MENTORS IN ORTHOPEDICS

ENDOSCOPIC PIRIFORMIS TENOTOMY AND SCIATIC NERVE RELEASE: WHY AND HOW?

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AUTHORS

Rémy Coulomb - Centre Hospitalier Universitaire de Nîmes, Nîmes, France
Pierre Martz - Centre Hospitalier Universitaire de Dijon, Dijon, France

SUMMARY

Background: Piriformis syndrome, historically defined as sciatic nerve compression by the piriformis muscle, is increasingly recognized as a subset of deep gluteal syndrome often involving fibrovascular adhesions rather than simple compression. Despite its prevalence, the condition remains a diagnostic challenge due to overlapping clinical presentations with spinal and intra-articular hip pathologies.

Objective: This article aims to define the clinical indications for surgical intervention, describe the technical execution of endoscopic sciatic nerve release and piriformis tenotomy, and evaluate postoperative functional outcomes.

Key Points: Diagnosis requires the exclusion of lumbar spine disease, ischiofemoral impingement, and intra-articular hip degeneration. Clinical assessment utilizes provocative maneuvers, including passive traction in hip flexion and active abduction-external rotation tests. Magnetic resonance imaging and ultrasound-guided perineural injections provide essential diagnostic confirmation. Surgical intervention is indicated only after six months of failed conservative management, including specialized physiotherapy and injections. The endoscopic approach, performed in the prone or lateral position, allows for comprehensive decompression of the deep subgluteal space from the greater sciatic notch to the ischium. Technical steps involve trochanteric bursectomy, identification of the triceps coxae, and meticulous neurolysis of fibrovascular bands. Reported outcomes show a 77.8% success rate with significant functional improvement, though patient selection remains the primary determinant of surgical success.

Conclusion: Endoscopic sciatic nerve release and piriformis tenotomy offer a reproducible and effective treatment for refractory deep gluteal syndrome. Success depends on rigorous diagnostic exclusion and precise arthroscopic neurolysis to restore nerve mobility throughout the subgluteal space.

KEYWORDS

Sciatic Nerve; Piriformis Muscle; Arthroscopy; Nerve Compression Syndromes; Buttocks

The term 'piriformis syndrome' was first described in 1947 by Robinson, who defined it as entrapment neuropathy involving compression of the sciatic nerve by the piriformis muscle [1,2]. However, the condition is now recognized to be caused rather by adhesions than by genuine compression of the sciatic nerve [3]. 'Piriformis syndrome' is therefore restrictive and forms a sub-group of the painful deep gluteal syndrome [4]. Although there has been numerous literature on the topic in recent years, the condition remains a diagnostic challenge. The pain can be due to numerous causes, but once a diagnosis has been made, surgical outcomes appear satisfactory. The purpose of this paper is to describe when surgery is indicated, what is the best procedure and what will be the outcome for the patients.

SURGICAL INDICATIONS

1. Typical presentation of deep gluteal syndrome

This syndrome typically presents with chronic pain in the gluteal region, often linked to a history of trauma. The trauma may have been direct (impact) or indirect (torn muscle) [5]. The patient describes posterior pain arising from the buttocks and spreading across the back of the thigh suggestive of truncated sciatica of the buttock [6].

Prolonged sitting is uncomfortable or possibly painful and cannot usually be maintained for longer than 30 minutes. During a physical examination, traditional passive motion tests (Beatty, FAIR, Pace & Nagle) are moderately sensitive and specific. Two manoeuvres show a positive association and strong link to a diagnosis of sciatic nerve adhesion. The first is passive traction of piriformis, with the patient seated on the edge of the table, hip flexed to 90° and knee extended. The examiner palpates over the greater sciatic notch, whilst holding the lower leg in adduction and internal rotation (Fig. 1).

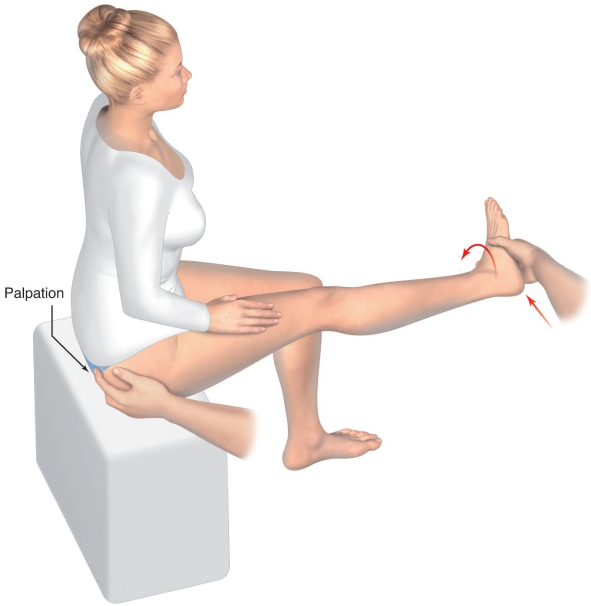


Figure 1: The examiner palpates over the greater sciatic notch, whilst holding the lower leg in adduction and internal rotation.

The second manoeuvre represents an active test of the piriformis muscle. The patient is positioned in lateral decubitus, lying on the healthy side. The patient is asked to abduct and external rotate the hip whilst the examiner places resistance on the lateral knee [7] (Fig. 2).

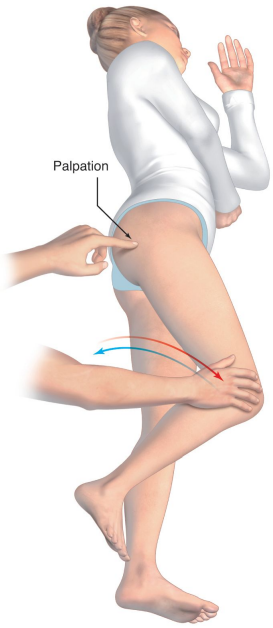


Figure 2. Whilst in lateral decubitus, lying on the healthy side, the patient abducts and external rotates the hip whilst the examiner pushes on the lateral knee.

2. Ruling out other diagnoses

Deep gluteal syndrome is a diagnosis by exclusion. The patient should first be tested for any intra-articular cause, especially degeneration. The next stage is to eliminate any spinal cause. Finally, check for ischiofemoral impingement. It is also important to diagnose any associated pathologies such as abductor or hamstring tendinopathy that could be treated simultaneously.

3. Additional diagnostic tests

Due to the controversy surrounding this diagnosis, it is essential to conduct further tests for additional evidence. In cases of severe compression, electromyography may find signs of sciatic nerve entrapment but is primarily useful for ruling out a differential diagnosis [8].

Multi-slice imaging, ideally using magnetic resonance imaging (MRI), can be used to assess the route of the nerve (T2 hyperintensity), establish a diagnosis of adhesion due to fibrovascular bands and detect asymmetry of the piriformis muscles [9,10]. The test can also provide a differential diagnosis for buttock or lesser pelvis tumours that may be compressing the nerve, or femoral ischial ossification that would explain the postural symptoms. Finally, it can diagnose gluteal and hamstring tendinopathy and any associated bursitis.

4. Injection therapy

Deep gluteal syndrome is an evidence-based diagnosis. One of the arguments in favour of a diagnosis is effectiveness of perineural injection therapy. Ultrasound-guided injections around the nerve are essential for both diagnostic and curative purposes. The aim is to release the nerve by injecting a large volume of saline solution, anaesthetic and corticosteroids under pressure [11,12]. A single injection into the body of piriformis has limited effects due to the physiopathology. Likewise, intramuscular botulinum toxin therapy is useful only for isolated syndromes of piriformis [13], and in fact has been linked to fibrosis that can aggravate the entrapment of the sciatic nerve.

5. Surgical indications in typical cases

Surgery is not the first line treatment. In fact, medical treatment has proven effective in numerous cases. Conservative treatment with anti-inflammatories, muscle relaxants and medication to target the nerve pain combined with suitable physiotherapy remains the first line treatment for these patients [10]. Physiotherapy will help mobilise and move the nerve, stretch the pelvitrochanteric muscles and release the myofascial trigger points [13]. Postural work on the spino-pelvic complex and hip stretches are essential for relieving the buttock pain and preventing a recurrence [14]. Perineural injections are the second line of treatment, along with toxin injections in some cases [11,12]. If medical treatment has not been successful after six months, despite being correctly implemented, only then is there an indication for surgery.

6. Open surgery and endoscopy

Sciatic nerve release can be performed in open surgery [15–17] or by endoscopy [18–23]. Endoscopy will give access to the deep subgluteal space, allowing a direct view of the sciatic nerve which can be entirely released. Open surgery may result in a higher rate of secondary adhesions. Endoscopic nerve release is therefore our preferred first-line option for patients who have undergone no prior surgery or only on one occasion (e.g. acetabular surgery). Patients should be informed of the possibility of having to convert to an open technique, should technical difficulties arise. On the other hand, if a primary nerve release has failed the nerve will have to be tunnelled to avoid any fibrosis, which is only possible with endoscopy. A painful relapse after a primary endoscopic nerve release or complex cases involving multiple posterior hip procedures are an indication for open surgery.

ENDOSCOPIC NERVE RELEASE IN ADDITION TO PIRIFORMIS TENOTOMY

Long debated from a physiopathology viewpoint, we now know that piriformis syndrome is due more to adhesions than to genuine entrapment of the sciatic nerve. These adhesions can occur at different points along the sciatic nerve as it passes through the deep gluteal region between the greater sciatic notch and the ischial origin of the hamstring muscles. Various authors have described adhesions to piriformis, but also to fibrovascular bands, the gemelli-obturator complex, the gluteal muscles and hamstrings (Fig. 3). This is why the term ‘piriformis syndrome’ is restrictive and forms a sub-group of the painful deep gluteal syndrome [20].

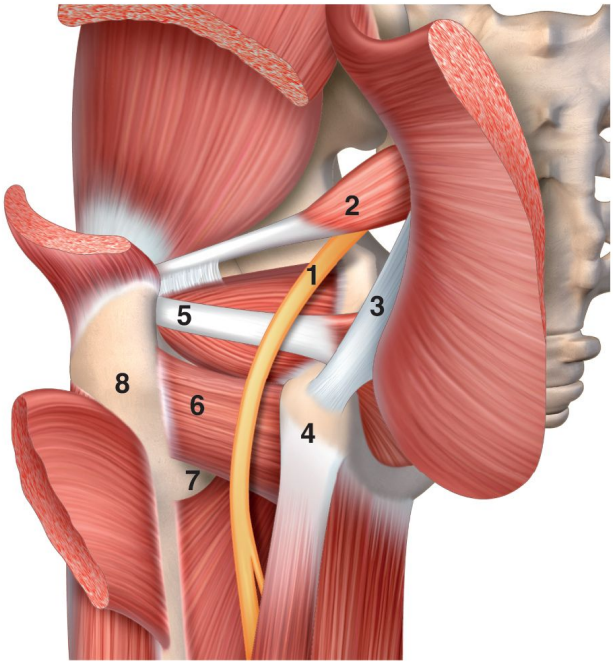


Figure 3: These adhesions can occur at different points along the sciatic nerve as it passes through the deep gluteal region between the greater sciatic notch and the ischial origin of the hamstring muscles.

ENDOSCOPIC SCIATIC NERVE RELEASE

1. Patient set-up

Based on the Kocher-Langenbeck approach in ventral decubitus position for surgery to the acetabulum, this set-up appears most intuitive [19]. In addition, if conversion to open surgery is necessary, it allows direct access to the sciatic nerve. The advantage of ventral decubitus position for the arthroscopy is the ability to treat peritrochanteric and ischial problems, whilst simultaneously allowing a direct view of the deep gluteal region, from the greater notch to the ischium. We recommend draping the entire leg so that the hip and knee can be mobilised to test the mobility of the nerve. Depending on the technique, literature describes both lateral decubitus - suitable for a postero-lateral approach to the hip [22] -, and dorsal decubitus - which allows for combined arthroscopy of the intra-articular space, peritrochanteric structures and deep gluteal region [18–23].

2. Surgical approaches

We used a cadaver study to analyse the average distance from the piriformis tenotomy site at the posterior margin of greater trochanter to the sciatic nerve, which was 5 cm [19]. For approaching the hip, we therefore recommend triangulating with the posterior edge of greater trochanter. Two arthroscopy portals, one posterolateral and one distal posterolateral, spaced 5 cm apart, can be used to triangulate with the greater trochanteric posterior bald spot [Fig. 4).

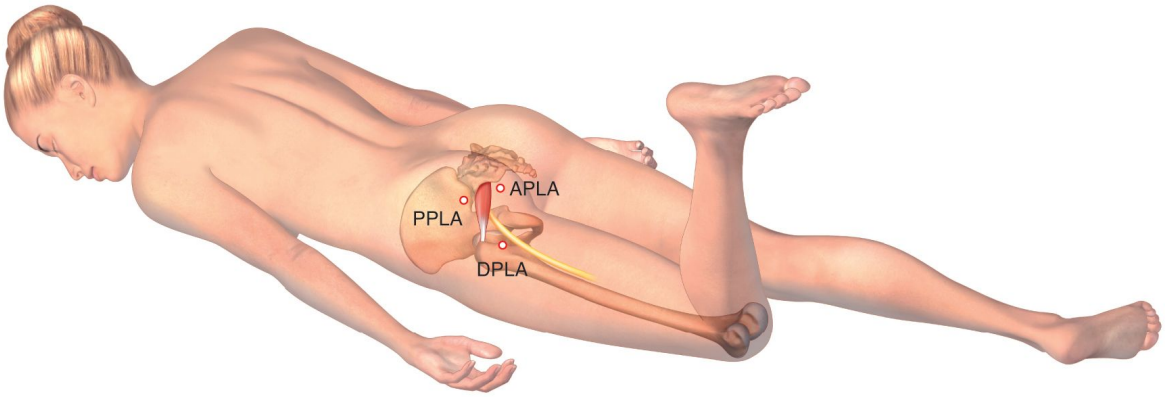


Figure 4: Two arthroscopy portals, one posterolateral (PPLA) and one distal posterolateral (DPLA), spaced 5 cm apart, can be used to triangulate with the greater trochanteric posterior bald spot. Sciatic nerve release requires a third accessory posterior approach (APLA).

The vastus lateralis tendon and distal insertion of gluteus maximus can be used to check the correct orientation of the trochanteric window. Sciatic nerve release requires a third accessory posterior approach (Fig. 5).

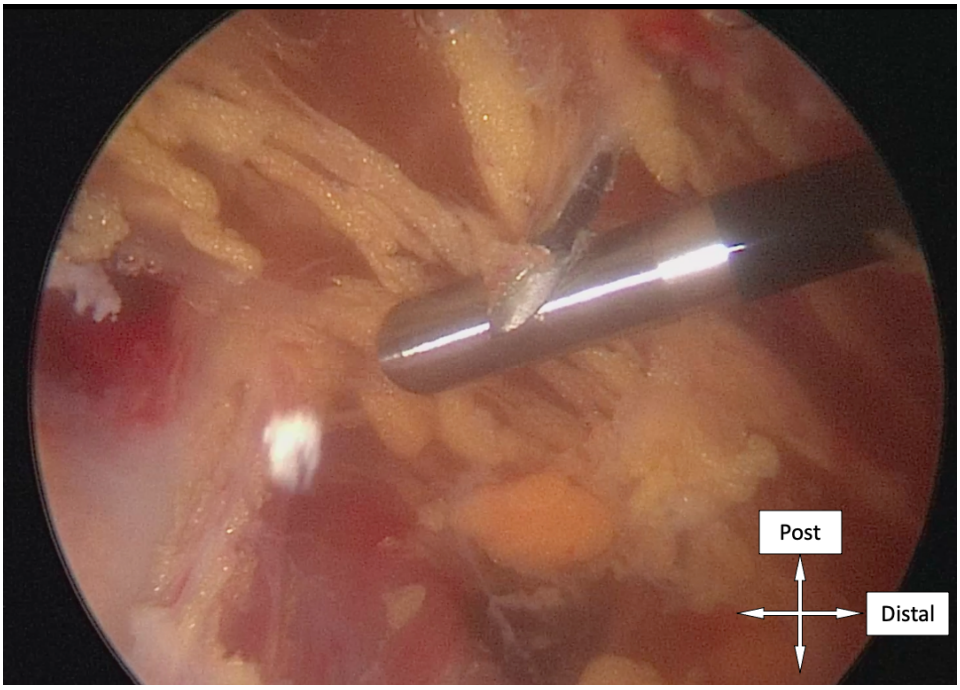


Figure 5: Accessory posterior approach.

It is created under direct optical entry, perpendicular to the nerve to avoid damage. If there is any concomitant pathology of the hamstring tendons, two ischial portals can be created in this same position, in the subgluteal skin fold, using fluoroscopy to triangulate with the ischium [23].

3. Arthroscopic anatomy of the deep gluteal region

The anatomy is familiar for anyone who uses a posterolateral approach to the hip. Once a working space has been created with a trochanteric bursectomy, the gluteus medius/vastus lateralis pair can be seen, along with the distal insertion of gluteus maximus (Fig. 6).

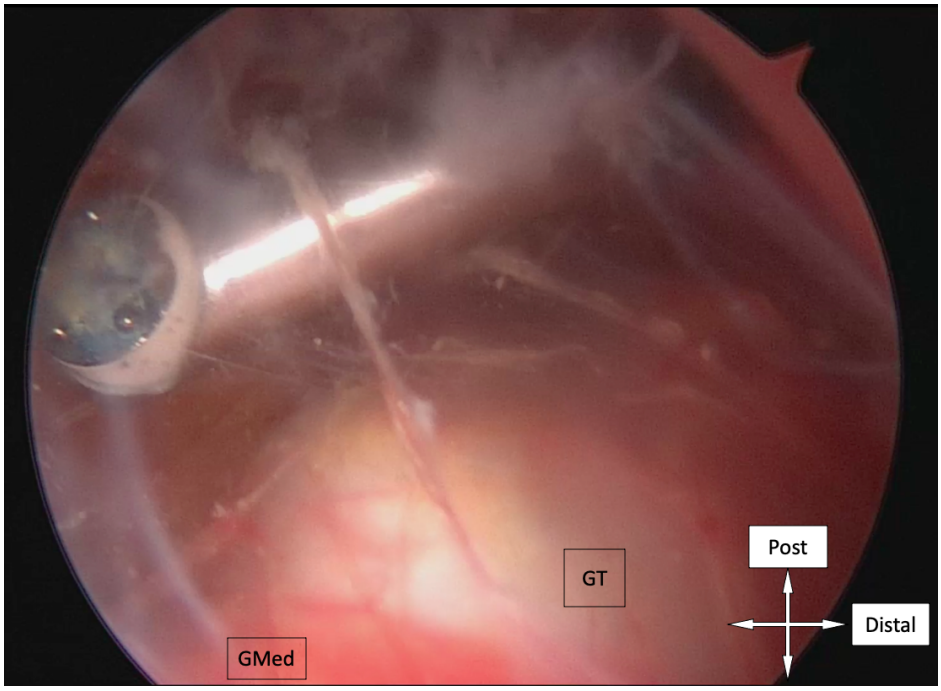


Figure 6: Trochanteric bursectomy. GT: Greater Trochanter; GMed: Gluteus Medius.

The pelvitrochanteric muscles are gradually exposed by extending the arthroscopic dissection medially [19] (Figs. 7 & 8).

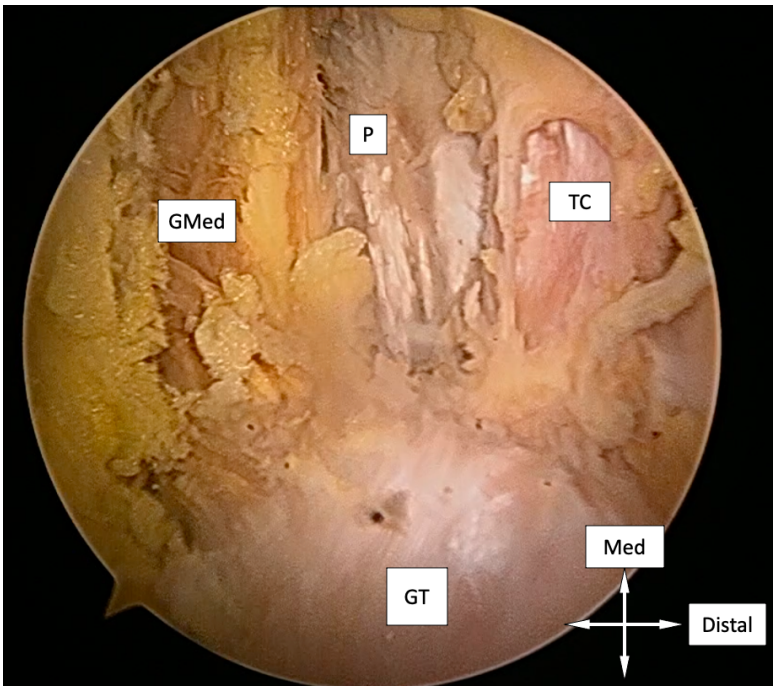


Figure 7: Proximal view of the pelvitrochanteric muscles. GT: Greater Trochanter; GMed: Gluteus Medius; TC: Triceps Coxae; P: Piriformis.

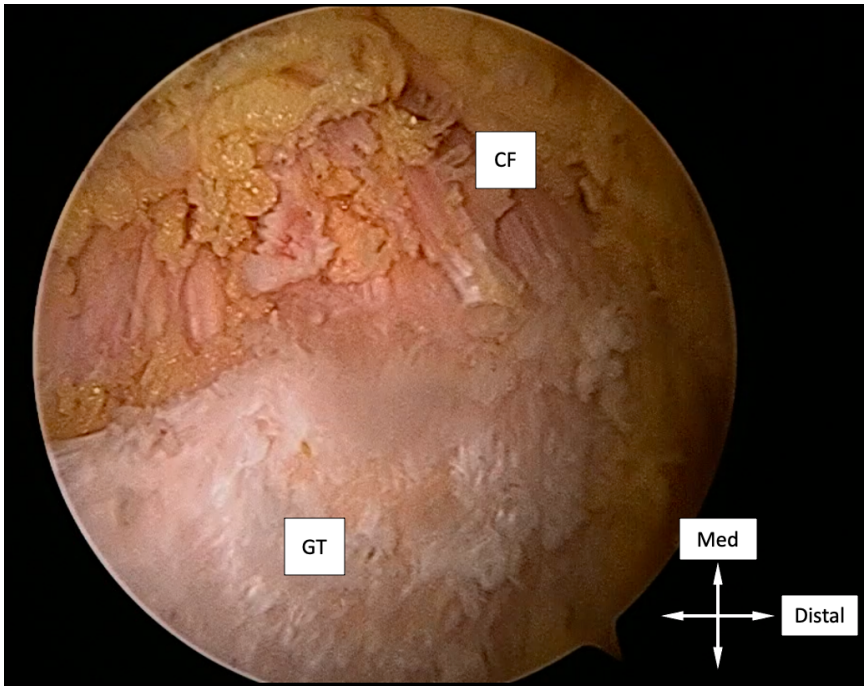


Figure 8: Distal view of the pelvitrochanteric muscles. GT: Greater Trochanter; CF: Quadratus Femoris.

Haemostasis is often required of the anastomosis between a branch of the interior gluteal artery and a branch of the posterior circumflex (Fig. 9).

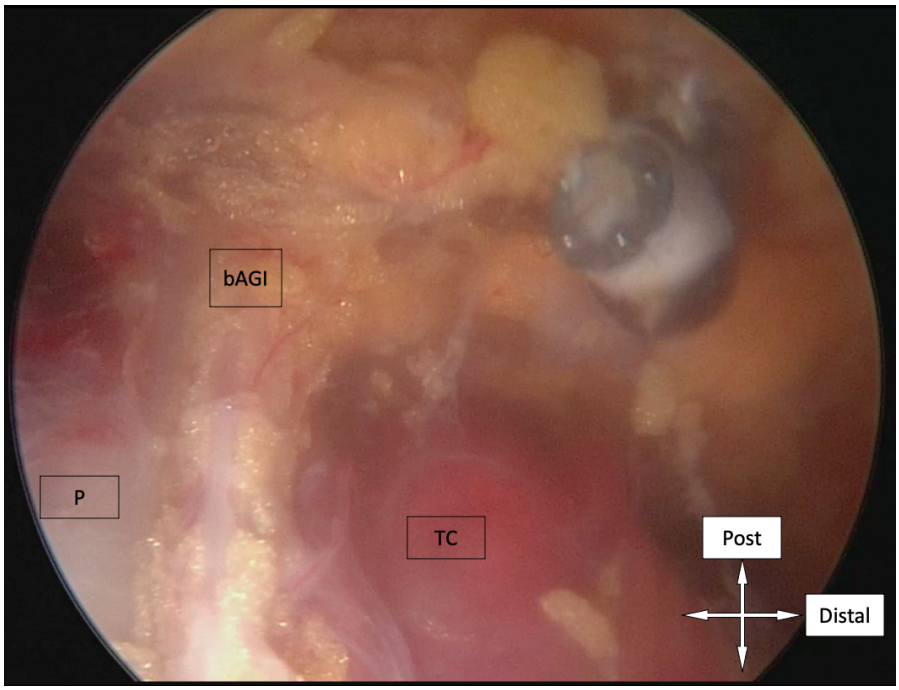


Figure 9: Haemostasis of a branch of the IGA. TC: Triceps Coxae; P: Piriformis; bAGI: branch of the inferior gluteal artery.

The piriformis, triceps coxae (gemelli-obturator complex) and quadratus femoris muscles must all be exposed, and the dissection should progress gradually, starting laterally and moving medially towards the sciatic nerve (Fig. 10).

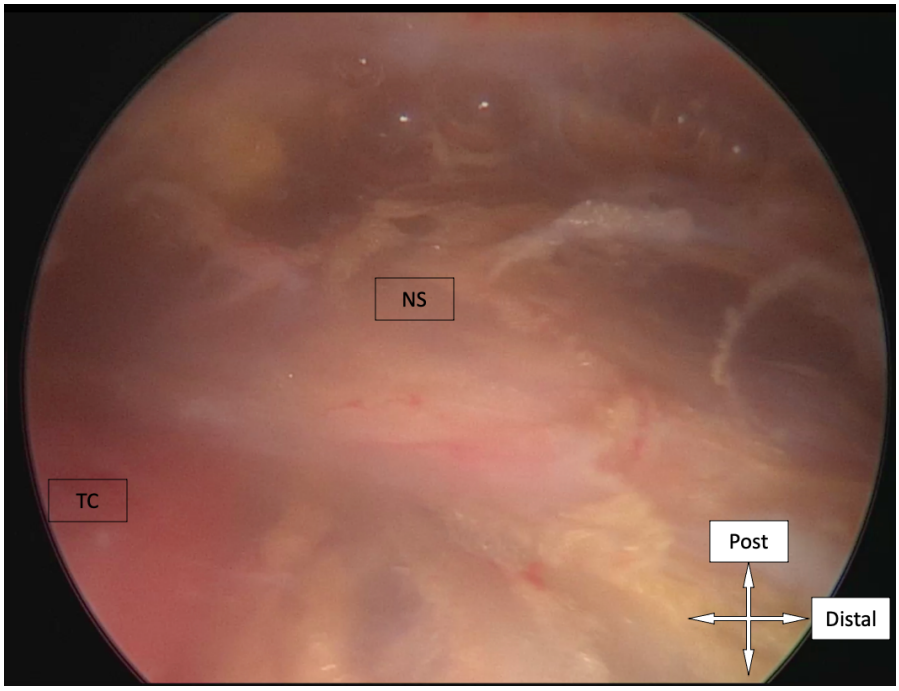


Figure 10: Exposing the sciatic nerve. NS: Sciatic Nerve; TC: Triceps Coxae.

Once the nerve can be seen, dissection should be gradual. Release any obvious fibrovascular bands (Fig. 11), then release laterally, posteriorly, anteriorly and finally medially in order to dissect the branch of the posterior cutaneous nerve of thigh (Fig. 12).

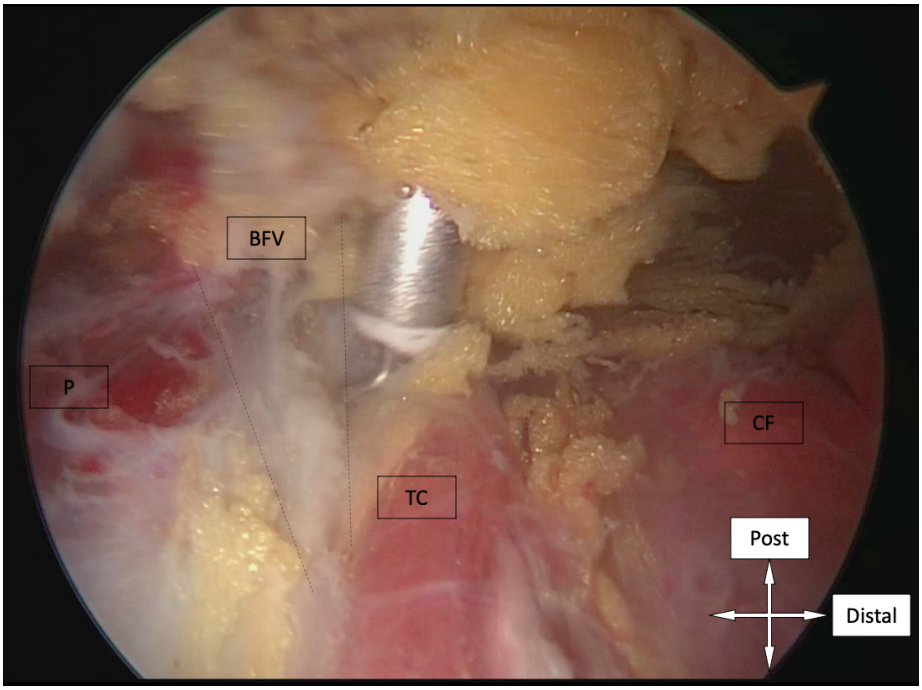


Figure 11: Cutting a fibrovascular band. BFV: Fibrovascular band; TC: Triceps Coxae; P: Piriformis; CF: Quadratus Femoris.

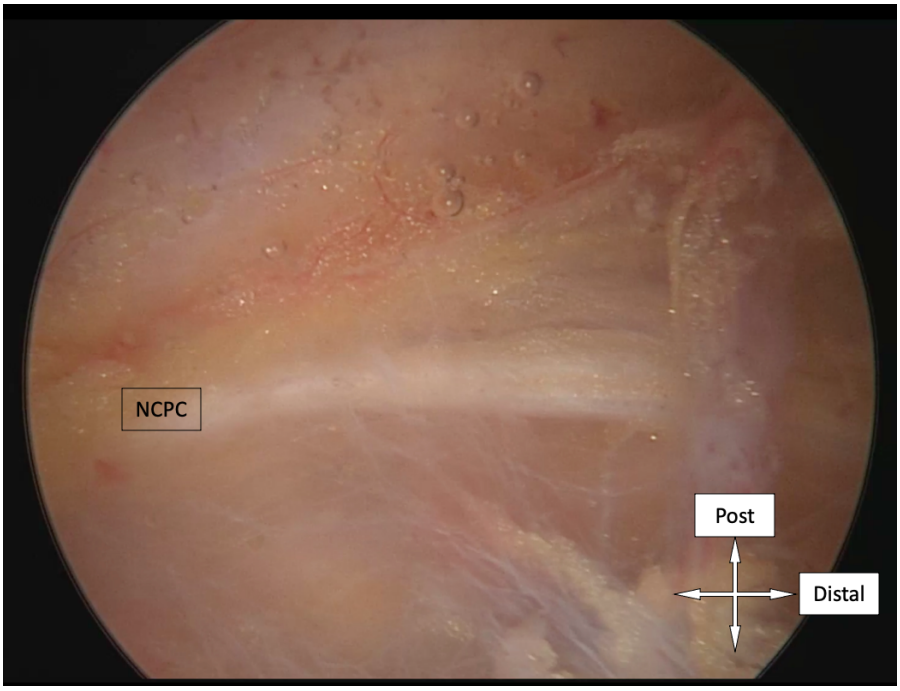


Figure 12: Releasing the branch of the posterior cutaneous nerve of thigh. NCPC: Posterior cutaneous nerve of thigh.

Once the entire mid-section of the nerve has been released, extend the dissection proximally by dissecting piriformis (Figs. 13 & 14) towards the greater sciatic notch, then distally towards the ischium (Fig. 15) [18].

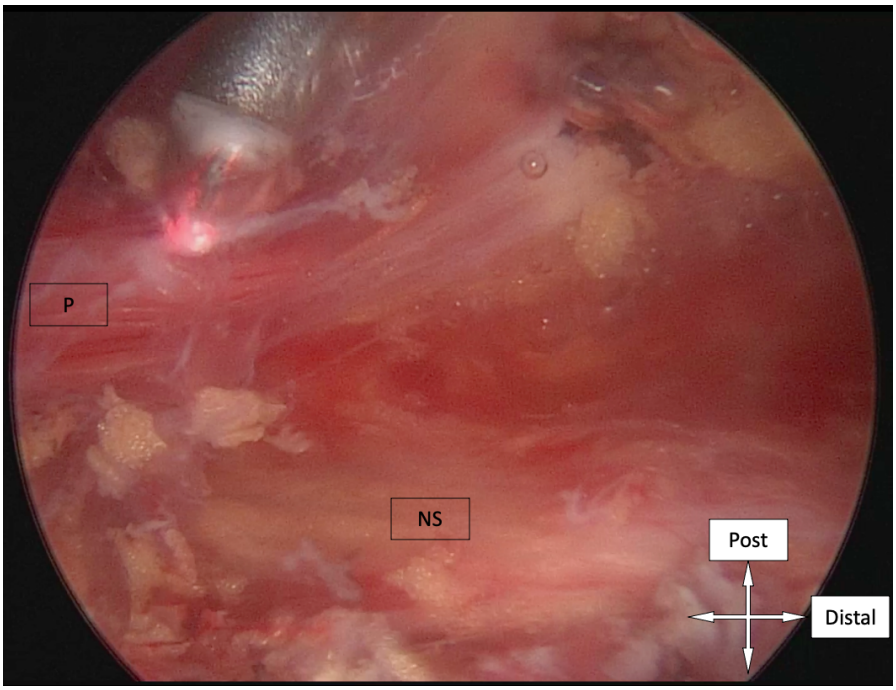


Figure 13: Proximal release of the sciatic nerve. P: Piriformis; NS: Sciatic nerve.

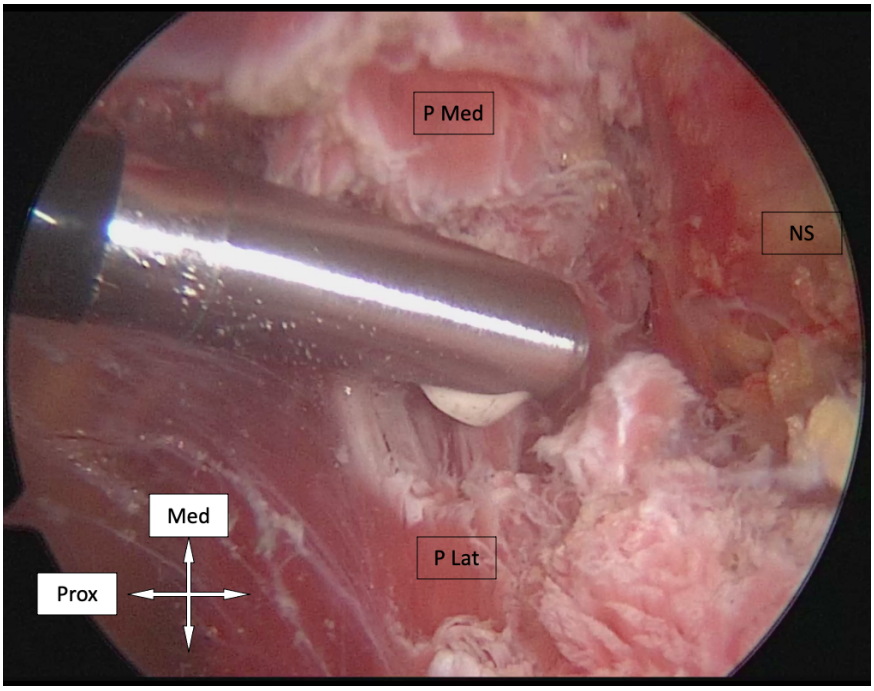


Figure 14: Dissecting piriformis; superior view. Pmed: Medial edge of piriformis; Plat: Lateral edge of piriformis; NS: sciatic nerve.

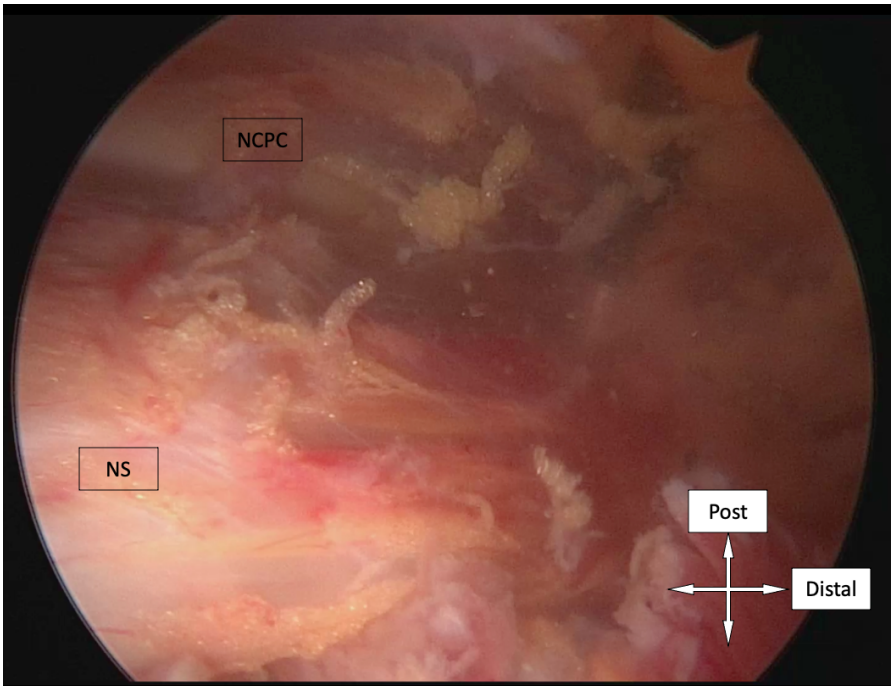


Figure 15: Distal release of the sciatic nerve. NS: Sciatic nerve; NCPC: Posterior cutaneous nerve of thigh.

4. Special equipment

Our teams have invested in special equipment for performing arthroscopy of the hip. However, shoulder arthroscopy instruments can also be used. An arthroscopy pump is needed to explore this highly vascularized region. However, pressure should remain low at approximately 30 mm Hg for most of the surgery. We usually use a 70° arthroscope specific to arthroscopy of the hip, which makes it easier to view the target regions and is especially useful when extending the nerve release to the greater notch and ischium. A special system for hip arthroscopy with a long cannula, a set of sticks and a half-cannula is useful in case of swelling of the soft tissues during the procedure. The shaver is used sparingly due to the vascularisation of the gluteal region, and radiofrequency electrodes are better suited. The flow rate should be constant whilst working with the electrode, limiting the duration of each sequence in order to avoid heat damage to the sciatic nerve. Likewise, when working close to the nerve, dissection with a blunt arthroscopy stick will avoid trauma, and the fibrovascular bands can be coagulated with the radiofrequency probe by pulling on the band to distance it from the nerve. Some authors recommend monitoring the evoked potentials of the sciatic nerve during the procedure. We have no experience of evoked potentials for this indication.

5. Judging the success of sciatic nerve release

When the nerve is first exposed, it is important to assess the quality of the perineural vessels, since regions of adhesion are poorly vascularized. Likewise, at the start of the operation, test the mobility of the nerve with rotational movements. When the hip is rotated, an adherent nerve will move less than a centimetre. In connection with the nerve release, we dissect the piriformis muscle, either at the myotendinous junction or perpendicular to the nerve if the anatomy is atypical. Once released, the nerve should be fully mobile during rotation, completely free from the posterior pelvitrochanteric muscles, and not taut during direct mobilisation (Fig. 16) [18]. Some authors use a silicone band passed through the accessory posterior portal to mobilise the nerve and check it has been released from the greater notch all the way to the ischium.

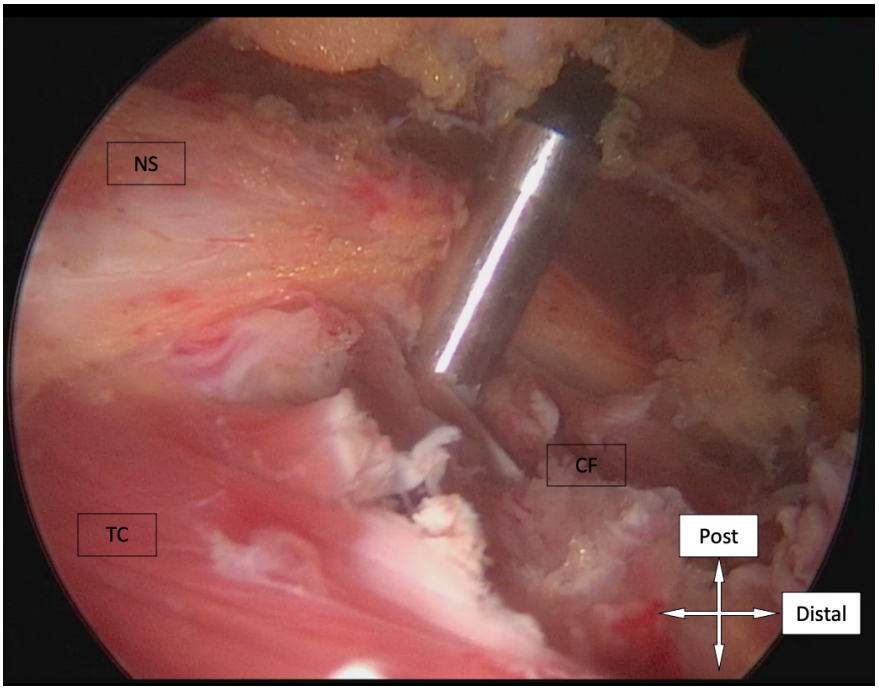
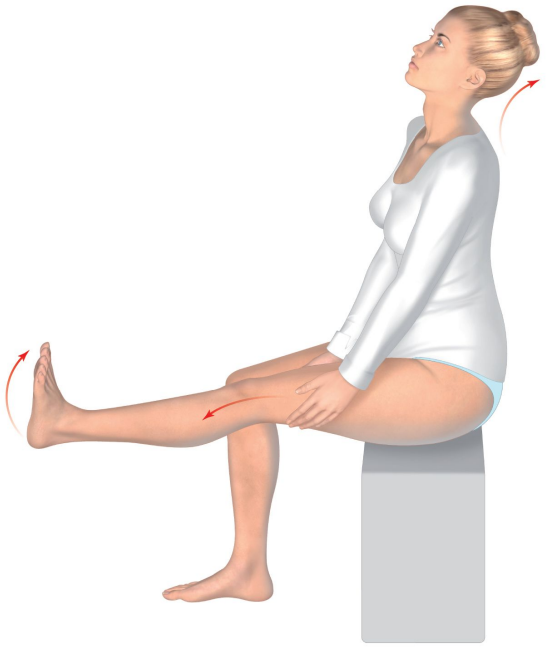


Figure 16: Testing the mobility of the sciatic nerve. NS: Sciatic Nerve; TC: Triceps Coxae; CF: Quadratus femoris.

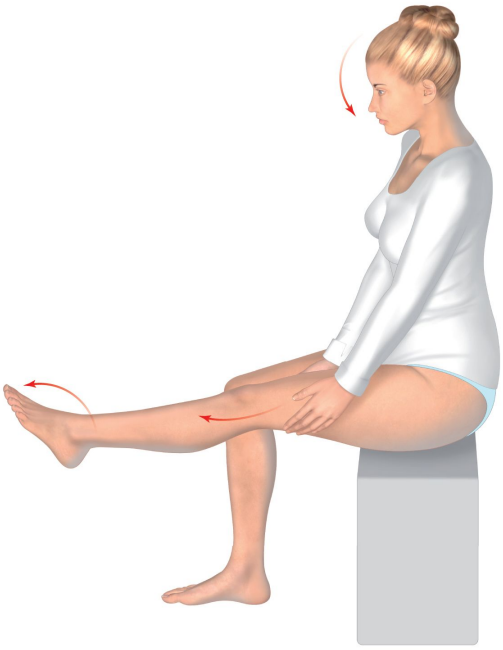
AFTER AN ENDOSCOPIC NERVE RELEASE

1. Rehabilitation

There are no particular requirements after surgery, patients may bear weight on the limb immediately, and anti-inflammatory painkillers should be given for 15 days. Some authors use a splint to limit extension of the knee and protect the nerve [24]. Patients may be advised not to bear weight and/or to use an orthosis if there has also been repair of the gluteal or hamstring muscles. Rehabilitation should begin immediately with the aim of improving movement of the nerve through the deep gluteal space, flexion of the cervical spine combined with plantar flexion of the ankle, then cervical extension/dorsal extension of the ankle whilst flexing the hip at 90° and extending the knee [24] (Fig. 17). The physiotherapy can increase after one month, depending on the pain level. The physiotherapy should also include exercises for any related pathology of the gluteal or hamstring muscles.



Figs 17a and b: Rehabilitation should begin immediately and aim to improve movement of the nerve through the deep gluteal space using cervical spine extension combined with dorsal extension of the ankle (17a) followed by cervical spine flexion and plantar flexion of the ankle (17b) whilst flexing the hip at 90° and extending the knee.



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2. Short-term outcomes

Our series of two surgeons and nine patients produced a positive outcome for seven cases (77.8%) with significant improvements in pain and functional scores. Six out of the nine patients (66.7%) would be happy to undergo the operation on the other side if the same symptoms were to appear. Two patients (22.2%) experienced no improvement post-surgery, and one patient (11.1%) relapsed within three months, requiring open revision surgery to repeat the nerve release and place a synovial patch around the sciatic nerve. There were no minor or major complications and no sciatic nerve damage. All patients had consolidated after an average of 6 months. These results are encouraging and imply a long-term solution for patients with a failed diagnosis and treatment.

CONCLUSION

In our practice, once a diagnosis is confirmed, an endoscopic piriformis tenotomy with sciatic nerve release is usually reliable, effective and reproducible. Although tricky, this surgery is achievable for a surgeon trained in hip arthroscopy. The greatest difficulty lies in patient selection and is currently the primary cause of failure for this procedure.

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