Technical Note

Endoscopic Technique: Sciatic Neurolysis and Piriformis Tendon Release for Treating Piriformis Syndrome

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Abstract: Piriformis syndrome (PS) is an underdiagnosed condition, caused by entrapment of the sciatic nerve by the piriformis muscle tendon and adhesions in the deep gluteal space. We present a step-by-step endoscopic technique with the patient in a prone position through a posterior approach. This approach provides improved orientation for tracking the sciatic nerve from distal to proximal, facilitating the release of all adhesions and concluding with a piriformis tendon release. This method aims to enhance surgical safety during the procedure.

Deep gluteal syndrome (DGS) is an underdiagnosed condition, caused by an extraspinal entrapment of the sciatic nerve in the deep gluteal space.[1-3] The sciatic nerve is the primary structure content in the deep gluteal space, exits the pelvis through the greater sciatic notch, and runs deep in relation to the piriformis muscle.

Piriformis syndrome (PS) occurs when the adjacent piriformis muscle compresses or irritates the sciatic nerve in this region, leading to symptoms such as buttock and leg pain, altered sensations along the nerve's path, and discomfort while seated.[2,4] Diagnosis typically involves a combination of symptoms, supported by advanced imaging, and guided diagnostic and therapeutic injections.[1,2,5-7]

Traditionally, surgical interventions such as sciatic neurolysis and piriformis tenotomy have been the most accepted treatments, with both open and endoscopic techniques showing favorable outcomes.[5,8-11] However, recently introduced endoscopic techniques involve a supine patient with a lateral approach at the level of the greater trochanter of the femur.[11-13] This approach poses a higher risk to adjacent neurovascular structures during the dissection process.

We describe a step-by-step endoscopic technique with the patient in a prone position through a posterior approach. This approach provides improved orientation for tracking the sciatic nerve from distal to proximal, facilitating the release of all adhesions and concluding with a piriformis tendon release. This method aims to enhance surgical safety during the procedure.

Surgical Technique

Technique Video 1 describes the endoscopic sciatic neurolysis and piriformis release technique in detail. This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki. This study was carried out in accordance with relevant regulations of the U.S. Health Insurance Portability and Accountability Act. Details that might disclose the identity of the subjects under study have been omitted. This study was approved by the institutional review board (IRB ID: 5276).

Positioning

After obtaining and signing the surgical informed consent, the appropriate extremity is identified and marked in the preoperative holding zone; subsequently, the patient is transported to the operating room. After administering general anesthesia without paralysis, the

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patient is moved onto the operating table and positioned in a standard prone position. Sufficient padding is provided for all bony prominences. It is important to ensure easy access for the C-arm of fluoroscopy in a posterior-anterior view. The surgical limb is prepared with ChloraPrep (Becton Dickinson, Franklin Lakes, NJ) and draped to enable unrestricted movement. The surgical field is covered with Ioban (3M Corporation, Maplewood, MN; Fig 1).

Fig 1. Positioning: patient is placed into the prone position. The left leg is draped in a sterile normal fashion. A padded roll is placed over the chest. All bony prominences are well padded.

Surgical Approach

Under fluoroscopy, the distal portal is marked at the center of the ischial tubercle. The proximal portal is positioned 2 to 3 cm superior and 2 cm medial from the distal portal, with an additional proximal portal marked 2 to 3 cm superior to the previous one if needed during the procedure. This configuration allows for easy triangulation between the arthroscope and instruments (Fig 2).

To ensure easy access to the deep gluteal space, spinal needles inserted through the marked portals should strike the ischial tuberosity at a 30° to 40° angle to the vertical plane. A 30° scope with a blunt trocar is introduced into the distal portal, aiming for the distal tip of the ischial tuberosity. A fluid pump (Arthrex, Naples, FL) set at 40 mm Hg is used to expand the deep gluteal space.

Step 1: starting by identifying the ischial tubercle is important for orientation confirmation. Dissection medially to identify the conjoint tendon of the hamstring muscles is crucial for further orientation, with the sciatic nerve located just lateral to it (Fig 3). Step 2: once the sciatic nerve is fully identified, careful neurolysis around the nerve is then performed with a mechanical shaver to release and allow gentle movement. Step 3: the nerve is then followed proximally into the greater sciatic notch, with careful attention paid to surrounding neurovascular structures such as the inferior gluteal nerve at the inferior border of the piriformis muscle and branches of the inferior gluteal artery as they exit the greater sciatic notch. Once proximal neurolysis is completed, the nerve can be visualized traveling under the piriformis tendon. Step 4: a piriformis tenotomy is performed to release the entrapment of the sciatic nerve. Knee flexion and hip internal rotation help pull the nerve away from the tendon (Fig 4). The final step involves ensuring that the nerve is free along its path, followed by the removal of arthroscopic fluid. Throughout the dissection process, it is important for the assistant to keep a hand on the foot, reporting any movement that may indicate stimulation of the nerve.

Postoperative Rehabilitation Protocol

The postoperative rehabilitation protocol begins by allowing patients to bear partial weight, while also instructing them to use crutches for assistance in walking until they achieve gait stability for the first 2 weeks. The range of motion of the hip is restricted to

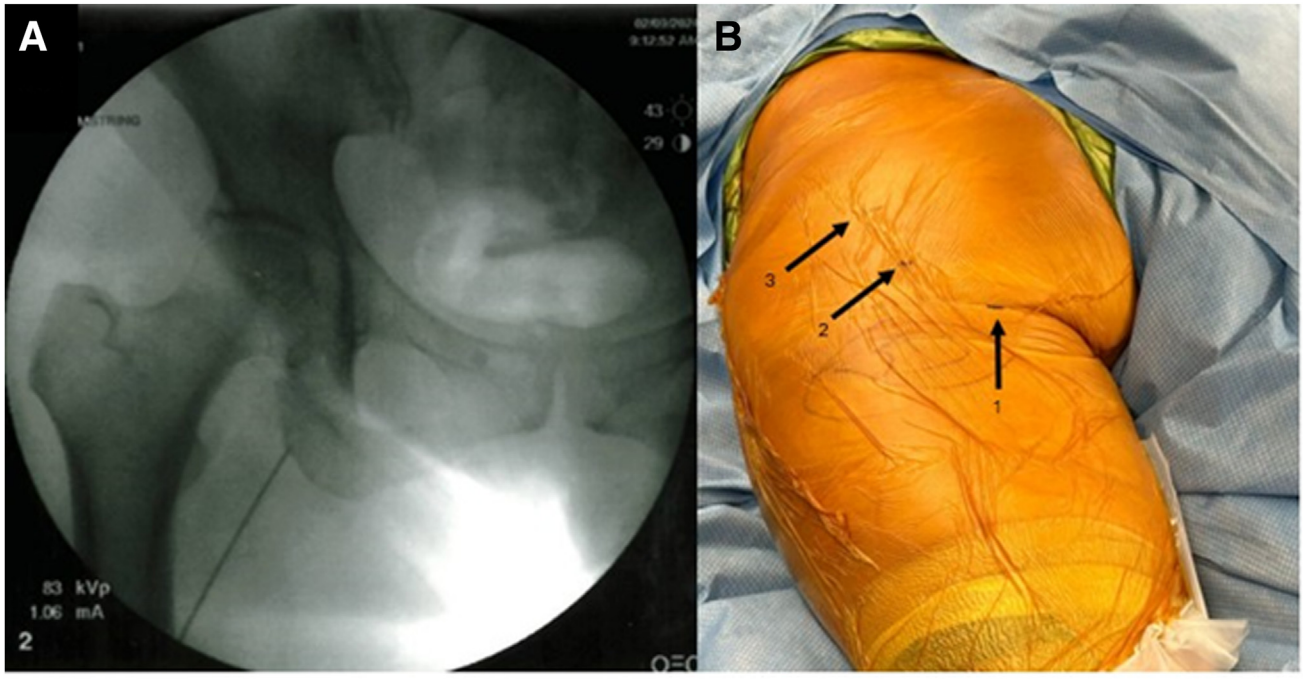

Fig 2. (A) Posterior-anterior fluoroscopy view of the left hip; the distal portal is marked at the ischial tubercle (1). (B) Left hip: the proximal portal is positioned 2 to 3 cm superior and 2 cm medial from the distal portal (2); an additional proximal portal is then marked 2 to 3 cm superior to the previous one (3).

0° to 90° with a DonJoy VersaROM Hip Brace (Enovis, Wilmington, DE). Therapy then focuses on achieving strength and full range of motion.

Discussion

Piriformis syndrome is a rare condition, but endoscopic or open surgical decompression is considered for patients with persistent or recurrent symptoms after conservative treatment. By addressing this pathology endoscopically, one minimizes the comorbidities associated with open surgery. Previous reports, with a supine patient and a lateral entry portal, have shown positive outcomes. &&Ilizaliturri et al.[13] reported on a cohort of 15 patients who underwent endoscopic release with a minimum follow-up of 2 years, showing a significant improvement in modified Harris Hip Score and visual analog scale for pain.

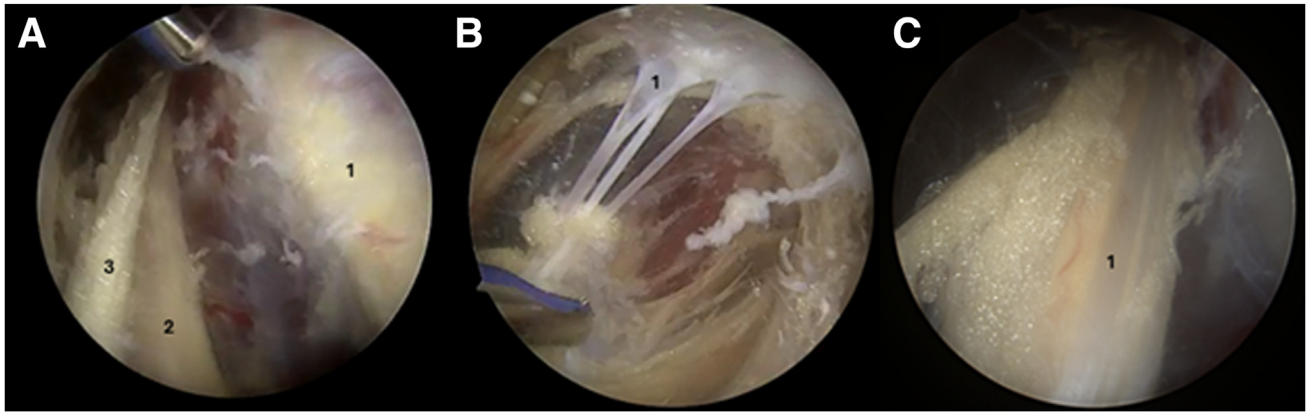

Fig 3. Left hip, Distal portal view. Intraoperative images. (A) Distal anatomic landmarks: (1) hamstring conjoint tendon, (2) sciatic nerve, (3) adhesions surrounding the sciatic nerve. (B, 1) Adhesions. (C, 1) Sciatic nerve after neurolysis.

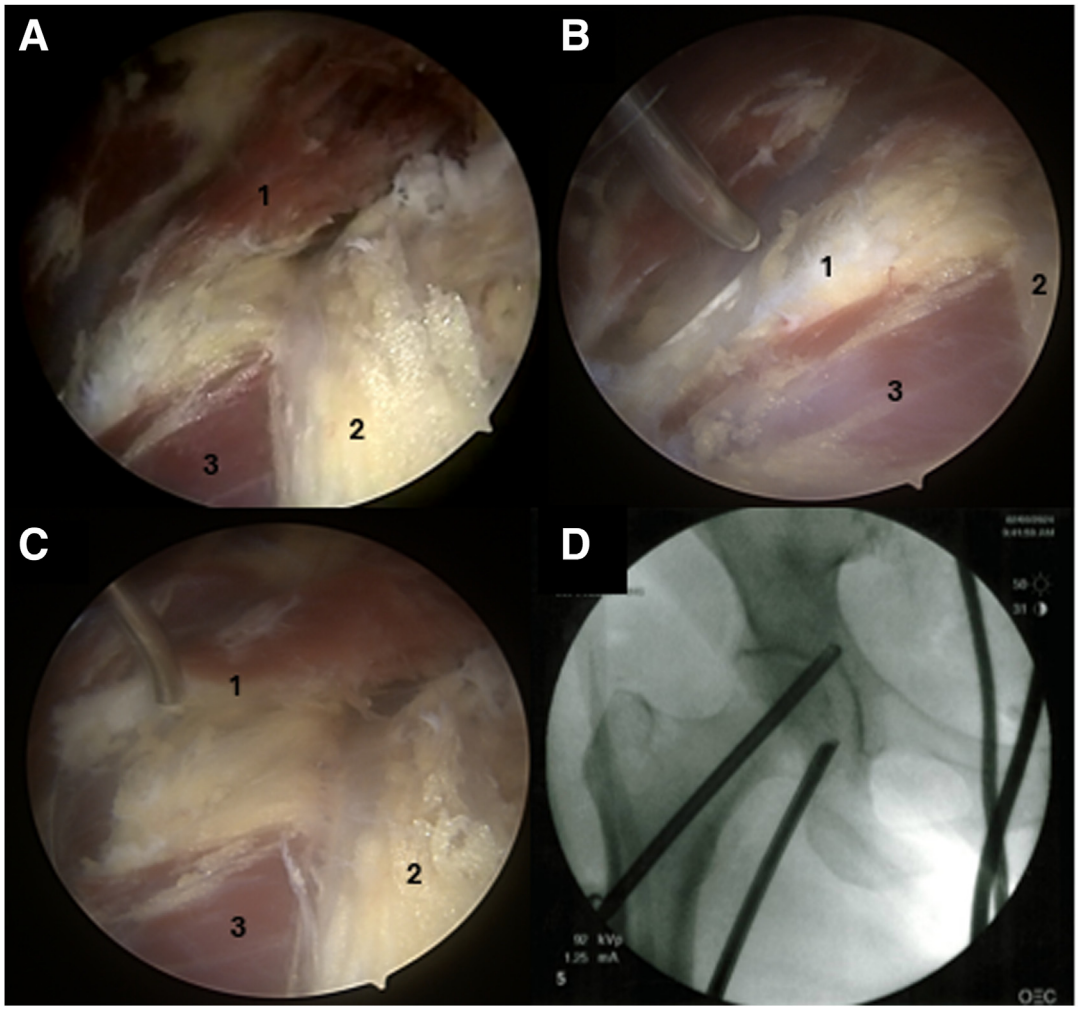

Fig 4. Left hip: (A) Proximal anatomic landmarks. (B) Dissection and release of the piriformis tendon from the sciatic nerve. (C) Post tenotomy of the piriformis tendon. (D) Fluoroscopic localization of neurolysis to the level of the sciatic notch. (1) Piriformis muscle and tendon, (2) sciatic nerve, (3) quadratus femoris muscle.

Our technique presents an alternative method for sciatic nerve neurolysis and piriformis tendon release, aiming to refine existing techniques. The prone position approach allows for straightforward access to the deep gluteal space, enabling full control and visualization of the sciatic nerve from the lesser trochanter to the greater sciatic notch. Additionally, the technique prevents extensive dissection near neurovascular structures as seen with lateral portals. The advantages and disadvantages of the technique, as well as technical pearls and pitfalls, are described in Tables 1 and 2. In conclusion, this method presents a direct approach that aims to increase surgical efficiency, diminish potential risks, and facilitate access to the deep gluteal space.

Table 1. Advantages and Disadvantages of Prone Position Endoscopic Sciatic Neurolysis and Piriformis Tendon Release

Advantages	Disadvantages
Easy direct access	Patient positioning may take longer
Appropriate visualization of the path of the sciatic nerve, in the deep gluteal space	Does not allow intra-articular treatment in the same setup
Minimizes the risk of neurovascular damage of surrounding structures compared with the supine endoscopic approach or open surgery	
Makes it easy to address concomitant pathology of the deep gluteal space, such as hamstring tendon tears	

Table 2. Pearls and Pitfalls of Prone Position Endoscopic Sciatic Neurolysis and Piriformis Tendon Release

Pearls	Pitfalls
The anesthesiologist should not use a paralyzing agent.	Bleeding close to the sciatic nerve is difficult to manage while protecting the nerve. Therefore, one should maintain meticulous hemostasis.
Begin by marking the tip of the ischial tuberosity under fluoroscopy.	Knowledge of anatomy is key to avoid damage to the sciatic nerve or adjacent structures.
Assess the freedom of the sciatic nerve through internal and external rotation in both hip flexion and extension to ensure a complete release.	

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: R.Q-J. received travel reimbursement from Arthrex, Stryker, and Zimmer Biomet. A.H.K-R. received travel reimbursement from Arthrex, Stryker, and Zimmer Biomet. B.D.K. received hospitality payments from Medical Device Business Services and serves on the editorial board for *Arthroscopy*. T.R.M. received grants from Arthrex; received education support from Smith & Nephew, Crossroads Orthopedics, and Prime Surgical; and received hospitality payments from Medacta USA. B.G.D. received financial support from the American Orthopedic Foundation; received consulting or advisory, funding grants, non-financial support, speaking and lecture fees, royalties, and travel reimbursement from Arthrex; royalties and non-financial support from DJO Global; royalties, consulting or advisory, and non-financial support from Medacta; received consulting or advisory, funding grants, non-financial support, royalties, and travel reimbursement from Stryker; received funding grants from Smith & Nephew; received royalties from Orthomerica; serves as a board member at and received non-financial support from Saint Alexius Medical Center; received funding grants from Ossur; received non-financial support from Medwest Associates, Zimmer Biomet, DuPuy Synthes, Medtronic, Trice Medical, Xiros, Intellijoint Surgical, and Electronic Waveform Lab; received consulting or advisory and non-financial support from SI-Bone; serves as a board member of the American Hip Institute Research Foundation, the AANA Learning Center Committee, the *Journal of Hip Preservation Surgery*, the *Journal of Arthroscopy*, the AOSSM Research Committee, and the ISHA Executive Board; and has had ownership interests in the American Hip Institute and affiliates, the Greater Chicago Center for Advanced Surgery, North Shore Surgical Suites, and the Munster Specialty Surgery Center. R.Q-J. received travel reimbursement from Arthrex, Stryker, and Zimmer Biomet. The other author (Y.E.K.) declares 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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