Arthroscopic Decompression of Greater Trochanteric Sciatic Nerve Impingement

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Abstract: Therapeutic extra-articular hip endoscopy is an effective treatment of greater trochanteric sciatic nerve impingement. We describe in detail technical pearls of the procedure including positioning, portal placement, and steps to obtaining adequate decompression while avoiding iatrogenic nerve injury.

Advances in hip arthroscopy have led to a continuing expansion in the indications for arthroscopy for hip pathology. Among other conditions, extra-articular hip arthroscopy has been described in the use of sciatic nerve entrapment with favorable results.[1,2] Greater trochanteric decompression of sciatic nerve entrapment has not been well examined. Extra-articular hip endoscopy is commonly performed with the patient in the lateral or supine position. It can be used as a diagnostic modality when a patient's pathology is unclear. This can be the case for sciatic nerve entrapment. Major complications include direct trauma to the major neurovascular structures, iatrogenic nerve injury, and damage to surrounding structures.[3] These, however, are often transient, and rarely persist.

Sciatic nerve impingement has been attributed to multiple factors, including vertebral defects, fibrous bands with blood vessels, gluteal, piriformis, and hamstring musculature, and the greater trochanter.[1,4] Differentiating these causes of impingement can often be difficult. Patients will often present with dysesthias and radiculopathic-type pain to their lower extremity in the sciatic nerve distribution. Regarding greater trochanteric impingement, a FABER test can potentially produce pain by compressing the sciatic nerve. This is performed by flexing the patient's symptomatic hip and knee while he or she is lying supine. The foot is placed on the examination table or the patient's contralateral thigh and the leg is abducted (Fig 1). Pain would then radiate down the posterior thigh and leg during a positive examination. In this maneuver, the greater trochanter externally rotates and, thus, compresses the sciatic nerve in at-risk patients. There have not been any studies evaluating the validity of this examination for sciatic nerve compression. It has, however, been evaluated for intra-articular pathology of the hip and sacroiliac joint.[5]

Excluding other causes of sciatic nerve impingement is critical, as these etiologies will often present with similar symptoms. Lumbar spinal pathology can be ruled out by performing a thorough examination as well as through advanced imaging, including magnetic resonance imaging.[6] Entrapment by the piriformis can be ruled out by physical examination findings as well. The active piriformis compression examination is performed with the patient lying supine and crossing his or her affected extremity to the contralateral thigh and placing his or her foot on the examining table. The patient will then abduct his knee against the examiner's hand, which is applying an adduction force (Fig 2).[1,5] Pain to the posterior thigh and leg would indicate a positive examination finding. This clinical maneuver has been found to be 78% to 91% sensitive and 80% specific in diagnosing piriformis compression of the sciatic nerve. The seated piriformis stretch test is conducted with the patient sitting upright, with his or her affected extremity flexed at the hip at 90° with the knee fully extended. The patient will then

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Fig 1. This image demonstrates the FABER test to assess for sciatic nerve impingement. The lower extremity is placed in flexion, abduction, and external rotation. Dysesthesia and pain in sciatic nerve distribution indicates a positive test.

internally rotate the lower extremity (Fig 3). Positive examination findings would show pain propagating down the posterior thigh and leg. The seated piriformis stretch test has been found to be 52% sensitive and 90% specific.[1,5] An MRI of the pelvis will often show structural causes of impingement by a thick fibrous band, hypertrophied hamstrings, or the greater trochanter. Often, the sciatic nerve and surrounding tissue will have signal enhancement on T2-weighted images.

The optimal treatment of sciatic nerve impingement depends on many factors, including patient's physical characteristics and demands, but more importantly the concurrent pathology. Extra-articular arthroscopic greater trochanteric decompression leads to improved patient symptoms with good efficacy if it is the primary cause of entrapment. To our knowledge, there has been no report in the literature describing an endoscopic decompression of the sciatic nerve due to greater trochanteric impingement.

Surgical Technique

Patient Setup

The patient is placed supine on the operating room table, as seen in Video 1. We recommend general anesthesia without regional, spinal, or epidural anesthesia for all perisciatic procedures. This will allow the surgeon to obtain a reliable postoperative neurovascular examination. The lower extremity is prepared and draped in a standard sterile fashion. Because this procedure is extra-articular, traction is not used.

Proximal and Distal Posterior Accessory Portal Placement

The greater trochanter and anterior superior iliac spine are carefully palpated and marked. The greater trochanteric bursa is entered with proximal and distal trochanteric portals in line with the longitudinal femoral axis. With direct visualization, a proximal posterior accessory portal is created with an incision made 5 cm posterior to the greater trochanter. This is done with the lower extremity out of traction and in neutral rotation. A blunt trocar is introduced, followed by a 70° arthroscope (Smith & Nephew Endoscopy, Andover, MA). The distal posterior accessory portal (DPAP) is then placed under direct visualization. This is located 5 cm distal to the proximal posterior accessory portal (Fig 4). The DPAP will be used as the working portal. Internal rotation of the femur may be applied to expose the posterior border of the greater trochanter. The arthroscopic fluid pressure is maintained at 45 to 55 mmHg at medium flow.

Fig 2. This image demonstrates the active piriformis compression examination. The patient is lying supine and crossing her affected extremity to the contralateral thigh while placing her foot on the examination table. The patient then abducts her knee against the examiner's hand. Pain to the posterior thigh and leg would indicate a positive test as this represents the piriformis compressing the sciatic nerve.

Assessment of Sciatic Nerve Impingement

A thorough evaluation of the peritrochanteric joint space is performed. By placing the lower extremity in flexion, abduction, and external rotation, it is possible to see the posterior aspect of the greater trochanter compressing the sciatic nerve (Fig 5, Video 1). A blunt switching stick (Smith & Nephew Endoscopy) can be inserted into the DPAP and used to further characterize the contact.

Sciatic Nerve Decompression

With the lower extremity internally rotated, the shaver (4.4-mm full-radius concave shaver; Smith & Nephew Endoscopy) is now introduced into the DPAP and used to probe the trochanteric ridge that is the source of the impingement (Fig 6, Video 1). It is then used to remove the overlying tissue. This is done under low suction to prevent iatrogenic injury to the sciatic nerve. A flexible radiofrequency wand (Dyonics Eflex; Smith & Nephew) is used to control the bleeding through the DPAP (Fig 7, Video 1). When the periosteum is well visualized, a burr (180-mm-long × 5.5-mm burr; Smith & Nephew Endoscopy) is used to decompress the bony ridge though the DPAP (Fig 8, Video 1). We prefer to use the burr on the reverse setting to lower the risk of soft tissue obstruction and iatrogenic nerve injury. To evaluate if sufficient decompression has been achieved, a dynamic examination is performed. In addition, fluoroscopy can be used to evaluate the amount and contour of the proximal femur after the decompression. The lower extremity is externally rotated to examine if the greater trochanter is still in contact with the sciatic nerve (Fig 9, Video 1). Further decompression is performed until no further bony contact of the sciatic nerve is evident through this maneuver. It is best to be efficient when performing the decompression to prevent fluid extravasation in the posterior compartment, which could irritate the sciatic nerve.

Irrigation, Closure, and Casting

The arthroscopic instrumentation is removed, and the skin is closed with buried subcutaneous no. 3-0 Monocryl sutures (Ethicon, Johnson&Johnson,

Fig 3. The seated piriformis stretch test is demonstrated in this image. While sitting, the hip is flexed, the knee is extended, and the patient has her lower extremity rotated from external to internal rotation. Pain propagating down the posterior thigh while the leg is internally rotated is a positive test. This represents the piriformis compressing the sciatic nerve.

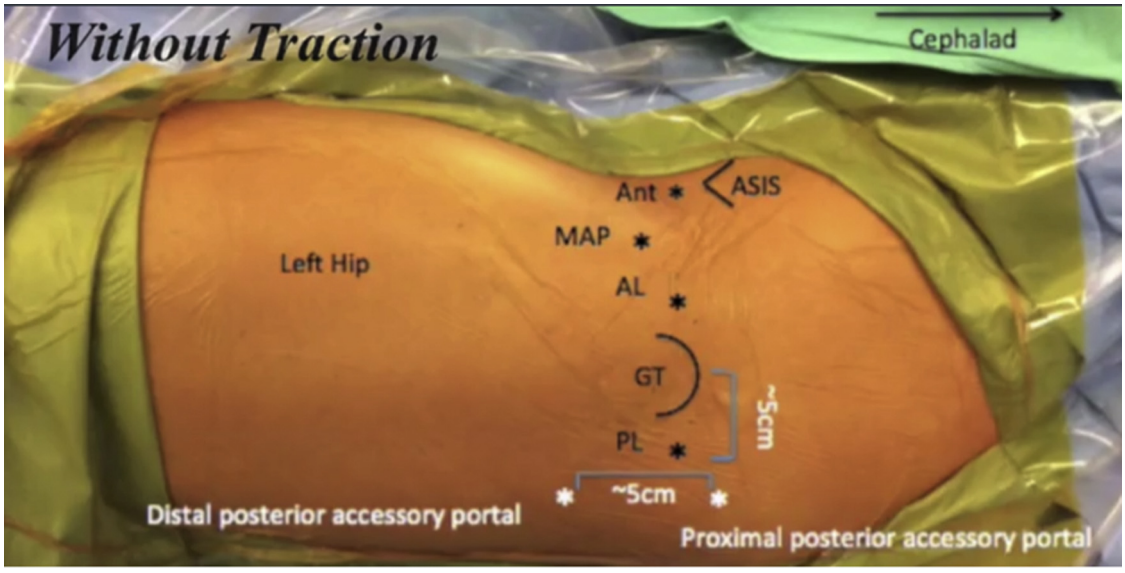

Fig 4. This image demonstrates the patient positioning and portal placement during sciatic nerve decompression. The patient is in the supine position with the left hip marked. The greater trochanter and anterior superior iliac spine are palpated and marked. The proximal and distal trochanteric portals are made in line with the longitudinal femoral axis. The proximal posterior accessory portal is created with an incision 5 cm posterior to the greater trochanter. The distal posterior accessory portal is placed 5 cm distal to the PPAP. (AL, anterolateral portal; Ant, anterior portal placement; ASIS, anterior superior iliac spine; GT, greater tuberosity of the femur; MAP, modified anterior portal; PL, posterolateral portal placement; PPAP, proximal posterior accessory portal.)

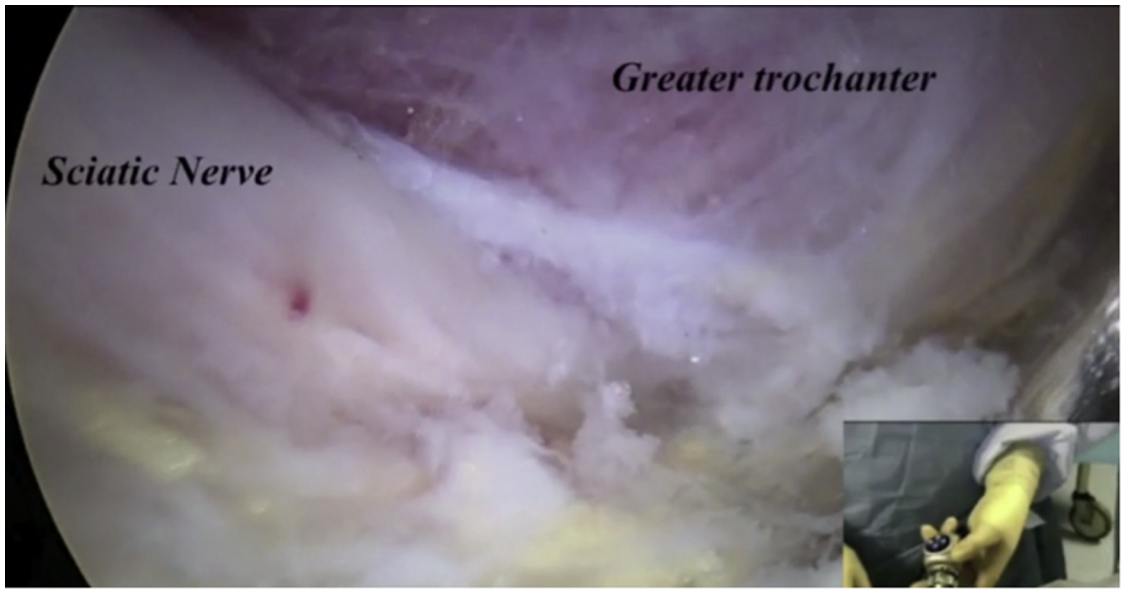

Fig 5. In this image, sciatic nerve impingement is viewed arthroscopically from the posterior aspect of the greater trochanter using a 70° arthroscope in the left proximal posterior accessory portal (PPAP). The patient is supine. The lower extremity is out of traction and in a neutral position.

Parsippany, NJ). Occlusive dry sterile dressings are applied.

Postoperative Care

The patient is made weight bearing as tolerated for isolated sciatic nerve decompressions. At the first clinic visit at 2 weeks, the patient is assessed for wound and neurovascular function. Sciatic symptoms may take up to 18 months to resolve in chronic cases. We recommend providing 500 mg of Naproxen twice a day for 4 to 6 weeks to prevent heterotopic ossification around the sciatic nerve.

Discussion

Impingement of the sciatic nerve can originate from many anatomic locations. Because of the difficulty in diagnosing the origin of the pain, the term *deep gluteal*

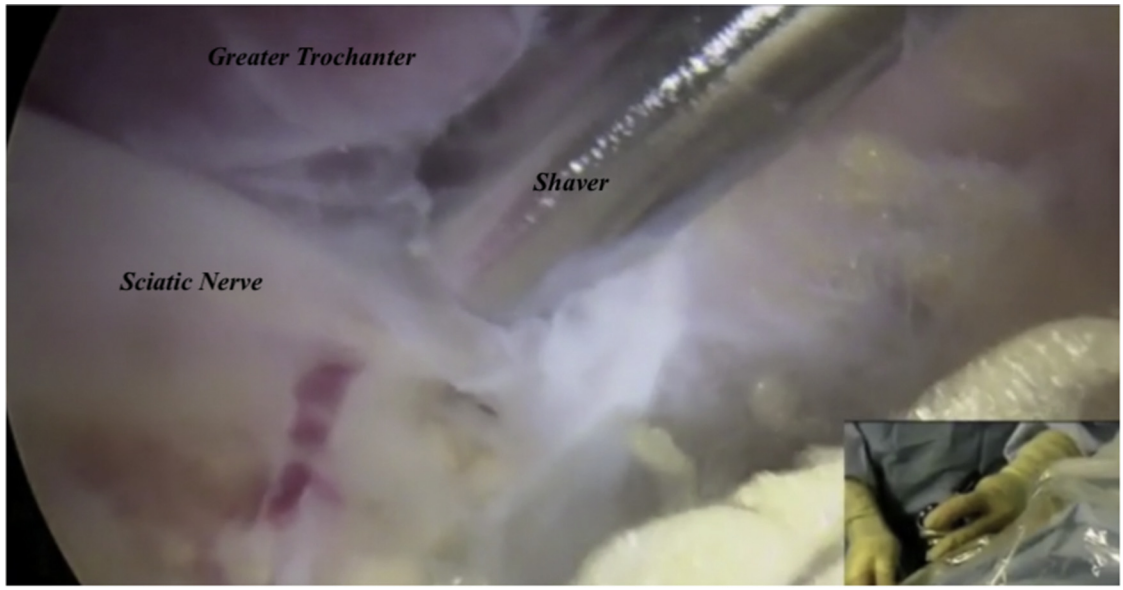

Fig 6. The patient is in the supine position with visualization using the 70° arthroscope in the left proximal posterior accessory portal (PPAP). The shaver is inserted in the distal posterior accessory portal (DPAP) and placed on low suction to decompress the sciatic nerve.

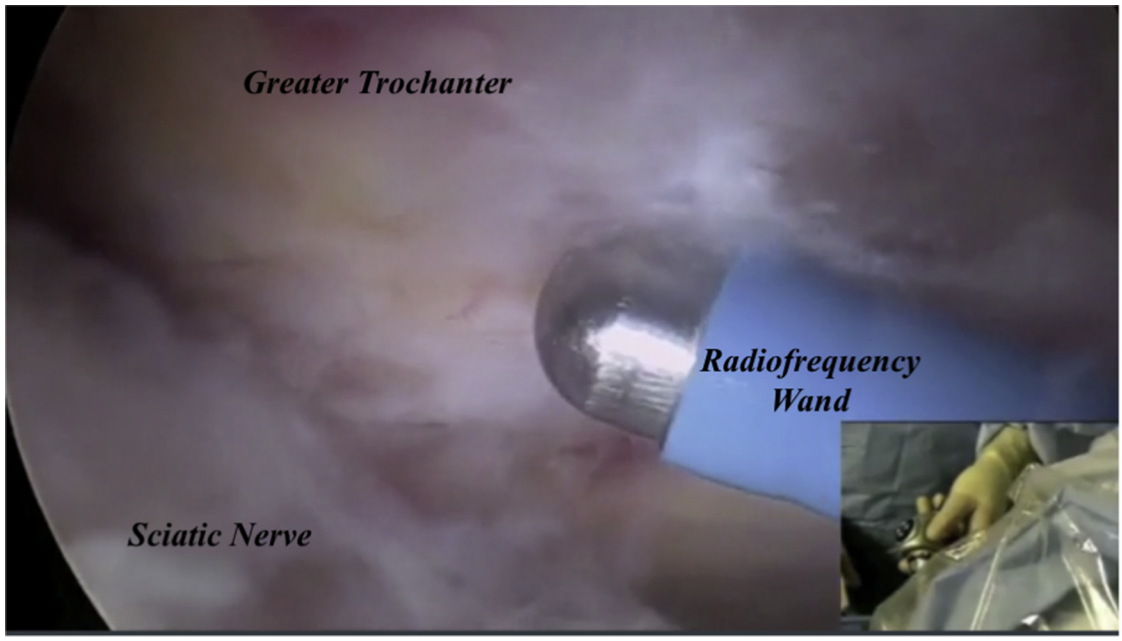

Fig 7. The patient is in the supine position with visualization using the 70° arthroscope in the left proximal posterior accessory portal (PPAP). A radiofrequency wand is introduced into the distal posterior accessory portal (DPAP) to control bleeding.

syndrome is used for pain and/or dysesthesias in the buttock area, hip, or posterior thigh due to non-discogenic sciatic nerve entrapment in the subgluteal space.[6] Endoscopic periarticular hip endoscopy has been supported as a viable technique to diagnose and treat deep gluteal syndrome.[7] Sciatic nerve entrapment has been described as due to fibrous bands, piriformis syndrome, gemelli compression, obturator internus syndrome, quadratus femoris compression, ischiofemoral impingement, and gluteal tendon compression. Uncommonly though, entrapment of the sciatic nerve can be directly visualized with external rotation of the femur.[6]

Avoiding iatrogenic damage to the nerve is of utmost importance during this procedure. Three things we recommend to assist in avoiding nerve damage include direct visualization of the sciatic nerve with appropriate portal placement, using the

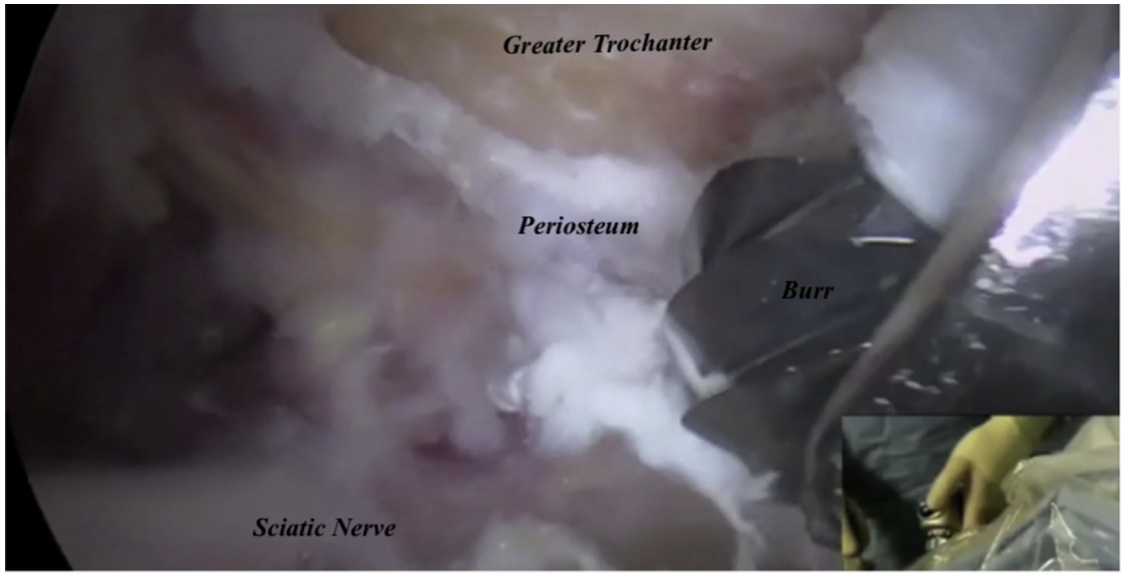

Fig 8. With the patient supine, the 70° arthroscope is in the proximal posterior accessory portal (PPAP), and a burr is used in the distal posterior accessory portal (DPAP) to decompress the bony ridge of the left greater trochanter. We recommend running the burr on reverse to avoid soft tissue incarceration and iatrogenic nerve injury.

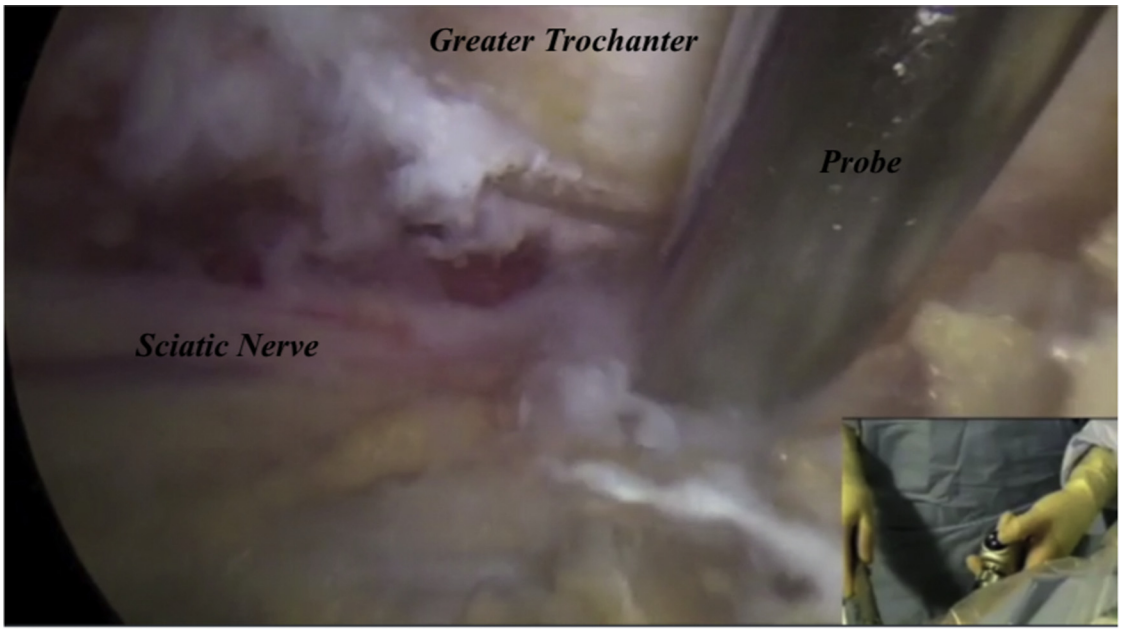

Fig 9. The sciatic nerve is reexamined after decompression during external rotation of the lower extremity. The patient is supine. Using the Left proximal posterior accessory portal (PPAP) for visualization and a probe in the distal posterior accessory portal (DPAP), the sciatic nerve is observed and the leg is externally rotated to examine if the greater trochanter is still in contact.

burr on reverse rotation, and maintaining the femur in internal rotation during osseous decompression. Other recommendations include documenting nerve conduction after trochanteric decompression and ensuring adequate posterior retraction of the nerve (Table 1).[8] Additional limitations of this technique involve surgeon experience and the need for fluoroscopy. Surgeon experience is relatively limited in hip arthroscopy, but is critical to the success of this procedure. Furthermore, adequate resection of the greater trochanter cannot always be appropriately visualized via the arthroscope. The use of fluoroscopy is needed in those cases to ensure appropriate decompression (Table 2).

Voos et al.[2] and Martin et al.[1] have described obtaining access to the peritrochanteric space. These techniques have focused largely on anterior entry, whereas we prefer 2 posterior accessory portals. This enables reproducible visualization of the critical anatomy. The superficial anatomy, and when needed, fluoroscopy, serves as a guide for portal placement. Given that it is a contained anatomic space, the peritrochanteric region can be endoscopically evaluated and treated. As is seen in the video, adequate visualization of the sciatic nerve can be obtained.

Table 1. Surgical Techniques to Avoid Iatrogenic Sciatic Nerve Injury During Greater Trochanteric Decompression

Pearls	Pitfalls
1. Directly visualize the sciatic nerve	1. Poor visualization of sciatic nerve
2. Use the burr in reverse to minimize soft-tissue incarceration	2. Use of regional anesthetic that may interfere with postoperative sciatic nerve examination
3. Maintain the femur in internal rotation during decompression	3. Risk of heterotopic ossification around the sciatic nerve
4. Document nerve conduction after trochanteric decompression	4. Increased operative time could lead to fluid extravasation around the sciatic nerve
5. Ensure adequate retraction of the sciatic nerve posteriorly	

Table 2. Advantages and Disadvantages to Using an Arthroscopic Approach to Sciatic Nerve Greater Tuberosity Decompression

Advantages	Disadvantages
1. It is a minimally invasive approach.	1. It can be difficult to retract sciatic nerve out of the operative field.
2. Dynamic evaluation of sciatic nerve compression is possible.	2. It requires surgeon experience with hip arthroscopy.
3. Direct visualization of sciatic nerve decompression is possible.	3. Fluoroscopic imaging to confirm adequate resection may be necessary.

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