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# Arthroscopic Ulnar Nerve Identification During Posterior Elbow Arthroscopy

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**Abstract:** Elbow arthroscopy has increased in popularity in the past 10 years for both diagnostic and therapeutic purposes. A major limiting factor faced by the elbow arthroscopist is the close proximity of the neurovasculature to the working field, with the risk of iatrogenic injury. Many arthroscopic procedures are less extensive than their open equivalents because of an inability to consistently and safely eliminate the risk of neural and vascular injury. Many open procedures in the posterior compartment of the elbow joint are not routinely performed arthroscopically. The primary reason for this restriction in arthroscopic practice is the locality of the posteromedially positioned ulnar nerve in the posterior compartment. Experience and practice with elbow arthroscopic techniques allows surgeons to expand the indications for arthroscopic treatment of an increasing number of elbow pathologies. A philosophy that is routine in open surgery when dealing with pathology that is adjacent to neurovasculature is to identify the neurovasculature and hence reduce the risk of injury. Our aim is to translate this philosophy to arthroscopy by helping define a safe technique for identifying the ulnar nerve in the posteromedial elbow gutter and allowing for a safer performance of procedures in the posteromedial region of the elbow.

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**E**lbow arthroscopy has increased in popularity for both diagnostic and therapeutic purposes.<sup>1</sup> The best available evidence supports the use of arthroscopy for procedures routinely performed using arthroscopic techniques.<sup>2</sup> One of the major limiting factors faced by the elbow arthroscopist is the close proximity of the neurovasculature to the working field, with the risk of iatrogenic injury.<sup>3,4</sup> Many arthroscopic procedures are less extensive than their open equivalents because of an inability to consistently

and safely eliminate the risk of neural and vascular injury. Open procedures in the posterior compartment of the elbow joint, such as medial gutter soft-tissue release for extension contractures, in situ ulnar nerve decompression, and medial gutter osteophyctomy, are not routinely performed arthroscopically. The primary reason for this restriction in arthroscopic practice is the locality of the posteromedially positioned ulnar nerve in the posterior compartment. Experience and practice with elbow arthroscopic techniques allow surgeons to expand the indications for arthroscopic treatment of an increasing number of elbow pathologies.<sup>5</sup> Our aim in this report is to help define a safe technique for identifying the ulnar nerve in the posteromedial elbow gutter.

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## TECHNIQUE

The patient is positioned in the lateral decubitus position, with the operational side uppermost, and maintained in position with anterior and posterior bolsters. The ulnar nerve is palpated and its location marked, and any tendency to sublunate should be clearly noted, because this poses a potential risk to the

nerve. A tourniquet is placed on the arm with the inflow tube uppermost. The elbow is draped over a joint holder and taped loosely into position with the elbow maintained at 90° of flexion, allowing tourniquet inflation before starting the procedure. The arm is prepared and draped in a standard fashion and compressed manually, and the tourniquet is inflated. A routine anterior compartment inspection is conducted through standard anteromedial and anterolateral portals.<sup>6</sup> The posterior compartment inspection is conducted through a proximal midline posterior portal,<sup>7</sup> and an arthroscopic shaver is introduced through a posterolateral portal (Table 1).

Video 1 shows the following sequence of events of the technique.

### Step 1: Visualize Posterior Compartment and Create Working Space

The aim of the initial sequence is to visualize the olecranon fossa and the tip of the olecranon process, to the medial extent of the medial trochlear ridge (Fig 1). It is important in this initial sequence to remove any olecranon fossa debris, the midline posterior capsule, and the posterior midline fat pad.

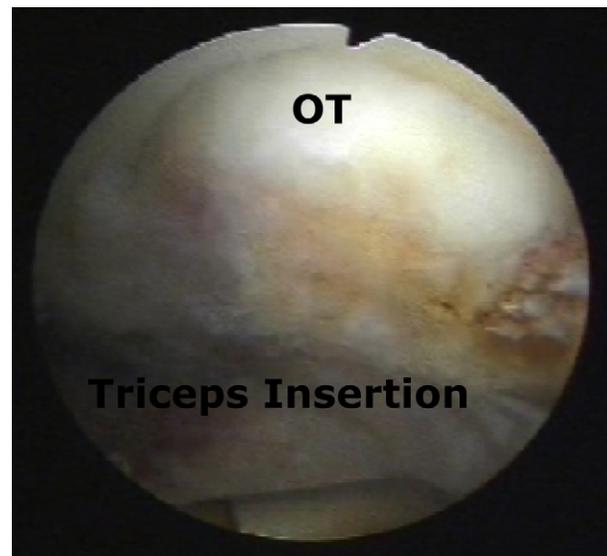
### Step 2: Define Entrance to Extracapsular Plane

The next goal is to define the posteromedial capsule, as well as to delineate it from the overlying distal triceps (Fig 2). This is achieved by using a 4.2-mm Merlin Pre-bent Cuda shaver (ConMed Linvatec, Largo, FL) to resect the midline posterior capsule from the tip of the olecranon process to the deep extent of the triceps attachment to the olecranon. Once the triceps insertion is visualized, the capsule resection is extended to a medial limit in line with the medial trochlear ridge. Care should be taken to re-



**FIGURE 1.** Initial entry into the posterior compartment of the left elbow shows the tip of the olecranon process and the posterior trochlea. The patient is the lateral decubitus position. (OT, olecranon tip.)

move the suction used by the shaver, thereby depending on gravity flow only. The shaver blade should be pointed laterally and posteriorly during this capsular resection. The 3 structures of note in the visual field at this point are, from lateral to medial, the medial face



**FIGURE 2.** Resection of the midline fat pad and capsule allows the triceps insertion to be visualized. This view was obtained from the left elbow through a midline posterior portal with the patient in the lateral decubitus position. (OT, olecranon tip.)

**TABLE 1.** Overview of Technique

	Description
Step 1	Establish portals
Step 2	Perform midline capsular resection
Step 3	Progress to posteromedial olecranon process
Step 4	Identify cross section of capsule
Step 5	Start progressing to extracapsular dissection
Step 6	For decompression, use bone bur with ulnar nerve retracted out of way or use curved and straight osteotome for posterior medial epicondyle resection
Step 7	Cycle elbow to confirm no contact between ulnar nerve and bone

of the medial trochlear ridge, the posterior bundle of the medial collateral ligament (MCL), and the triceps muscle (Fig 3). At this point, the arthroscope is reintroduced through the posterolateral portal, and the posterior midline portal becomes the working portal.

### Step 3: Dissect Extracapsular Plane Toward Ulnar Nerve

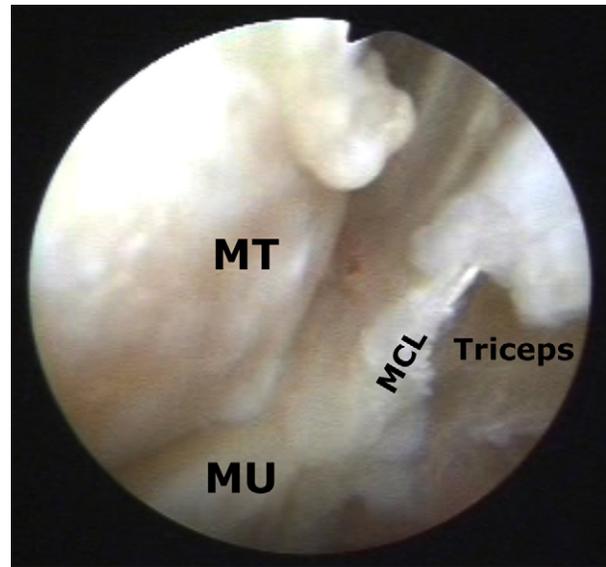
Curved McIndoe scissors are introduced into the posterior midline portal and introduced into the medial gutter, between the posterior bundle of the MCL and the triceps. Keeping the working plane of the blades vertical, the plane between the posterior bundle of the MCL and the triceps muscle is defined until the posteromedial epicondyle is reached. At this point, the ulnar nerve is directly medial to the scissor tip. Up to this point in the dissection, only blunt spreading dissection is needed, a measure to allow access to the vicinity of the nerve, without endangering it.

### Step 4: Palpate Nerve

The scissors are withdrawn, and a blunt trocar is reintroduced into the dissected plane to the level of the epicondyle. The ulnar nerve can be palpated with the tip of the blunt trocar by rolling the nerve under the



**FIGURE 3.** Resection of the capsule is continued level with the medial trochlear ridge. From lateral to medial, the visible structures are the medial face of the medial trochlea, posterior band of the MCL, and triceps muscle. The extracapsular plane between the capsule and triceps is visible. This view was obtained from the left elbow through a midline posterior portal with the patient in the lateral decubitus position.



**FIGURE 4.** Transection of the capsule and posterior band of the MCL from the ulna insertion allows the ulnar nerve to be visualized for the first time. This view was obtained from the left elbow through a midline posterior portal with the patient in the lateral decubitus position. (MT, medial trochlea; MU, medial ulna.)

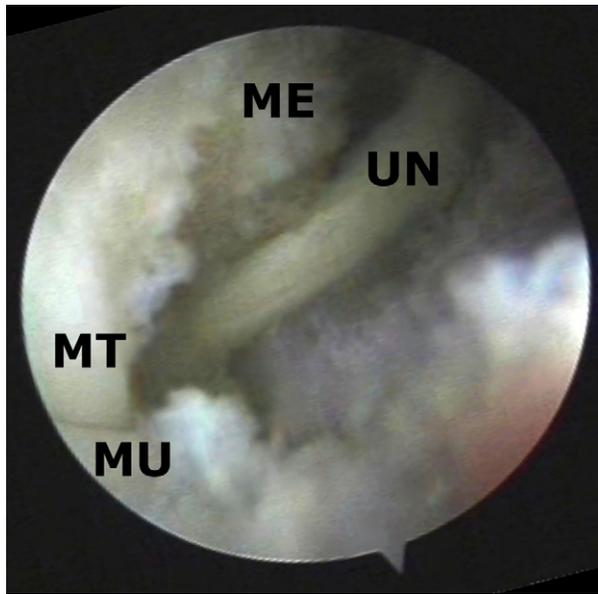
blunt tip, just as the nerve is rolled beneath a palpating finger during open surgery.

### Step 5: Visually Define Nerve

Palpation of the nerve allows it to be localized within the working field, and better visualization can then be achieved with capsular resection by a combination of bipolar thermal ablation (TurboVac 90 ICW; ArthroCare, Sunnyvale, CA) and shaving with a slotted soft-tissue shaver (2.9-mm TurboWhisker; ConMed Linvatec) (Fig 4). When working in close approximation to the nerve, it is paramount to have the working face of the ablator probe/shaver turned away from the nerve and to minimize, if not turn off, any suction. Once the nerve is visualized in the working space, the remainder of the medial gutter can be approached with safety (Fig 5).

### Steps 6 and 7: Decompress Nerve and Evaluate Motion

Nerve decompression can be accomplished by partial posterior medial epicondyle resection with the ulnar nerve protected through retraction. In our practice, we typically use a bone burr or a combination of straight and curved osteotomes to complete the partial medial epicondyle resection. The elbow should be



**FIGURE 5.** The ulnar nerve (UN) is fully defined and cleared of its surrounding soft tissues. The relation of the nerve with the medial ulnotrochlear joint is clearly shown. This view was obtained from the left elbow through a midline posterior portal with the patient in the lateral decubitus position. (ME, medial epicondyle; MT, medial trochlea; MU, medial ulna.)

cycled through full range of motion to confirm that the ulnar nerve is not taut over raw bony surfaces.

## DISCUSSION

A number of therapeutic operations of the posteromedial elbow performed through an open approach are not routinely performed arthroscopically. These

**TABLE 2.** *Key Tips and Potential Pitfalls*

### Tips

- Elbow flexion of 80° rather than 90° relaxes the triceps tendon under tension, inhibiting access to the medial gutter.
- Always orient the shaver blade pointing toward the medial articular surface, away from the ulnar nerve.
- Remove suction from the shaver.
- Do not use an arthroscopic fluid pump. Fluid should flow by gravity only.

### Pitfalls

- Elbow flexion of 90° puts the triceps tendon, allowing access to the medial gutter.
- Orienting the shaver blade away from the medial articular surface puts the ulnar nerve at risk.
- The ulnar nerve may be inadvertently drawn into the shaver if suction is used.
- The use of a fluid pump leads to overly edematous soft tissues.

**TABLE 3.** *Relative Contraindications*

Scarring from previous surgery
Scarring from prior trauma
Subluxation of ulnar nerve
Previous ulnar nerve transposition

include medial gutter osteophyctomy, in situ ulnar nerve decompression, and posterior bundle MCL resection for extension contractures of the elbow. The primary reason for this lack of translation of these open operations to the arthroscopic method is the concern of ulnar nerve injury. A philosophy that is routine in open surgery when dealing with pathology that is adjacent to the neurovasculature is to identify the neurovasculature and hence reduce the risk of injury. This current description of ulnar nerve identification simply represents the translation of this philosophy to arthroscopy and hence allows a safer performance of procedures in the posteromedial region of the elbow (Table 2).

The described procedure is in routine use in our practice but is recognized to be more difficult when the elbow has been subjected to previous surgery, trauma, or fractures or previous cortisone injections into this region. Therefore this arthroscopic technique is not recommended in situations where the bony anatomy may be altered, heterotopic ossification is present, previous ulnar nerve surgery may have altered its position, or the plane between the triceps and medial capsule/MCL is difficult to define because of scarring (Table 3).

It should be noted that the most important reason to understand this sequence of dissection is not necessarily to dissect and decompress the nerve arthroscopically but to understand its location when working in the posteromedial elbow gutter. By safely understanding its location, any debridement or osteophyte resection in this territory may be more complete, without fear of nerve injury.

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