Technical Note

Lateral Femoral Cutaneous Neurectomy With Nerve End Implantation for Meralgia Paresthetica: A Technique Guide

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Abstract: Meralgia paresthetica is an uncommon but painful neuropathy causing anterolateral thigh pain. Compression or injury of the lateral femoral cutaneous nerve (LFCN) leads to pain and/or numbness in its distribution throughout the thigh. Historically, surgical decompression of the LFCN just below the inguinal ligament was most commonly utilized for first-line surgical management, but recently, fully transecting the LFCN is becoming increasingly popular as more favorable outcomes are reported. This Technical Note describes our surgical approach to neurectomy and nerve end implantation for the treatment of meralgia paresthetica.

The lateral femoral cutaneous nerve (LFCN) is a sensory nerve that supplies sensation to the anterolateral thigh. It commonly originates from the dorsal branches of L2 and L3 ventral rami.[1] It first appears at the lateral border of the psoas major muscle and then travels in an oblique direction over the iliacus toward the anterior superior iliac spine (ASIS). The nerve exits the lesser pelvis below the inguinal ligament. While variations exist, the LFCN typically travels just medial to or through the sartorius muscle into the anterior thigh.

Meralgia paresthetica (MP) is characterized by pain, tingling, and/or numbness at the anterolateral or lateral thigh, resulting from compression to the LFCN. One population-based study estimated the age- and sex-adjusted incidence of MP to be 32.6 per 100,000 patient years.[2] Increased incidence of MP was associated with increasing age, obesity, and diabetes mellitus. Meralgia paresthetica is also a known potential complication following hip arthroscopy.[3] The LFCN is at risk of injury with standard anterior portal placement as its course is in line with the ASIS.

Surgical options are considered following failed conservative measures. The most common surgical approaches include LFCN decompression or neurectomy.[4] This Technical Note outlines the preoperative evaluation of MP and surgical techniques for LFCN neurectomy with nerve end implantation into muscle (Video 1).

Patient Evaluation, Imaging, and Indications

Initial evaluation for patients with suspected MP begins with patient history and physical examination. Patients typically report anterolateral thigh pain, with sensitivity to light touch or clothing pressed against the affected area. Physical examination maneuvers include evaluating for exacerbation of symptoms while compressing the LFCN distal to the ASIS. This can be performed by holding pressure for 30 seconds. Next, consider percussing the LFCN and monitoring for symptom exacerbation. This is known as Tinel's sign, and it is accomplished by placing the patient supine and tapping several centimeters inferior to the ASIS. Additionally, consider tests such as a straight-leg raise to help rule out lumbar pathologies. Following a physical examination, diagnostic injection of the LFCN with local anesthetic is routinely performed. Injecting anesthetic in the same area as the Tinel's sign test should

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Table 1. Indications and Contraindications for LFCN Surgery

Relative Indications	Relative Contraindications
1. Failed nonsurgical treatment (weight loss, hydro-dissection, medications) 2. Patients with abdominal obesity (indication for neurectomy only) a. These patients are unlikely to benefit from nonsurgical treatments or decompression at the inguinal ligament due to increased compression on the LFCN by subcutaneous abdominal fat and chronicity of symptoms. 3. Onset of symptoms following either open hip surgery via the anterior approach or hip arthroscopy a. Similar to abdominal obesity, this is a relative indication for neurectomy and a contraindication to decompression.	1. Concomitant lumbar radiculopathy or imaging signs of lumbar nerve root compression 2. Intrapelvic structure producing mass effect on the LFCN proximal to the inguinal ligament is a relative contraindication to neurectomy distal to the inguinal ligament.

LFCN, lateral femoral cutaneous nerve.

result in substantial symptomatic relief and is confirmatory for a diagnosis of MP. Further, since there is significant anatomic variation in LFCN branching patterns, complete or near-complete pain relief with a diagnostic injection in this location confirms that the affected nerve branches are accessible through an incision in this area. Lastly, nerve conduction studies and/or electromyography can be utilized, although we rarely do. Nerve conduction studies assess for LFCN neuropathy, while electromyography is another test to help rule out spinal pathology and is expected to be negative in MP as the LFCN is a purely sensory nerve.

Imaging such as radiographs, magnetic resonance imaging, or ultrasound (US) may be indicated for several reasons. Consider radiographs to rule out lumbar degenerative disease. Consider magnetic resonance imaging or US to evaluate the anatomic course of the LFCN, to evaluate for structures causing a mass effect on the extraperitoneal portion of the LFCN proximal to the inguinal ligament, and to rule out an inguinal hernia. One study from de Ruiter et al.[5] evaluated the role of US in the preoperative assessment for LFCN neurectomy. They classified 56 patients' LFCN course into 1 of 5 different variations, A through E, based on a classification system developed by Aszmann et al.[6] de Ruiter et al.[5] found 0% of patients with variant type A (where the LFCN runs laterally around the ASIS), 88% of patients with variants B and C (where the LFCN runs through the inguinal ligament and slightly medial to the ASIS), and 12% of patients with variants D and E (where the LFCN does not run through inguinal ligament and runs further medial with respect to the ASIS). Mapping the LFCN anatomy can

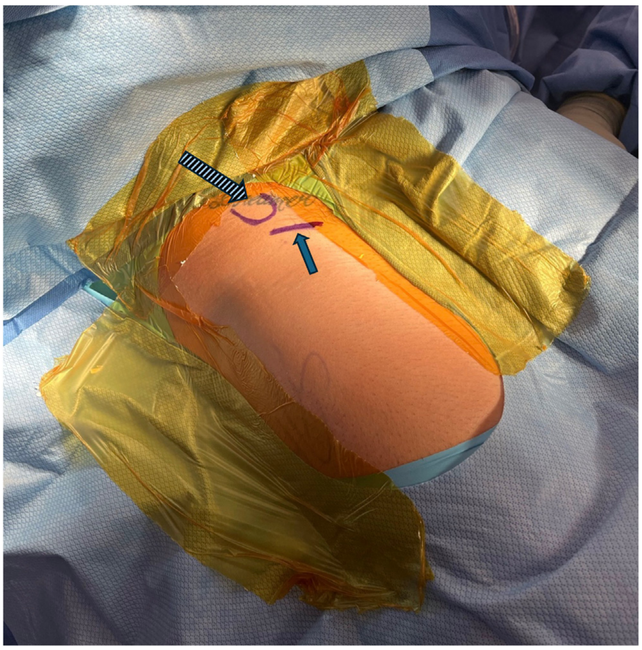

Fig 1. Image of patient positioning. Patient is supine on the operating table. Right anterolateral thigh is prepared in standard fashion. The anterior superior iliac spine is outlined in curved purple marker (stripped arrow). The incision is made on the straight purple line (solid arrow).

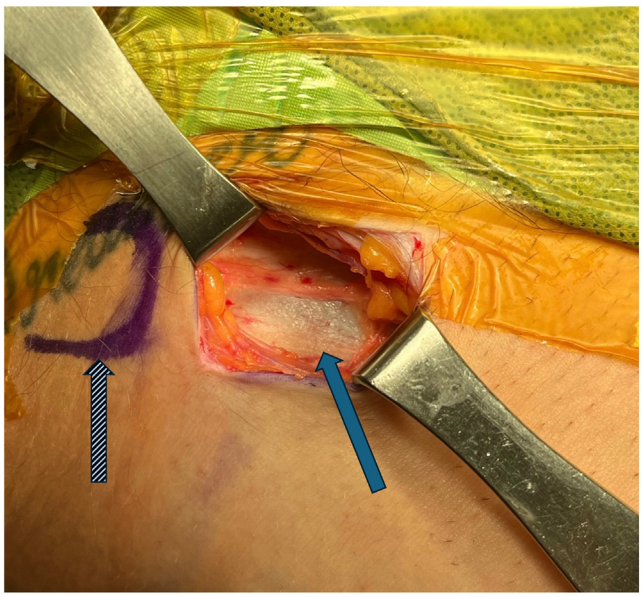

Fig 2. Right hip, supine position. View of dissection down to fascia (solid arrow) overlying the sartorius, inguinal ligament, and tensor fascia lata. Anterior superior iliac spine marked by stripped arrow.

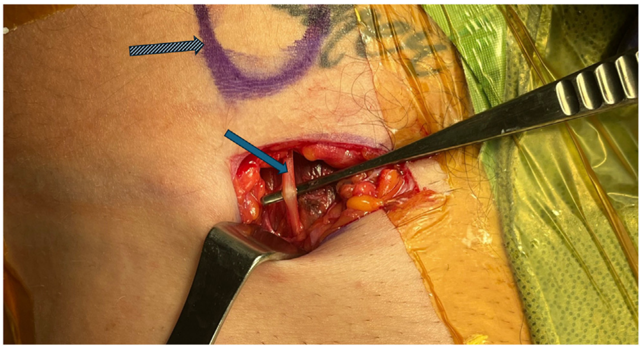

Fig 3. Right hip, supine position. View of the lateral femoral cutaneous nerve (LFCN) as a single branch following fascial dissection. LFCN pictured at solid arrow. Anterior superior iliac spine marked by stripped arrow.

be useful but is not necessary as it does not change our surgical technique.

There are several indications and relative contraindications to LFCN surgery (Table 1).

Surgical Technique

Positioning

The patient is placed supine on the operating table. The anterolateral thigh is prepped in standard fashion (Fig 1).

Infrainguinal LFCN Neurectomy

Make an oblique incision along the inguinal crease several centimeters distal to the ASIS. Subcutaneous flaps are developed. Dissect to fascia overlying the

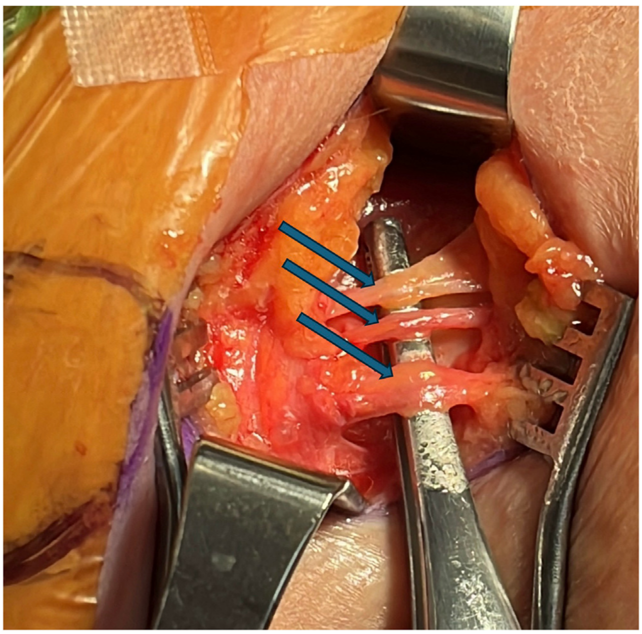

Fig 4. Right hip, supine position. View of three distinct lateral femoral cutaneous nerve branches pictured at solid arrows.

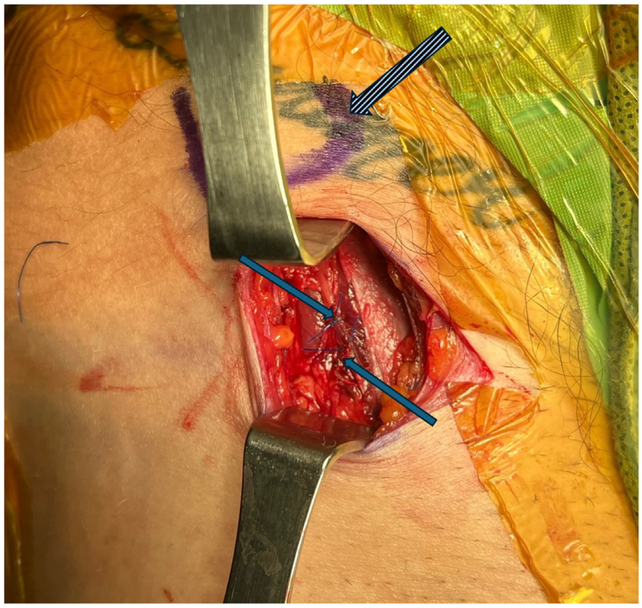

Fig 5. Right hip, supine position. View of transected lateral femoral cutaneous nerve sutured into muscle. Proline sutures visualized at ends of solid arrows. Anterior superior iliac spine marked by stripped arrow.

sartorius and tensor fascia lata (Fig 2). Typically, branches of the LFCN are readily apparent immediately underneath the anterior thigh fascia (Figs 3-4). There is significant individual variation in the number of branches seen distal to the inguinal ligament; we often see 1 to 3 branches at this location, although more than 3 branches can be present. Perform neurolysis of these LFCN branches using Metzenbaum scissors. Continue proximally to the site where the LFCN exits the pelvis. Partially release the sartorius and inguinal ligament from the ASIS to decompress the LFCN at this site. Identify and tag all LFCN branches before sharp transection. Implant the nerve endings into the nearby sartorius muscle. We prefer 4-0 proline suture to sew the cut nerve ends into the muscle tissue (Fig 5). In the event that a painful neuroma forms and revision surgery is required, the proline suture allows easy identification of the prior neurectomy site.

Table 2. Considerations for the Infrainguinal Approach for Lateral Femoral Cutaneous Nerve Neurectomy

1. Multiple nerve branches may be present distal to the inguinal ligament. Be sure to identify and treat each nerve branch.
2. Utilize proline suture as this is easy to identify in the case of neuroma formation in the event a revision is required.
3. An anterior oblique incision is at higher risk for superficial infection in patients with abdominal obesity.
4. Consider submitting excised nerve segment to pathology to confirm it is nerve tissue.
5. If anatomy is in doubt, consider use of an intraoperative nerve stimulator to confirm the isolated nerve is not the femoral nerve.

Table 3. Advantages, Risks, and Limitations

Advantages	Risks/Limitations
- Easy approach - Revision is straightforward, especially with the use of a proline suture as a marker - Can confirm the efficacy preoperatively with the help of a diagnostic injection while using bony landmarks	- Can develop symptomatic neuroma - Infrainguinal approach is not adequate to expose all LFCN branches if there is significant proximal branching - Care must be taken to keep the incision clean to avoid infection, particularly in obese patients

LFCN, lateral femoral cutaneous nerve.

For the nerve end implantation, tuck in the nerve ends into the muscle between fascicles. The muscle is folded over the nerve for approximately 1.5 cm, and proline is used to secure the muscle in this position. Implanting the nerve into an adjacent muscle may protect against potential neuroma stimulation and reduce the severity of symptoms caused by the neuroma.[7] Implantation into adjacent muscle tissue may not prevent neuroma formation, but it often results in more organized nerve architecture and smaller neuroma size.

Postoperative Care and Recovery

Acute flares of nerve pain can occur following a neurectomy. We prescribe an oral corticosteroid taper to be used as needed in the event a pain flare occurs. The incision site should be monitored for superficial infection, particularly in patients with abdominal obesity. Patients should limit prolonged walking or physical activities for 2 to 3 weeks after surgery to reduce risk of seroma formation.

Discussion

This article describes an infrainguinal approach with LFCN neurectomy for the treatment of MP. Alternatively, LFCN neurolysis/decompression is often used to surgically treat MP. Some surgeons suggest decompression is preferred over neurectomy as it preserves sensation to the anterolateral thigh, and it bears less risk of complications.[8] In our experience, we have found that patients are typically not bothered by the numbness to light touch following neurectomy. We have also found that patients experience better outcomes with a lower chance of recurrence when performing neurectomy as opposed to decompression. This finding is increasingly supported in the surgical literature.[9-11] Satisfaction rates in these 3 studies ranged from 88% to 100% in neurectomy cases versus 60% to 78% for decompression cases.

It is important to keep in mind some considerations when performing this infrainguinal approach for LFCN neurectomy (Table 2). Some considerations include being mindful of the presence of multiple nerve branches distal to the inguinal ligament, utilizing a proline suture, and monitoring for infection in obese patients. The main advantages of the proposed techniques are complete resolution of MP symptoms, a simple and minimally invasive approach, and lack of symptomatic recurrence as the nerve is fully transected (Table 3). The major limitation of these techniques is the postoperative numbness in the anterolateral thigh. Additional risks include the development of symptomatic neuroma and nonexposed LFCN branches if there is significant proximal branching. This technique has offered satisfactory results in our patients and is safe and effective in nearly all patients with MP.

Disclosures

All authors (J.T.F., A.R.G., A.M.P., N.A.C., J.S.E.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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