

Endoscopically Assisted Myectomy for Intramuscular Lipoma of Pronator Quadratus



Tun Hing Lui, and Suk Ying Mak

Abstract: Intramuscular lipoma is usually growing infiltratively and can affect any muscle, although the proximal muscles of the extremities are mostly commonly involved. This lesion can occur in the pronator quadratus. Because of muscle is small and deep seated, the intramuscular lipoma usually involves the whole muscle and even has an extramuscular component before it presents clinically. In this Technical Note, we report the technique of endoscopically assisted myectomy of the pronator quadratus for infiltrating intramuscular lipoma of the muscle. This has the advantage of minimally invasive surgery of minimal soft tissue dissection and fewer soft tissue complications.

Intramuscular lipoma constitutes 1.8% of all primary tumors of adipose tissue and <1% of all lipomas.^{1,2} Intramuscular lipoma primarily occurs in the trunk and proximal parts of the upper and lower extremities.^{1,3-5} There are 2 types of intramuscular lipoma: infiltrating (83%) and well circumscribed (17%).^{1,3,6} The intramuscular lipoma with extramuscular component may have a capsule at the extramuscular margin and not on the margin in the muscle.¹ Differential diagnosis of intramuscular lipomas include other benign (e.g., hematoma, muscle herniation, ganglion cyst, angioliipoma, hemangioma, fibrous myositis, primary muscular disease with fatty infiltration) and malignant (e.g., liposarcoma, fibrosarcoma) soft tissue masses.¹ It may be difficult to differentiate between infiltrative intramuscular lipoma and liposarcoma.^{1,6} In questionable cases, cytogenetic testing has been useful to differentiate the 2 groups on the basis of specific chromosomal aberrations.⁶ Surgical excision is the

treatment of choice when the patient is symptomatic or for cosmetic purposes.^{1,4} Marginal excision of the well-circumscribed area and wide excision with free margin in the infiltrative areas, whenever possible, will help prevent recurrence.¹ Open resection is the classic surgical approach.⁷ In some cases, arthroscopic marginal resection is possible.⁸ Recurrence can occur and is thought to be due to incomplete removal of lipoma during surgery.^{1,4}

Although it rarely occurs in the hand and foot,^{1,4,5} intramuscular lipoma can occur in the pronator quadratus.⁹ Because of muscle is small and deep seated, the intramuscular lipoma usually involves the whole muscle and even has an extramuscular component before it presents clinically. In this Technical Note, we report the technique of endoscopically assisted myectomy of the pronator quadratus. It is indicated for infiltrating intramuscular lipoma of the pronator quadratus muscle. It is contraindicated if there is extensive extramuscular component or the adjacent anatomic structures (nerves, arteries, tendons) are involved. It is also relatively contraindicated if there is distal radiocarpal or distal radioulnar joint instability requiring open reconstruction (Table 1).

Technique

Preoperative Planning and Patient Positioning

Preoperative magnetic resonance imaging is important for confirmation of the diagnosis and determination of the extent of the lesion and its relationships with adjacent anatomic structures (Figure 1).¹

The patient is in supine position with the hand on the side table. An arm tourniquet is applied to provide a

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Table 1. Indications and contraindications

Indications	Contraindications
Infiltrating intramuscular lipoma of the pronator quadratus muscle	<ol style="list-style-type: none"> 1. Presence of an extensive extramuscular component of the intramuscular lipoma 2. Adjacent anatomic structures (nerves, arteries, tendons) are involved 3. Presence of distal radiocarpal or distal radioulnar joint instability requiring open reconstruction

bloodless operative field. A 4.0-mm 30° arthroscope (Dyonics, Smith & Nephew, Andover, MA) is used for this procedure. Fluid inflow is by gravity, and no arthro-pump is used.

Portal Placement

The procedure is performed via the radial and ulnar portals at the level of the pronator quadratus muscle. The radial portal is at the radial edge of the flexor carpi radialis tendon. The ulnar portal is at the ulnar edge of the distal ulna and ulnar to the flexor carpi ulnaris tendon (Figure 2).

Endoscopy of Pronator Quadratus Muscle

Longitudinal skin incision is made at the radial portal, and the flexor carpi radialis tendon is identified. Blunt dissection by a hemostat is done at the radial side of the tendon, down to the palmar surface of the pronator quadratus muscle. The blunt dissection is continued ulnarly along the palmar surface of the muscle and deep to the flexor tendons, median nerve, and ulnar neurovascular bundle. After creation of this initial endoscopic working space just volar to the pronator quadratus muscle, the arthroscope trocar-cannula is

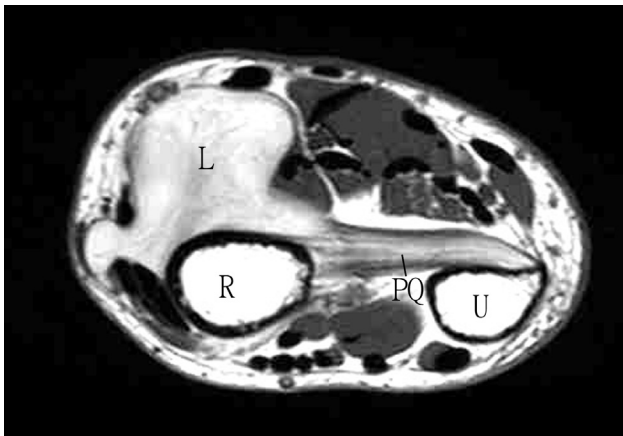


Figure 1. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. Preoperative magnetic resonance imaging showed intramuscular lipoma of the pronator quadratus muscle with extramuscular component. L, lipoma; R, radius; U, ulna.

introduced into the space via the radial portal and goes to the ulnar portal. Skin incision is made at the tip of the trocar, and the ulnar portal is created. The ulnar and radial portals are interchangeable during the pronator quadratus endoscopy, and the proximal and distal boundaries of the muscle are identified (Figure 3).

Release of Medial Edge of Pronator Quadratus Muscle

The radial portal is the viewing portal, and the ulnar portal is the working portal. The ulnar border of the pronator quadratus muscle is identified. The ulnar insertion of the muscle is released with a scalpel with no. 15 blade (Figure 4).

Stripping of Pronator Quadratus Muscle From Distal Ulna

The radial portal is the viewing portal, and the ulnar portal is the working portal. The pronator quadratus

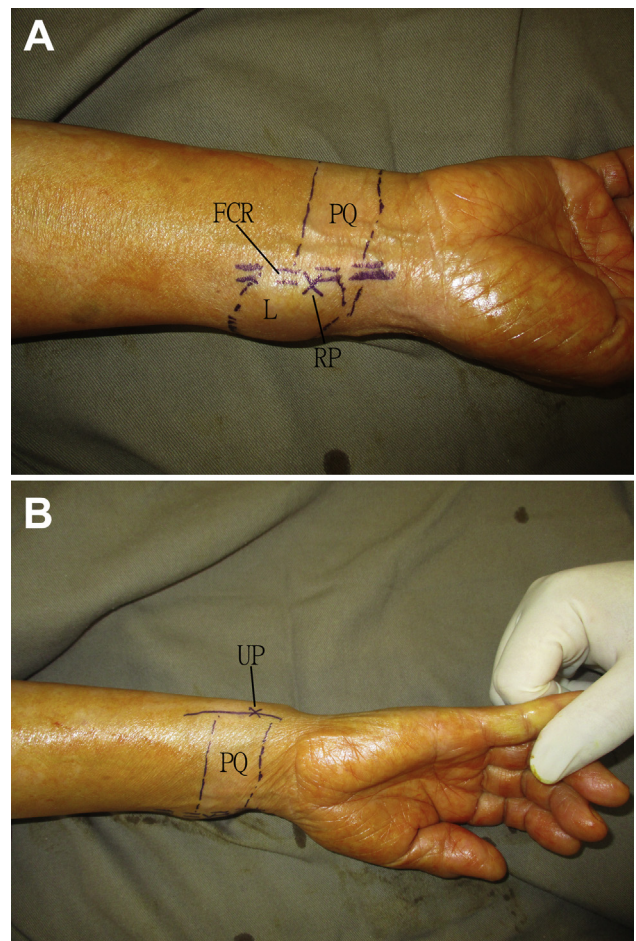
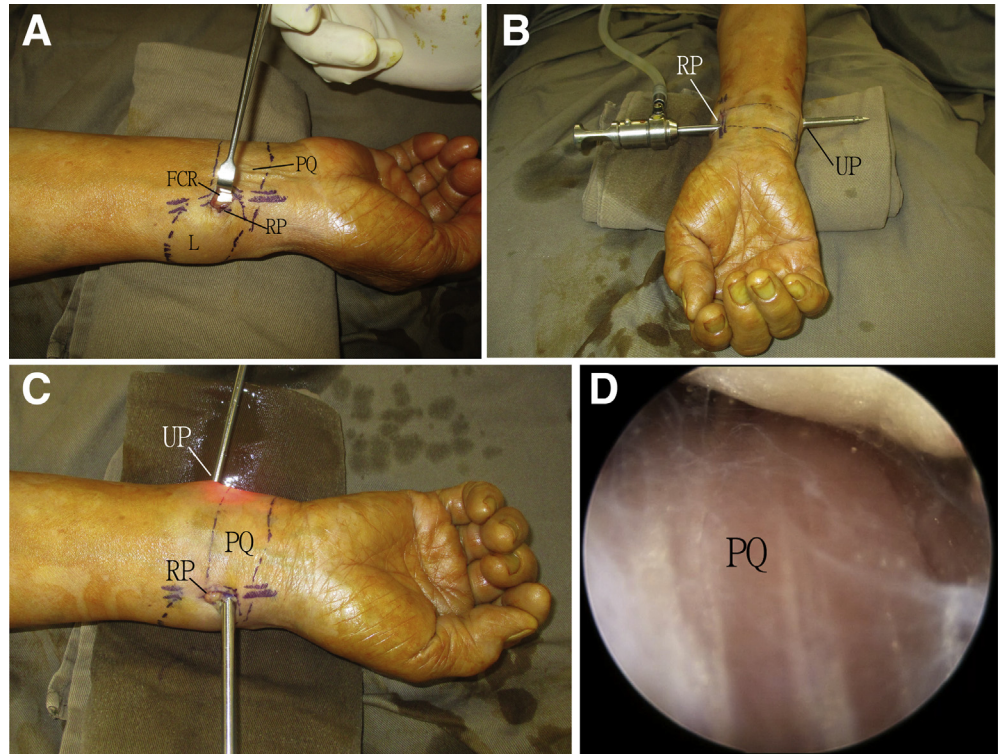


Figure 2. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. (A) The radial portal is at the radial edge of the flexor carpi radialis tendon (FCR). (B) The ulnar portal is at the ulnar edge of the distal ulna and ulnar to the flexor carpi ulnaris tendon. L, lipoma; RP, radial portal; UP, ulnar portal.

Figure 3. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. (A) The flexor carpi radialis tendon (FCR) is identified at the radial portal. (B) The arthroscrope trocar-cannula passes through both the radial and ulnar portals. (C) Pronator quadratus endoscopy is performed with the radial portal as the viewing portal. (D) Endoscopic view of the pronator quadratus muscle. L, lipoma; RP, radial portal; UP, ulnar portal.



muscle is stripped subperiosteally from the distal ulna with a periosteal elevator (Figure 5). Care should be taken not to injure the palmar ulnocarpal and palmar radioulnar ligaments.

Stripping of Pronator Quadratus Muscle From Interosseous Membrane

The ulnar portal is the viewing portal, and the radial portal is the working portal. The muscle is stripped from the interosseous membrane by the periosteal elevator

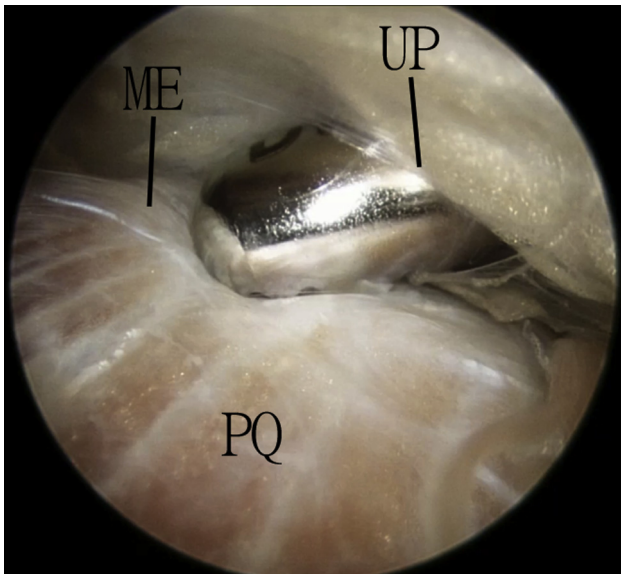


Figure 4. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. The radial portal is the viewing portal, and the ulnar portal is the working portal. The medial edge of the pronator quadratus muscle is identified. ME, medial edge of the pronator quadratus muscle; UP, ulnar portal.

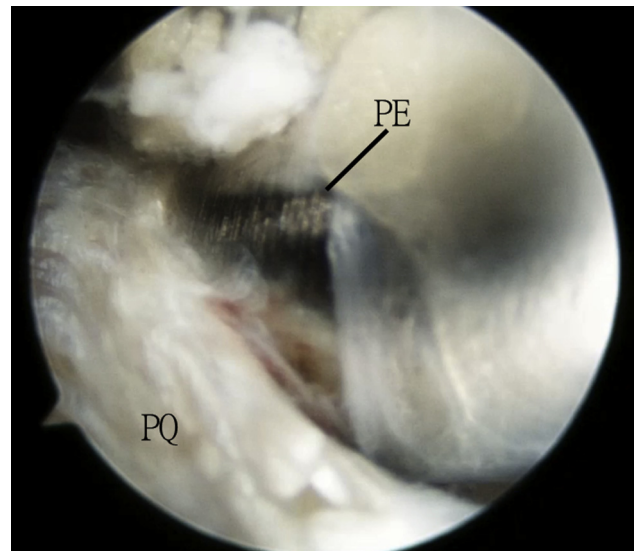


Figure 5. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. The radial portal is the viewing portal, and the ulnar portal is the working portal. The PQ is stripped from distal ulna by a periosteal elevator (PE).

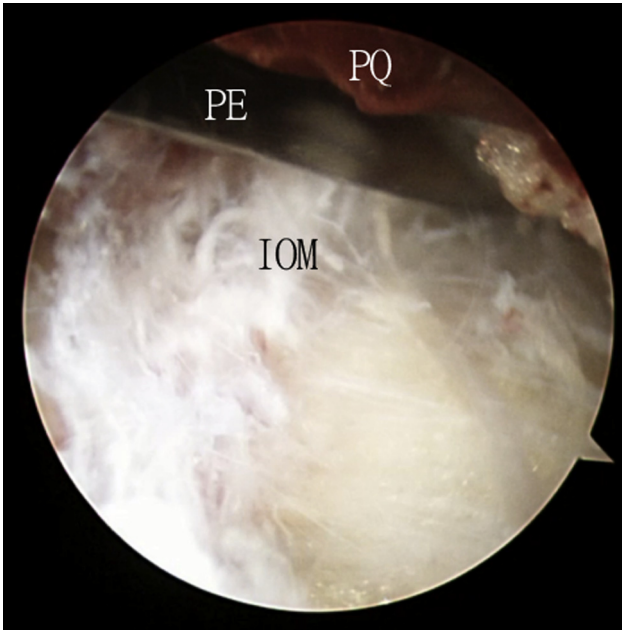


Figure 6. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. The ulnar portal is the viewing portal, and the radial portal is the working portal. The muscle is stripped from the interosseous membrane (IOM) by a periosteal elevator (PE).

(Figure 6). Care should be taken not to injure the palmar ulnocarpal and palmar radioulnar ligaments and the interosseous membrane.

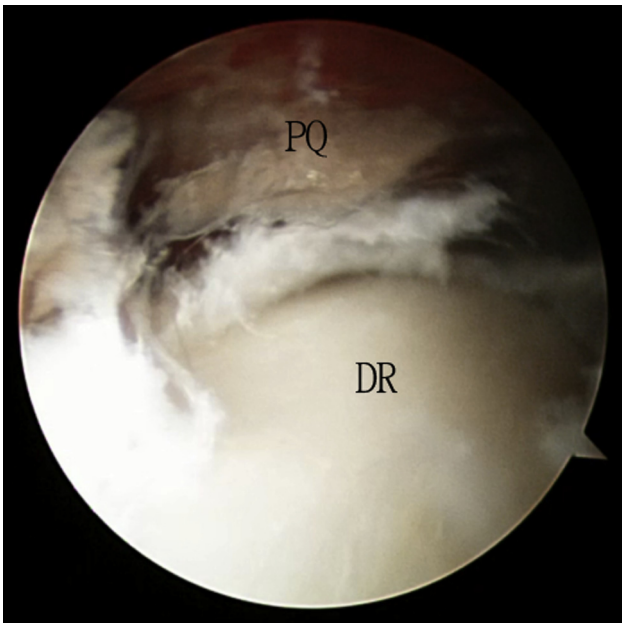


Figure 7. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. The ulnar portal is the viewing portal, and the radial portal is the working portal. The muscle is stripped from the distal radius (DR).

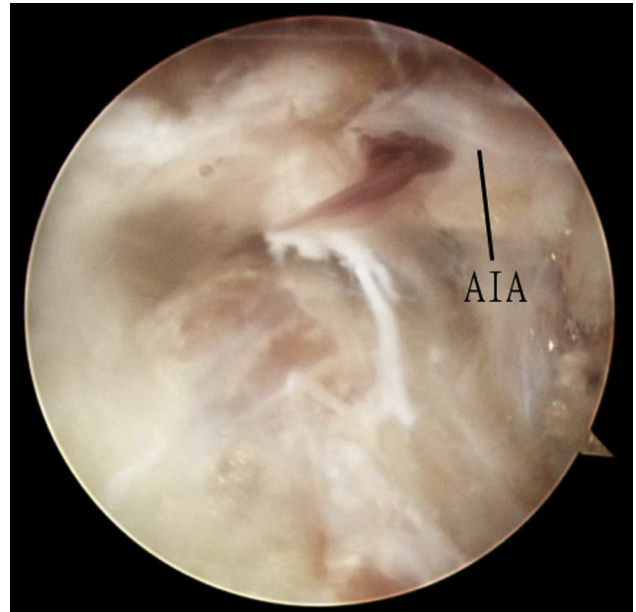


Figure 8. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus of the right wrist. The patient is in supine position with the hand on the side table. The ulnar portal is the viewing portal. This endoscopic view shows the bleeding anterior interosseous artery (AIA).

Stripping of Pronator Quadratus Muscle From Distal Radius

The ulnar portal is the viewing portal, and the radial portal is the working portal. The muscle is stripped from the distal radius with an arthroscopic shaver (Smith & Nephew) (Figure 7). Care should be taken not to injure the palmar radiocarpal ligaments.

Hemostasis

The ulnar portal is the viewing portal, and the radial portal is the working portal. The surgical field is

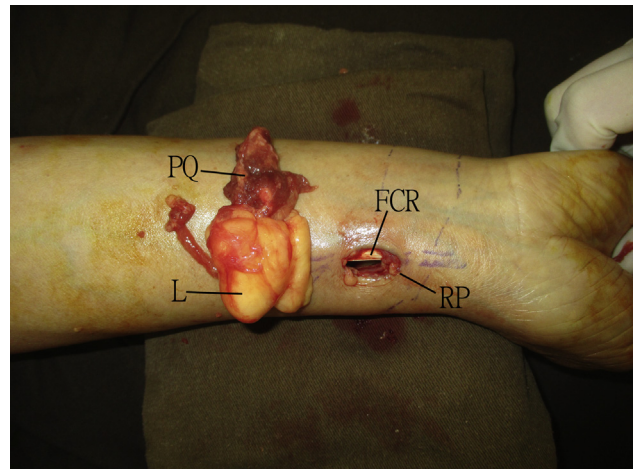


Figure 9. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus (PQ) of the right wrist. The patient is in supine position with the hand on the side table. FCR, flexor carpi radialis; L, lipoma; RP, radial portal.

Table 2. Pearls and pitfalls

Pearls	Pitfalls
1. Instrumentation via the radial portal should be strictly at the radial edge of the flexor carpi radialis tendon and point dorsally and ulnarly	1. During creation of the ulnar portal by the inside-out technique, the ulnar nerve and artery may be injured if the trocar-cannula accidentally exits radial to the flexor carpi ulnaris
2. The arthroscope should be placed just volar to the pronator quadratus muscle	2. Extensive stripping at the distal border of the pronator quadratus muscle may injure the palmar radiocarpal and ulnocarpal ligaments

examined for any bleeding vessels, especially the anterior interosseous artery (Figure 8). The bleeding vessel is cauterized by an arthroscopic diathermy (Smith & Nephew).

Removal of the Pronator Quadratus Muscle Together With the Lipoma

The radial portal is extended, and the encapsulated extramuscular component of the lipoma is dissected out. The lipoma is then removed together with the pronator quadratus muscle. The surgeon should be careful not to injure the radial artery during this step (Figure 9, Table 2, and Video 1).

Discussion

The pronator quadratus (PQ) muscle is composed of 2 distinct heads. The superficial head functions in pronation, and the deep head serves as a dynamic stabilizer of the distal radioulnar joint (DRUJ).¹⁰⁻¹³ The patient should be informed that pronation power may be affected after the surgery. The palmar radiocarpal and ulnocarpal capsuloligamentous structures, the palmar radioulnar ligament, and the distal oblique bundle of the interosseous membrane are in close proximity to the distal border of the pronator quadratus.^{10,11} These capsuloligamentous structures should be preserved

Table 3. Advantages and risks

Advantages	risks
1. Less soft tissue dissection	1. Injury to the radial artery, ulnar artery, ulnar nerve, or median nerve
2. Fewer soft tissue complications such as wound dehiscence and infection, neurovascular damage, and scar tethering	2. Injury to the palmar radiocarpal and ulnocarpal capsuloligamentous structures
	3. Injury to the palmar radioulnar ligament
	4. Injury to the distal oblique bundle of the interosseous membrane

during endoscopic myectomy to avoid radiocarpal or distal radioulnar instability and pain.¹⁰

The radial portal of this technique is at the radial edge of the flexor carpi radialis tendon. This can protect the median nerve during the instrumentation, as the nerve is ulnar to the tendon.¹⁴ However, the radial artery can be injured during instrumentation via the radial portal, as the artery is radial to the flexor carpi radialis tendon. The instrumentation via this portal should be strictly at the radial edge of the tendon and pointing dorsally and ulnarly. In the illustrated case, the artery is protected by the lipoma during the endoscopic procedure.

This endoscopic technique has the advantage of minimally invasive surgery, e.g., less soft tissue dissection and fewer soft tissue complications such as wound dehiscence and infection, neurovascular damage, and scar tethering. The potential risks of this technique include injury to the radial artery, ulnar artery, ulnar nerve, median nerve, palmar radiocarpal and ulnocarpal capsuloligamentous structures, palmar radioulnar ligament, and distal oblique bundle of the interosseous membrane (Table 3). This is not technically demanding and may be attempted by average hand and wrist arthroscopists.

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