Technical Note

Endoscopic Lesser Trochanter Resection With Refixation of the Iliopsoas Tendon for Treatment of Ischiofemoral Impingement

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Abstract: Ischiofemoral impingement is a source of hip pain derived from impingement between the lesser trochanter and the ischium. Lesser trochanter excision has been recommended for recalcitrant ischiofemoral impingement through either an anterior or posterior approach. However, neither of these approaches involves refixation of the iliopsoas tendon. We describe an endoscopic procedure involving anterior trochanter-plasty, minimizing the risk of sciatic complications, with refixation of the partially detached iliopsoas tendinous insertion, potentially minimizing compromise to hip flexion strength and anterior hip stability.

Ischiofemoral impingement (IFI) is a source of hip pain derived from impingement between the lesser trochanter (LT) and the ischium or from entrapment of the quadratus femoris muscle between the 2 structures.[1] The LT is closest to the ischium in external rotation and is furthest away in internal rotation when the hip is in neutral flexion-extension or abduction-adduction. The average ischiofemoral distance in neutral rotation is 2.8 cm.[2]

The diagnosis of IFI can be made with the combination of a physical examination and radiologic imaging. The IFI test is intended to provoke impingement in extension with a neutral or adducted hip (re-creating the posterior pain lateral to the ischium), and it relieves the impingement pain in extension with an abducted hip with subsequent abduction.[3] A diagnosis of IFI is determined by static magnetic resonance imaging that shows narrowing of the distance between the ischium and LT that is less than 15 mm,[4] as well as edematous findings within the substance of the quadratus femoris muscle.[1]

LT excision has been recommended if conservative treatment fails, but the operative method has not been standardized. In terms of treatment options, Johnson[5] recommended excision of the LT (by open surgery) as a potential solution in patients with IFI after total hip arthroplasty. The goal is enlargement of the narrowed ischiofemoral space with resolution of ongoing mechanical and clinical IFI.

The arthroscopic anterior procedure has been described with detachment of the iliopsoas tendon (IPT) from the LT during or before arthroscopic osteoplasty of the LT with a standard arthroscopic burr.[6] The posterior approach has been described with endoscopic access to the deep gluteal space with visualization of the quadratus femoris muscle and sciatic nerve, followed by endoscopic osteoplasty of the posterior one-third of the LT[7] to obtain an ischiofemoral space of at least 17 mm, leaving most of the iliopsoas insertion intact. Thus, the posterior endoscopic approach has the advantage of less compromise to the IPT but the disadvantage of a greater risk of sciatic nerve damage. The anterior endoscopic approach is arguably more familiar to surgeons who

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The authors report the following potential conflict of interest or source of funding: M.A. receives support from Stryker, Biomet, DePuy Synthes. D.M. receives support from Zimmer Biomet, DISC Sports and Spine, Smith & Nephew. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received August 10, 2017; accepted September 26, 2017.

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2212-6287/17973

https://doi.org/10.1016/j.eats.2017.09.010

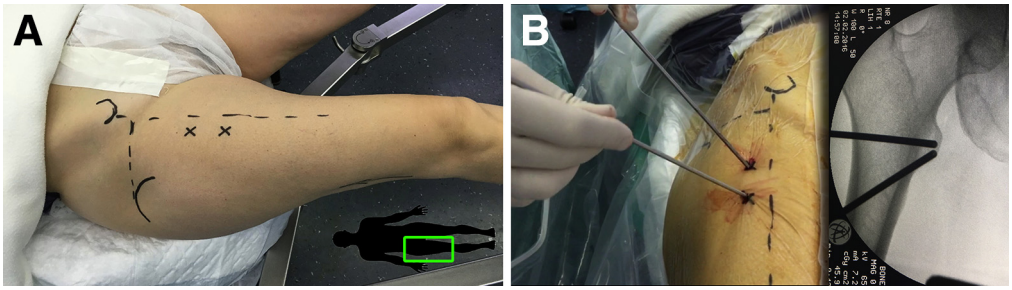

Fig 1. (A) The arthroscopic portals used are shown in a right hip, with the patient in the supine position. Bone references were plotted previously. Two portals are used, both vertically oriented 1 to 2 cm and positioned lateral to the line between the anterosuperior iliac spine and the central axis of the patella. (B) The arthroscopic portals used are shown in a right hip, with the patient in the supine position, under anteroposterior fluoroscopic guidance with the hip externally rotated. The anteroproximal viewing portal is established to gain access to the proximal aspect of the lesser trochanter. The anterodistal working portal is then established 3 to 4 cm distal to the anteroproximal portal, reaching the distal aspect of the lesser trochanter under fluoroscopic guidance.

have performed endoscopic release of the IPT from the LT for internal snapping hip and has a lower risk of sciatic complications but has a greater risk of IPT compromise.

An arthroscopic anterior LT decompression procedure was proposed[8] to reduce the risk of damage to the sciatic nerve, which is located 4 mm from the femoral border.[9] In addition, the IPT was detached from the LT and was not shown to detach and retract during trochanter resection. The aim of this article is to describe a treatment for IFI by excising the LT and reinserting the IPT by means of 2 anchorages placed in the footprint after performing a trochanter-plasty.

Surgical Technique

Positioning

The patient is placed in the decubitus supine position on a radiolucent surgery table (Fig 1A). No perineal post is required because no traction is used. The operative hip is draped free to enable unrestricted range of motion in the sagittal and rotational planes.

Bony Landmarks

Bone references are plotted: anterosuperior iliac spine (ASIS) and greater trochanter. The ASIS center of the patella line and its perpendicular tangential to the tip of the greater trochanter are plotted. A standard-length 30° arthroscope is used with arthroscopic pump pressure ranging between 30 and 40 mm Hg.

Table 1. Five Simple Steps for IPT Refixation

Step 1: Surgical approach and IPT identification
Step 2: LT incomplete resection
Step 3: IPT distal refixation (first anchor)
Step 4: LT complete resection
Step 5: IPT proximal refixation (second anchor)

IPT, iliopsoas tendon; LT, lesser trochanter.

Portals

Two portals are used, both vertically oriented 1 to 2 cm and positioned lateral to the line between the ASIS and the central axis of the patella. The anteroproximal viewing portal is established under anteroposterior fluoroscopic guidance with the hip externally rotated, bringing the LT into 2-dimensional profile. A blunt metallic obturator and matching arthroscopic cannula are passed through this portal to gain access to the proximal aspect of the LT. The anterodistal working portal is then established 3 to 4 cm distal to the anteroproximal portal, and a blunt probe is used to reach the distal aspect of the LT under fluoroscopic guidance (Fig 1B). Once triangulated and converging on the anterior LT, the blunt obturator is exchanged for the arthroscope and a slotted cannula is used for controlled exchange of the blunt probe with a motorized shaver. Under direct vision of the IPT, the following 4 steps for LT resection and IPT refixation are performed (Table 1).

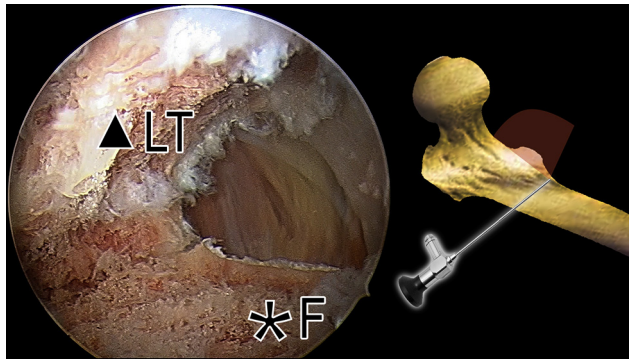

Fig 2. Arthroscopic view from the proximal portal in a right hip, showing partial resection of the lesser trochanter. A bone block is progressively formed that corresponds to the tip of the lesser trochanter (LT, triangle). This bone block contains the intact iliopsoas posterior tendinous insertion. (*F, trochanterplasty footprint.)

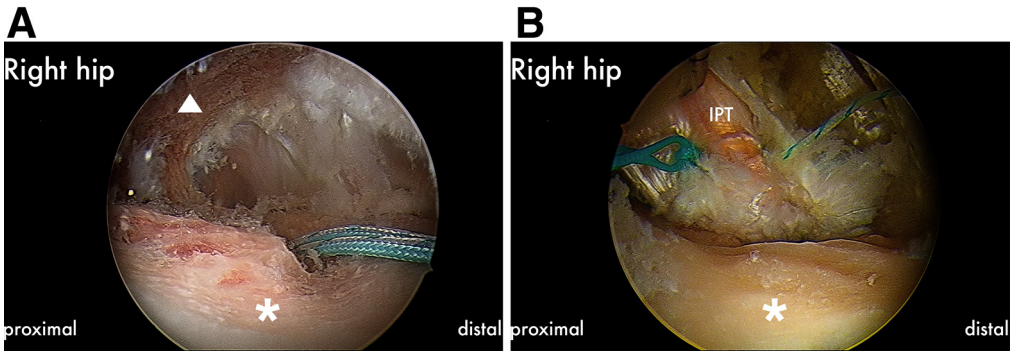

Fig 3. Arthroscopic views from the proximal portal in a right hip. (A) An anchor is inserted on the trochanter-plasty footprint (asterisk), both distally and anteriorly relative to this footprint. The triangle indicates the tip of the lesser trochanter. (B) The threads used to reinsert the iliopsoas tendon (IPT) on the distal footprint of the lesser trochanter—plasty are secured under gentle tension through a standard arthroscopic knot-tying technique. The asterisk indicates the trochanter-plasty footprint.

LT Resection (Incomplete)

With arthroscopic visualization, the shaver is used to resect the peritrochanteric bursal tissue, facilitating visualization of the IPT anterior insertional fibers onto the LT. A distal-to-proximal LT-plasty is performed by means of a motorized 5.5-mm round burr following the direction of the femur's medial cortical bone. Access to the most posterior part of the LT is facilitated by progressive hip flexion and external rotation (Video 1). The resection is performed under arthroscopic visualization with intermittent fluoroscopic spot imaging. A bone block is progressively formed that corresponds to the tip of the LT and features a posterior pedicle. This bone block contains the intact iliopsoas posterior tendinous insertion, which prevents excessive retraction of the detached anterior portion (Fig 2).

IPT Distal Refixation

A 2.9-mm Juggerknot all-suture anchor (Zimmer Biomet) is seated in its drill hole before full resection of the medial cortical bone of the femur, both distally and anteriorly relative to the footprint of the trochanter-plasty (Fig 3A). A SpeedPass suture passer (Zimmer Biomet) facilitates passage of 2 suture threads of the implant through the IPT to achieve distal control of the detached anterior portion of the IPT (without tying the knots).

LT Complete Resection

Complete bone resection is performed, allowing the bone block that contains the IPT to be mobilized. The threads used to reinsert the IPT on the distal footprint of the LT-plasty are then secured under gentle tension through a standard arthroscopic knot-tying technique (Fig 3B).

IPT Proximal Refixation

Once suturing has been performed in the most distal location, a second implant is placed in the medial femoral cortical bone, both proximally and anteriorly relative to the footprint of the trochanter-plasty (Fig 4A). Two threads are passed through the

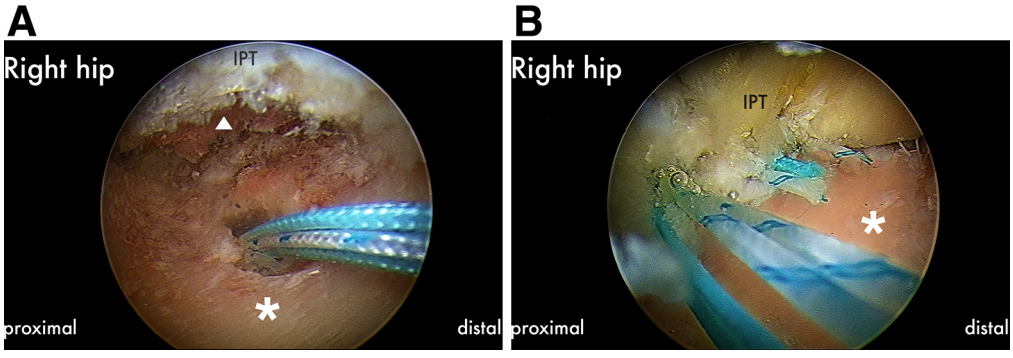

Fig 4. (A) Arthroscopic view from the proximal portal in a right hip, showing that a second implant is placed in the medial femoral cortical bone, both proximally and anteriorly relative to the trochanter-plasty footprint (asterisk). The triangle indicates the tip of the lesser trochanter. (IPT, iliopsoas tendon.) (B) Arthroscopic view in a right hip. With viewing from the proximal portal, threads are passed through the proximal segment of the iliopsoas tendon (IPT) using the SpeedPass suture passer and subsequently tied and reinserted proximally in the trochanter-plasty footprint. The asterisk indicates the footprint of the trochanter-plasty.

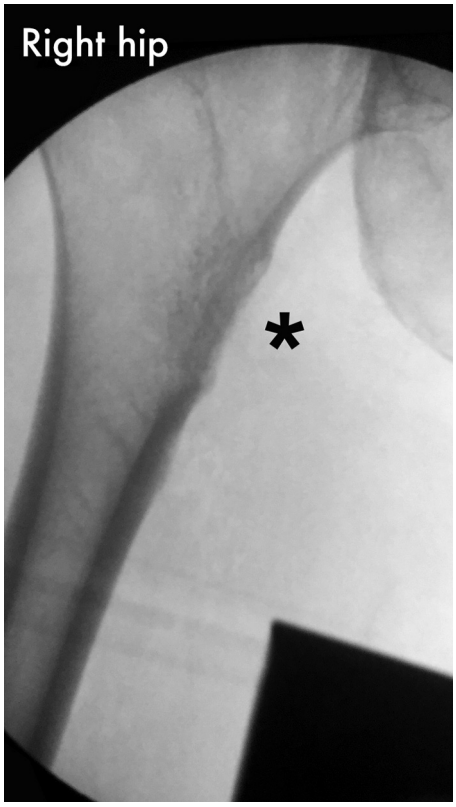

Fig 5. Anteroposterior radiograph of right proximal femur showing lesser trochanter resection (asterisk). A right hip is shown with the patient in the supine position, with no traction and with external rotation of the operative leg.

proximal segment of the IPT using the SpeedPass suture passer and subsequently tied and reinserted proximally in the trochanter-plasty footprint (Fig 4B).

Figure 5 shows the final fluoroscopic view of a right hip after completed endoscopic resection of the LT. Pearls and pitfalls of our procedure are summarized in Table 2, and advantages and disadvantages are summarized in Table 3.

Table 2. Surgical Pearls and Pitfalls of Endoscopic LT Resection With IPT Refixation

Pearls
The portals must be a certain distance from each other to allow proper triangulation.
Initially, the incomplete resection creates a bone block that corresponds to the tip of the LT and features a posterior pedicle.
The first anchor is seated in its drill hole before full resection of the medial cortical bone of the femur, both distally and anteriorly relative to the footprint of the trochanter-plasty.
Before placement of the second anchor, complete LT bone resection is performed.
After IPT refixation, patients are kept non–weight bearing for 4 wk postoperatively.
Pitfalls
Extravasation of fluid into the extracapsular soft tissues is possible.
Retraction of the IPT must be avoided.

IPT, iliopsoas tendon; LT, lesser trochanter.

Table 3. Advantages and Disadvantages of IPT Refixation

Advantages
The technique provides IPT tendon refixation in the footprint.
The technique is minimally invasive.
Iatrogenic loss of strength is prevented.
Disadvantages
Arthroscopic refixation can be technically challenging.
IPT refixation still requires long-term studies with large patient populations. Therefore, there may be long-term complications that have not yet been determined.

IPT, iliopsoas tendon.

Rehabilitation

After IPT refixation, patients are kept non–weight bearing for 4 weeks postoperatively with crutches. Partial weight bearing as tolerated is recommended using double crutches for 3 weeks and 1 crutch for the following 3 weeks. Hip passive motion is first restored after 3 weeks, followed by active motion after 6 weeks and then strength.

Discussion

In the surgical treatment of IFI, only open techniques propose that reinsertion be performed once the LT has been excised.[10] The surgical arthroscopic resection technique for the LT by a posterior approach is carried out through the deep subgluteal space.[7] According to the published technique, the first stage of this approach consists of identifying the quadratus femoris muscle and sciatic nerve.

Access to the LT is gained through a small window in the quadratus femoris, with resection of the muscle at the level of the LT between the medial circumflex femoral artery (proximal) and first perforating femoral artery (distal). After partial resection of the middle portion of the quadratus muscle, an osteoplasty of the posterior third of the LT is performed.

It seems that full access to the LT through this approach may increase the risk of iatrogenic damage to the adjacent major neurovascular structures.[2,9] Bone resection, moreover, may be limited with attempts to preserve the insertion of the IPT.

The anterior arthroscopic approach minimizes the risks of neurovascular injury and/or insufficient bony decompression,[6,8] although the described technique requires that the IPT be detached. IPT tenotomies are not free of complications. Potential complications include persistent weak hip flexion[11] and potential anterior hip instability.

The insertional anatomy of the IPT has recently been described.[12] A double tendinous footprint is found in most cases and located on the anteromedial tip of the LT. It seems that an LT-plasty performed to increase the ischiofemoral space without partially or totally detaching the IPT is improbable (even with a partial LT-plasty).[12]

The average dimensions of the IPT when inserted as a conjoined structure were reported to be 11.6 × 22.6 mm, with a mean area of 211.2 mm^2.[12] These dimensions

make it possible to place at least 2 suture anchors in the footprint of the LT subsequent to LT-plasty.

Endoscopic LT-plasty through an anterior approach with reattachment of the IPT has been described. Potential advantages include a more functional osteoplastic resection on the offending anterior aspect of the LT and lower potential for iatrogenic sciatic injury. The major conceptual disadvantage of iliopsoas release may be minimized with the endoscopic reattachment technique described in this article. Further investigation is merited to determine whether outcomes are improved by the addition of IPT reattachment to arthroscopic LT-plasty for the treatment of IFI.

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