Technical Note

Open Ischiofemoral Impingement Decompression

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Abstract: Ischiofemoral impingement is a relatively rare cause of posterior hip pain associated with narrowing of the space between the lateral aspect of the ischium and the lesser trochanter. Symptoms typically consist of lower buttock, groin, and/or medial thigh pain, which is commonly exacerbated by adduction, extension, and external rotation of the hip. This condition can be treated nonoperatively in many circumstances; however, recalcitrant cases may require surgical intervention. Whereas described operative treatment options for this pathology range from endoscopic to open procedures, this Technical Note describes a safe and reliable technique for open ischiofemoral decompression with sciatic nerve neurolysis through a posterior approach for treatment of ischiofemoral impingement refractory to conservative treatment.

Ischiofemoral impingement (IFI) was first described in 1977 by Johnson[1] in patients with persistent hip pain after total hip replacement. The symptoms were described as medial thigh and groin pain, worsening with external rotation, adduction, and extension of the hip and improving with regional lidocaine injections. The modern concept of IFI, in which the quadratus femoris (QF) is compressed between the lesser trochanter (LT) and ischium, has come to light in the past decade after the publication of several case reports and radiologic studies.[2-4]

IFI is a relatively rare diagnosis, and proper clinical workup and imaging are imperative to exclude other pathologies.[5] The differential diagnosis for patients with chronic groin and/or buttock pain can include snapping psoas tendon, lumbar radiculopathy, proximal hamstring injury, QF tear, and adductor tendinopathy. Establishing the diagnosis includes a thorough physical examination in which pain is likely elicited by palpation of the area just lateral to the ischial tuberosity. This pain is usually worsened with external rotation, adduction, and extension of the affected hip. The location of pain lateral to the ischium is important in the diagnosis of IFI[6] because this differs from the more medial-based pain observed with proximal hamstring tendinopathy. Patients may exhibit a shortened stride length to decrease hip extension, which elicits pain during IFI. Additionally, impingement between the ischium and LT can be assessed by passive extension of the affected hip, which reproduces the patient's symptoms when the hip is positioned neutrally or adducted. However, their symptoms are not reproduced when the hip is extended and abducted[5] (Fig 1).

Recommended plain radiographs include an anteroposterior pelvis radiograph and cross-table or frog-leg lateral radiograph of the hip. Although these images can appear normal, patients with chronic IFI may show cystic and/or sclerotic changes of the lesser trochanter and ischium. Additionally, narrowing of the ischiofemoral space on false-profile radiographs has been described as a screening tool.[8] Dynamic ultrasound can help delineate if the pathology is impingement related rather than a direct QF tear.

Magnetic resonance imaging (MRI) is currently accepted as the best method to evaluate QF pathology. Axial T2-weighted images can show edema within the muscle belly of the QF or disruption of the muscle fibers.[9] Sclerosis of the lesser trochanter can also be evident on MRI, indicating a likely chronic pathology versus an acute injury. Moreover, axial imaging can be used to assess the ischiofemoral space, defined as the

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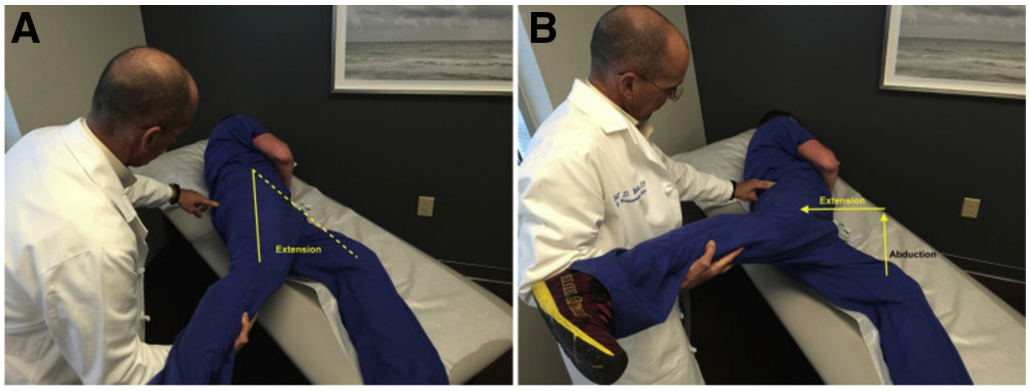

Fig 1. Physical examination findings of ischiofemoral impingement. (A) Pain with passive extension of affected hip. (B) No pain when hip is extended and abducted. (Courtesy of Gomez-Hoyos et al. *Arthroscopy* 2016.)[7]

distance between the medial cortex of the lesser trochanter and the lateral cortex of the ischial tuberosity.[3] However, conflicting results have been reported for the cutoff value between a normal ischiofemoral distance and pathologic narrowing.[10-12] Coronal-plane images will show edema between the lesser trochanter and the ischial tuberosity. The hamstring origin and intra-articular hip, as well as other muscular and intra-abdominal pathologies, must also be investigated as potential causes of pain clinically and on MRI.

There is a relative paucity of data regarding the best treatment strategy for IFI, which is likely because of the degree of difficulty in establishing the diagnosis and the commonly successful results with conservative treatment. Authors have previously described initial conservative modalities consisting of activity restriction, anti-inflammatory medications, and physical therapy.[13-15] In addition to diagnostic utility, ultrasound-guided injections may provide patients with long-standing relief.[16] Many authors have described successful access to the lesser tuberosity endoscopically with favorable outcomes.[6,17,18] The advantages of open surgical management of IFI are likely a quicker operative procedure, better visualization, direct visualization of the sciatic nerve, a decreased risk of damaging the femoral circumflex artery, and a decreased number of intraoperative radiographs. Additionally, an open approach can afford increased exposure to remove all bony debris to decrease the risk of heterotopic ossification. Finally, an open approach has a decreased learning curve compared with an endoscopic approach for surgeons who may not be as familiar with endoscopic procedures surrounding the hip.

Surgical Technique

After administration of general anesthesia, the patient is placed prone on a radiolucent operating table. Care is taken to ensure proper padding of all bony prominences as well as the upper extremities with gel rolls positioned transversely at the chest and pelvis. The entire operative leg is prepared and draped to allow for rotation and excursion of the proximal femur to double-check anatomic landmarks. A 5-cm transverse incision is made in the gluteal crease (Fig 2). The transverse fibers of the gluteus maximus are identified, the fascia is split, and a plane is developed bluntly under

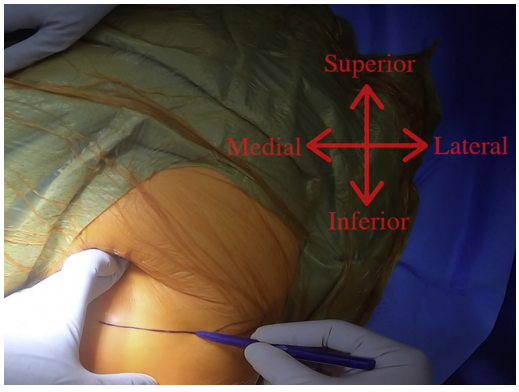

Fig 2. The patient is positioned prone with gel rolls oriented transversely at the chest and pelvis. A 5-cm transverse incision is planned and made in the gluteal crease. This location allows for better cosmesis.

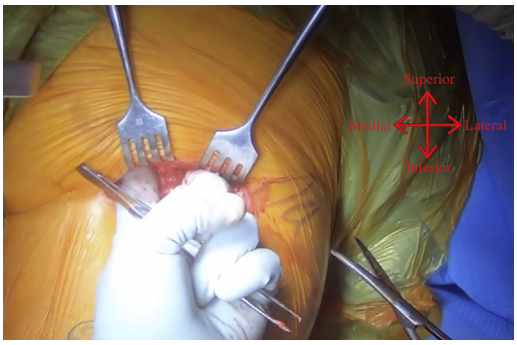

Fig 3. The gluteal fascia is split along the transverse fibers, and a plane is bluntly developed to the ischium using finger dissection. Rake retractors are used for assistance with superior soft-tissue retraction.

the muscle (Fig 3). One can work superior to the QF by splitting the external rotators. Alternatively, if large lesions are present, the external rotators can be released or tagged for future repair. Deaver retractors are used to retract the muscle proximally (Fig 4, Video 1). After palpation of the ischial tuberosity, the sciatic nerve is identified lateral to the origin of the proximal hamstring tendons. The leg can be internally and externally rotated to confirm the location of the ischial tuberosity and lesser trochanter. Neurolysis of the sciatic nerve is performed with Metzenbaum scissors, and a vessel loop is placed carefully around the nerve without traction (Fig 5). The lesser trochanter prominence is then palpated. The external rotators are retracted proximally, and a key elevator and blunt dissection are used to visualize the prominent LT. A pointed Hohmann retractor is then placed on the ischial tuberosity, with careful observation of the position of the sciatic nerve, and the hip is extended and internally rotated to expose the lesser trochanter further. Blunt Hohmann retractors

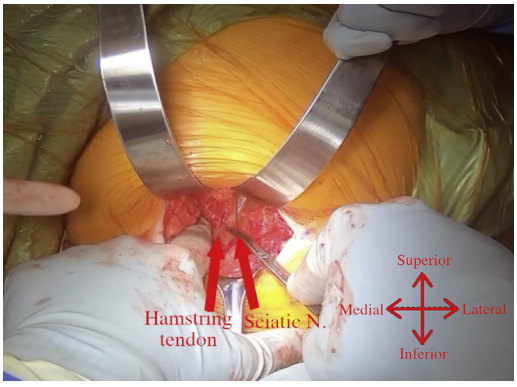

Fig 4. Once the plane is established, Deaver retractors are placed in the gluteal musculature and retracted superiorly. The sciatic nerve (N) is identified immediately lateral to the origin of the proximal hamstring tendons.

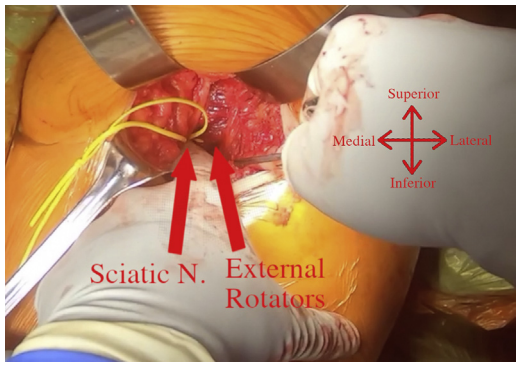

Fig 5. Sciatic nerve (N) neurolysis. After identification of the sciatic nerve, neurolysis of the sciatic nerve is performed using Metzenbaum scissors. A vessel loop is placed around the sciatic nerve to allow identification and gentle traction, if needed.

are placed around the lesser trochanter with the help of blunt dissection (Fig 6). Intraoperative radiographs are used to confirm the position on the LT (Fig 7), and the iliopsoas tendon is released. A sagittal saw (Stryker, Kalamazoo, MI) is then used to remove the lesser trochanteric prominence, with care taken to avoid injury to the sciatic nerve (Fig 8). Resection is completed using an osteotome and rongeur (Fig 9). After resection, the hip is taken through a full range of motion to ensure no further impingement. Additional

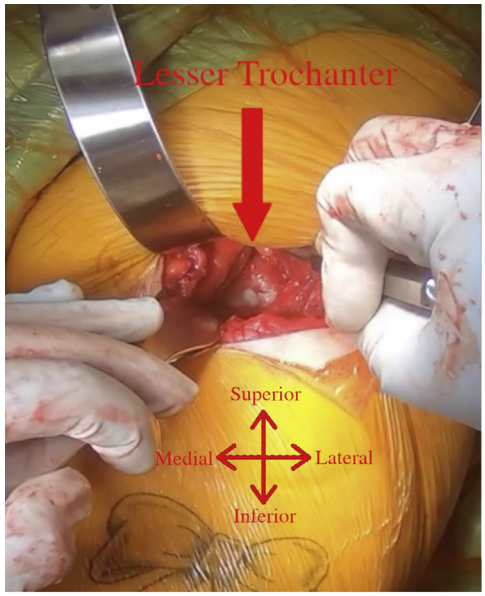

Fig 6. Lesser trochanter exposure. A pointed Hohmann retractor is placed on the ischial tuberosity, with careful observation of the position of the sciatic nerve, and the hip is extended and internally rotated to expose the lesser trochanter further. Blunt Hohmann retractors are then placed around the lesser trochanter with the help of blunt dissection.

Fig 7. Fluoroscopic confirmation of position. The position of the lesser trochanter is confirmed on fluoroscopy, and the soft tissue is removed from the lesser trochanter using a key elevator.

assessment using radiographs with the hip in full external and internal rotation confirms no residual impingement (Fig 10). Radiographs also confirm that an over-resection into the femoral neck has not occurred (Fig 11). Bone wax is placed over the resection area, and hemostasis is achieved. The vessel loop is removed from the sciatic nerve and then evaluated visually to assess for signs of trauma. The wound is irrigated with care to remove any residual remaining bone to minimize the heterotopic ossification risk, and the gluteal fascia is closed with absorbable suture followed by a standard layered closure. A waterproof dressing is applied.

Postoperative Protocol

The postoperative protocol includes immediate physical therapy with toe-touch weight bearing for 1 month with no range-of-motion restrictions. Heterotopic ossification prophylaxis includes indomethacin for 4 days and naproxen daily for 1 month. Additionally, deep vein thrombosis prophylaxis consists of 81 mg of aspirin twice daily for 1 month.

Discussion

The described surgical technique is a reproducible and safe method for ischiofemoral decompression. This technique confers an efficient procedure as well as a decreased number of intraoperative radiographs owing to open exposure, direct visualization of the sciatic nerve, decreased risk of femoral circumflex artery injury, and increased exposure for removal of bony debris to prevent heterotopic ossification. Pearls and pitfalls of our technique are presented in Table 1, and advantages, disadvantages, and limitations are listed in Table 2.

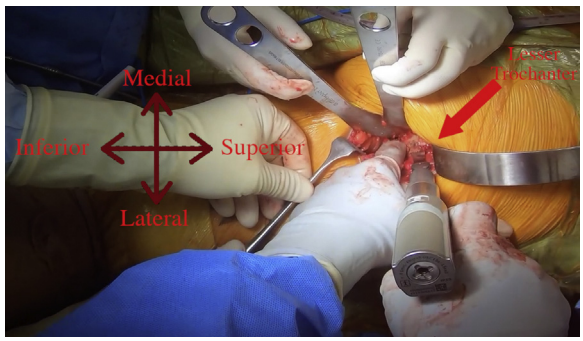

Fig 8. The hip is extended and internally rotated. Blunt Hohmann retractors are placed around the lesser trochanter to protect the sciatic nerve, and part of the iliopsoas tendon insertion is released. An oscillating saw is used to cut across the heterotopic bone after intraoperative fluoroscopy is used to confirm the angle of the cut. Care should be taken not to angle toward the femoral neck and cause iatrogenic fracture.

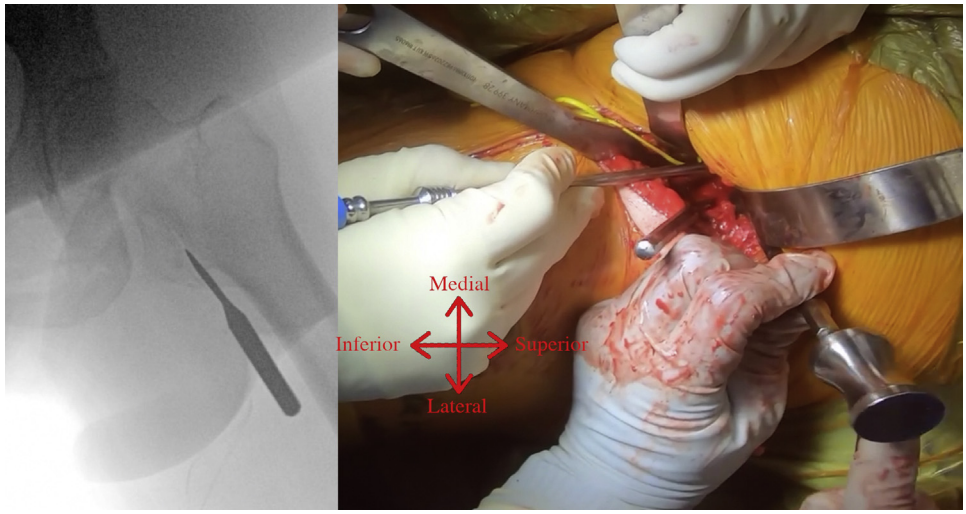

Fig 9. Osteotomy completion. The cut across the heterotopic bone is completed using an osteotome and mallet, with care taken to avoid the sciatic nerve. The cut is confirmed on intraoperative fluoroscopy.

Lesser trochanter resection can also be successfully performed endoscopically, as previously described by several authors.[18-22] Several complications have been reported with the endoscopic approach, including temporary sciatic nerve injury, hematoma, permanent nerve injury of the posterior femoral cutaneous nerve,[23] and intra-abdominal fluid extravasation.[24] This method does incur a steeper learning curve as well as less direct visualization of the important surrounding neurovascular structures; consequently, entrapment of the sciatic nerve is the leading reported cause of revision surgery.[23] Complications from an endoscopic approach can be severe, and an open approach may reduce the risk of several of these complications.

Numerous open approaches to resect lesions of the lesser trochanteric region have been described. Previously defined open techniques include open resection of ischial exostosis, which was described in a case report; however, this was completed using an anterior approach to the ischiofemoral space.[25] Another case report described open resection of the LT, although this was performed through a lateral approach including an iliotibial band split, subperiosteal release of the psoas

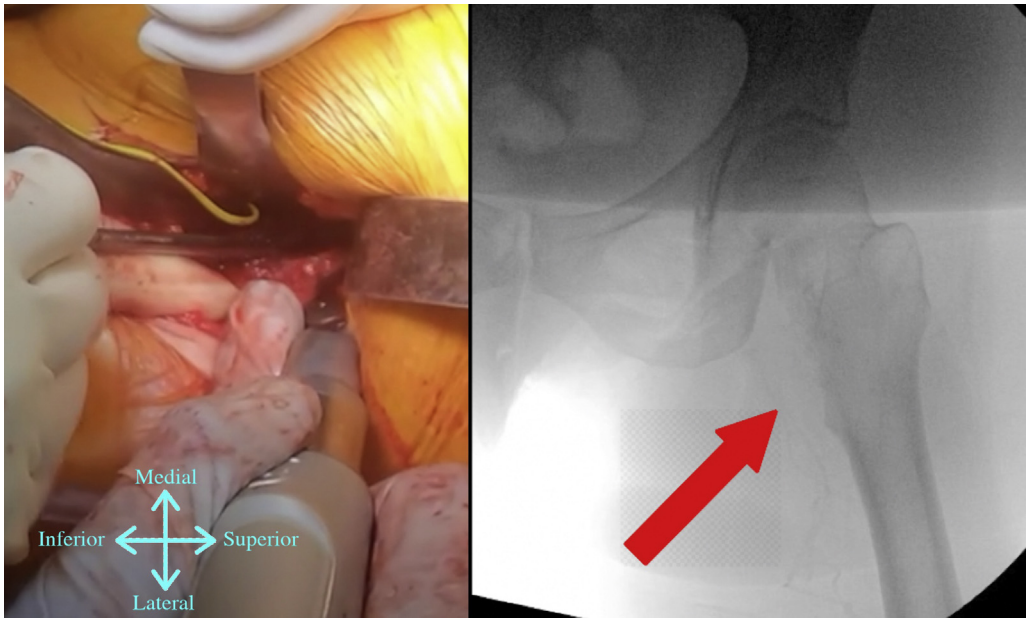

Fig 10. Confirmation of lesser trochanter position. Intraoperative radiographs are used to confirm the position on the lesser trochanter (arrow), and the iliopsoas tendon is released.

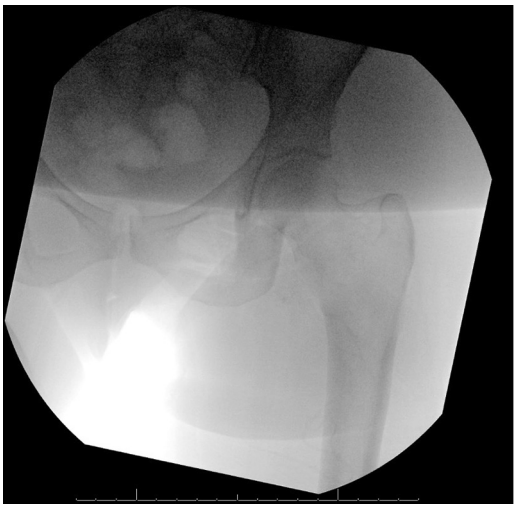

Fig 11. Confirmation of adequate resection. After resection, the hip is taken through a full range of motion to ensure no further impingement. Additional assessment using radiographs with the hip in full external and internal rotation confirms no residual impingement. Radiographs also confirm that an over-resection into the femoral neck has not occurred.

tendon, and ischial release of the QF.[26] A final report described a case of IFI due to a lipomatous tumor that was excised through an open posterior approach in the lateral position.[27] The open approach may improve cosmesis because it is made in the gluteal crease.

In conclusion, this Technical Note presents a reliable surgical method for open ischiofemoral decompression and sciatic nerve neurolysis. This technique may be used in isolation when indicated for IFI alone or combined with proximal hamstring pathology through the same surgical approach.

Table 1. Pearls and Pitfalls for Key Elements of Open Ischiofemoral Decompression Technique

Pearls
Proper palpation of posterior bony prominences to ensure well-placed incision
Identification and neurolysis of sciatic nerve
Hip position during exposure
Proper retractor placement
Iliopsoas tendon management
Optimal lesser tuberosity resection
Pitfalls
Incision too far laterally or medially
Incomplete neurolysis
Over-dissection of QF leading to iatrogenic medial femoral circumflex artery injury
Poor exposure of LT
Extension of LT osteotomy into femoral neck

LT, lesser trochanter; QF, quadratus femoris.

Table 2. Advantages, Disadvantages, and Limitations of Open Ischiofemoral Decompression Technique

Advantages
Cosmetic incision
Better visualization of neurovascular structures
Quicker operative time
Decreased number of intraoperative radiographs
Improved release of sciatic nerve
Improved removal of bony debris
Disadvantages and limitations
Larger incision than arthroscopic approach
Risk of injury to sciatic nerve
Wound complications
If bony overgrowth extends proximally or distally, approach is not very extensile

References

1. Johnson KA. Impingement of the lesser trochanter on the ischial ramus after total hip arthroplasty. Report of three cases. *J Bone Joint Surg Am* 1977;59:268-269.
2. Patti JW, Ouellette H, Bredella MA, Torriani M. Impingement of lesser trochanter on ischium as a potential cause for hip pain. *Skeletal Radiol* 2008;37:939-941.
3. Torriani M, Souto SCL, Thomas BJ, Ouellette H, Bredella MA. Ischiofemoral impingement syndrome: An entity with hip pain and abnormalities of the quadratus femoris muscle. *AJR Am J Roentgenol* 2009;193:186-190.
4. Stafford GH, Villar RN. Ischiofemoral impingement. *J Bone Joint Surg Br* 2011;93:1300-1302.
5. Gómez-Hoyos J, Martin RL, Martin HD. Current concepts review: Evaluation and management of posterior hip pain. *J Am Acad Orthop Surg* 2018;26:597-609.
6. Hatem MA, Palmer IJ, Martin HD. Diagnosis and 2-year outcomes of endoscopic treatment for ischiofemoral impingement. *Arthroscopy* 2015;31:239-246.
7. Gómez-Hoyos J, Martin RL, Schröder R, Palmer IJ, Martin HD. Accuracy of 2 clinical tests for ischiofemoral impingement in patients with posterior hip pain and endoscopically confirmed diagnosis. *Arthroscopy* 2016;32:1279-1284.
8. Kwak D-K, Yang I-H, Kim S, Lee S-C, Park K-K, Lee W-S. Utility of false profile view for screening of ischiofemoral impingement. *Hip Pelvis* 2018;30:219-225.
9. Kassarjian A. Signal abnormalities in the quadratus femoris muscle: Tear or impingement? *AJR Am J Roentgenol* 2008;190:W379. author reply W380-W381.
10. Hujazi I, Jones T, Johal S, Bearcroft P, Muniz-Terra G, Khanduja V. The normal ischiofemoral distance and its variations. *J Hip Preserv Surg* 2016;3:197-202.
11. Xing Q, Feng X, Wan L, Cao H, Bai X, Wang S. MRI measurement assessment on ischiofemoral impingement syndrome. *Hip Int* 2021. 11207000211007750.
12. Zhang D-z, Li D-m, Yi X-b, Luo H. MRI diagnostic criteria for ischiofemoral impingement syndrome. *Chin J Tissue Eng Res* 2017;21:2406-2409.
13. Lee S, Kim I, Lee SM, Lee J. Ischiofemoral impingement syndrome. *Ann Rehabil Med* 2013;37:143-146.
14. Tosun Ö, Çay N, Bozkurt M, Arslan H. Ischiofemoral impingement in an 11-year-old girl. *Diagn Interv Radiol* 2012;18:571-573.

15. Yanagishita CMA, Falótico GG, Rosário DAV, Pugina GG, Wever AAN, Takata ET. Ischiofemoral impingement—An etiology of hip pain: Case report. *Rev Bras Ortop* 2012;47:780-783.
16. Kim W-J, Shin H-Y, Koo G-H, Park H-G, Ha Y-C, Park Y-H. Ultrasound-guided prolotherapy with polydeoxyribonucleotide sodium in ischiofemoral impingement syndrome. *Pain Pract* 2014;14:649-655.
17. Jo S, O'Donnell JM. Endoscopic lesser trochanter resection for treatment of ischiofemoral impingement. *J Hip Preserv Surg* 2015;2:184-189.
18. Wilson MD, Keene JS. Treatment of ischiofemoral impingement: Results of diagnostic injections and arthroscopic resection of the lesser trochanter. *J Hip Preserv Surg* 2016;3:146-153.
19. Howse EA, Mannava S, Martin HD, Bredella MA, Stubbs AJ. Ischiofemoral space decompression through posterolateral approach: Cutting block technique. *Arthrosc Tech* 2014;3:e661-e665.
20. Safran M, Ryu J. Ischiofemoral impingement of the hip: A novel approach to treatment. *Knee Surg Sports Traumatol Arthrosc* 2014;22:781-784.
21. Goodwin JA, Chhabra A, Patel KA, Hartigan DE. Lesser trochanter osteoplasty for ischiofemoral impingement. *Arthrosc Tech* 2017;6:e1755-e1760.
22. Aguilera-Bohórquez B, Leiva M, Pacheco J, Calvache D, Fernandez M, Cantor E. Pain relief and good functional outcomes after hip endoscopy via posterior approach in patients with ischiofemoral impingement. *Knee Surg Sports Traumatol Arthrosc* 2021;29:2394-2400.
23. Aguilera-Bohórquez B, Pacheco J, Castillo L, Calvache D, Cantor E. Complications of hip endoscopy in the treatment of subgluteal space pathologies. *Arthroscopy* 2021;37:2152-2161.
24. Aguilera-Bohórquez B, Ramirez S, Cantor E, et al. Intra-abdominal fluid extravasation: Is endoscopic deep gluteal space exploration a risk factor? *Orthop J Sports Med* 2020;8.2325967120940958.
25. Viala P, Larbi A, Cyteval C, et al. Bilateral ischiofemoral impingement in a patient with hereditary multiple exostoses. *Skeletal Radiol* 2012;41:1637-1640.
26. Mohsan Ali A, Whitwell D, Ostlere SJ. Case report: Imaging and surgical treatment of a snapping hip due to ischiofemoral impingement. *Skeletal Radiol* 2011;40:653-656.
27. Papoutsi D, Daniels J, Mistry A, Chandraseker C. Ischiofemoral impingement due to a lipoma of the ischiofemoral space. *BMJ Case Rep* 2016;2016,bcr2015213210.