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Clinical outcomes of combined surgical treatment of medial epicondylitis and cubital tunnel syndrome

Résultats cliniques du traitement chirurgical combiné de l'épicondylite médiale et du syndrome du tunnel cubital

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ABSTRACT

Surgical results for treatment of medial epicondylitis and cubital tunnel syndrome are generally satisfactory when performed alone. However, our experience suggests a combined procedure is associated with inferior outcomes. A retrospective review was conducted of consecutive surgical cases of medial epicondylectomy/debridement and ulnar nerve decompression during a single operation at our institution from March 2008 to February 2017 using CPT codes. Thirty combined procedures were identified in 29 patients. Fourteen patients and 15 elbows returned to clinic for evaluation at average 4.3 years after surgery (8 men, 6 women, mean age 45.1 years). A Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, visual analogue pain scale (VAS), and physical examination were performed. The data was stratified by type of ulnar nerve procedure and analyzed. Three of fifteen elbows underwent in situ ulnar nerve decompression, and twelve of 15 had transposition, five subcutaneous and seven submuscular. The mean DASH score for in situ decompression was significantly higher than that of transposition (68.2 vs. 13.1). The average visual pain score for patients whom underwent in situ decompression was significantly higher than that of those with ulnar nerve transposition (8.0 vs. 1.2). All other physical exam measures demonstrated no significant difference between the two groups. In situ ulnar nerve decompression in the setting of medial epicondylectomy/debridement may be associated with inferior clinical outcomes in comparison to ulnar nerve transposition. Further studies are needed to validate the results of our study and inform management.

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R É S U M É

Les résultats chirurgicaux du traitement de l'épicondylite médiale et du syndrome du canal cubital sont généralement satisfaisants lorsqu'ils sont réalisés seuls. Cependant, notre expérience suggère qu'une opération combinée est associée à des résultats inférieurs. Une étude rétrospective a été réalisée sur des cas chirurgicaux consécutifs d'épicondylectomie/débridement interne et de décompression du nerf ulnaire au cours d'une opération unique effectuée dans notre établissement entre mars 2008 et février 2017, en utilisant les codes CPT. Trente opérations combinées ont été identifiées chez 29 patients. Quatorze patients et 15 coudes ont été revus à la clinique pour évaluation 4,3 ans en moyenne après la chirurgie (8 hommes, 6 femmes, âge moyen 45,1 ans). Un questionnaire Disabilities of the Arm, Shoulder, and Hand (DASH), une échelle visuelle analogique de la douleur (EVA) et un examen physique ont été réalisés. Les données ont été stratifiées par type d'opération sur le nerf ulnaire et analysées. Trois des quinze coudes avaient subi une décompression du nerf ulnaire in situ et douze avaient subi une transposition, cinq sous-cutané et sept sous-musculaires. Le score DASH moyen pour la décompression in situ était significativement supérieur à celui de la transposition (68,2 contre 13,1). Le score visuel

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analogique moyen de la douleur chez les patients ayant subi une décompression in situ était significativement supérieur à celui de ceux ayant subi une transposition du nerf ulnaire (8,0 vs 1,2). Toutes les autres mesures de l'examen physique n'ont montré aucune différence significative entre les deux groupes. La décompression du nerf ulnaire in situ dans le cadre d'une épicondylectomie/débridement interne peut être associée à des résultats cliniques inférieurs à la transposition du nerf ulnaire. Des études complémentaires sont nécessaires pour valider les résultats de notre étude.

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1. Introduction

Medial epicondylitis and cubital tunnel syndrome are common conditions seen by the orthopedic surgeon. While more commonly seen independently, these conditions can occasionally be seen concurrently about the ipsilateral upper extremity. Typically, management for both conditions is conservative with non-steroidal anti-inflammatory drugs, activity modification, occupational or physical therapy, and immobilization. However, if conservative measures fail, surgical intervention may be necessary. Operative treatment of medial epicondylitis involves debridement of the medial epicondyle and flexor-pronator origin with or without epicondylectomy while treatment for ulnar nerve entrapment traditionally includes decompression with or without nerve transposition but may also include medial epicondylectomy [1–5].

Surgical results following concurrent treatment of medial epicondylitis and ulnar neuropathy are generally satisfactory [5,6]. While many studies have been conducted to investigate the operative results following medial epicondyle debridement or ulnar nerve decompression in isolation, there are few that have evaluated the clinical outcomes of a combination of the two procedures. Historically these combined procedures have shown mixed results and the studies have had small sample sizes [3,7,8].

The aim of this study was to evaluate the clinical outcomes associated with a combined procedure as our clinical experience suggested a combined procedure is associated with poorer results.

2. Patients and methods

This study was approved by our institutional review board. A retrospective review of consecutive cases of medial epicondyle debridement or epicondylectomy and ulnar nerve decompression completed in a single operation at our institution from March 2008 to February 2017 was conducted. Patients were identified by a focused query of medical charts using the CPT codes 24358 and 24359 for medial epicondyle debridement and 64718 for ulnar nerve decompression. The inclusion criteria utilized for this study consisted of a clinical diagnosis of both medial epicondylitis and cubital tunnel syndrome who underwent combined medial epicondyle debridement or epicondylectomy and ulnar nerve decompression, at least one follow up visit after a minimum of 6 months from the date of surgery and willingness to participate in standard of care examination. Clinical physical exam findings such as a positive ulnar compression test, elbow flexion test, Tinel sign, diminished sensation to the ulnar nerve distribution, positive Froment sign, and interosseous wasting were used in addition to patient reported symptoms to establish the diagnosis of cubital tunnel syndrome. Electromyogram and nerve conduction studies were not required for the diagnosis of cubital tunnel syndrome. Exclusion criteria included those who had previous medial epicondyle or ulnar nerve procedures, known rheumatologic or inflammatory arthritis, previous ulnar nerve injury, and those who were unable to give informed consent.

Once identified, medical records were systematically reviewed based on the inclusion and exclusion criteria. A total of thirty operative cases met inclusion criteria. Patients were contacted and asked to return to clinic for an additional standard of care post-operative visit including a physical exam. The exam included a Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, visual analogue pain scale (VAS), measurement of pinch and grip strength along with elbow range of motion, and examination of two-point discrimination. VAS scores were global measures of pain, not specifically related to ulnar nerve symptoms or tendinitis. No additional interventions or tests were performed. Fourteen of the thirty patients meeting criteria returned to clinic for evaluation. One of the fourteen patients had bilateral medial epicondyle debridement and ulnar nerve decompression during two separate operations, therefore a total of fifteen elbows presented for follow-up visit. The average age was 45.1 years old (range 31–57), including eight males, six females, and an average time since surgery to date of physical exam was 4.3 years (range 0.6–8.9).

Patients were stratified according to the type of ulnar nerve procedure performed, in situ decompression or transposition (subcutaneous or submuscular). Decision to perform in situ decompression or transposition was based on intraoperative stability of the ulnar nerve after in situ decompression. If instability was noted, the surgeon elected to proceed with transposition subcutaneous or submuscular based on surgeon preference. If no instability was noted, the nerve was left in situ.

Univariate analysis was performed on all variables. The student *t*-test was used for comparison of continuous variables and the Fisher exact test was used for comparison of categorical variables. In all analyses, $P < 0.05$ was considered to indicate significance.

3. Results

The mean DASH score for all patients was 24.1 and VAS score was 2.5. Three of 15 elbows underwent in situ ulnar nerve decompression, and twelve of fifteen underwent transposition, five subcutaneous and seven submuscular. The mean DASH score for those who underwent ulnar nerve in situ decompression was 68.2 compared to 13.1 in those with ulnar nerve transposition ($P = 0.0040$) (Table 1). The average DASH score in the subcutaneous group was 13.2 compared to 13.0 in the submuscular group. The average VAS score for patients who underwent in situ decompression was 8.0 and 1.2 for those who underwent transposition ($P = 0.0002$).

The average three-point pinch strength was 15.8 lbs (7.2 kg) for all patients, 12.4 lbs (5.6 kg) for those that underwent in situ decompression of the ulnar nerve and 16.6 lbs (7.5 kg) in transposition ($P = 0.4477$). Average key pinch in pounds for all patients was 16.7 lbs (7.6 kg), 10.7 lbs (4.9 kg) in those with in situ ulnar nerve decompression and 18.2 lbs (8.3 kg) in those with transposition ($P = 0.1604$). Average grip strength for all patients was 74.6 lbs (33.8 kg), 43.6 lbs (19.8 kg) in those with in situ decompression and 82.4 lbs (37.4 kg) in transposition ($P = 0.1311$). Average two-point discrimination was 4.8 mm for all patients,

Table 1
Post-operative average outcome measures.

Outcome measures	Ulnar nerve in situ decompression (n=3)	Ulnar nerve transposition (n=12)	P value
DASH score	68.2	13.1	0.0040 ^a
VAS score	8.0	1.2	0.0002 ^a
3-point pinch (lbs (kg))	12.4 (5.6)	16.6 (7.5)	0.4478
Key pinch (lbs (kg))	10.7 (4.9)	18.2 (8.3)	0.1604
Grip strength (lbs (kg))	43.6 (19.8)	82.4 (37.4)	0.1311
2-point discrimination (mm)	5.7	4.6	0.2153
Elbow extension (degrees)	15°	4.6°	0.1829
Elbow flexion (degrees)	118°	136°	0.1009

^a Indicates a statistically significant value

5.7 mm in those with in situ decompression, and 4.6 mm in ulnar nerve transposition ($P = 0.2154$). The average elbow range of motion was found to be 6.8° to 132.1° for all patients, 15.0° to 118.3° for in situ ulnar nerve decompression and 4.6° to 135.9° for ulnar nerve transposition ($P = 0.1820$ and $P = 0.1001$, respectively).

On physical exam, one patient was found to have wasting of the interossei muscles of the operative extremity with clawing of the digits. This patient had undergone submuscular transposition of the ulnar nerve. No other patients demonstrated intrinsic muscle wasting or clawing of the digits. The routine use of postoperative splinting was not utilized in this cohort.

Two of fifteen elbows developed post-operative complications. One patient developed hematoma after a submuscular transposition, and another patient developed both hematoma and wound dehiscence following a subcutaneous transposition and subsequent irrigation and debridement with wound closure was performed. The other patient underwent a later additional procedure for scar revision following subcutaneous transposition. Another patient required revision nerve decompression. This patient initially was treated with in situ decompression and therefore was revised with ulnar nerve decompression and subcutaneous transposition.

4. Discussion

Medial epicondylitis is a known cause of medial elbow pain due to degeneration of the flexor-pronator muscle wad. The etiology of medial epicondylitis is not fully understood. Kurvers et al. hypothesized that local inflammatory factors in medial epicondylitis can induce ulnar neuritis, producing symptoms of cubital tunnel syndrome [6]. The incidence of concurrent cubital tunnel syndrome affecting a patient with medial epicondylitis has a reported prevalence of 23% to 61% [4–7]. Co-existing ulnar neuritis has been associated with a poor result when combined with a diagnosis of medial epicondylitis requiring operative treatment [2,7].

The present study demonstrates that in operative treatment of concurrent medial epicondylitis and cubital tunnel syndrome, subjects continued to have mild to moderate pain and mild difficulty with activities of daily living. DASH scores are validated and accepted measures of subjective upper extremity pain and function [9]. In our study these scores indicated mild difficulty with activities of daily living (DASH= 24.09) and a visual analog pain score indicating mild to moderate pain (VAS= 2.53). In a 2015 study by Harder et al., post-operative DASH scores for ulnar nerve decompression alone were reportedly 13.0, compared to 52.6 pre-operatively and VAS score decreased from 2.9 to 0 [10]. Likewise, Han et al. reported average DASH score reduction of 57 to 23 after surgical treatment of medial epicondylitis alone and VAS score reduction of 8.5 to 2.4 [5]. Our data suggests that when compared to ulnar nerve decompression alone, combined pro-

cedures result in worse clinical outcomes as measured by DASH and VAS scores.

Overall, there appears to be a definite trend toward better outcomes with ulnar nerve transposition in the presence of medial epicondylitis. The combined procedures of medial epicondyle debridement or epicondylectomy and ulnar nerve in situ decompression had a less favorable subjective outcome when compared to ulnar nerve subcutaneous or submuscular transposition in regard to DASH and visual analog scores which demonstrated statistically significant differences between the two groups. There were no statistically significant differences demonstrated for the remaining outcome measures in terms of grip and pinch strength, elbow range of motion, two-point discrimination, and physical exam findings in the patients studied. However, the trend within these variables was towards inferior outcomes within in situ ulnar nerve decompression compared to transposition.

Vangsness et al. found that when treating medial epicondylitis alone, nearly 97% had good to excellent results, and when combined with ulnar nerve anterior transposition, excellent results were reported in 80% of patients [4]. Gabel et al. found similar results when medial epicondylitis debridement was performed alone, with good or excellent results in 97% of patients [7]. In contrast, Kurvers et al. reported that in operative treatment of medial epicondylitis with symptoms of ulnar neuritis, in situ decompression resulted in a poor outcome [6]. It is hypothesized that performing an in-situ decompression maintains the nerve near the flexor musculature, which is an inflammatory generator in medial epicondylitis, resulting in inflammation of the ulnar nerve [7]. To our knowledge, there is no current literature on the comparison of ulnar nerve in situ decompression with transposition specifically when combined with medial epicondyle debridement.

There are several limitations to this study. First, the study included the use of CPT codes for patient identification and diagnosis. Although the use of CPT codes allows for all subjects with the same procedure code to be utilized, it does not account for intraoperative variations. The operations identified were performed by four surgeons using the same CPT codes for medial epicondyle debridement and ulnar nerve decompression; however, there were likely differing intraoperative techniques utilized between surgeons and differing post-operative protocols. Our data collection accounted for the variations regarding ulnar nerve decompression, in situ versus transposition, but did not account for other intraoperative factors. Secondly, the study size was small and consisted of three ulnar nerve in situ decompressions and twelve transpositions. This is similar to previous studies, demonstrating small sample sizes. However, a statistically significant difference was demonstrated despite this small sample size. Additional studies with increased sample size are further warranted. The third limitation of this study remains that it is a retrospective chart review. Due to the study design, no control group or standard of

care protocol was utilized. No pre-operative data was collected in regard to the measured parameters. Additional prospective randomized controlled trials are required for further investigation of clinical outcomes with combined medial epicondyle debridement and ulnar nerve decompression.

5. Conclusion

Medial epicondylitis and cubital tunnel syndrome continue to be common orthopedic complaints and can occur in concert. Medial epicondyle debridement when combined with ulnar nerve in situ decompression may result in poor clinical outcomes in comparison to ulnar nerve transposition, either subcutaneous or submuscular. Careful consideration of ulnar nerve decompression with transposition should be made by the surgeon when treating patients with concomitant medial epicondylitis and cubital tunnel syndrome in a single operation.

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Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Disclosure of interest

The authors declare that they have no competing interest.

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