<table>
<thead>
<tr>
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<th>Our early experience in surgical and clinical outcome on endoscopic cubital tunnel release: a preliminary result</th>
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</table>
Clinical Study

Our Early Experience in Surgical and Clinical Outcome on Endoscopic Cubital Tunnel Release: A Preliminary Result

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Cubital tunnel syndrome is one of the common upper extremity problem encountered. A mild syndrome can be often treated without surgery, but a failure of conservative treatment with constant symptoms or muscle atrophy and weakness requires surgical intervention. Despite the fact that is the second most common nerve entrapment in the upper limb, there is no accepted gold standard in the surgical management. But with the new technique in minimally invasive surgery and available endoscope, it addresses all potential compression sites with good visualisation but with small surgical exposure. The procedure is safe and reliable way to address this problem.

1. Introduction

Entrapment of the ulnar nerve in the elbow region is the second most common compression neuropathy in the upper extremity. There is no accepted standard for surgical treatment [1]. Many procedures have been advocated for decompression of the ulnar nerve at the elbow, including anterior subcutaneous transposition [2], anterior intramuscular transposition [3], anterior submuscular transposition [4], medial epicondylectomy [5], simple decompression [6], neurolysis [7], and in situ decompression.

The introduction of endoscopic release, the newest of all the surgical options for this problem has been described by several authors. The new approach to peripheral nerve surgery specifically in cubital tunnel syndrome is the introduction of the endoscopic procedure. Since the advent of endoscopic methods to release the course of the ulnar nerve entrapment at the elbow site, there has been a flurry of interest and controversy about the efficacy and safety of this newest technique.

Endoscopic decompression of the ulnar nerve at the elbow was first described in 1995 by Tsai et al. [8]. Multiple variations of endoscopic technique have been described since then [9]. There are different variations of endoscopic surgical technique, but the purpose and goals preserve the vascularity of the ulnar nerve at the elbow, release all possible compression sites, allow early mobilisation of the elbow, avoid extensive surgical exposure, and scar discomfort. It provides for limited soft tissue dissection, thereby allowing more rapid recovery with minimal scarring [10].

Potential ulnar nerve entrapment can occur at five sites around the elbow: the arcade of struthers, the medial intermuscular septum, the medial epicondyle, the cubital tunnel, and the deep flexor pronator aponeurosis. The most common site of entrapment is the cubital tunnel [11].

Various surgical techniques for decompression of the ulnar nerve have been described in the literature, and a definitive gold standard does not exist [9]. Comparative studies have shown some short-term advantages to one or another technique, but overall results between the treatments have essentially been equivocal [9]. A thorough preoperative diagnosis and workup will help guide us for the type of surgical technique. We report our experience with this newer technique in six patients, with special focus on the clinical and surgical outcome.

2. Method

The study was carried out in the Department of Orthopaedics and Traumatology, Division of Hand and Foot Surgery,
Six patients who had compressive cubital tunnel syndrome at the elbow were treated with endoscopic CuTR at our institution after electrophysiological confirmation of the diagnosis. The sensory conduction studies (i.e., amplitude of the sensory action potential and sensory conduction velocity of the ulnar nerve) were considered prolonged in all cases; the motor conduction studies (i.e., nerve site, onset, amplitude, segment, latency difference, distance, and conduction velocity) were prolonged in all cases. The Dellon’s scale score was used for rating the severity of the lesions and the postoperative outcome was assessed based on the modified Bishop rating scale system.

The final postoperative outcome was assessed 6 months after the surgery by subjective information based on Modified Bishop Scoring Classification System (severity of residual system, improvement, work status, strength, and sensibility), this Bishop score is defined as poor, 0 to 2; fair, 3 to 4; good, 5 to 7; excellent, 8 to 9. The objective parameters (grip strength and sensory two-point discrimination) were considered prolonged in all cases; the motor conduction studies (i.e., nerve site, onset, amplitude, segment, latency difference, distance, and conduction velocity) were prolonged in all cases. The Dellon’s scale score was used for rating the severity of the lesions and the postoperative outcome was assessed based on the modified Bishop rating scale system.

The mean length of the surgery in the endoscopic release average 47 minutes (range, 32–62 minutes). The mean length of the skin incision was 2.25 cm (range, 1.5–3 cm). Retrospectively, no patient was classified as mild, three patients (50%) were moderate, and three (50%) were severe according to Dellon’s classification in stages of ulnar nerve compression at the elbow (Table 2).

The postoperative outcome result is based on modified Bishop rating system classification based on severity of residual symptoms, improvement of symptoms, work status, strength, and sensitivity which shows two (33%) with excellent results, and four (66%) have good results (Table 3). Three working group patients return to work with their previous job description. The dental hygienist who has major repetitive left elbow flexion more than 90 degrees constantly during the therapy session (>1 hour) and sustained holding of hand tools. Surgical site is not the dominant hand, then

### 4. Result

Our patient population in this series is six patients: two woman and four men with 1:2 being the ratio. The median average age was 55 years (range, 33–77). A surgical endoscopic release was performed on the right side in four elbows and on the left side in two elbows. The main job profile of two patients is mainly table-top tasks, one works as dental hygienist, and three are nonworking in their retirement age, and all patients were not manual labourer. In five patients, the right side is dominant except one patient who was ambidextrous (Table 1).

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### Table 1: The profile of the patient.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age/Sex</th>
<th>Job</th>
<th>Dexterity</th>
<th>Limb affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33 F</td>
<td>Dental hygienist</td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>2</td>
<td>52 F</td>
<td>Office assistant</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>3</td>
<td>58 M</td>
<td>Table task work</td>
<td>Ambidexterity</td>
<td>R</td>
</tr>
<tr>
<td>4</td>
<td>64 M</td>
<td>Home</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>5</td>
<td>77 M</td>
<td>Home</td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>6</td>
<td>63 M</td>
<td>Home</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

**R** = right, **L** = left.
exposure to the vibratory tooth scaler machine is not a risk factor. There is no change of job to this patient, but with recommendations incorporate half-hour sessions of duties avoiding sustained gripping or sustaining affected elbow flexion >90 degrees after every half-hour of therapy session and regular intermittent stretching of left elbow during the therapy session. This patient has excellent modified Bishop score. Three patients who are in retirement age with initial subjective evaluation base on modified Bishop’s classification reach to score of good result without adding the subtype point score of work status of the patients for the reason, and this is not applicable to this group of patients (Table 4).

None of the patient was converted endoscopic release to in situ open due to any complication. No patients develop a postoperative infection, cutaneous nerve injury, hematoma, or painful surgical site. All patients improved symptom one day after the surgery with sensory loss improved and go back to their full activity in one month, and three patients previously went back to work after two months. The recovery and return to work was rapid and with a high patient satisfaction and no recurrence of symptom noted. None of the patients complained about scar discomfort, painful neuroma, burning sensation, superficial hypersensitivity, no elbow extension deficit, or ulnar nerve subluxation. Sensory lost improved in all patients after the surgery and gradually improve after reevaluation at six-month subjective scale with good to excellent results. All preoperative electrophysiologi- cal studies were considered in all cases with abnormal results and with postoperative comparison which result findings five (83%) residual changes but one patient (16%) who has residual impaired because of the preoperative findings of evidence of axonal loss. This patient presented with severe preoperative compromise of the intrinsic musculature of the hand and subjective persistent numbness of the ulnar 1(1/2) side digits distribution, the postoperative NCV shows evidence of axonal loss but after 6 months postoperative NCS shows interval improvement with moderate prolonged. This patient improved the subjective parameters of modified bishop scoring system to good score result even when with persistent ulnar nerve distribution numbness and subjectively claimed that numbness decrease by 90% postoperatively, and objective parameter was satisfactory with overall clinical improvement. Overall, these six cases were good to excellent subjective improvement of the result and also objective parameters in grip strength improvement. Patients usually complain of sensory symptoms rather than muscle weakness so the result of the surgery was considered satisfactory by the patients, as their major complaints were related to the sensory symptoms.

There were no complications in this series of six patients with good patient satisfaction and successful outcome without untoward complication.

5. Discussion

There is no gold standard in the surgical management of the cubital tunnel syndrome for the main reason that no single standard consensus of primary problem in nerve compression. In two groups of authors one believed that nerve compression is caused by overlying structure [12] and that the syndrome is best treated by decompression of the ulnar nerve without removing it from its bed. Other group of authors are citing evidence that the nerve is under tension with elbow flexion [13]. That can only be relieved by placing the nerve anterior to the medial epicondyle [14].

Various surgical techniques for decompression of the ulnar nerve have been described in the literature, and

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**Table 2: Dellon’s stages of the ulnar nerve compression at the elbow.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sensory</th>
<th>Motors</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>1</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+: positive.

**Table 3: Modified Bishop’s scoring system.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Severity of residual</th>
<th>Symptoms improvement</th>
<th>Work status</th>
<th>Strength</th>
<th>Sensibility</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>33</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>58</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
<td>2</td>
<td>2</td>
<td>na</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>77</td>
<td>2</td>
<td>2</td>
<td>na</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>63</td>
<td>2</td>
<td>2</td>
<td>na</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Score: 8–9 excellent; 5–7 good; 3–4 fair; 0–2 poor.

na.: not applicable.
a definitive gold standard does not exist [9]. Heithoﬀ
(1999) stated that all surgical techniques for cubital tunnel
syndrome yielded similar results and that the choice of
surgical technique should be based on simplicity [15].

The endoscopic approach to in situ decompression in our
series of six patients has a rapidity of postoperative improve-
ment of symptoms compatible to the study of Hoffmann and
Siemionow in 2006. A completely new approach to surgery
which enables to see and to do more through much smaller
incision than those used by more traditional technique [16].
It is a minimally invasive alternative for decompression
of the ulnar nerve at the elbow, aiming to minimize the
trauma to the tissues and improved postoperative recovery
to the patients. Its theoretical advantages over the classical
open approach are the immediate well being of the patient,
decreased invasiveness, minimal vascular complications, and
less scar discomfort.

In our view, like that patient with our inclusion criteria
will be beneﬁted from endoscopic release. A review with
various authors (Assmus, 1994; Nathan et al., 1992, 1995;
Pavellza et al., 2004; Taniguchi et al, 2002; Tsai et al., 1999)
that the transposition of the ulnar nerve is not only
unnecessary for the treatment of cubital tunnel syndrome,
but that it may often be harmful and seriously disadvan-
tageous, considering its potential complications (Heithoﬀ,
1999, Mariani et al., 1999) [16]. The efficacy of simple
decompression for the treatment of cubital tunnel syndrome
was ﬁrst reported by Osborne (1957). Since then, many
authors have reported good to excellent results with simple
decompression (Chan et al., 1980). Adelaar et al., (1984),
Bismmler and Meyer (1996), Davies et al., (1991), and Foster
and Edshage (1981) compared simple decompression with
anterior transposition, and found no signiﬁcant diﬀerence in
clinical outcome. A recent comparison between endoscopic
techniques and in situ decompression demonstrated
statistically signiﬁcant less pain and greater satisfaction
with the endoscopic technique [9]. By minimally invasive
with a direct visualisation to the ulnar nerve by endoscopic
guidance can be visualised better more the potential com-
pression sites of ulnar nerve entrapment, and all potential
sites of nerve compression in the elbow region were released
without damage to the macroscopically visible nerves. With
endoscopy, a long portion of the nerve can be released with-
out damage to cutaneous innervation. Limited soft-tissue
dissection with the preservation of the anatomy, especially
vascularisation, minimises perineural ﬁbrosis and enables
rapid postoperative rehabilitation and can be safe and
reliable with good functional and aesthetic result. According
to the study by Hoffmann and Siemionow, the results of
endoscopic release showed better functional recovery, lower
morbidity and faster return to manual labour compared
to conventional open method, and there were no serious
complications.

We conclude that endoscopic release is a safe procedure
in the hands of the experienced surgeon with careful
protection of the nerve and the branches and a complete
decompression. The observed postoperative results demon-
strated that this surgical technique to the ulnar nerve
at the level of the elbow was very eﬀective, and there
was improvement in the clinical and electrophysiological
outcomes in all the subjects who underwent the procedure.
This procedure is a relatively alternative to the conventional
open release technique in the uncomplicated cases. The
short term has proven to be a safe and eﬀective tool for
the operative management of uncomplicated cases. The
results showed better immediate functional recovery, lower
morbidity, and faster and shorter rehabilitation time, and
return to active activity was rapid or quicker return of the
patients to their daily activity, acceptable aesthetic result and
above all with a high patient satisfaction rate. Endoscopic
cubital tunnel release theoretically has better short-term
outcome comparing to other technique in decompression
but, however, to date, the number of studies reporting the
case remains small.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Dellon's scale</th>
<th>Preoperative NCS</th>
<th>Postoperative NVS</th>
<th>Bishop scale</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motor NC</td>
<td>Sensory and mixed NC</td>
<td>Mot&quot;or NC</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>II</td>
<td>P</td>
<td>P</td>
<td>Mild to moderate P</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>II</td>
<td>P</td>
<td>P</td>
<td>Improved</td>
</tr>
<tr>
<td>3</td>
<td>58</td>
<td>II</td>
<td>P</td>
<td>P</td>
<td>Mild to moderate P</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
<td>III</td>
<td>P</td>
<td>P</td>
<td>Improvement</td>
</tr>
<tr>
<td>5</td>
<td>77</td>
<td>III</td>
<td>P</td>
<td>P</td>
<td>Normalized</td>
</tr>
<tr>
<td>6</td>
<td>63</td>
<td>III</td>
<td>P</td>
<td>P</td>
<td>Mild to moderate P</td>
</tr>
</tbody>
</table>

P = prolonged.

Table 4: Nerve conduction study.
References