsy.

Grade of lesion	Characteristics
Grade I	Mild lesions with paresthesia in the ulnar nerve distribution and a feeling of clumsiness in the affected hand; no wasting or weakness of the intrinsic muscles
Grade II	Intermediate lesions with weak interossei and muscle wasting
Grade III	Severe lesions with paralysis of the interossei and a marked weakness of the hand

Annexure-2: Functional outcome determined in terms of Quick DASH score.

	QuickDash Score	Level of Difficulty	Functional Outcome
1	Up to 11	No difficulty	Excellent
2	12-22	Mild difficulty	Good
3	23-33	Moderate difficulty	Fair
4	34-44	Severe difficulty	Poor
5	45-55	Unable	Disable

DASH: Disabilities of the Arm, Shoulder and Hand.

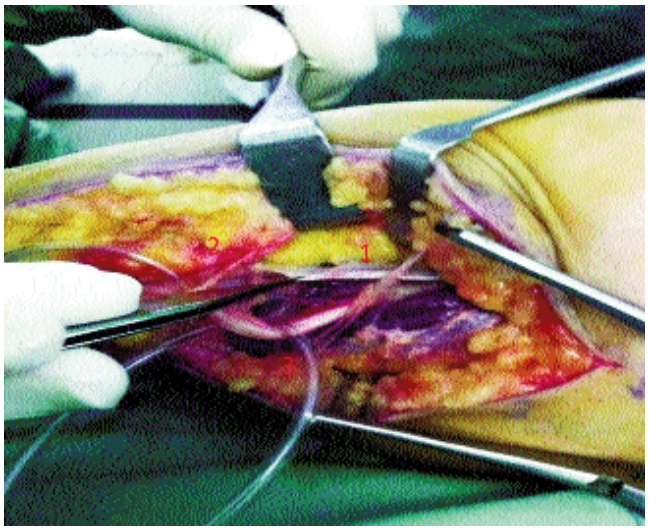

Figure-1: The incision along the medial aspect of elbow with exposed 1) medial intermuscular septum, 2) medial antebrachial cutaneous nerve in sling, 3) ulnar nerve in sling antebrachial cutaneous.

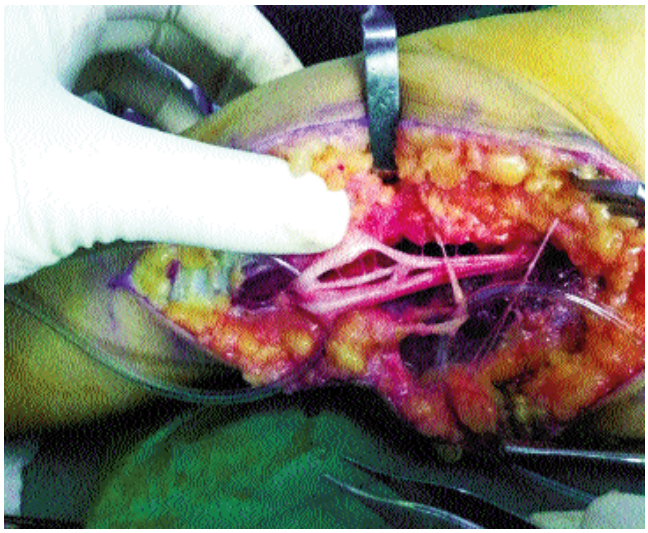

Figure-2: Nerve fasicles separated under loupes and microscissors for iternalneurolysis of ulnar nerve.

was flexed and extended. Stitches were taken out at the 12th post-operative day. The elbow was immobilised at a right angle for 3 weeks. Physical therapy was started and it was continued to prevent secondary changes in the muscles of the hand. Patients were assessed for improvement in hand function as measured by Quick Disabilities of the Arm, Shoulder and Hand (DASH) score (Annexure-2) preoperatively and at 6 months postoperatively to determine the functional outcome. Data was analysed through SPSS 16.

Results

The 20 consecutive patients of CuTS in the study had ages ranging from 14 years to 60 years with a standard deviation of 16.35. Of them, 14(70%) were males and 6(30%) were females. Also, 14(70%) were right-handed and 6(30%) were left-handed. In terms of the affected hand, there were 10(50%) each for either hand and none had bilateral involvement. Further, 12(60%) patients were

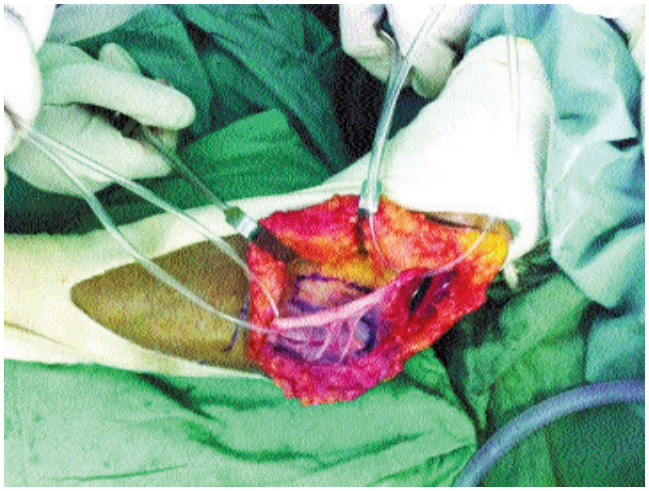

Figure-3: Exposed barnches of ulnar nerve over the flexor pronator mass.

Table: Details of the 20 cases operated.

ID	Age	Sex	Occupation	Duration of symptoms years	Mc Gowan Grade	Quick DASH Pre op	Quick DASH Post op	Functional outcome	Improvement in hand function
1	30.0	Female	house wife	10.0	3.0	54.0	17.0	Good	Yes
2	32.0	Male	fancy lights worker	3.0	3.0	44.0	27.0	Fair	Yes
3	21.0	Male	cricketer	2.0	3.0	46.0	20.0	Good	Yes
4	23.0	Male	fruit seller	0.5	3.0	55.0	31.0	Fair	Yes
5	40.0	Male	purse maker	20.0	3.0	51.0	29.0	Fair	Yes
6	20.0	Female	student	0.5	3.0	41.0	22.0	Good	Yes
7	15.0	Male	student	0.5	2.0	37.0	15.0	Good	Yes
8	19.0	Female	student	3.0	3.0	49.0	21.0	Good	Yes
9	50.0	Female	house wife	0.7	3.0	50.0	38.0	Poor	No
10	46.0	Female	supervisor at store	9.0	2.0	37.0	21.0	Good	Yes
11	22.0	Female	student	10.0	3.0	46.0	15.0	Good	Yes
12	55.0	Male	book binder	20.0	2.0	31.0	14.0	Good	Yes
13	60.0	Male	farmer	0.2	2.0	41.0	34.0	Poor	No
14	27.0	Male	laborer	0.5	3.0	41.0	11.0	Excellent	Yes
15	28.0	Male	optician	20.0	2.0	37.0	17.0	Good	Yes
16	35.0	Male	Labourer	0.8	3.0	46.0	21.0	Good	Yes
17	56.0	Male	book binder	2.0	2.0	41.0	15.0	Good	Yes
18	14.0	Male	student	2.0	2.0	34.0	17.0	Good	Yes
19	23.0	Male	motor mechanic	0.3	3.0	45.0	17.0	Good	Yes
20	30.0	Male	shopkeeper	2.0	3.0	45.0	31.0	fair	Yes

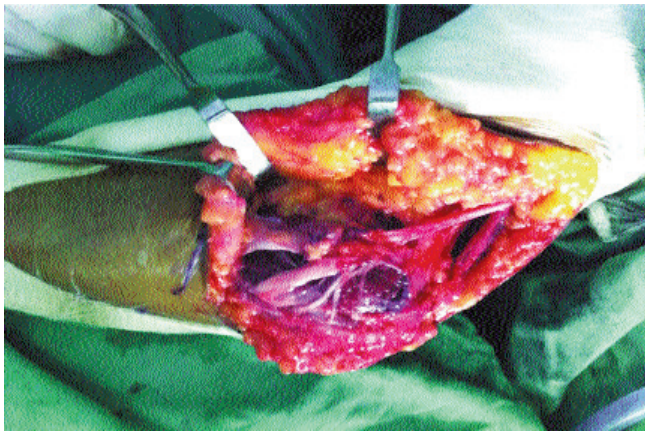

Figure-4: Transposed ulnar nerve under the z plasty of flexor pronator mass.

involved on their dominant hand side and 6(40%) on their non-dominant side. Overall, 18(90%) patients had a history of trauma to the elbow and 2(10%) had occupational hazard. Only 1(5%) patient had associated neuropathy as well. Those who had gone to the bone-setters were 14(70%). The duration of symptoms ranged from 2 months to 2 years. Seven (35%) patients had McGowan grade II and 13(65%) had garde III. In terms of outcome, 13(65%) patients had good results, and 18 (95%) showed improvement in their hand function at 6-monthfollow-up. The mean QuickDASH score improved from 21 to 43 (standard deviation from6.46 to 7.51) (Table-1).

Discussion

Ulnar nerve entrapment at the elbow, or CuTS, is increasingly recognised as a source of upper-extremity sensory and motor symptoms.[14] The treatment for nerve compression is the decompression of the nerve. No consensus exists in literature regarding the optimal surgical treatment for CuTS. Surgical treatment options include open and endoscopic simple decompression, decompression with medial epicondylectomy and anterior transposition of the nerve (subcutaneous, IM or submuscular).[15] In patients with grade II and III disease with greater nerve entrapment and scarring, internal neurolysis is combined with submuscular transposition to greatly increase the functional outcome.

In the current prospective case series, we enrolled 20 consecutive patients with tardy ulnar nerve palsy. In line with literature, most patients were men 14(70%) and 18(80%) had a history of trauma to the elbow. The overall mean age was 32 years, which is on the younger side. Amongst the patients 12(60%) had their dominant side involved. Strikingly, 14(70%) patients had visited bone-setters and had received some sort of treatment from them, mostly in the form of bandages, splinting and massages. This shows the trends in both urban and rural population of low socioeconomic strata towards non-refined treatment modalities. One patient had ipsilateral carpal tunnel involvement as well and two patients had diabetes. The duration of symptoms ranged from 2 months to 2 years, and most patients belonged to McGowan grade III.

Patient-reported outcome measures have become an important part of the assessments used in clinical studies. One of the outcome measures intended for upper extremity disorders is the 30-item DASH questionnaire, which has been assessed for reliability, cross-sectional validity and longitudinal validity in a variety of arm disorders. The use of the DASH has been growing rapidly in clinical trials and other studies of upper extremity disorders and it is now available in several languages [4]. From the original DASH questionnaire a shorter version, named the QuickDASH, has been developed using what was called a "concept-retention" approach. It consists of 11 items from the original 30-item DASH. It is more appealing than the DASH as it is associated with less burden on the responder as well as less administrative burden.[16-18] In our study, all patients underwent QuickDASH scoring preoperatively and 6 months postoperatively by a single investigator.

Though literature still fails to establish the best procedure for tardy ulnar nerve palsy and many reviews and meta-analysis are available favouring different options(19), the improvement recorded in our study was significant in 90%patients.

Conclusion

Patients with McGowan grade II and III tardy ulnar nerve palsy showed good functional outcome when internal neurolysis was combined with submuscular transposition.

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