Technical Note

Arthroscopic Medial Bi-portal Extra-articular Debridement for Recalcitrant Medial Epicondylitis

Chuan Zhang, M.D., Jiang-Tao Ma, Ph.D., M.D., and Wen-Sheng Wang, M.D.

Abstract: Medial epicondylitis, or golfer's elbow, is characterized by pain and tenderness at the tendon insertion points of the pronator teres and flexor carpi radialis. Conservative treatment is sufficient for most patients, whereas surgical treatment is the best choice for intractable medial epicondylitis. With open surgery or arthroscopic surgery, good clinical results have been reported. However, there is still no consensus on which surgical technique is more ideal. We describe our technique of arthroscopic medial bi-portal extra-articular debridement, which is a safe and effective technique that allows more accurate debridement and maximum protection of the ulnar nerve while reducing surgical scars, relieving postoperative pain, reducing the probability of elbow infection and ankylosis, and shortening the recovery time.

Medial epicondylitis, or golfer's elbow, is a less common pathologic condition than lateral epicondylitis, which is characterized by pain and tenderness at the tendon insertion points of the flexor carpi radialis and pronator teres muscles.[1] It was first discovered in 1882 by Henry J. Morris; its pathologic features consist of microtrauma at the end of the tendon and infiltration of inflammatory mediators leading to angiofibroblastic hyperplasia and scar hardening of the tendon tissue.[2,3] Most patients can achieve satisfactory results after conservative treatment (including rest, medication, local blockade, physical therapy, and shock wave therapy), but refractory disease is observed in more than 10% of cases, in which more than 3 months of conservative treatment is deemed ineffective.[1,4] At this time, surgical treatment is the first choice. Currently, the surgical options available include open debridement (with repair), percutaneous techniques, and arthroscopic techniques, but there is still controversy over which is the optimal surgical method.[5,6] However, given the lack of high-quality randomized controlled trials and large sample sizes, the authors of most studies currently believe that regardless of the surgical technique performed, patients can achieve good results,[5-7] making it difficult to compare surgical techniques and determine which is relatively better. In addition, scar tissue formation, postoperative intractable pain, elbow joint infection and ankylosis, ulnar nerve paralysis or injury, and long recovery times are worthy of attention. Surgeons can choose which surgical technique to perform to treat recalcitrant medial epicondylitis only according to the patient's condition and the surgeons' own experience and preference.

We present our surgical technique of arthroscopic medial bi-portal extra-articular debridement. We believe that arthroscopic debridement of recalcitrant medial epicondylitis has the advantages of reducing incision length and scars, relieving postoperative pain, reducing the probability of elbow infection and ankylosis, and having a fast recovery time.

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Surgical Technique

The surgical technique is shown in Video 1.

Patient Positioning and Setup

The patient is placed in the supine position, and a tourniquet is placed as close as possible to the proximal end of the upper arm. The operative extremity is prepared according to the principle of sterility and draped with the operative arm placed on the side table; the forearm is wrapped with sterile towels. An elastic

Fig 1. Left elbow case. The patient is in a supine position, with the upper limb on the surgical side placed on the operating table. The surgeon is standing on the ulnar side of the surgical elbow, and the assistant is standing on the radial side of the patient's surgical elbow. The upper limb on the surgical side is abducted and rotated externally to facilitate operation, and the elbow joint is slightly flexed and fixed with the assistance of the assistant.

bandage is applied, and the tourniquet is inflated after exsanguination.[8,9] The arm is abducted and externally rotated with the surgeon standing on the medial aspect of the elbow and the assistant holding the patient's forearm standing on the opposite side.

Exposure

The medial epicondyle and arthroscopic portal sites for medial epicondylitis debridement are localized and marked. The primary area of tenderness, which precisely indicates the location of pathologic change, is outlined before anesthesia, when the patient is aware. The double-approach incisions, 1 cm anterior to the medial epicondyle and 2 cm proximal and distal to the medial epicondyle, are marked and punctured with a No. 11 scalpel blade superficially through the skin with its length sufficient for the scope sheath insertion.

Arthroscopic Medial Bi-portal Extra-articular Debridement Technique

A blunt-tipped trocar and a straight blunt switch pod are introduced separately from the 2 portals to spread the subcutaneous soft tissues (Fig 1). The tips of the trocar and switch pod are crossed subcutaneously, the medial epicondyle is localized with the trocar tip, and the cutaneous tissue is stripped and elevated bluntly from the medial epicondyle. After the preliminary subcutaneous space has been created, a 4.0-mm 30° arthroscope is inserted from the proximal portal, which is used as the viewing portal, and the distal portal is introduced with a 4.0-mm full radius shaver (Arthrex, Naples, FL) or a bipolar radiofrequency device (COOLPULSE 90 Electrode; DePuy Mitek, Raynham, MA) as the working portal (Fig 2). During the procedure, the scope and shaver or radiofrequency device can be switched in the 2 portals to facilitate the operation. The subcutaneous tissue between the deep fascia and superficial skin is dissected subsequently to expand the subcutaneous working space; the shaver blade and the radiofrequency device ablation tip are under direct visualization throughout the process to prevent injury to the superficial neurovascular structures such as the medial antebrachial cutaneous nerve (Fig 3). The medial epicondyle is located with the radiofrequency device, and with soft-tissue dissection distally and laterally, the lateral border of the pronator teres and the bicipital aponeurosis crossing the pronator-flexor origin are identified (Figs 4-6).

Subsequent release of the lateral part of the pronator-flexor origin (pronator teres and flexor tendons of the radial carpal region) and decortication are performed with the deep tissue as the superficial fibers of the anterior oblique bundle of the ulnar collateral ligament preserved. A needle is inserted through the preoperatively marked skin at the site of tenderness to the medial epicondyle to reconfirm whether the pronator-flexor origin is precisely released. The origin of the common flexor tendon is not reinserted (Figs 7-9).

For medial epicondylitis combined with ulnar neuropathy—type IIA medial epicondylitis according to the Nirschl classification with associated minimal ulnar neuropathy—arthroscopic cubital tunnel release is performed without nerve transfer in this setting. The retinaculum (epicondyle to ulna) is stripped off from the posterior-inferior corner of the medial epicondyle using the radiofrequency device; the probe and radiofrequency device are alternately used to open the interval fascia overlying the nerve and then incise distally for 1 to 2 cm to complete the decompression, exposing the 2 heads of the flexor carpi ulnaris. At this point, the ulnar nerve is examined without disturbing its bed, flexing the elbow to 135° to assess nerve stability

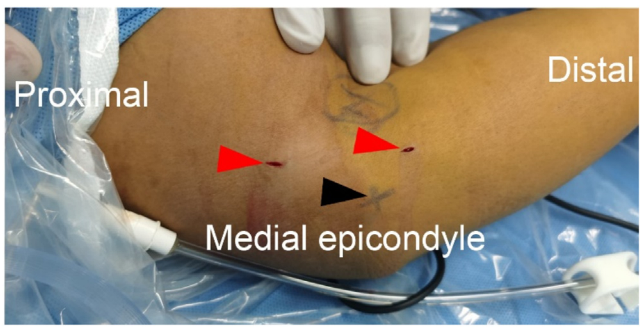

Fig 2. Approach in left elbow. The medial epicondyle (black arrowhead) is marked; two 4- to 5-mm-long incisions (red arrowheads) are made as the medial 2 portals, which are located 1 cm anterior to the medial epicondyle and 2 cm distal and proximal to the medial epicondyle; and the area of tenderness is marked on the anterior side of the medial epicondyle before surgery when the patient is conscious, before anesthesia.

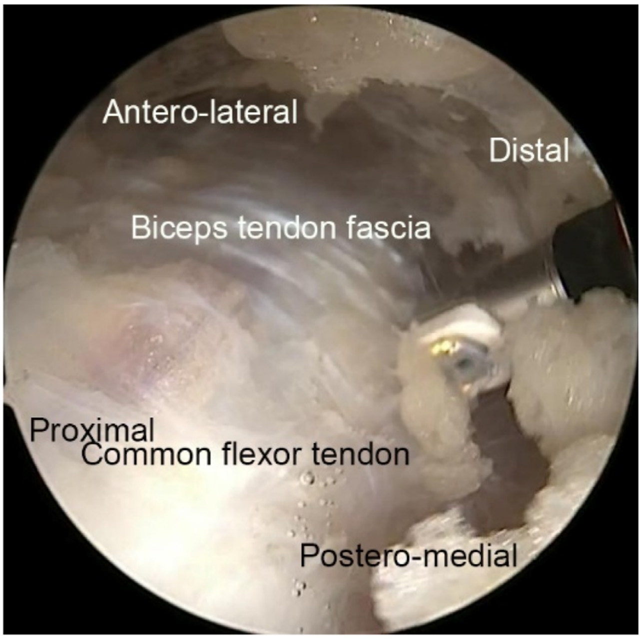

Fig 3. Left elbow case. A blunt-tipped trocar and a straight blunt switch pod is introduced separately from the two portals to spread subcutaneous soft tissues. After the preliminary subcutaneous working space is created, a 4.0-mm 30-degree arthroscope is inserted from the proximal portal, the distal portal is introduced with a radio frequency device to clear the subcutaneous tissue, the common flex tendon is exposed and with the working space expanded distally and the biceps tendon fascia is also exposed.

(Figs 10 and 11). Once the arthroscopy is completed, the fluid is evacuated from the subcutaneous space and the portals are closed.

Postoperative Protocol

At 1 to 2 weeks after surgery, the patient should wear an elbow joint brace to fix the elbow joint at a position of 90° of flexion with the forearm in neutral rotation. The elbow joint is trained for range of motion with the assistance of braces. At 3 to 4 weeks after surgery, the patient can remove all elbow joint immobilizers and begin active joint range-of-motion training for the elbow joint. The first postoperative follow-up visit is arranged in the third week after discharge. The patient is encouraged to change from passive exercise to active exercise. At 5 to 6 weeks after surgery, the patient can stop using elbow braces and actively engage in elbow flexion and extension training. At 12 weeks after surgery, the patient can return to normal work and life. The pearls and pitfalls of our arthroscopic technique are outlined in Table 1.

Discussion

In contrast to the fewer studies on medial epicondylitis, the studies on lateral epicondylitis are numerous, extensive, and in-depth—but controversial. Moran et al.[10] compared the complication rates and 5-year reoperation rates between open debridement and arthroscopic debridement for recalcitrant lateral epicondylitis of the humerus and found that both procedures had lower 90-day adverse event rates and 5-year reoperation rates and that there was no statistically significant difference between these 2 approaches. However, a systematic review that included 16,815 patients showed that complication rates and reoperation rates after elbow arthroscopy in children and adults were widely divergent.[11] A systematic review that included 3 studies showed platelet-rich plasma injections to have comparable outcomes to surgery in improving pain and function in patients with lateral epicondylitis.[12] However, a systematic review that included 40 randomized controlled trials found extracorporeal shock wave therapy to be superior to injection therapy in improving pain and grip strength in patients with epicondylitis.[13] Therefore, a perfect treatment for lateral epicondylitis is still missing to date.

Likewise, the ideal surgical treatment for recalcitrant medial epicondylitis is still controversial. Open, arthroscopic, and subcutaneous techniques have been described; these 3 techniques may involve the debridement and/or repair of the pronator teres and flexor carpi radialis, debridement of the diseased synovium, and release of the ulnar nerve. However, compared with open debridement with or without

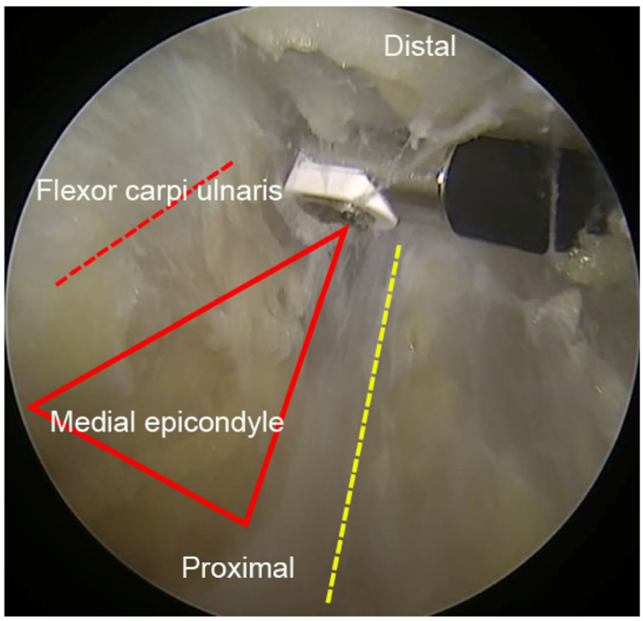

Fig 4. Left elbow case. With the scope viewing from the proximal portal the subcutaneous working space is expanded distally and medially to the posterior edge of the common flexor tendon (ulnar edge of the humeral head of the flexor carpi ulnaris, red dotted line), while also exposing the interval space (red triangular area) between the humeral head and the ulnar head of the ulnar wrist flexor muscle (yellow dotted line) with a bipolar radiofrequency device.

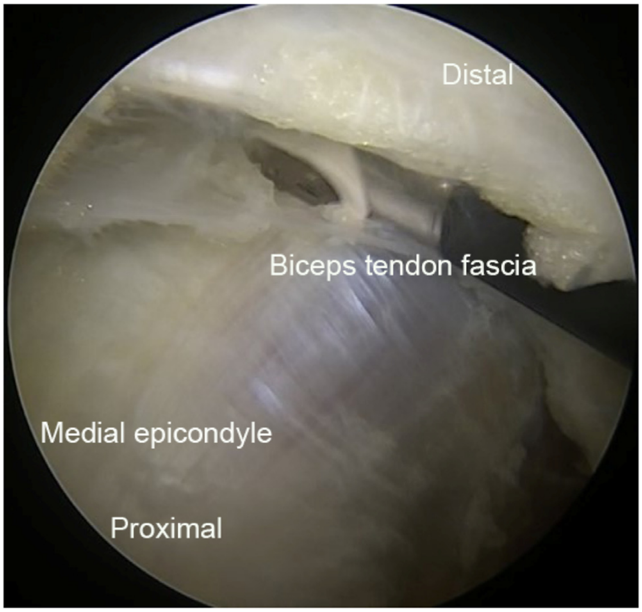

Fig 5. Left elbow case. Viewing from the proximal portal the biceps tendon fascia running towards the distal medial side is exposed by radiofrequency, the bicipital aponeurosis intersects vertically over the superficial fiber bundles of the common flexor tendon.

repair for recalcitrant medial epicondylitis, there are few reported studies on arthroscopic treatment of recalcitrant medial epicondylitis.[5] Zonno et al.[14] were the first authors to report on the outcomes of an

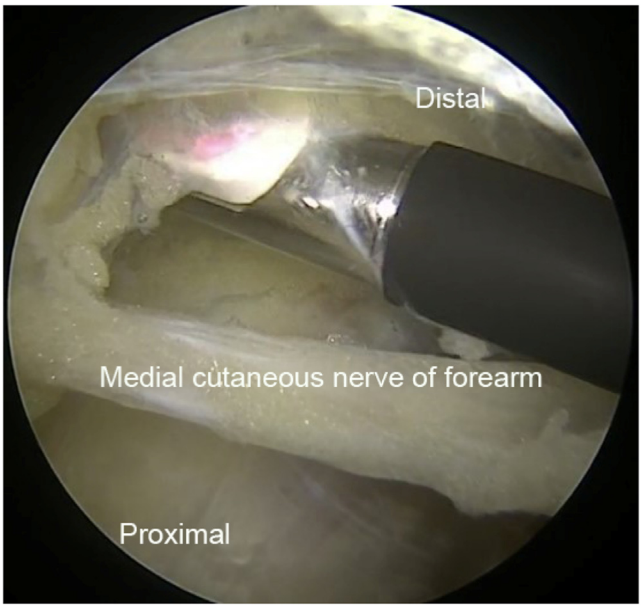

Fig 6. Left elbow case. The medial cutaneous nerve of forearm running over the working space is not deliberately exposed, although it is exposed in this special case. The shaver blade and the radiofrequency device ablation tip inserted from the distal portal should be under direct visualization throughout the process to prevent injury to the superficial neurovascular structures.

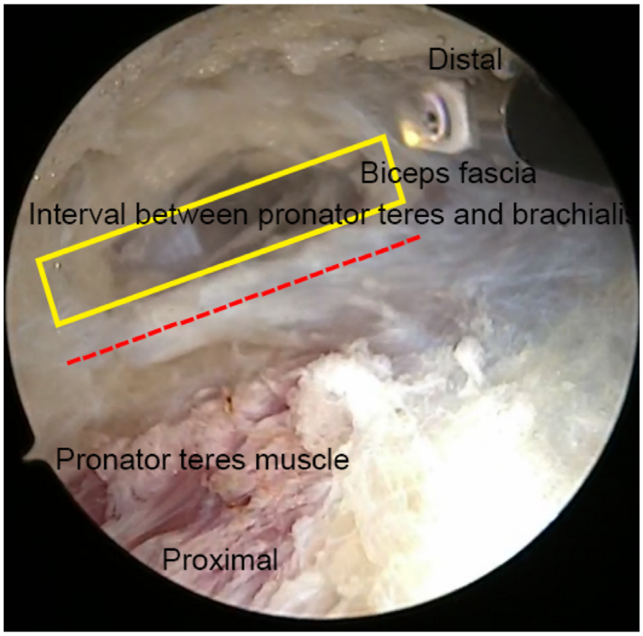

Fig 7. Left elbow case. The bicipital aponeurosis is exposed laterally to the lateral edge of the humeral head of pronator teres muscle (red dotted line) with a radiofrequency device. The biceps fascia is incised to expose the interval between pronator teres and brachialis (yellow quadrilateral area), proximal portion of the pronator teres is removed.

arthroscopic technique for the treatment of recalcitrant medial epicondylitis, in 2010. They measured the shortest distance from the debridement site to both the ulnar nerve and medial collateral ligament (MCL)

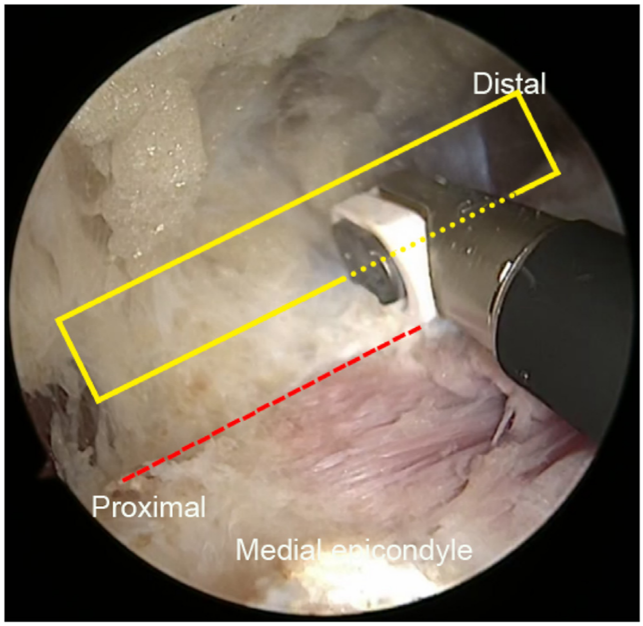

Fig 8. Left elbow case. The proximal lateral edge of the pronator teres (red dotted line) is exposed and the interval fascia (yellow quadrilateral area) is incised with the radiofrequency.

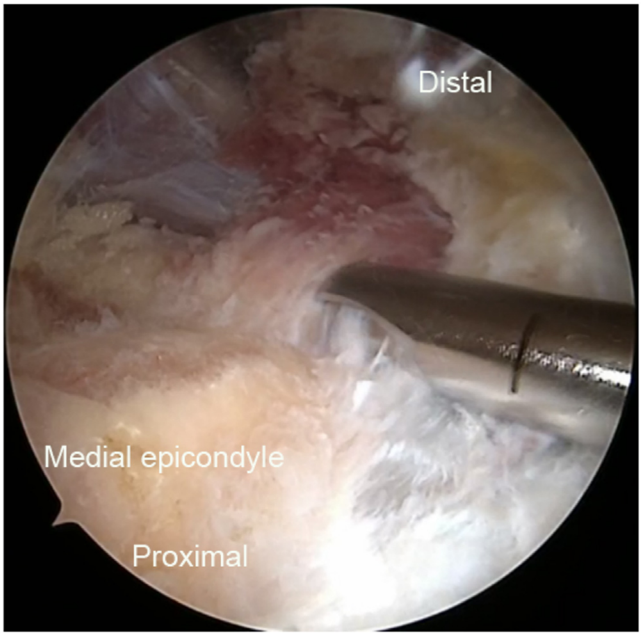

Fig 9. Left elbow case. Additional debridement of the origin tissue of the pronator teres tendon and common flexors is performed 2 cm distally.

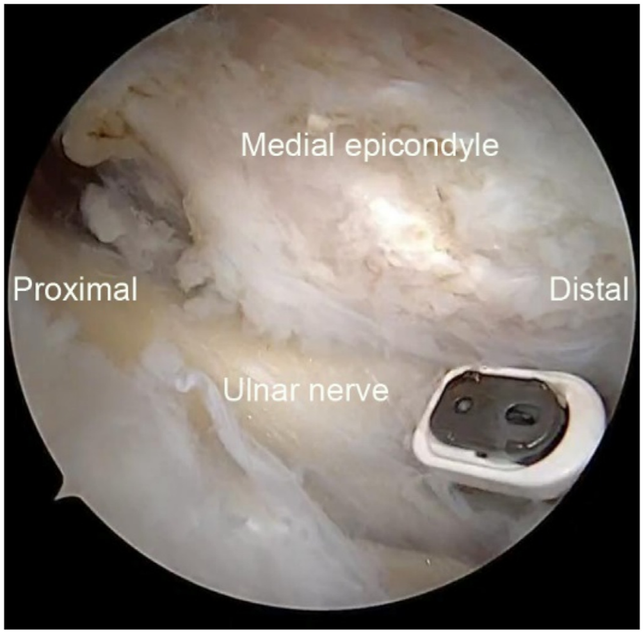

Fig 11. Left elbow case. The cubital tunnel retinaculum is removed by radiofrequency from distal portal or from the switched proximal portal, and the ulnar nerve is released with its base undisturbed to preserve stability.

complex with a 3-dimensional motion-tracking system in 8 fresh-frozen cadaveric specimens. Their research showed that arthroscopic debridement of medial epicondylitis is a safe operation with a low risk of damage to the ulnar nerve and MCL complex. In this technique, the debridement of the tissue underneath the pronators and common flexors is limited, so damage to the anterior band of the MCL can be prevented, and the debridement medially is performed under direct vision to prevent damage to the ulnar nerve.

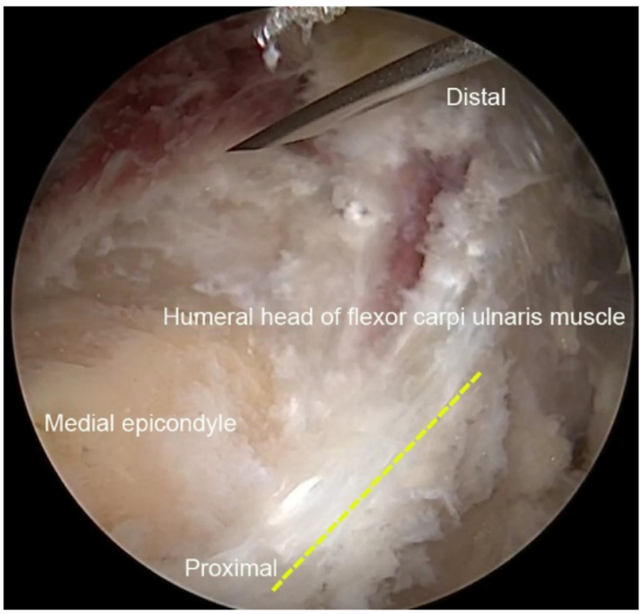

Fig 10. Left elbow case. The spinal needle is inserted from the marked tenderness area using the outside-in technique to reconfirm that the debridement corresponds with the preoperative area of tenderness, and that the humeal head of the flexor carpi ulnaris (yellow dotted line) is preserved.

Do Nascimento and Claudio[4] reported the results of arthroscopic surgical debridement for intractable medial epicondylitis after an average follow-up period of 17 months after surgery. They included 7 elbows, and all patients achieved good results without any complications. Therefore, they believe that arthroscopic treatment of intractable medial epicondylitis is safe and effective, and its advantage is early rehabilitation.

Table 1. Pearls and Pitfalls of Arthroscopic Medial Bi-portal Extra-articular Debridement

The incisions should be minimized to 4-5 mm long, only long enough to introduce the shell of the scope or the radiofrequency device; excessive leakage of saline solution from the portals should be prevented.
Complete visualization is achieved, with cleaning of the humeral head of the pronator teres muscle and the medial epicondylar origin complex of the flexor tendon, under arthroscopy.
Debridement should be performed according to the preoperative area of tenderness, and it could be expanded to a small degree; the deep tissue as the anterior band of the MCL should be undisturbed.
Accurate localization and identification of important anatomic structures (e.g., medial epicondyle and ulnar nerve) are possible with debridement of epicondylitis.
Successful differential treatment of different lesion structures can be achieved under arthroscopy.
During the procedure, the cutaneous nerve may be injured by the radiofrequency device and shaver, so the devices should constantly be under visualization.

MCL, medial collateral ligament.

Table 2. Advantages and Disadvantages of Arthroscopic Medial Bi-portal Extra-articular Debridement Technique

Advantages
All procedures are performed under visualization, and the magnified lesion tissue can be conveniently identified and excised under arthroscopy.
Arthroscopic treatment of recalcitrant medial epicondylitis has the advantages of reducing incision length and scar, relieving postoperative pain, reducing the probability of elbow infection and ankylosis, and having a fast recovery time.
By these two portals the type IIA medial epicondylitis according to the Nirschl classification in which combined with minimal ulnar neuropathy could also be released under arthroscopy. Type IIB medial epicondylitis combined with moderate or severe ulnar neuropathy should be treated with open release and transposition of the ulnar nerve, so the arthroscopic procedure is not suitable for type IIB medial epicondylitis.
Surgeons can visually release the ulnar nerve, making surgery more safe, efficient, and accurate.
Disadvantages
There is a high cost of arthroscopic equipment, in addition to a long learning curve for doctors.
Compared with open surgery, arthroscopic surgery takes a longer preparation time.
Elbow arthroscopy is appropriate for the management of medial epicondylitis combined with mild ulnar neuropathy but not for severe ulnar neuropathy.
To prevent ischemia of the affected limb, the tourniquet time should preferably not exceed 90 min.
A physician lacking anatomic knowledge and clinical experience may cause an iatrogenic injury in an attempt to locate the ulnar nerve.

Oda et al.[15] reported excellent outcomes at an average of 16.2 months postoperatively after arthroscopic release of the pronator-flexor origin in 5 elbows with recalcitrant medial epicondylitis. They believe that arthroscopic partial release with debridement of the common pronator-flexor origin for medial epicondylitis is a safe and effective procedure and its advantages include significantly reduced postoperative pain, better detection of intra-articular lesions, a shorter period of rehabilitation, and less morbidity.[15-17] Kim et al.[6] reported the results of a follow-up period of 20.2 months comparing open and arthroscopic treatment of chronic medial epicondylitis. Except for the longer surgical time in the arthroscopic group, there was no significant difference in clinical outcomes between the 2 groups after surgery. Good clinical results were achieved by 80% of patients in the open group and 84% in the arthroscopic group. The authors believe that both techniques are very effective and comparable for treating chronic medial epicondylitis. Whereas traditional open debridement requires a 4- to 5-cm longitudinal incision above and below the medial epicondyle to explore the ulnar nerve, our technique uses a double-entry incision 1 cm anterior to the medial epicondyle and 2 cm above and below the medial epicondyle to explore the ulnar nerve, with a single incision of approximately 4 to 5 mm in length, which results in a much smaller incision length and surgical scar. Similarly, smaller surgical incisions and soft-tissue injuries play an important role in reducing the risk of elbow infection, ankylosis, and postoperative pain.

Because the anatomic structures are unfamiliar and the surgical field of vision is not clear, injuries of the ulnar nerve and MCL are often encountered during open debridement. We adopt the medial bi-portal method under elbow arthroscopy to clean up intractable medial epicondylitis outside the joint. All procedures are performed under visualization, and the magnified lesion tissue can be conveniently identified and excised under arthroscopy. By these two portals the type IIA medial epicondylitis according to the Nirschl classification in which combined with minimal ulnar neuropathy could also be released under arthroscopy. Type IIB medial epicondylitis combined with moderate or severe ulnar neuropathy should be treated with open release and transposition of the ulnar nerve, so the arthroscopic procedure is not suitable for type IIB medial epicondylitis.

The limitations of elbow arthroscopic techniques must also be considered. First, elbow arthroscopic equipment is expensive and the learning curve for doctors is long, which means that even if primary care doctors have carefully learned arthroscopic techniques in the arthroscopy department of a higher-level hospital, primary hospitals may not have arthroscopic equipment. In addition, a 6-month learning period is far from sufficient for proficiency in the technique. Second, elbow arthroscopy is appropriate for the management of medial epicondylitis combined with mild ulnar neuropathy but not for the management of severe ulnar neuropathy. Third, to prevent ischemia of the affected limb, the tourniquet time should preferably not exceed 90 minutes, and if it does, the affected limb needs to rest for a period before the tourniquet is reinflated. In addition, anatomic variations of the ulnar nerve such as subluxation of nerve may be encountered occasionally, so preoperative ultrasonic localization of the ulnar nerve could be applied in cases in which the ulnar nerve cannot be palpated clearly. Owing to the lack of large-scale randomized controlled trials, the authors of a few retrospective studies currently believe that arthroscopic surgery is as safe and effective as open surgery for recalcitrant medial epicondylitis.[5,6,18] We recommend arthroscopy as a priority option for the treatment of recalcitrant medial epicondylitis for the following reasons: Visually operating under arthroscopy enables surgeons to visually release the ulnar nerve, making surgery more safe, efficient, and accurate. Advantages and disadvantages of our surgical technique are presented in Table 2. In conclusion, our technique of arthroscopic medial bi-portal extra-articular debridement is a safe and effective technique that allows maximum protection of the ulnar nerve while reducing surgical scars, relieving postoperative pain, reducing the probability of elbow infection and ankylosis, and having a fast recovery time.

Disclosures

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