Minimal Medial Epicondylectomy

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Introduction

There are several accepted techniques for the surgical treatment of cubital tunnel syndrome [1]. Medial epicondylectomy combined with ulnar nerve decompression is one of them and its primary advantage is the preservation of the ulnar nerve's intraneural and extraneural blood supply, as compared to other ulnar nerve transposition techniques [2]. However, complications after conventional medial epicondylectomy, such as medial elbow instability and weakness related to detachment of the flexor pronator origin, have been reported [3–5].

To prevent these potential complications, investigators have advocated further modifications of the conventional medial epicondylectomy. The partial medial epicondylectomy is a modified technique in which approximately 40% of total width of medial epicondyle in the coronal plane is excised [6–9]. Despite the good outcomes that have been reported with the partial medial epicondylectomy, valgus instability of the elbow may occur postoperatively [8].

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In an anatomic study of the medial ulnar collateral ligament in 10 cadaver elbows, O'Driscoll et al observed that only 19% of the width of the medial epicondyle in the coronal plane could be resected without potentially violating the anterior band of the medial collateral ligament [10]. Subsequently, authors have described modifications of the minimal medial epicondylectomy. With this modified technique, less than 20% of medial epicondyle in the coronal plane is excised, preserving the medial collateral ligament [11–15]. Thus the potential disadvantage of elbow instability can be minimized with the minimal medial epicondylectomy [11–14].

Indications

The minimal medial epicondylectomy combined with in situ ulnar nerve decompression is indicated for surgical treatment of primary cubital tunnel syndrome. This technique is particularly useful for cases of concomitant ulnar nerve subluxation, allowing smooth gliding of the ulnar nerve during the elbow range of motion.

In addition, the minimal medial epicondylectomy is indicated in cases of recurrent cubital tunnel syndrome after failed anterior, submuscular or subcutaneous, ulnar nerve transposition. In these cases, the posterior aspect of the ulnar nerve is compressed against the anterior aspect of the medial epicondyle, resulting in a z-deformity of

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the ulnar nerve [16, 17]. The minimal medial epicondylectomy, along with the revision decompression of the ulnar nerve, can eliminate the anterior tether by the medial epicondyle and allow the ulnar nerve to travel in a straight course throughout the elbow range of motion.

Surgical Technique

The minimal medial epicondylectomy combined with ulnar nerve decompression can be performed under general or regional anesthesia. The patient is positioned supine with the arm extended on a hand table. Under tourniquet control and loupe magnification, a medial incision 5 cm proximally and 5 cm distally to the medial epicondyle is made (Fig. 16.1). Dissection is carried down through the skin and subcutaneous tissue with attention being paid to identifying and protecting the medial antebrachial cutaneous nerve (Fig. 16.2).

The ulnar nerve is identified under the medial intermuscular septum, which is released and resected to avoid impingement on the nerve. The arcade of Struthers is released proximally and then the ulnar nerve is released through Osborne's ligament and the cubital tunnel (Fig. 16.3). Care is taken to release the Osborne ligament as posterior as possible to avoid subluxation of the ulnar nerve. Then the ulnar nerve is decompressed distally releasing the aponeurosis and deep fascia of the flexor carpi ulnaris. Attention is paid to preserve the perineural bloody supply throughout the ulnar nerve decompression.

Upon completion of the ulnar nerve decompression, the medial epicondyle is exposed with a sharp subperiosteal dissection of the flexor-pronator origin. Care is taken to preserve good flaps anteriorly and posteriorly to facilitate closure (Fig. 16.4). Under visualization of the medial collateral ligament, a minimal, less than 20%, bony resection of the medial epicondyle is performed. The osteotomy is performed with the use of a small 12 mm osteotome, from distal to proximal, removing more bone posteriorly than

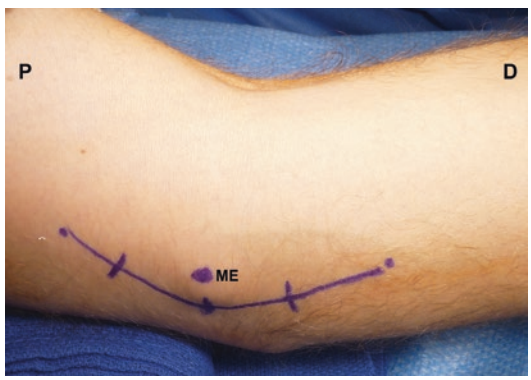

Fig. 16.1 Skin incision for minimal medial epicondylectomy centered over medial epicondyle. D: distal, P: proximal, ME: medial epicondyle

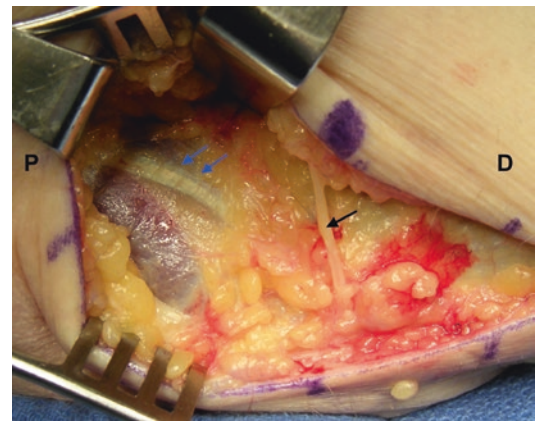

Fig. 16.2 Intra-operative photograph demonstrates identification of the medial antebrachial cutaneous nerve (black arrow) and the medial intermuscular septum (blue arrows). D: distal, P: proximal

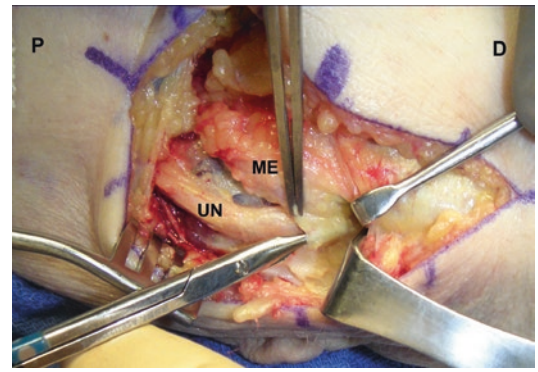

Fig. 16.3 Intra-operative photograph demonstrates release of the ulna nerve through Osborne's ligament and the cubital tunnel. UN: ulnar nerve, ME: medial epicondyle, D: distal, P: proximal

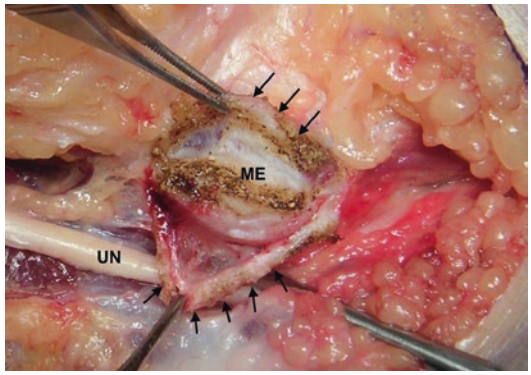

Fig. 16.4 Intra-operative photograph demonstrates the exposure of the medial epicondyle with subperiosteal dissection preserving good flaps anteriorly and posteriorly (black arrows). UN: ulnar nerve, ME: medial epicondyle

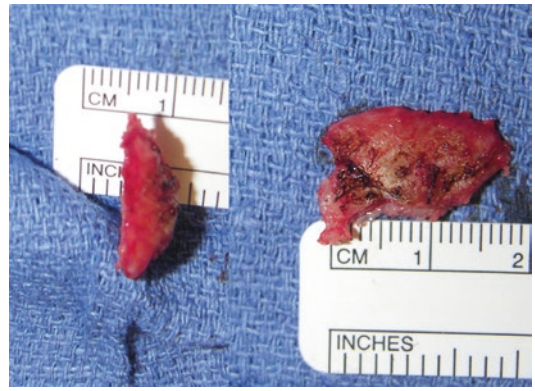

Fig. 16.6 Measurement of the size of the osteotomy fragment, less than 20% of the medial epicondyle was resected

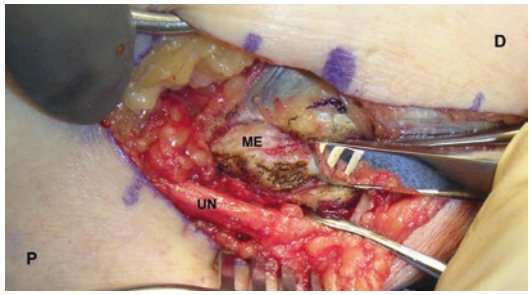

Fig. 16.5 Intra-operative photograph demonstrates the use of a small osteotome to perform a minimal medial epicondylectomy form distal to proximal. UN: ulnar nerve, ME: medial epicondyle, D: distal, P: proximal

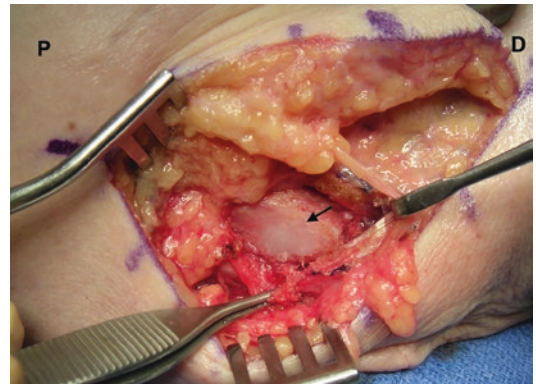

Fig. 16.7 Intra-operative photograph demonstrates the application of bone wax at the osteotomy site (black arrow). D: distal, P: proximal

anteriorly while protecting the anterior band of the medial collateral ligament (Figs. 16.5 and 16.6). After smoothing all sharp edges with a rongeur, bone wax is applied at the osteotomy site (Fig. 16.7) and the elbow is flexed and extended to ensure that the nerve is gliding over a smooth surface with elbow motion. Then, subperiosteal flap closure is performed with sutures buried (Fig. 16.8). Care is taken to ensure that the ulnar nerve is not subluxated anteriorly over the medial epicondyle with a dynamic flexion test of the elbow. After deflation of the tourniquet and proper hemostatsis, the wound is irrigated and the incision is closed in layers. At the conclusion of the procedure, the arm is placed in a bulky soft dressing. Early mobilization is suggested with gentle active range of motion exercises of the

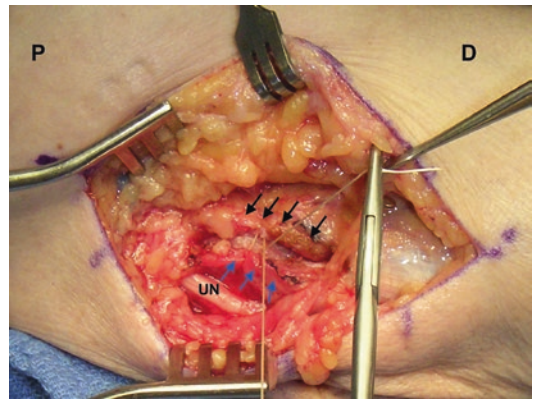

Fig. 16.8 Intra-operative photograph demonstrates subperiosteal flap closure (black arrows: anterior flap and blue arrows: posterior flap) with sutures buried. UN: ulnar nerve

elbow on the first postoperative day. Normal elbow motion is encouraged at the beginning of the second postoperative week.

Complications

Elbow instability can occur after medial epicondylectomy [3–5]. To avoid this potential complication, great attention must be paid to the size of the osteotomy. When less than 20% of the width of the medial epicondyle in the coronal plane is resected the risk of injury of the anterior band of the medial collateral ligament is minimized preventing valgus instability of the elbow.

Additional reported complications after medial epicondylectomy include grip weakness, tenderness at the osteotomy site and ulna nerve subluxation [3–8, 14, 16]. Grip weakness related to detachment of the flexor pronator origin can be avoided with careful dissection. Transient medial elbow pain at the site of osteotomy may occur up to 6–12 months after minimal medial epicondylectomy [3–8, 11–14]. To avoid ulna nerve subluxation over the remaining medial epicondyle, correct surgical technique must be used to create smooth surface allowing the ulnar nerve to freely glide throughout the elbow motion. The risk of damage to the medial antebrachial cutaneous nerve can be lessened by careful dissection.

Outcomes

In general, the clinical outcomes of minimal epicondylectomy were reported as 79–94% good to excellent based on the Wilson and Krout criteria [6–9, 11–14]. These results compare favorably to those of the other surgical treatment options for cubital tunnel syndrome. However, it is difficult to compare the outcomes between surgical techniques due to the lack of randomized prospective studies and the heterogeneity in reports.

Based on the Wilson and Krout grading system [18], excellent means minimal sensory and motor deficit and no tenderness at the incision site; good means mild deficit but occasional ache or tenderness at the incision or osteotomy site; fair means an improvement but persistent deficit; and poor means no improvement or a worsened condition.

Gobel et al reviewed 64 patients (66 elbows) with cubital tunnel syndrome that were treated with minimal medial epicondylectomy [11]. Excellent outcomes were reported in 44%, good in 35%, fair in 10% and poor in 6% of patients [11]. The authors noted no clinical signs of elbow instability, ulnar nerve subluxation or ulnar nerve palsy during the follow up period [11]. Similar results were reported by Kim et al in 25 patients after minimal medial epicondylectomy [12]. The authors reported excellent results in 64%, good in 20%, fair in 8% and poor in 8% of patients [12]. None of the patients showed clinical evidence of ulnar nerve subluxation or medial elbow instability after the minimal medial epicondylectomy [12].

In another clinical study, Osei et al evaluated 27 patients treated with a modified oblique minimal medial epicondylectomy for cubital tunnel syndrome [13]. The authors achieved good to excellent results in 25 of 27 patients (93%) according to the Wilson and Krout criteria [13]. No symptomatic ulnar nerve subluxation or elbow instability with valgus stress testing was noted postoperatively [13].

Beak et al performed a retrospective study of 56 patients with cubital tunnel syndrome, comparing the outcomes between minimal medial epicondylectomy and the anterior subcutaneous transposition [19]. In the 22 patients who were treated with minimal medial epicondylectomy, excellent results were reported in 41%, good in 45%, fair in 9% and poor in 5% of patients [19]. In the 34 patients who were treated with anterior subcutaneous transposition, excellent results were reported in 41%, good in 38%, fair in 6% and poor in 3% of patients [19]. The authors found no significant difference between the two surgical techniques [19].

In the senior author's (D.G.S.) personal series, since the original clinical study [11], consistently good to excellent results with the minimal medial epicondylectomy have been noted in more than three hundred patients with primary or recurrent cubital tunnel syndome.

Conclusion

The minimal medial epicondylectomy is an effective alternative technique for the surgical treatment of primary or recurrent cubital tunnel syndrome. This technique can address the compressive and tensile forces on the ulnar nerve while minimizing injury to the blood supply to the ulnar nerve. However, great attention must be paid to the size of the osteotomy to avoid potential complications. Resection less than 20% of the width of the medial epicondyle in the coronal plane can minimize the risk of damage of the anterior band of the medial collateral ligament preventing valgus instability of the elbow.

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