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Hip Arthroscopy: Extra-articular Procedures

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Abstract

Hip preservation is one of the fastest growing fields in orthopaedics and indications of intra-articular procedures are well established. In the last decade, extra-articular procedures have gained momentum and arthroscopic solutions to peri-articular hip pathologies have been offered. It should be noted that many of these pathologies are well-treated conservatively and only those who fail conservative management should be treated operatively.

These indications can be divided into 5 categories: greater trochanteric pain syndrome; internal hip snapping; anterior inferior iliac spine/sub-spine impingement; sciatic nerve entrapment; and proximal hamstring injuries.

This article reviews the anatomy, patient history and physical examination, imaging, non-operative treatment, endoscopic operative treatment and outcomes of each category.

While indications for hip arthroscopy, specifically extra-articular procedures, are rising steadily, there is not enough data to support its superiority over open procedures. Current literature consists of case studies, case reports, and expert opinions and lacks large, randomised control studies.

Keywords

Extra-articular, greater trochanteric pain syndrome, hip endoscopy, internal hip snapping, proximal hamstring avulsions, sub-spine impingement, sciatic nerve entrapment

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Introduction

With rapid growth in hip arthroscopy over the past 15 years, there has been an influx of new information with regard to hip pathologies, which were previously not well characterised. Due to enhanced understanding and improvement in surgical techniques, there has been a push towards expanding the scope of treatment options for peri-articular hip pathologies. In recent years, endoscopic procedures for treatment of extra-articular hip pathologies have gained momentum and additional arthroscopic solutions to peri-articular hip pathologies have been described. These pathologies can be divided into 5 categories: greater trochanteric pain syndrome (GTPS); internal hip snapping; anterior inferior iliac spine (AIIS)/sub-spine impingement; sciatic nerve entrapment; and proximal hamstring injury. Early results have been promising. In 1 systematic review of reports on endoscopic treatment of extra-articular pathologies by De Sa et al.[1] identified 14 studies, examining 333 hips, which resulted in 88% of patients achieving good to excellent results with significant improvements in hip outcome scores. While, many of these pathologies can be initially treated nonoperatively, endoscopy can be an option, as well as an alternative to open procedures, for those who fail conservative management. In this article, we focus on the appropriate anatomy, diagnosis, and treatment of these entities.

Indications

Anatomy

Greater trochanter anatomy. Pain around the greater trochanter may stem from a number of different pathologies

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in the region, including gluteus medius and minimus tendinopathy or tears, trochanteric bursitis, and external snapping hip. Gluteus medius and minimus attach to the superior-lateral and superior-anterior aspects of the greater trochanter, respectively.[2] Lateral to this insertion is the tensor fascia lata.[3] There are a number of bursae in the trochanteric region, including the gluteus minimus bursa, located anterior and superior to the greater trochanter, the subgluteus medius bursa which lies deep to the gluteus medius tendon, and the subgluteus maximus, also better known as the trochanteric bursa, which lies between the gluteus medius and maximus laterally.[3] Inflammation of any of these bursae can cause significant pain in patients.

Abductor tendinopathy is another source of pain. The various fibres of the gluteus medius and minimus have different functions. The posterior portion of the tendons acts to stabilise the femoral head in the acetabulum. The middle and anterior portions act in abduction. The anterior fibres experience the most force and are more likely to tear and separate off the greater trochanter.[3] Iliotibial band and tensor fascia lata may also be the cause of pain, especially in female patients who have larger pelvic width relative to body width, patients with lower femoral neck shaft angles, and patients with increased acetabular anteversion. These characteristics increase tension on the iliotibial band (ITB) and consequently increases friction as it glides over the greater trochanter.[3]

Iliopsoas muscle and tendon. The iliopsoas (IP) is composed of the muscle bellies of the psoas and iliacus muscles. The IP tendon attaches at the lesser trochanter and acts as a hip flexor.[4] The IP has been implicated in internal snapping hip, as the tendon catches on the iliopectineal eminence or the femoral head. Recently, it has been associated with labral tears in the 2–3 o'clock position, where the muscle-tendon belly travels close to the anterior labrum.[4,5]

Anterior inferior iliac spine. Extra-articular hip impingement may be another source of hip pain, which is associated with abnormal morphology of the AIIS. The AIIS is a bony prominence of the ilium and consists of 2 facets. The superior facet is the origin of the direct head of the recuts femoris. The inferior facet gives rise to the iliocapsularis muscle.[6] 3 morphological variants of the AIIS are described. Type I - a smooth ilium wall between the AIIS and the anterosuperior rim; Type II - the AIIS prominence extends to the level of acetabular rim; Type III - the AIIS extends distal to the acetabular rim.[7]

Ischium. Ischiofemoral impingement (IFI) has been described as narrowing of the space between the ischial tuberosity and the lesser trochanter.[8] Certain morphologies of the ischium have been associated with IFI, including increased intertuberous diameter, the distance between the inner aspects of the ischial tuberosities, which is often observed in women, and may explain the higher prevalence of IFI in women. Additionally, IFI has been associated with increased ischial angle, which is the angle measured between the long axis of the ischiopubic ramus and the horizontal plane as evaluated on axial cuts.[8]

The proximal hamstring inserts onto the ischial tuberosity. The semimembranosus attaches anterolaterally, while biceps femoris and semitendinosus attach medially.[9] Ischial tuberosity enthesopathies can lead to swelling and widening of the proximal hamstring tendon insertion and cause IFI.[10] Injuries to the proximal hamstring attachment may vary from incomplete to complete tears, and may take place at musculotendinous junction, as an avulsion off the bone, or with a bony attachment. If significantly retracted the hamstring tendons may tether the sciatic nerve.[11]

Proximal femur. Certain morphologies of the proximal femur have been implicated in IFI, include coxa valga, prominent lesser trochanter, abnormal femoral anteversion, as well as coxa breva.[10] In coxa valga, increased femoral neck angle brings the femur closer to the ischium, resulting in narrowing of the ischiofemoral space and impingement.[8] Similarly, increased femoral anteversion, prominent lesser trochanter, and coxa breva narrow the ischiofemoral space.

Deep gluteal space. The deep gluteal space is demarcated by gluteus maximus muscle posteriorly, linea aspera and confluence of the deep and middle gluteal aponeurosis laterally, the greater and lesser sciatic foramina medially, femoral neck and the greater and lesser trochanters anteriorly, extending into the posterior thigh inferiorly. This space contains the short external rotators. Additionally, the superior gluteal nerve and artery run in the supra-piriformis space, while the inferior gluteal nerve/artery, sciatic nerve, posterior femoral cutaneous nerve, ascending circumflex femoral artery are inferior to the piriformis.[9] Sciatic nerve may become entrapped in this space by the piriformis, scar tissue from thickened bursae, obturator internus, quadratus femoris, or hamstring tendon insertion scarring.[12]

History and physical

History and physical exam should take note of patients' demographics: age, sex, body mass index (BMI), etc. Initial assessment should focus on the onset of symptoms, mechanism of injury and duration of injury. Patients may report an acute injury during a specific activity and may recall a pop or snapping sensation, followed by an immediate onset of pain. For chronic problems, they may report progressively worsening pain with certain activities, such as kicking or deep squatting. Location and character of the pain are also important to note, as well as alleviating and aggravating factors. Patients should also be asked about their activities/sports, previous trauma to the area, and treatments that they may have had already. A flow-chart for highlights in physical exam for extra articular hip pain is suggested in Figure 1.

Greater trochanteric pain syndrome. GTPS patients describe chronic pain over the lateral aspect of the greater trochanter, which can radiate distally along the lateral thigh. GTPS is predominantly seen in females between ages of 40–60 years, which may be related to larger pelvic width leading to greater prominence of the trochanter and bursitis.[13] Pain may also be related to gluteus medius and minimus tendon pathologies. Pain is exacerbated by lying on the affected side, prolonged standing or walking, and transitioning from sitting to standing.[13]

Examination reveals point tenderness over the posterolateral aspect of the greater trochanter. This often overlies the gluteus medius tendon insertion or if more proximal could indicate gluteus minimus tendon involvement. Pain may be reproduced with resisted active abduction of the hip. Patient's may exhibit Trendelenburg's sign, the finding most specific for an abductor tendon tear.[13,14] A positive Ober's test may indicate presence of iliotibial band (ITB) syndrome. Reproducible snapping of the iliotibial tract, which can often be visible, over the greater trochanter with hip flexion and extension is consistent with the external snapping hip syndrome.

Internal hip snapping. Patients often complain of painful snapping sensations in the groin with specific movements of the hip.[15]

On exam, snapping can often be reproduced by bringing the hip from flexion and abduction to extension and adduction. Snapping can sometimes be prevented by examiner by applying finger pressure over the iliopsoas tendon at the level of the femoral head.[15]

AIIS/sub-spine impingement. Patients presenting with AIIS impingement often have a history of a previous hip injury, such as avulsion of the AIIS, injury to the rectus femoris tendon resulting in hypertrophy of the AIIS.[6] While the acute symptoms resolve after initial trauma, progressive activity-related pain and restriction of motion develop over time. This occurs due to AIIS malunion or rectus tendon ossification. It may also arise from repetitive strain on the capsule and the iliofemoral ligament due to repetitive hyperextension and rotational stresses during running and twisting sports. Congenital AIIS anomalies are also encountered.[6]

On exam, patients commonly have limited hip flexion with associated anterior hip pain. They also exhibit restricted flexion adduction and internal rotation as the prominent AIIS comes in contact with the femoral neck. Weakness with resisted straight leg raise may also be present.[6]

Sciatic nerve entrapment. Patients with sciatic nerve entrapment often have a history of trauma. They often are unable to sit for prolonged period of time and complain of pain in the sciatic nerve distribution, which is frequently accompanied by paresthesias. Many are unable to sit for longer than 30 minutes.[9,12,16]

On exam, patients may have a positive supine straight leg raise test, which places the sciatic nerve on stretch reproducing symptoms. The active piriformis test is performed with the patient in the lateral decubitus position. With the knees bent, patient is asked to initiate resisted hip abduction and external rotation while digging the ipsilateral heel into the examination table. Pain is reproduced as the short external rotators compress the sciatic nerve. The seated piriformis test is performed with the patient sitting at the edge of the examination table. The hip is flexed to 90° with the knee extended. As the hip is adducted and internally rotated, the external rotators are placed under tension stretching and compressing the sciatic nerve.[16]

Proximal hamstring injuries. In proximal hamstring avulsions, the mechanism of injury typically involves eccentric contraction of the hamstring from sudden hyperflexion of the hip with the knee fully extended. Patients note an immediate onset of pain in the posterior proximal thigh. They may report a pop at the time of injury and develop extensive bruising and swelling in the area. Patients often report weakness with knee flexion and complain of pain when sitting on the affected side. Pain may be referred down the lower extremity in the sciatic nerve distribution if the nerve is tethered by the retracted tendon.[11] A palpable gap at the proximal hamstring and/or prominence of the retracted muscle belly may be appreciated.[11] Examination in the prone position may reveal objective weakness with resisted knee flexion.[11]

Imaging

X-ray. All patients should initially be evaluated with x-ray. In addition to standard anteroposterior (AP), lateral pelvis and hip radiographs, the false profile view is useful in evaluating the morphology of the AIIS. AP radiographs should be oriented with the extremities in 15° of internal rotation to maximise length of the femoral neck. Coccyx should be directly in line with the pubic symphysis, and the iliac wings and obturator foramina should be symmetrical. Proper pelvic inclination is confirmed with the distance between the coccyx and the pubic symphysis measuring between 1–3cm. False profile view is done with the pelvis rotated 65° and the foot of the affected hip should be positioned parallel to the cassette.[17] In cases of sub-spine impingement, AIIS morphology can be readily assessed on AP and false profile views. Additionally, enthesopathy and bony avulsions may be apparent in patients with tendon pathologies.[11]

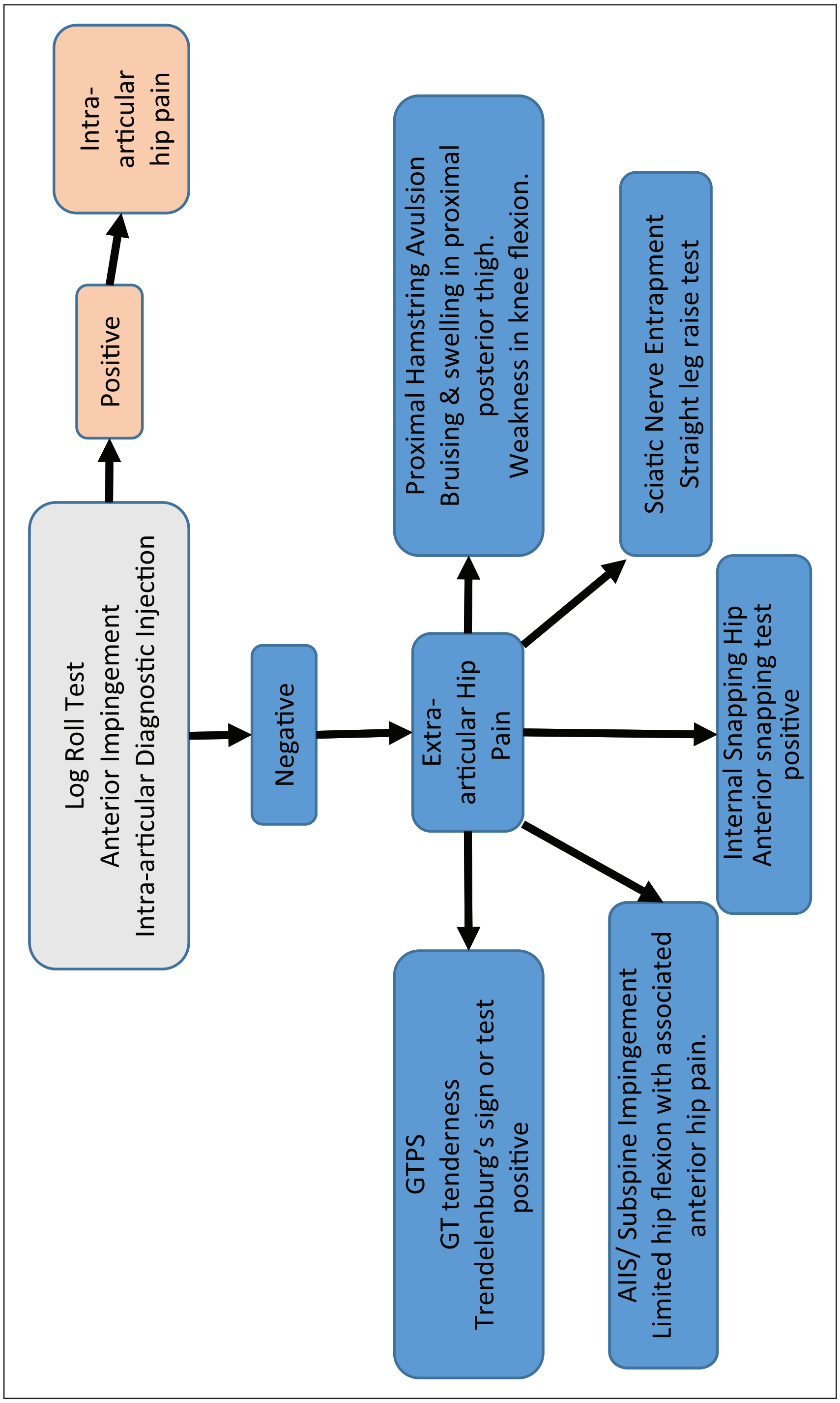

Figure 1. Highlights in physical exam for extra-articular hip pain.

Femoral neck-shaft angle may be evaluated on the AP radiographs. Decreased neck-shaft angle and increased offset may predispose to GTPS as discussed previously.[3] Increased neck-shaft angle and decreased offset may predispose to IFI.[10] Absence or presence of a crossover sign may help determine the acetabular version.[3]

Ultrasound – diagnostic versus therapeutic uses. Ultrasound (US) may be helpful in evaluating local hip anatomy, and may show tendon tears, localised hyperaemia, as well as snapping tendons.[10] US-guided injections may be utilised in treatment and/or diagnosis of extra-articular pathologies. Anaesthetic and corticosteroid injection into the perineural sciatic space may provide symptom relief in the case of sciatic nerve impingement and provide diagnosis. Additionally intramuscular injection of botox into the piriformis muscle may provide temporary relief in cases of piriformis syndrome.[9]

Magnetic resonance imaging (MRI)

Greater trochanteric pain syndrome. Greater trochanteric bursitis is usually treated with conservative measures. However, when the pain fails to improve with conservative measures and is accompanied by abductor weakness or Trendelenburg gait, the pain may be due to an undiagnosed abductor tear.[18] MRI is the gold standard for visualisation of abductor tears.[18] On MRI, trochanteric bursitis is visualised as distention of the subgluteus maximus or subgluteus medius bursa. Increased signal intensity on T2 images or thickening of the tendon on T1 images signifies gluteus medius/minimus tendinitis. Partial tears of the tendon also appear as increased signal intensity on T2 and thinning of the tendon on T1 images. Complete tears are identified by the complete disruption of the tendon on T1 and bright signal on T2 images, signifying presence of fluid or granulation tissue in the defect.[14] Hartigan et al.[18] describe a stepwise approach for identification of abductor tears. 1st, an axial T2 fat-saturated (FS) sequence to look for undersurface tears with fluid between tendon and bone. Tensor fascia lata (TFL) size is also noted, as the muscle may be hypertrophied in cases of chronic abductor insufficiency. Next, a coronal T2 FS images are evaluated from posterior to anterior to identify undersurface tears, bursitis, and tendon disruptions.[18] The length of the abductor tendons should be measured from the musculotendinous junction to their insertion. Length >2 cm is highly suspicious for a partial thickness tear.[19] Finally, a coronal T1 sequence of the pelvis is used to compare the size of the TFL. Goutallier/Fuchs may be used to evaluate for muscle atrophy of gluteus medius in a similar fashion as it is used in the shoulder.[18,20]

Sciatic nerve entrapment. Sciatic nerve entrapment in the deep gluteal space (DGS) can be due to various etiologies, which may be distinguished with the use of MRI. These include fibrous/fibrovascular bands, piriformis syndrome, obturator internus/gemellus syndrome, quadratus femoris and ischiofemoral pathologies.

Fibrovascular bands may be completely fibrous, may contain vessels surrounded by fibrous tissue, or may contain vessels only. Inferior gluteal artery branches are often associated with fibrous bands that lie in close proximity to the piriformis muscle. These bands are classified into 3 types. Type 1 is a compressive or bridge-type band that compresses the nerve. These bands tend to extend between the posterior greater trochanter and the sciatic notch. Type 2 bands are adhesive or horse-strap in nature. They bind to the sciatic nerve directly and limit its movement in a single direction during hip movement. These bands may originate from the greater trochanter laterally (most common) or the sacrospinous ligament medially. In type 3, bands adhere to the sciatic nerve from multiple origins, anchoring the sciatic nerve movement in multiple directions.[9]

Piriformis syndrome may be attributed to primary or secondary causes. Primary causes are associated with anatomical variations or anomalous attachments. MRI may detect hypertrophy of the piriformis muscle. However, piriformis asymmetry alone has only been shown to have specificity of 66% and sensitivity of 46%. When the hypertrophy was associated with increased signal of the sciatic nerve at the sciatic notch, specificity improved to 93% and sensitivity to 64%.[9,21] In dynamic nerve entrapment by the piriformis, the only finding may be sciatic nerve hyperintensity. Obturator internus/gemellus complex syndrome present in much the same way as the piriformis syndrome. [9]

MRI can also be used to measure the ischiofemoral space, as patients with ischiofemoral space measuring <23 mm may be predisposed to impingement.[9] Oedema and inflammatory changes in the quadratus femoris from repetitive impingement have been reported to cause adhesions of the muscle to the sciatic nerve. There have been no reports of dynamic entrapment of the nerve by the quadratus femoris itself. Increased signal in the ischiofemoral adipose tissue in the deep gluteal space and bursa-like fluid collection in the region of the lesser trochanter can also be seen. However, these findings can mimic iliopsoas, obturator externus, ischial bursitis.[9,10]

Proximal hamstring avulsions. In acute proximal hamstring avulsion injuries, T2-weighted imaging reveal high intensity signal intervening between the tendon edge and the ischial tuberosity. Chronic avulsion injuries do not typically exhibit hyperintensity on T2, but fatty infiltration and reduction in size of the hamstring muscle and scarring of the tendon to adjacent structures can be seen. Tethering of the sciatic nerve to the tendon edge may also be appreciated. In younger patients, apophyseal avulsion can be well characterised.[11]

Non-operative treatment

Non-operative management includes activity modification to avoid activities that exacerbate symptoms. Non-steroidal anti-inflammatory drugs (NSAIDs) may help address the inflammatory component of associated pathology, such as chronic tendinopathy.[3] Physiotherapy may be attempted to improve general core strength and muscle imbalance. Eccentric exercises in particular have been shown to be effective in reducing pain and leading to normalisation of tendon structure.[3,22] Corticosteroid injections may be of benefit, especially in cases of GTPS, internal snapping, and deep gluteal space syndromes.[3,9,23] However, there is concern of weakening tendon structure.[3] Low energy shockwave therapy may be useful in GTPS tendinopathy, which has been stipulated to increase blood flow and stimulate cellular activity.[3]

Operative treatment

Operative treatment is reserved for recalcitrant cases. Below we focus on endoscopic techniques to address these pathologies.

Abductor repair. Greater trochanter pain associated with abductor tendon tears that fail conservative treatment may be treated with tendon repair. Endoscopic approach is recommended in most cases with the exception of full-thickness tears with >2 cm of retraction, Goutallier/Fucks grade III/IV, or in revision repair situations.[18] Endoscopic repair is carried out through proximal and distal direct-lateral portals with the aid of accessory anterolateral or posterolateral portals. Once tendon tear(s) are visualised, tendons are mobilised, and the footprint is debrided. Anchors are placed through the most direct portal. The sutures are passed through the tendon(s) and tied down for a tension-free repair.[2] Figure 2 provides endoscopic views of an abductor tendon repair. In partial-thickness tears, Hartigan et al.[24] reported significant improvement in patient-reported outcomes scores (PROs) in 25 patients at the 2-year postoperative mark. Of the 11 patients with objective abductor weakness, 7 gained at least 1 strength grade, and of the 14 patients with a Trendelenburg gait, 12 regained normal gait at latest follow up.[24] Similar PRO improvements were maintained at 5-year follow-up for 14 patients undergoing endoscopic repair of both partial (11) and full-thickness (3) tears, as reported by the same group.[25] In a systematic review comparing outcomes of open and endoscopic abductor tendon repair, Alpaugh et al.[26] found equivalent good to excellent results in a majority of patients in both groups. There was a higher complication rate in the open group (13%) compared to endoscopic group (3%). Tendon re-tear rate in the open group was 9% and no re-tears were reported in the endoscopic group.[26] In a systematic review by Chandrasekaran

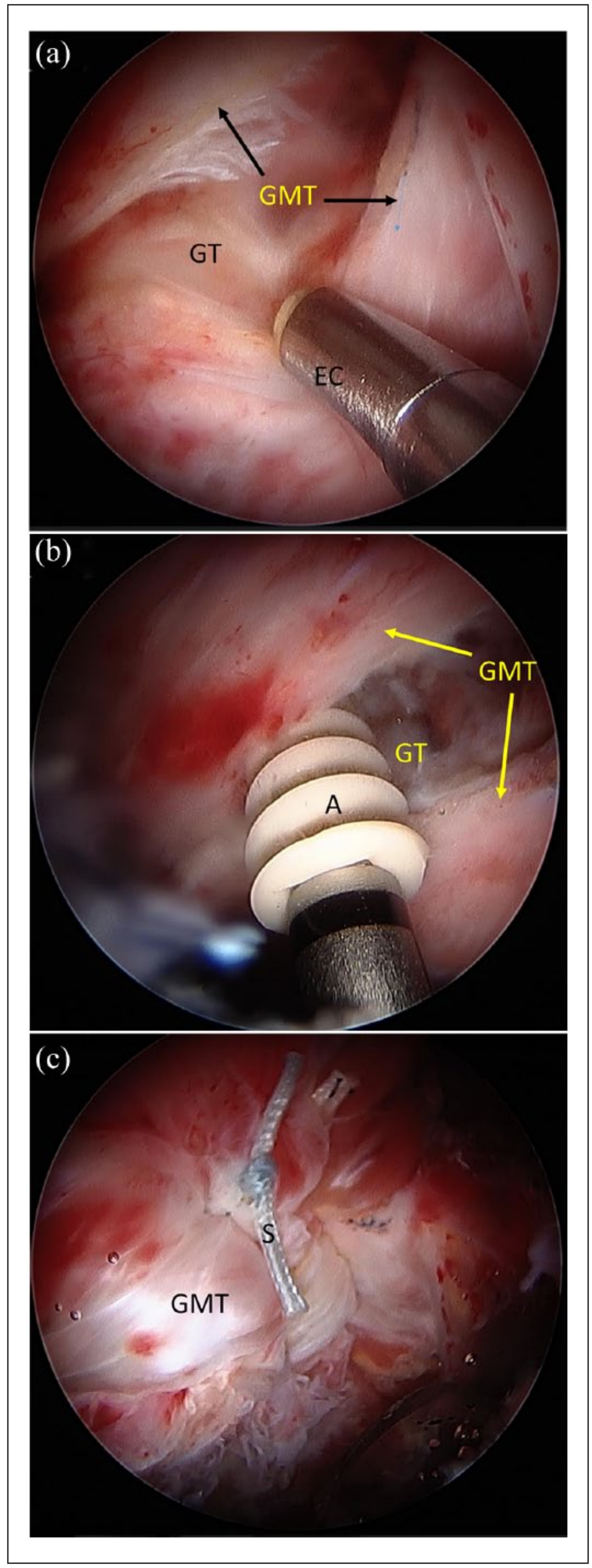

Figure 2. (a) Gluteus medius tear with exposed greater trochanter. (b) An anchor is placed in the greater trochanter between the 2 torn leaves of the gluteus medius tendon. (c) After tying the suture, the tendon is placed on the footprint. GT, greater trochanter; GMT, gluteus medius tendon; EC, electrocautery; A, anchor; S, suture.

et al.[27], authors found that clinical outcome and pain scores were similar between the 2 groups at 1- and 2-year follow-up. Abductor strength was also equivalent between the open and endoscopic groups. Again, there was a higher rate of complications in the open group.[27]

Iliopsoas fractional lengthening. Arthroscopic iliopsoas fractional lengthening (IFL) aims at addressing internal snapping of the tendon over the iliopectineal eminence or the femoral head. Arthroscopic release of the iliopsoas tendon is generally performed in conjunction with other procedures, including addressing femoroacetabular impingement (FAI) and labral tears. Arthroscopic IP tendon lengthening may be performed through the central compartment at the level of the joint line. At this level, the iliopsoas tendon is approximately 50% tendon and 50% muscle. Exposure of the iliopsoas tendon is performed by performing a medial extension capsulotomy. Once the tendon is exposed, a beaver blade may be used to transversely incise the tendon. Care is taken to preserve the muscular portion of the tendon at this level.[5] Figure 3 demonstrates this technique for IFL. El Bitar et al.[5] in a prospective study with a minimum of 2-year follow-up showed that patients have significant improvements in PROs. Of the patients in the study, 82% reported resolution of painful snapping and overall good to excellent results.[5] Perets et al.[28] reported results of a 2-year study looking at clinical outcomes and return to sport in competitive athletes undergoing arthroscopic IFL. Of the 60 patients, 91.7% had resolution of painful snapping, 65% returned to their sport, and patients had statically significant improvement in PROs. When matched to 41 control patients who did not undergo IFL, no difference was found between the 2 groups.[28] However, iliopsoas lengthening may not be indicated for all patients as pointed out by Fabricant et al.[29] In a cohort of 67 patients, authors found that a subset of patients with increased femoral anteversion had inferior results. Specifically, those with femoral anteversion greater than 25° had lower hip outcome scores. It has been proposed that the iliopsoas tendon may play an important role as a stabiliser of the hip, especially in the extremes of hip extension and external rotation. Disruption of the tendon in these patients may result in greater alteration of hip kinematics leading to inferior outcomes.[29] It has been shown that certain patients undergoing iliopsoas release may have similar clinical presentations as patients with micro-instability,[28,30] in which case appropriate capsular repair or plication may play a role. Hartigan et al[31] reported on 2-year outcomes in 32 patients with radiographic acetabular dysplasia, who underwent iliopsoas fractional lengthening for painful iliopsoas snapping, supplemented with capsular plication. There was statistically significant improvement in PROs at 2 years, and while 4 patients underwent revision arthroscopy of traumatic labral re-tears, none required treatment for post-operative instability.[31]

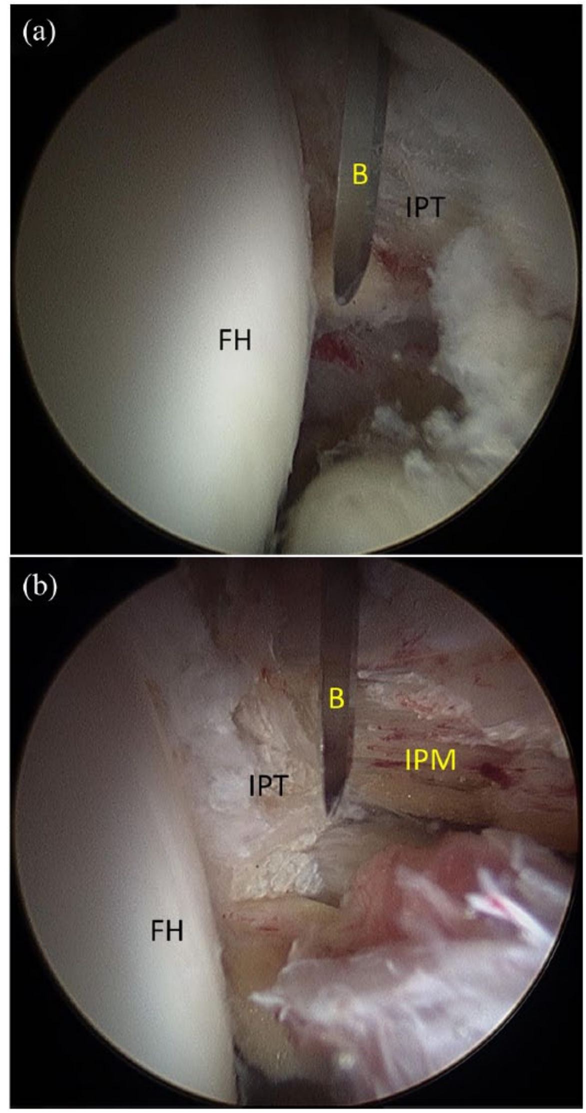

Figure 3. (a) A blade is introduced at the level of the joint. (b) The tendon part of the iliopsoas is cut with a blade, leaving the muscular part intact.
IPT, iliopsoas tendon; FH, femoral head; B, blade; IPM, iliopsoas muscle.

Sub-spine decompression. Hetsroni et al.[32] described a technique for decompression of prominent AIIS. The procedure is performed through the standard anterolateral and mid-anterior portals that are used for intra-articular pathologies. The capsule is dissected proximally between the 1:30 and 2 o'clock positions, exposing the distal portion of the AIIS. The AIIS is then cleared of soft tissue, and finally decompressed with the use of a bur. Authors reported excellent results in 10 patients. Hip flexion range of motion improved from 99–117°. There were no cases of fluid extravasation into the abdomen, detachment of the rectus femoris from the AIIS, or heterotopic ossification.[32]

Sciatic nerve neurolysis. Endoscopic sciatic nerve decompression is generally carried out through the posterolateral portals. Care is taken not to injure the sciatic nerve during the blind portal placement. Fibrovascular bands about the sciatic nerve are debrided utilising an arthroscopic shaver. Outcomes at a mean 2-year follow-up were reported by Park et al.[33] In a cohort of 45 hips, authors reported significant improvement in visual analogue scale (VAS) and mHHS (modified Harris Hip Score) scores. Paresthesias and sitting tolerance were also significantly improved at final follow-up. There were no complications. Best outcomes were seen in patients who did not have major previous trauma to the hip, such as prior fractures.[33] Martin et al.[12] reported positive outcomes of endoscopic sciatic nerve neurolysis in 35 patients at a mean follow-up of 12 months with improvement in mMHS and VAS scores and 83% of patients achieving resolution of sciatic sit pain.

Proximal hamstring repair. Indications for operative treatment of proximal hamstring injuries include bony avulsions with 2 cm of retraction, complete tears of all 3 tendons with or without retraction, and partial tears that have failed conservative treatment.[34] Traditionally repair was conducted using an open technique, however more recently, endoscopic techniques have been described.[34] Endoscopic proximal hamstring repair is performed in the prone position, utilising a direct posterior and posterolateral portals in the gluteal folds. Utilising fluoroscopy guidance and blunt dissection, the subgluteal space is cleared of scar tissue, neurolysis may be performed at this time if necessary. Hamstring origin is inspected, and ischial tuberosity footprint is cleared of soft tissue. Anchors are placed through accessory portals and the hamstring tendons are reattached to their origin. Post-operatively, patient's hip range of motion is restricted and in chronically retracted cases, knee may need to be maintained in the flexed position for 3–6 weeks.[34] A systematic review evaluated outcomes of proximal hamstring avulsion repair, showing a high satisfaction in both acute and delayed repairs. Return to sports ranged from 76–100%, with 55–100% returning to preinjury level. Satisfaction rate ranged from 88% to 100%. Hamstring strength and endurance recovered in over 78% of patients. Complication rate was low and rerupture rate was reported at 3%. However, residual pain, weakness, and decreased activity tolerance were reported in some patients.[35] The study did not make a distinction between open and endoscopic repair.

Conclusion

While indications for extra-articular arthroscopic/endoscopic hip procedures are rising steadily, current literature is sparse and primarily consists of case studies, case reports, and expert opinions and lacks large, randomised control studies. Nevertheless, arthroscopic procedures of the hip offer advantages including limited disruption of normal anatomy, superior visualisation, and decreased bleeding. With the expanding operative indications and techniques, early outcomes have been quite promising.

Declaration of conflicting interests

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