

Endoscopically Assisted Resection of Intramuscular Lipoma of the Soleus



Tun Hing Lui, M.B.B.S., F.R.C.S.Ed., FHKAM(Ortho), F.H.K.C.O.S., and
Tsang Yeung, M.B.B.S. (HK)

Abstract: Intramuscular lipoma is a rare soft-tissue tumor with an overall incidence of less than 1% of all lipomas. It primarily occurs in the trunk and proximal parts of the upper and lower extremities. Intramuscular lipoma of the soleus muscle has not been reported before in the English literature and the best treatment option is not known. The purpose of this Technical Note is to describe the details of endoscopically assisted resection of intramuscular lipoma of the soleus. This is indicated for well demarcated intramuscular lipoma of the soleus and is contraindicated in infiltrating intramuscular lipoma. Besides the advantage of minimally invasive surgery, this endoscopic technique allows en bloc resection of the intramuscular lipoma.

Introduction

Intramuscular lipoma is a rare soft-tissue tumor with an overall incidence of less than 1% of all lipomas.¹⁻⁴ It primarily occurs in the trunk and proximal parts of the upper and lower extremities.² There are 2 types of intramuscular lipoma: infiltrating (83%) and well circumscribed (17%).² Surgical excision is the treatment of choice when the patient is symptomatic or for cosmetic purposes.^{1,2} Generally accepted factors that favor surgical resection include size more than 5 cm, deep-seated tumors of the proximal lower extremities, infiltrative growth, or recurrence despite benign histology after resection.³ Open resection with marginal excision of the well-circumscribed tumor and wide excision of the infiltrative tumor is the classic surgical approach.^{2,5} For small and deep-seated muscle, the intramuscular lipoma usually involves the whole muscle and even has an extramuscular component before it presents clinically.² In this case, myectomy can be considered.² Endoscopically assisted marginal resection of selected cases of well-circumscribed

intramuscular lipoma has been reported.⁵ Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus has also been reported.² These endoscopic techniques have the advantages of minimally invasive surgery of better cosmetic results and less surgical trauma. The purpose of this Technical Note is to describe the details of endoscopically assisted resection of intramuscular lipoma of the soleus. It is indicated in well-demarcated intramuscular lipoma of the soleus. It is contraindicated in infiltrating intramuscular lipoma of the soleus or the lipoma extending beyond the boundary of the soleus muscle and involving the adjacent structures. Liposarcoma is also contraindicated for endoscopically assisted resection (Table 1).

Surgical Technique

Preoperative Assessment and Patient Positioning

Magnetic resonance imaging is useful for study of the nature and extent of the tumor and anatomical relationship of the tumor with the adjacent neurovascular structures (Fig 1), which is important for preoperative planning.^{1,3}

The patient is in the supine position with the legs spread. A thigh tourniquet is applied to provide a bloodless operative field. A 4.0-mm 30° arthroscope (Dyonics, Smith and Nephew, Andover, MA) is used for this procedure. Fluid inflow is by gravity, and arthro-pump is not used.

United Christian Hospital, Hong Kong, SAR, China.

Received February 28, 2022; accepted March 25, 2022.

Address correspondence to: Tun Hing Lui, M.B.B.S., F.R.C.S.Ed., FHKAM(Ortho), F.H.K.C.O.S., Department of Orthopaedics and Traumatology, North District Hospital, 9 Po Kin Rd., Sheung Shui, NT, Hong Kong SAR, China. E-mail: luithderek@yahoo.co.uk

© 2022 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/22304

<https://doi.org/10.1016/j.eats.2022.03.021>

Table 1. Indications and Contraindications of Endoscopically Assisted Resection of Intramuscular Lipoma of the Soleus

Indications	Contraindications
1. Well demarcated intramuscular lipoma of the soleus	1. Infiltrating intramuscular lipoma of the soleus
	2. Lipoma extended beyond the boundary of the soleus muscle and involved the adjacent structures
	3. Liposarcoma

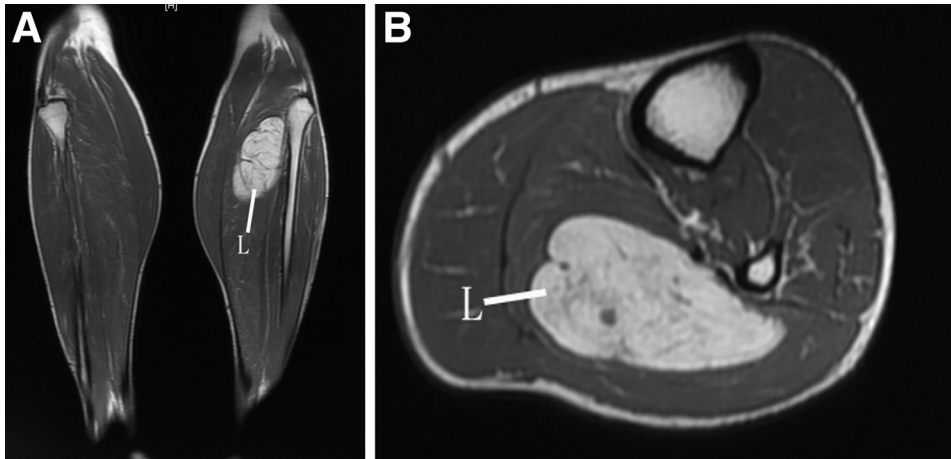


Fig 1. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in supine position with the legs spread. Preoperative magnetic resonance of the left leg of the illustrated case showed the intramuscular lipoma of the soleus. A: coronal view; B: transverse view; L: lipoma.

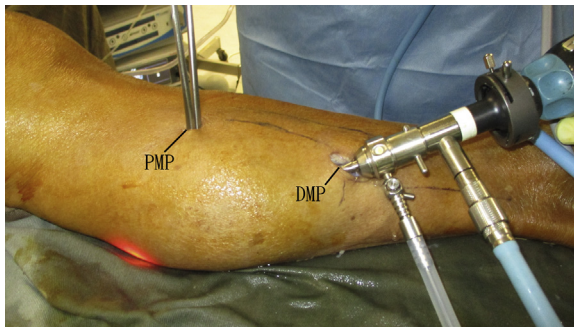


Fig 2. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in supine position with the legs spread. This procedure is performed with the proximal medial portal and the distal medial portal. The distal medial portal is at the proximal end of medial edge of the Achilles tendon. The proximal medial portal is at the medial side of the interface between the gastrocnemius and soleus muscles and at the level of the tumor. DMP: distal medial portal; PMP: proximal medial portal.

Portal Placement

This procedure is performed with the proximal medial portal and the distal medial portal. The distal medial portal is at the proximal end of medial edge of the Achilles tendon.⁶ The proximal medial portal is at the medial side of the interface between the gastrocnemius and soleus muscles and at the level of the tumor (Fig 2).

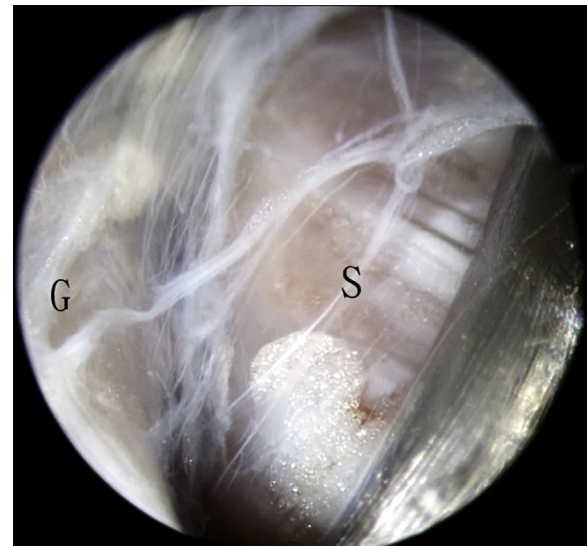


Fig 3. Endoscopically Assisted Resection of Intramuscular Lipoma of the Soleus of the left leg. Patient is in supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The interface between the soleus and gastrocnemius muscles is cleared up with a dental swab. G: gastrocnemius; S: soleus.

Identify Interface Between Soleus and Gastrocnemius

The distal medial portal is established first. The deep fascia is incised, and the distal end of the medial head of

Fig 4. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. (A) The soleus aponeurosis and muscle are split with a SuperCut scissors (Stille, Lombard, IL). (B) This can expose the intramuscular lipoma. L, lipoma; S, soleus; SA, soleus aponeurosis.

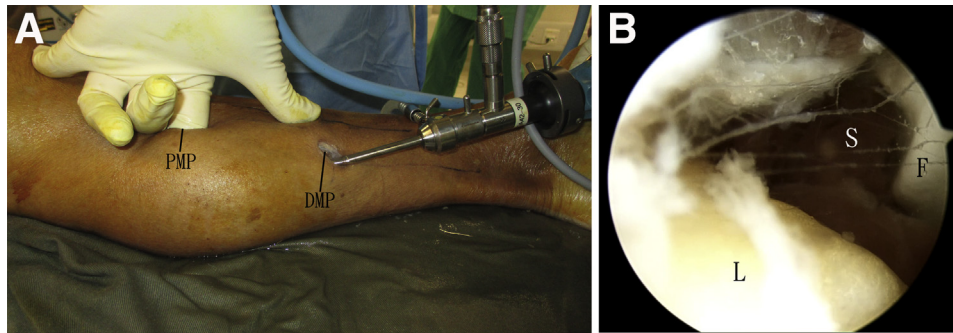
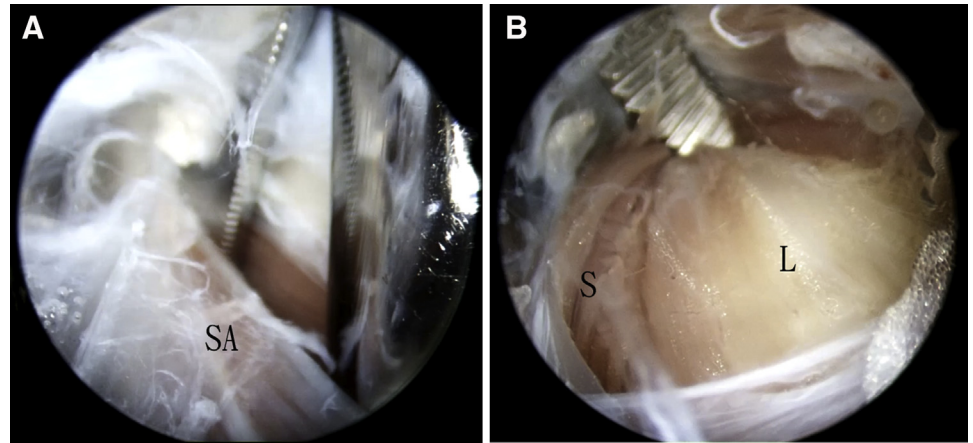


Fig 5. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in the supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The tumor is started to be freed from the soleus muscle by finger dissection. A, external view; B, endoscopic view; DMP, distal medial portal; F: surgeon's index finger; L, lipoma; PMP, proximal medial portal; S: soleus.

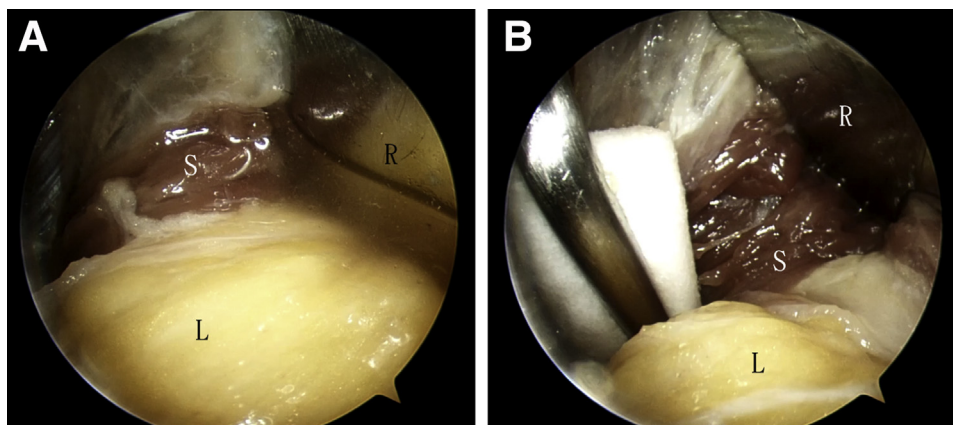


Fig 6. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The fluid inflow is turned off, and the proximal medial incision is enlarged. (A) The split soleus muscle is retracted with small retractor to expose the lipoma. (B) The lipoma is further dissected out from the muscle with a dental swab. L, lipoma; R, retractor; S, soleus.

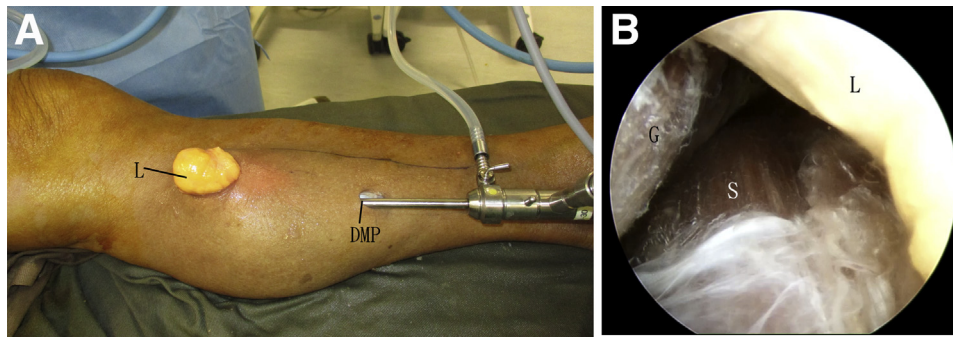


Fig 7. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in the supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. After the tumor is completely freed from the soleus muscle, the lipoma is evacuated from the muscle by the surgeon's finger. A, external view; B, endoscopic view; DMP, distal medial portal; G, gastrocnemius; L, lipoma; S, soleus.

the gastrocnemius muscle is identified. The muscle is reflected laterally to expose the underlying soleus muscle. The distal medial portal is the viewing portal, and the endoscope is inserted into the interface between the soleus and gastrocnemius muscles.^{7,8} The proximal medial portal is located with a needle and proper placement of the portal site is confirmed endoscopically by identifying the needle in the interface between the soleus and gastrocnemius muscles. Longitudinal skin incision is made at the proximal medial portal site, and the deep fascia is incised to expose the medial edges of the soleus and gastrocnemius muscles. The interface between these two muscles is easily identified as the space between the soleus and gastrocnemius aponeuroses. The space is cleared up with a dental swab via the proximal medial portal (Fig 3).

Incise the Soleus Aponeurosis and Expose the Lipoma

The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The soleus

aponeurosis and muscle are split with a SuperCut scissors (Stille, Lombard, IL). This can expose the intramuscular lipoma (Fig 4).

Finger Dissection

The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The tumor is slowly freed from the soleus muscle by finger dissection (Fig 5).

Tumor Dissection With Dry Endoscopy

The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The fluid inflow is turned off, and the proximal medial incision is enlarged. The split soleus muscle is retracted with small retractor to expose the lipoma. The lipoma is further dissected out from the muscle with a dental swab (Fig 6).

Extraction of the Lipoma

The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. After the tumor is completely freed from the soleus

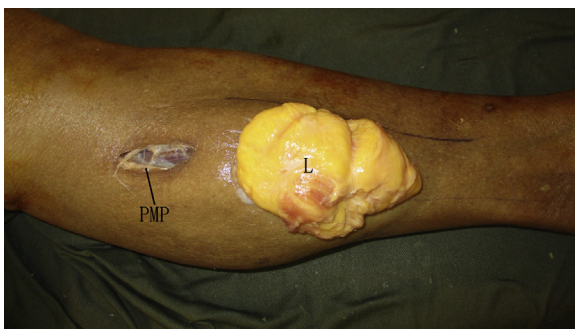


Fig 8. Endoscopically assisted resection of intramuscular lipoma of the soleus of the left leg. Patient is in supine position with the legs spread. The distal medial portal is the viewing portal, and the proximal medial portal is the working portal. The lipoma is completely extracted out from the proximal medial portal. L, lipoma; PMP, proximal medial portal.

Table 2. Pearls and Pitfalls of Endoscopically Assisted Resection of Intramuscular Lipoma of the Soleus

Pearls	Pitfalls
1. The identification of the interface between the soleus and gastrocnemius muscles should be begun at the distal medial portal	1. Endoscopically assisted resection for infiltrating intramuscular lipoma may have a high risk of recurrence.
2. The proximal medial portal is better established under endoscopic guide.	2. Wrong entry to the interface between the deep and superficial posterior compartments of the calf may lead to injury to the tibial neurovascular bundle.
3. Blunt dissection of the lipoma close to the fibular head region can minimize the risk of injury to the common peroneal nerve.	

Table 3. Advantages and Risks of Endoscopically Assisted Resection of Intramuscular Lipoma of the Soleus

Advantages	Risks
1. Small incisions and better cosmetic outcome	1. Postoperative hematoma
2. Minimal soft tissue trauma	2. Injury to the great saphenous and perforating veins and the saphenous nerve
3. En bloc resection of the lipoma	3. Muscular injury
	4. Incomplete tumor resection
	5. Recurrence

muscle, the lipoma is evacuated from the muscle by the surgeon's finger (Fig 7). The proximal medial portal is further enlarged to allow extraction of the tumor (Fig 8, Table 2, Video 1).

Discussion

To the best of our knowledge, intramuscular lipoma of the soleus muscle has not been reported before in the English literature, and the best treatment option is not known. Endoscopically assisted resection of the intramuscular lipoma is basically a form of marginal local resection. In general, intramuscular lipoma is a very rare form of lipoma, and the majority is the infiltrating type.⁴ Local marginal excision of the infiltrating intramuscular lipoma has a high rate of local recurrence, and therefore, endoscopically assisted resection is contraindicated.⁴ In order to have successful endoscopically assisted resection, careful case selection of well-circumscribed lipoma is most important. Moreover, we preferred en bloc excision of the whole lipoma instead remove the lipoma in a piecemeal fashion with an arthroscopic shaver, although the wound will be larger. This is because en bloc resection can provide good specimen of pathohistological examination and reduce the risk of seeding of residual tumor and reduce the trauma to the adjacent soleus muscle fibers.

The advantages of this technique include small incisions and better cosmetic outcome, minimal soft tissue trauma, and en-bloc resection of the lipoma. The potential risks of this technique include postoperative hematoma, injury to the great saphenous and perforating veins and the saphenous nerve, muscular injury, incomplete tumor resection and recurrence (Table 3).⁹

References

1. Awad P. Rare intramuscular lipoma of the foot: A case report. *J Am Podiatr Med Assoc* 2021;111, Article_17.
2. Lui TH, Mak SY. Endoscopically assisted myectomy for intramuscular lipoma of pronator quadratus. *Arthrosc Tech* 2020;9:e717-e722.
3. Toft F. Surgical resection of a giant intramuscular lipoma of the biceps brachii: A case report and review of the literature. *Arch Orthop Trauma Surg* 2022;142:373-379.
4. Han HH, Choi JY, Seo BF, et al. Treatment for intramuscular lipoma frequently confused with sarcoma: A 6-year retrospective study and literature review. *Biomed Res Int* 2014;2014:867689.
5. Conesa AP, Aznar CV, Herrera MR, Lopez-Prats FA. Arthroscopic marginal resection of a lipoma of the supraspinatus muscle in the subacromial space. *Arthrosc Tech* 2015;4:e371-e374.
6. Lui TH. Endoscopic fasciotomy of the superficial and deep posterior compartments of the leg. *Arthrosc Tech* 2017;6:e711-e715.
7. Lui TH. Endoscopic gastrocnemius intramuscular aponeurotic recession. *Arthrosc Tech* 2015;4:e615-e618.
8. Lui TH. Modified endoscopic release of gastrocnemius aponeurosis. *J Foot Ankle Surg* 2015;54:140-142.
9. Hutchinson MR, Bederka B, Kopplin M. Anatomic structures at risk during minimal-incision endoscopically assisted fascial compartment releases in the leg. *Am J Sports Med* 2003;31:764-769.