Research Square

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A Modified Endoscopic Approach for Piriformis Syndrome: Surgical Technique and Medium-Term Clinical Outcomes

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Abstract

Background: Piriformis syndrome (PS) is characterized by sciatic nerve entrapment within the deep gluteal space. Diagnosis remains challenging because no single clinical examination or imaging modality can independently confirm the condition. Endoscopic decompression is a surgical option for persistent symptoms, although the complex neurovascular anatomy of the deep gluteal space presents technical challenges. This study aimed to describe a modified endoscopic approach, report its medium-term clinical outcomes, and present the structured diagnostic work-up used to support diagnosis and surgical selection.

Methods: This retrospective consecutive case series included 22 patients who underwent modified endoscopic sciatic nerve decompression and piriformis tendon release by a single surgeon between January 2022 and January 2024. All patients had persistent symptoms despite at least 3 months of conservative treatment and underwent evaluation to exclude lumbar spine, intra-articular hip, and other deep gluteal disorders. Pain and hip-related function were assessed preoperatively and at the final follow-up using the Visual Analog Scale (VAS), modified Harris Hip Score (mHHS), Hip Outcome Score-Activities of Daily Living subscale (HOS-ADL), and Hip Outcome Score-Sports-Specific Subscale (HOS-SSS). The available aggregate data were summarized descriptively.

Results: The cohort comprised 13 women and 9 men, with a mean age of 42.3 years (range, 23-65 years). The mean duration of symptoms was 18.7 months (range, 12-58 months), and the mean follow-up was 24 months (range, 22-28 months). The mean VAS score decreased from 7.1 ± 1.2 to 2.3 ± 0.7. The mean mHHS increased from 53.0 ± 7.2 to 91.2 ± 6.1, the mean HOS-ADL increased from 60.2 ± 3.8 to 86.4 ± 9.6, and the mean HOS-SSS increased from 42.6 ± 10.5 to 81.8 ± 8.5. Anatomical variations of the sciatic nerve were identified in 9 patients (40.9%). Two patients had residual preoperative numbness that partially improved but had not completely resolved at the 2-year follow-up. No major postoperative complications requiring additional intervention or reoperations were recorded.

Conclusions: The modified minimally invasive endoscopic sciatic nerve decompression technique appears to be a safe and effective treatment option for carefully selected patients with piriformis syndrome. Pelvic MRI, particularly dedicated sciatic nerve MRI, may improve diagnostic confidence as part of a comprehensive diagnostic work-up.

Level of Evidence: Level IV, retrospective case series.

Introduction

Piriformis syndrome (PS) is characterized by entrapment of the sciatic nerve within the deep gluteal space [1]. Its clinical presentation typically includes buttock and leg pain, discomfort during prolonged sitting, and sensory disturbances along the sciatic nerve distribution [1, 2].

In the absence of a single definitive clinical or imaging test, PS is evaluated using a stepwise, multimodal approach [1, 3, 4]. Physical examination is directed at reproducing the patient's symptoms using the flexion-adduction-internal rotation (FAIR) test, piriformis activation and stretch maneuvers, the Pace sign, the Lasegue test, and the seated piriformis test [2–4]. Conventional imaging primarily serves to exclude lumbar spine and intra-articular hip disorders [3, 4]. In contrast, pelvic and dedicated sciatic nerve MRI may delineate the anatomical relationship between the piriformis muscle and sciatic nerve and demonstrate nerve morphological or signal abnormalities [5, 6]. When clinically indicated, electromyography helps distinguish PS from nerve root lesions, whereas image-guided piriformis injections provide supportive diagnostic information and may produce temporary symptom relief [3, 4, 7].

For patients whose symptoms persist despite adequate conservative treatment, endoscopic piriformis tendon release and sciatic nerve decompression may be considered [7–9]. However, endoscopic access to the deep gluteal space is technically demanding because of its complex neurovascular anatomy. This region contains the sciatic nerve, posterior femoral cutaneous nerve, inferior gluteal neurovascular bundle, internal pudendal neurovascular bundle, and pudendal nerve [5, 10]. Some previously described techniques use the ischial tuberosity as the principal anatomical landmark and fluoroscopy for portal localization [11]. Dissection near these structures requires careful visualization, and postoperative deep hematoma requiring additional intervention has been reported [7]. Alternatively, trochanteric portals and a lateral approach through the iliotibial band have been described [12].

Against this background, we developed a modified endoscopic approach using greater trochanter-based portals and lateral-to-medial dissection under direct endoscopic visualization. This configuration was intended to facilitate anatomical orientation and sciatic nerve exposure while limiting unnecessary manipulation of the medial neurovascular structures. The primary aim of this study was to describe the modified endoscopic approach and report its medium-term clinical outcomes. The secondary aim was to present the structured diagnostic work-up used to support the diagnosis of PS and select candidates for surgery.

Methods

Study Design and Patients

This single-center retrospective case series comprised 22 consecutive patients who underwent modified endoscopic sciatic nerve decompression and piriformis tendon release for PS at Changsha Central Hospital between January 2022 and January 2024. All procedures were performed by the same surgeon. The patient position, portal configuration, principal surgical steps, and diagnostic pathway are presented in Figures 1-3.

The cohort was restricted to surgically treated patients because the purpose of the study was to evaluate the clinical outcomes of the modified procedure; patients managed nonoperatively were therefore not included. Before surgery, all patients had persistent symptoms despite at least 3 months of

conservative treatment and underwent assessment for lumbar spine disorders, intra-articular hip abnormalities, and other causes of deep gluteal pain. All 22 patients completed at least 22 months of follow-up.

Diagnostic Assessment and Surgical Indications

A structured diagnostic pathway integrating clinical assessment, imaging, and diagnostic injection was used (Figure 3). The initial evaluation focused on the principal manifestations of PS, including pain during walking, pain or intolerance during prolonged sitting, and sensory disturbances along the sciatic nerve distribution. Physical examination included the FAIR test, piriformis activation and stretch maneuvers, the Pace sign, the Lasegue test, and the seated piriformis test.

Pelvic and lumbar spine imaging was reviewed to identify alternative explanations for the presenting symptoms. Lumbar spine disorders, intra-articular hip abnormalities, and other deep gluteal conditions were assessed before PS was considered the principal diagnosis. Dedicated sciatic nerve MRI was subsequently used to examine the anatomical relationship between the piriformis muscle and sciatic nerve and to identify morphological abnormalities involving these structures. Electromyography was performed when clinically indicated to evaluate possible nerve root involvement.

After alternative causes had been excluded or were considered insufficient to account for the symptoms, patients received an image-guided piriformis injection containing 5 mL of 2% lidocaine hydrochloride solution (100 mg) and one 1-mL ampoule of compound betamethasone injection (7 mg). The injection formed part of both the diagnostic work-up and conservative treatment. A temporary reduction in symptoms provided additional support for the diagnosis; however, the response was interpreted together with the clinical and imaging findings and was not treated as an independent mandatory requirement for surgery.

Surgical treatment was considered when symptoms persisted or recurred after at least 3 months of conservative management and when the combined history, physical examination, imaging findings, and response to injection supported PS as the principal source of symptoms.

Surgical Technique

Under general anesthesia, the patient was placed in the lateral decubitus position. After the contour of the greater trochanter had been marked, an anterior portal was established approximately 0.5 cm anterior to the greater trochanter at the level of its center. A posterior portal was positioned approximately 3 cm posterior to the greater trochanter (Figure 1).

Before endoscopic dissection, a 100-mL solution was prepared using 1 mL of 0.01% epinephrine stock solution, 10 mL of 0.05% ropivacaine, and normal saline to a total volume of 100 mL.
Approximately 40 to 60 mL was infiltrated into the deep gluteal tissues between the planned portals to

facilitate local hemostasis and postoperative analgesia; the remaining solution was not administered. During surgery, the same dose of compound betamethasone injection (one 1-mL ampoule; 7 mg) was administered locally.

The endoscopic working space was developed slightly superior to the greater trochanter. With the hip maintained in abduction, extension, and internal rotation, the natural tissue plane between the gluteus maximus and the underlying short external rotators opened, facilitating access to and visualization of the deep gluteal space. This approach did not require intentional splitting or detachment of the gluteus maximus and therefore limited disruption of the muscle. A limited portion of the iliotibial band adjacent to the gluteus maximus was released, and obstructing adipose tissue was removed as required.

Under continuous endoscopic visualization, the fibrovascular tissue overlying the sciatic nerve was carefully dissected from lateral to medial. Once the nerve had been identified, fibrous bands and adhesions were released from the level at which the sciatic nerve emerged beneath the piriformis muscle and continued distally. When necessary, neurolysis was extended to the level of the quadratus femoris. After the anatomical relationship between the sciatic nerve and piriformis tendon had been clearly delineated, the tendon was transected near its insertion on the greater trochanter to complete the decompression (Figure 2).

Hemostasis was confirmed at the end of the procedure, and a drainage tube was placed. Local ice was applied postoperatively. The drainage tube was removed on the first postoperative day, after which ambulation was permitted.

Clinical Outcome Measures

Clinical outcomes were assessed preoperatively and at the final follow-up. Pain severity was measured using the VAS, whereas hip-related function was evaluated using the mHHS, HOS-ADL, and HOS-SSS.

Changes in pain during walking, pain during prolonged sitting, and sensory disturbances were also recorded. Postoperative complications, additional interventions, and reoperations were documented throughout follow-up. Patient satisfaction was not treated as a formal outcome because it had not been evaluated using a predefined instrument.

Statistical Analysis

Categorical variables were summarized as numbers and percentages. Continuous variables were reported as means and standard deviations, with ranges provided where appropriate. Because only aggregate preoperative and final follow-up data were available for the four clinical scores, these outcomes were analyzed descriptively. Paired hypothesis testing and minimal clinically important difference analyses were not performed, and no unverified P values were reported.

Results

Patient Characteristics

The study included 22 consecutive patients who underwent modified endoscopic sciatic nerve decompression and piriformis tendon release. The cohort comprised 13 women and 9 men, with a mean age of 42.3 years (range, 23-65 years). The mean duration of symptoms before surgery was 18.7 months (range, 12-58 months). Patients were followed for a mean of 24 months (range, 22-28 months) (Table 1).

Table 1. Patient characteristics.

Characteristic	Value
Patients, n	22
Women, n	13
Men, n	9
Age, years	42.3 (23-65)
Duration of symptoms, months	18.7 (12-58)
Follow-up, months	24 (22-28)

Diagnostic Findings

All patients were evaluated according to the diagnostic pathway summarized in Figure 3. Dedicated sciatic nerve MRI demonstrated anatomical variations of the sciatic nerve in 9 patients (40.9%). Edema of the piriformis muscle on the affected side relative to the contralateral side was observed in 14 patients (63.6%).

Temporary symptom relief following image-guided piriformis injection was reported by 21 patients (95.5%). After the pharmacological effect had subsided, their symptoms returned to approximately the pre-injection level. One patient did not experience a clear temporary response to the injection but underwent surgery because the overall clinical, physical examination, and imaging findings supported the diagnosis of PS.

Clinical Outcomes

Descriptive changes in pain and hip-related function were observed between the preoperative assessment and final follow-up. The mean VAS score decreased from 7.1 ± 1.2 to 2.3 ± 0.7. The mean mHHS increased from 53.0 ± 7.2 to 91.2 ± 6.1, the mean HOS-ADL increased from 60.2 ± 3.8 to 86.4 ± 9.6, and the mean HOS-SSS increased from 42.6 ± 10.5 to 81.8 ± 8.5 (Table 2).

Walking-related pain was recorded in 13 patients (59.1%) preoperatively and in 4 patients (18.2%) at the final follow-up. Pain during prolonged sitting was reported by 18 patients (81.8%) before surgery and by 3 patients (13.6%) at follow-up. Sensory disturbances were documented in 15 patients (68.2%) preoperatively and in 2 patients (9.1%) at the final assessment.

Both patients with persistent sensory disturbances had experienced numbness before surgery. Although their numbness partially improved after the procedure, it had not completely resolved by the 2-year follow-up. No major postoperative complications requiring additional intervention were recorded, and no patient underwent revision surgery.

Table 2. Clinical outcomes before surgery and at the final follow-up.

Outcome	Preoperative	Final follow-up
Walking-related pain, n (%)	13 (59.1)	4 (18.2)
Pain during prolonged sitting, n (%)	18 (81.8)	3 (13.6)
Sensory disturbances, n (%)	15 (68.2)	2 (9.1)
VAS, mean ± SD	7.1 ± 1.2	2.3 ± 0.7
mHHS, mean ± SD	53.0 ± 7.2	91.2 ± 6.1
HOS-ADL, mean ± SD	60.2 ± 3.8	86.4 ± 9.6
HOS-SSS, mean ± SD	42.6 ± 10.5	81.8 ± 8.5

Data are presented as n (%) or mean ± standard deviation (SD). Outcomes were analyzed descriptively.

Discussion

The present study provides medium-term clinical evidence for a modified greater trochanter-based endoscopic approach to sciatic nerve decompression and piriformis tendon release. Among 22 consecutive surgical patients, concordant improvements were observed across the VAS, mHHS, HOS-ADL, and HOS-SSS over a mean follow-up of 24 months. Walking-related pain, sitting-related pain, and sensory disturbances also decreased. No major complication requiring additional intervention was recorded, and no patient underwent revision surgery. In addition to reporting these outcomes, this study describes the structured diagnostic pathway used for patient selection and the anatomical rationale underlying the modified technique.

Piriformis syndrome is generally understood as entrapment of the sciatic nerve within the deep gluteal space, typically presenting with buttock pain, intolerance of prolonged sitting, radiating leg pain, and sensory disturbances [1–4]. Because no single examination or imaging modality can independently establish the diagnosis, clinical findings should be interpreted together with the exclusion of lumbar spine, intra-articular hip, and other deep gluteal disorders [1, 3–5]. In the present series, dedicated sciatic nerve MRI, electromyography when indicated, and image-guided injection provided complementary

diagnostic information. Temporary symptom relief was observed in 21 of 22 patients after injection, although symptoms returned to approximately the pre-injection level once the pharmacological effect had subsided. One patient underwent surgery despite the absence of a clear injection response. These findings support the use of injection as part of a multimodal diagnostic assessment rather than as an isolated requirement for surgery.

Dedicated sciatic nerve MRI identified anatomical variations in 9 patients (40.9%) and piriformis muscle edema in 14 patients (63.6%). Poutoglidou et al. reported geographical variation in sciatic nerve anatomy, with a pooled prevalence of approximately 31% in East Asian populations [13]. The proportion observed in our China-based surgical cohort was numerically higher. In contrast, Bartret et al. found no association between sciatic nerve variants and the prevalence of piriformis syndrome, buttock pain, or sciatica in a general MRI population [6]. Differences in geographical background, patient selection, and imaging methods may partly explain these findings. Although the present study cannot establish an association because it included only surgically treated patients and lacked a control group, the relatively high proportion of variants raises the possibility that variant sciatic nerve anatomy may be clinically relevant in a subset of East Asian patients with PS. Further controlled studies in Chinese populations are required to investigate this potential relationship. Regardless of its etiological significance, preoperative recognition of sciatic nerve variants may assist anatomical assessment and surgical planning.

The clinical outcomes are consistent with previous reports and systematic reviews of endoscopic sciatic nerve decompression for piriformis syndrome and deep gluteal syndrome [7–9, 14, 15]. Improvements occurred in the same direction across measures of pain, daily activity, hip function, and sports-related function, supporting a sustained clinical response extending beyond a single outcome domain. Two patients continued to experience preoperative numbness at the 2-year follow-up, although both reported partial improvement. This finding suggests that complete resolution of longstanding sensory symptoms should not be assumed. For carefully selected patients with persistent symptoms despite conservative treatment, endoscopic decompression may represent a reasonable surgical option when the combined clinical, imaging, and injection findings support PS as the principal source of symptoms [7–9]. In the present series, the minimum duration of conservative treatment before surgery was 3 months.

The principal technical contribution of this study is the modified route used to enter and dissect the deep gluteal space. Quesada-Jimenez et al. described a prone, ischial tuberosity-based portal configuration using fluoroscopic localization; 1 of 18 patients (5.6%) developed an expanding deep gluteal hematoma requiring further surgery for drainage and hemostasis [7, 11]. A lateral approach using greater trochanter-based portals has also been described by Ilizaliturri et al. [12]. In the present technique, the greater trochanter served as a palpable landmark for portal placement. Positioning the hip in abduction, extension, and internal rotation facilitated access through the natural tissue plane deep to the gluteus maximus without intentional splitting or detachment of the muscle. Under continuous endoscopic visualization, fibrovascular tissue was dissected from lateral to medial, and neurolysis was extended distally according to the extent of nerve involvement. The epinephrine-ropivacaine solution was used as a technical adjunct with the intention of facilitating local hemostasis and postoperative analgesia.

Together, these features were intended to facilitate anatomical orientation, limit unnecessary muscle disruption, and reduce manipulation of the medial neurovascular structures.

No major postoperative hematoma or other complication requiring additional intervention occurred in this cohort. Although the absence of a direct comparison prevents a conclusion that the modified approach is superior to previously described techniques, the medium-term outcomes, absence of revision surgery, and observed complication profile provide preliminary support for its clinical feasibility and procedural safety. The modified approach may therefore offer an alternative endoscopic strategy for carefully selected patients with PS.

This study is limited by its retrospective single-center design, small sample size, lack of a control group, and the availability of only aggregate outcome data, which precluded paired statistical analyses. Larger prospective comparative studies are needed to confirm these findings and evaluate the generalizability of the modified approach.

Conclusions

The modified minimally invasive endoscopic sciatic nerve decompression technique appears to be a safe and effective treatment option for carefully selected patients with piriformis syndrome. Pelvic MRI, particularly dedicated sciatic nerve MRI, may improve diagnostic confidence as part of a comprehensive diagnostic work-up.

Abbreviations

PS, piriformis syndrome; FAIR, flexion-adduction-internal rotation; MRI, magnetic resonance imaging; EMG, electromyography; VAS, Visual Analog Scale; mHHS, modified Harris Hip Score; HOS-ADL, Hip Outcome Score-Activities of Daily Living subscale; HOS-SSS, Hip Outcome Score-Sports-Specific Subscale; SD, standard deviation.

Declarations

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Changsha Central Hospital (Approval No. 2026-153) and was conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent.

Clinical Trial Registration

Clinical trial number: not applicable.

Consent for Publication

All patients provided written informed consent for publication of their clinical data and images. No identifying information is included in this manuscript.

Availability of Data and Materials

The aggregate datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

L.L. and J.L. conceived and designed the study. All surgical procedures were performed by the same surgeon. J.X. and Y.X. collected clinical data and conducted follow-up evaluations. H.L. and W.T. performed the data analysis and interpreted the results. L.P. and W.Z. drafted the manuscript and prepared the figures. All authors critically revised the manuscript and approved the final version.

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Figures

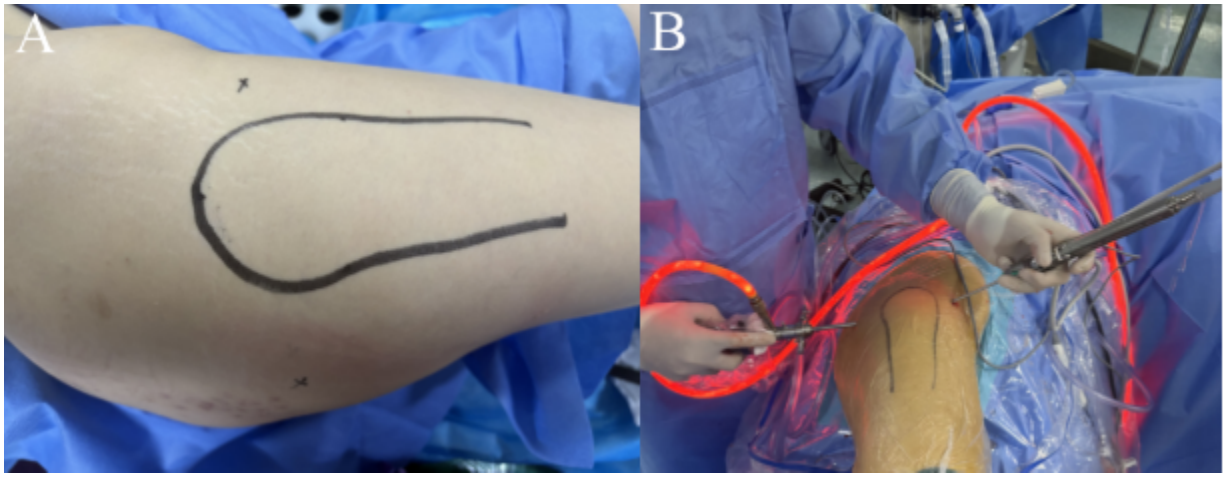

Figure 1

Patient positioning and portal placement. (A) The greater trochanter was marked, with anterior and posterior portals positioned relative to the landmark. (B) Intraoperative endoscopic setup with the patient in the lateral decubitus position.

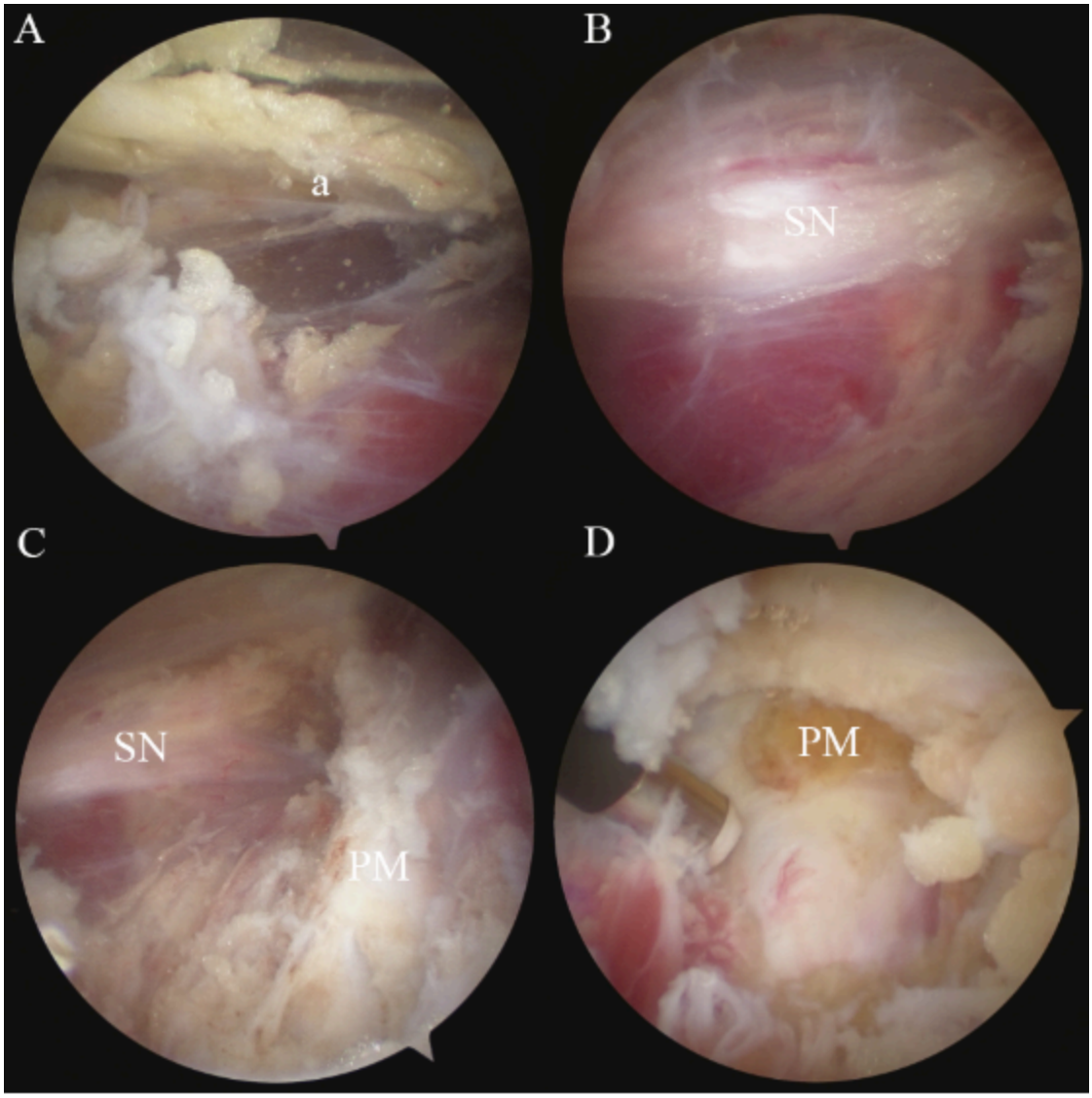

Figure 2

Intraoperative endoscopic views. (A) Fibrous adhesive band within the deep gluteal space. (B) Sciatic nerve (SN) after release of the overlying tissue. (C) Relationship between the sciatic nerve (SN) and piriformis tendon (PM). (D) Transection of the piriformis tendon near its insertion on the greater trochanter.

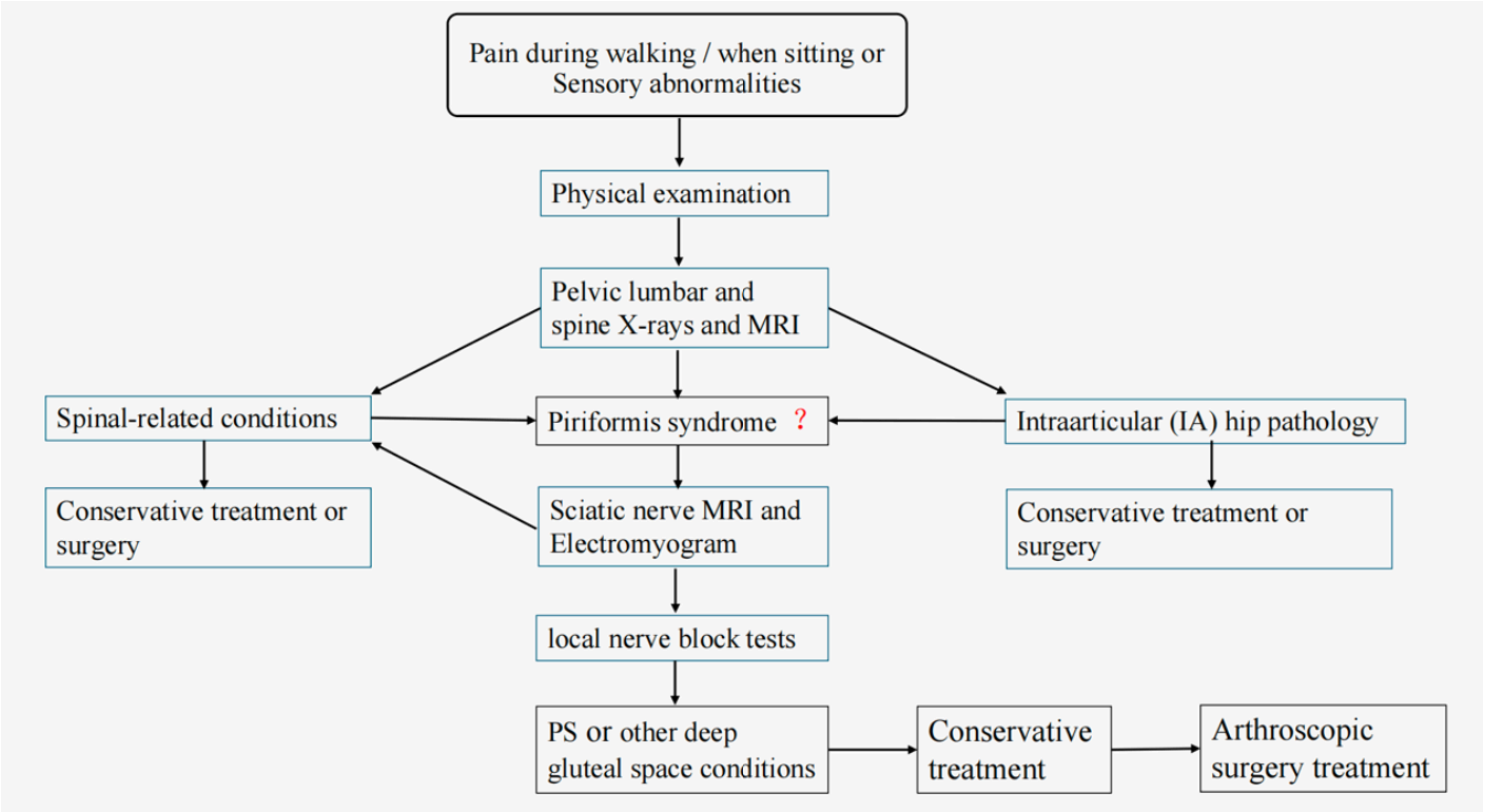

Figure 3

Diagnostic protocol for piriformis syndrome. PS, piriformis syndrome; MRI, magnetic resonance imaging; IA, intra-articular.