Specific Tissues and Conditions: Extra-articular Pathologic Conditions

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Introduction

Hip arthroscopy has expanded greatly over the past decade and remains one of the orthopedic field's fastest developing areas of treatment. Current techniques of diagnoses and treatment have facilitated evolving interventions for these conditions. With the growth of intra-articular surgical interventions, orthopedic surgeons are now venturing extracapsularly to treat soft tissue ailments. The use of the endoscope provides improved visualization of extra-articular pathology that previously required large open incisions for diagnosis and treatment.

Arthroscopic or endoscopic approaches are now effective in treating: transarticular or extra-articular lengthening of the iliopsoas in internal coxa saltans; extra-articular access to the iliotibial band for external coxa saltans; and endoscopic repair of gluteus medius tears (Table 57.1). The purpose of the present chapter is to characterize the extra-articular pathology around the hip joint and provide nonoperative and operative treatment of these disorders.

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Disorders of the Peritrochanteric Space

Abductor Muscle Tendinopathy and Tears

Greater trochanteric pain syndrome (GTPS) is characterized by lateral-sided hip pain and includes trochanteric bursitis, gluteus medius or minimus tears, and external coxa saltans [16, 17]. Gluteus medius or minimus tears, also known as "rotator cuff tear of the hip" [18], is the most common presentation and is often found in patients with ostensible recalcitrant trochanteric bursitis [18, 19]. The natural progression of hip abductor tendinopathy is similar to the pathogenesis of tendon degeneration elsewhere in the body and generally begins sequentially with bursitis, tendonitis, tendinopathy, partial thickness tears, full thickness tears, and massive tears.

Patients may present with a constellation of buttock, lateral hip, and groin pain which is due, in part, to the varying nerve supply to the peritrochanteric compartment. Inflammation in this area may cause radiating pain and paresthesia often leading to wide differential diagnoses. Patients may complain of activities that engage the hip abductors such as getting up from a seated position or difficulty climbing stairs. In most cases, the onset of symptoms is insidious, but there are some patients that report an acute exacerbation of symptoms after a recent fall [1]. Patients suffering specifically from a gluteus medius avulsion often present with an obvious limp, necessitating the use of a walker [20, 21]. Due to the stress placed on the greater trochanter, patients complain of pain in a lateral decubitus position that may awaken them at night. Certain anatomic abnormalities such as a high valgus knee angles and a leg length discrepancy have been known to cause mechanical abrasion and subsequent abductor tears due to the increased ITB tension [22].

Physical exam of the hip begins with observation of the patient for Trendelenburg gait followed by performing the Trendelenburg fatigue test. A distinct drop of the non-support pelvis indicates weakness or loss of function of the abductors. With the patient in a lateral decubitus position, the examiner

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Table 57.1 The diagnostic and treatment courses of the conditions comprising GTPS

Pathology	Clinical presentation	Pathology	Treatment	Outcomes
Abductor tendinopathy	– Lateral hip, buttock, and groin pain. Difficulty climbing stairs, pain with lateral decubitus position, night pain, "grinding sensation," weak ABD – Palpable pain at the gluteus medius insertion or directly over greater trochanter (GT). (+) Trendelenburg fatigue test – MRI T2 shows hyperintensity at superior GT	– Degenerative tears at anterior third due to frictional trauma from tight ITB, osteophytes at anterior intertrochanteric line or ischemia with resulting degenerative tears – 3 types: intrasubstance, partial, and complete tears	– NSAID – Physical therapy – Cortisone injections – Open or endoscopic repair	– Surgical repair may provide pain relief and improvement in functional outcome – Endoscopic gluteus medius repairs of 10 patients with metal suture anchors, all had complete pain relief and regained abductor strength at 25 months [1]
External coxa saltans	– Observable/palpable catching or impingement of ITB over GT during flexion/extension – Increased snapping with hip adduction and knee extension. (+) Ober test	– Increased adduction angle secondary to pelvic morphology, greater femoral neck angle and gait kinetics causing increased thickness to the posterior 1/3 of the ITB	– NSAIDs – Physical therapy to stretch the ITB – Cortisone injections – Surgery: ITB release at posterolateral portion of GT. From vastus tubercle to GT, Z-type release, longitudinal incisions distally to proximally in ITB, or diamond defect technique	– Most cases improve with PT, NSAIDs, corticosteroid injections for resultant bursitis – Endoscopic bursectomy and longitudinal ITB release of 11 hips saw absence of pain and return to previous activity level at 2 years in all except one patient [2, 3]
Internal coxa saltans	– Audible snapping in the anterior aspect of hip is common – Diagnosis is confirmed when the physician uses finger pressure over the area of the snapping sensation and successfully blocks the symptom [4, 5] – Physical exam can reproduce the clicking sensation by extending a flexed, abducted, and externally rotated hip with the patient in a supine position [5–7]	– Audible and *painful* displacement of the iliopsoas tendon over pectineal eminence or prominent pincer or cam deformity	– Physical therapy is successful in the majority of cases – Cortisone injections into the iliopsoas bursa – Open and arthroscopic iliopsoas release has proven to be extremely effective at relieving pain and symptomatic snapping	– Arthroscopic or endoscopic techniques are relatively new but have been shown to be equal to or better than open techniques – Open iliopsoas lengthening involves complications that include recurrence, hip flexor weakness, cosmetic disturbances, and loss of sensation [6]
Ischiofemoral femoral impingement	– No classical examination finding – Case reports show pain with hip flexion/extension, internal/external rotation, and abduction/adduction – Tosun et al. showed findings of pain with internal rotation, flexion, and abduction, with pain being localized to the posterior of the hip in most patients [8–13]	– Entrapment of the quadratus femoris muscle between the ischial tuberosity and the lesser trochanter of the femur – In older patients, IFI may be acquired through fractures of lesser trochanter, valgus-producing intertrochanteric osteotomy and osteoarthritis that can lead to superior and medial migration of the femur	– Surgical approaches can entail partial resection of the hip external rotators at the site of impingement, or bony recession at the lesser trochanter and ischium at the site of impingement	– Addressing the impingement endoscopically is currently investigational
Subspine (AIIS) hip impingement	– Anterior hip and groin pain exacerbated by straight hip flexion as well as prolonged hip flexion, noticed when sitting – This pain and limited range of motion can also be elicited with hip adduction, internal rotation. A "grinding" sensation is noted on hip flexion and lateral movements – Palpation of the tender AIIS can recreate the typical pain	– Impingement of the direct head of the rectus femoris tendon with the distal femoral neck – Can be developmental but is often secondary to prior AIIS avulsion or pelvic osteotomy [14]	– Arthroscopic or open decompression of the AIIS deformity	– In a 3 case study of arthroscopic decompression, both modified Harris Hip Score (HSS) and visual analog scale (VAS) improved. On average, the HHS increased from 75.6 preoperatively to 93.3 postoperatively and VAS improved from 6.18 to 1.13 [15]

should palpate the anterior, lateral, and posterior aspect of the greater trochanter for tenderness. Abductor strength testing can be performed with knee flexed and extended, enabling gravity strength testing. Provocative maneuvers can be performed including the "trochanteric pain sign" which is performed with the patient in a supine position with the hip flexed to 90°, abducted, and externally rotated. If there is pain with external rotation, then the test is considered to be positive. In addition, flexion, abduction, and external rotation (FABER) test may also elicit pain in patients with GTPS. A resisted external rotation should be performed while the patient is in the supine position with the hip flexed at 90° [23, 24].

Plain radiographs can be helpful to rule out osteoarthritis and may demonstrate evidence of calcific tendonitis. MRI and ultrasonography are the primary imaging modalities used to diagnose tendon pathology. Often concomitant with this tendinopathy are subminimus and submedius bursitis, enthesopathic changes along trochanteric insertion, and fatty atrophy [22]. On T2 MRI, hyperintensity is often seen due to thickened hip abductor tendons, tendinopathy, or tendon tears. Though the overall specificity of MRI is debated [25], Kingzett-Taylor et al. found T2-weighted MRI of the superior greater trochanter to be diagnostic of a partial abductor tendon tear with the highest sensitivity (73 %) and specificity (95 %) [17].

Surgical Technique

Endoscopic treatment of GTPS can be performed in either the lateral position on a standard table or in the supine position on the fracture table. The authors' preference is to perform the procedure in the supine position. After general endotracheal anesthesia, the patient is positioned in a hip traction table until the hip joint has been distracted approximately 1 cm. The patient is prepped and draped ensuring the anterior superior iliac spine (ASIS) and greater trochanter are readily accessible. Once the tip of the greater trochanter is identified, an anterolateral portal (ALP) is established approximately 1 cm anterior and 1 cm proximal to the anterior aspect of the greater trochanter (Fig. 57.1a). A diagnostic arthroscopy is performed in the central compartment to determine whether or not any intra-articular pathology is identified. After addressing any intra-articular pathologies the traction is then released and the leg is abducted 15–20°.

The peritrochanteric space is entered using a 5.0 mm metal cannula through the mid-anterior portal (MAP) over the vastus ridge. The cannula is directed between the iliotibial band (ITB) and the lateral aspect of the proximal greater trochanter. Once the cannula is in the appropriate interval, then the cannula is swiped from proximal to distal to open the potential space. The arthroscope and light source are both directed proximally so that the distal aspect of the peritrochanteric space is visualized. Using spinal needle localization, the 4.5 mm shaver is introduced over a Wissinger rod and 5.0 mm metal cannula. The arthroscopic shaver is then used to perform a thorough bursectomy until the tendon of the gluteus maximus is identified distally, the ITB is identified laterally, the undersurface of the gluteus maximus is identified proximally, and the abductor tendons and vastus lateralis are identified medially.

The arthroscope is then placed in the ALP and the arthroscopic shaver is placed in the MAP to continue to debride any excessive bursal tissue. The gluteus medius and minimus are readily identified and the tear pattern can be recognized at this point. An attempt is then made to characterize the mobility of the torn tendons, the quality of the tissue, and the size of the tear. A grasper is then used to ensure the tendon can be approximated to the gluteus medius footprint without tension. Using a 5.0 mm cylindrical burr the footprint is debrided to punctate cortical bleeding (Fig. 57.1b). For small and medium tears, a single row with one to two suture anchors is preferred. For large and massive tears, a double-row suture bridge is the preferred fixation construct. Anchors are inserted percutaneously via a posterolateral portal (PLP), which is 1 cm posterior and 1 cm proximal to the tip of the posterolateral aspect of the greater trochanter. Next, two 5.5 mm biocomposite anchors double-loaded with #2 high strength sutures (Biocorkscrew, Arthrex, Naples, Fl) are placed at the medial border of the gluteus medius footprint (Fig. 57.1c). Next, sutures are passed through the tendon with tissue penetrating device (InJector, Pivot Medical, Sunnyvale, CA) or suture shuttling device (Crescent SutureLasso, Arthrex, Naples, FL) and grasped through the MAP for suture management. In general, two sets of horizontal mattress stitches are passed per anchor and subsequently tied using reverse half hitches and alternating posts (RHAP). An 8.5 mm clear plastic cannula is placed in the PLP. One limb from each stitch is retrieved for the first lateral row anchor (Swivelock, Arthrex, Naples, FL), and the remaining limb is retrieved for the second lateral row anchor (Swivelock, Arthrex, Naples, FL) (Fig. 57.1d). The ends of the sutures are cut, and the hip is rotated to ensure anatomic reduction and fixation of the torn gluteus medius tendon.

Our postoperative protocol consists of bracing with partial weight bearing for the first 6 weeks after surgery. Gentle passive range of motion is performed for the first 6 weeks to prevent adhesions. From 6 to 8 weeks, the patient will progress to full weight bearing but continues to use assistive devices. The patient may continue to use a walker or cane until 3 months from surgery.

Repair of chronic tears may have limits. In a study using MRI to evaluate progress in a late abductor avulsion repair following a THA, it was found that fatty degeneration of the anterior gluteus medius did not reverse or improve at a 1-year follow-up. This illuminates the limitation of late stage abductor avulsion repairs and the possibility that fatty degeneration cannot be reversed [26].

In a study by Lequesne et al. [27], eight MRI diagnosed gluteus medius tears were repaired. Complete remission of spontaneous and provoked pain was seen in seven patients

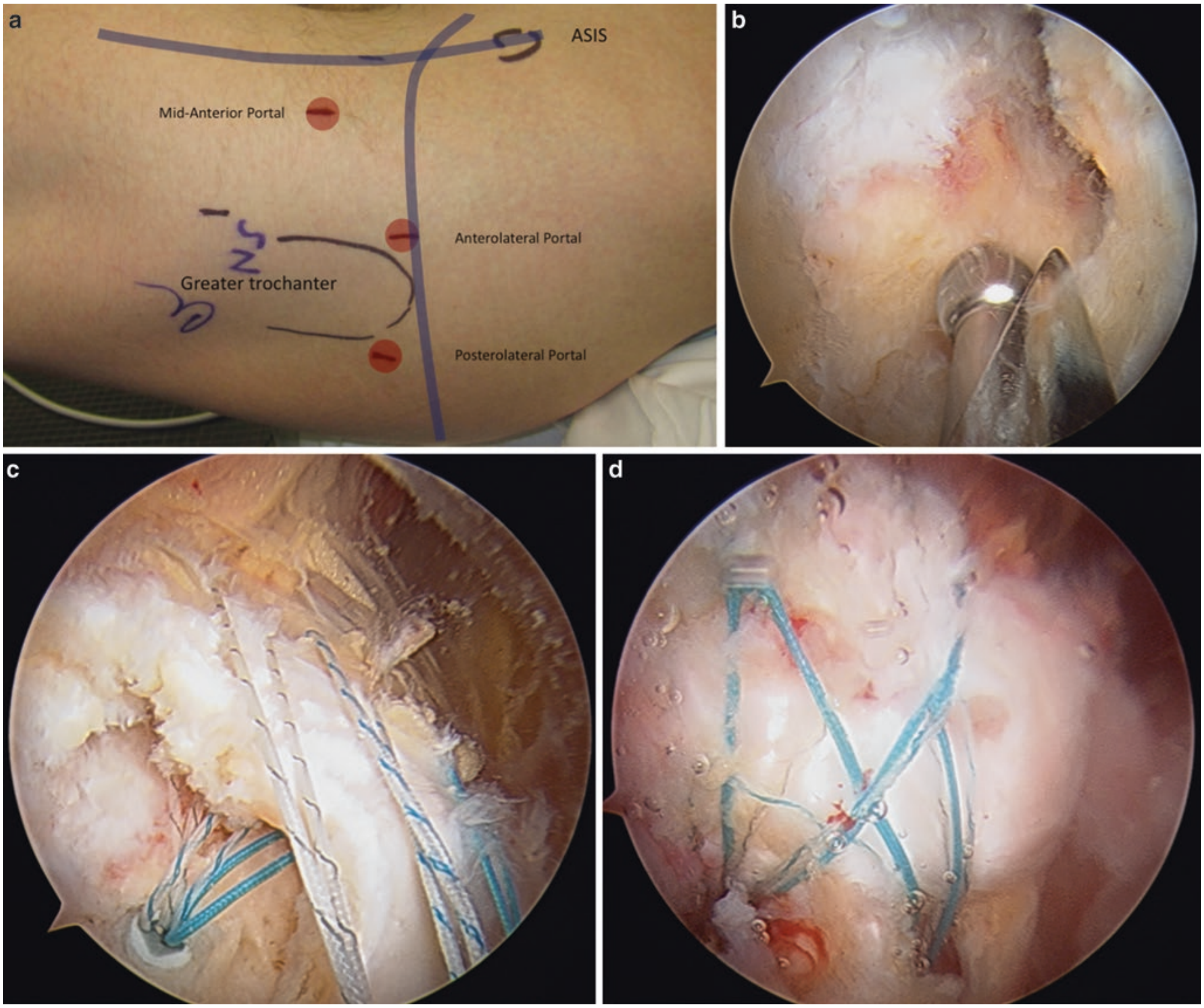

Fig. 57.1 (**a**) Landmarks for portals for peritrochanteric space. (**b**) Large gluteus medius tear. (**c**) Medial row suture anchor in the greater tuberosity. (**d**) Double-row suture bridge construct for repair of gluteus tendon

with partial submission in one patient. Six MRIs performed at 20.5 months showed good reinsertion of tendon. In a study by Voos et al. [1], ten patients with MRI diagnosed and endoscopically confirmed hip abductor tears with endoscopic repair had HHS of 94 and hip outcome scores of 95 at average 1-year follow-up. Seven of ten patients said their hip felt “normal” while three of ten reported “nearly normal” at 25-month follow-up.

Coxa Saltans Externa (External Snapping Hip Syndrome)

Snapping hip, or coxa saltans, has two variant etiologies. External snapping hip syndrome is often secondary to the thickening of the posterior third of the ITB that lies posterior to the greater trochanter in neutral position [22]. Repeated flexion and extension of the overly taut ITB will show signs of “catching” or “impingement” on the trochanter. Further tightening of the ITB and its resultant “snapping” is emphasized by hip adduction and extension at the knee [28]. Women with a large pelvis or more prominent greater trochanters have a predilection for external snapping hip. This is most commonly seen in women who adduct beyond their midline in their stride [28].

The actual snapping of the ITB itself is usually nonpainful [22]; however, the pathology of external coxa saltans lies in resultant complications. As commonly reported, inflammation of the trochanteric bursae may result from the abrasive wear characteristic of external coxa saltans [29]. Additionally, Kingzett-Taylor et al. [17] supported the notion that both abductor tendinopathy and trochanteric bursitis could be secondary to the frictional trauma caused by high tension of the ITB, backing the idea that one cause of GTPS begets other conditions and symptoms, making the disorder largely multifactorial.

The physical exam for external snapping hip syndrome includes a palpable or observable snapping of the ITB over the greater trochanter upon flexion and subsequent extension. The patient can be placed in a lateral decubitus position and a single leg bicycle maneuver can be performed which may reproduce ITB snapping. A significant tightening of the ITB can be observed, characterized by a positive Ober test, qualifying the patient for ITB release with concomitant removal of the symptomatic bursa [30].

Surgical Technique

Prior to surgery, the area of tenderness and snapping on the skin is marked in the preop area to guide the location of our release. The access to the peritrochanteric space is the same as previously described in the surgical technique for gluteus medius repairs. Once the trochanteric bursectomy is completed, the ITB lengthening can be performed (Fig. 57.2a, b). The endoscope is placed in the MAP portal and light source is directed medially to visualize the ITB. The spinal needle is used to localize the posterior third of the ITB at the level of the PLP. Next, an 11 blade on a scalpel is used to create a portal then passed deeper to incise the ITB. The blade is then passed in line with the ITB fibers approximately 2–3 cm. At the midpoint of the incised ITB, the perpendicular incision is then created anteriorly and posteriorly approximately 1.5 cm in each direction (Fig. 57.2c). Next, the 4.5 mm arthroscopic shaver is passed through the PLP and used to debride the flaps of the ITB so that a diamond configuration is visible at the conclusion of the ITB lengthening (Fig. 57.2d).

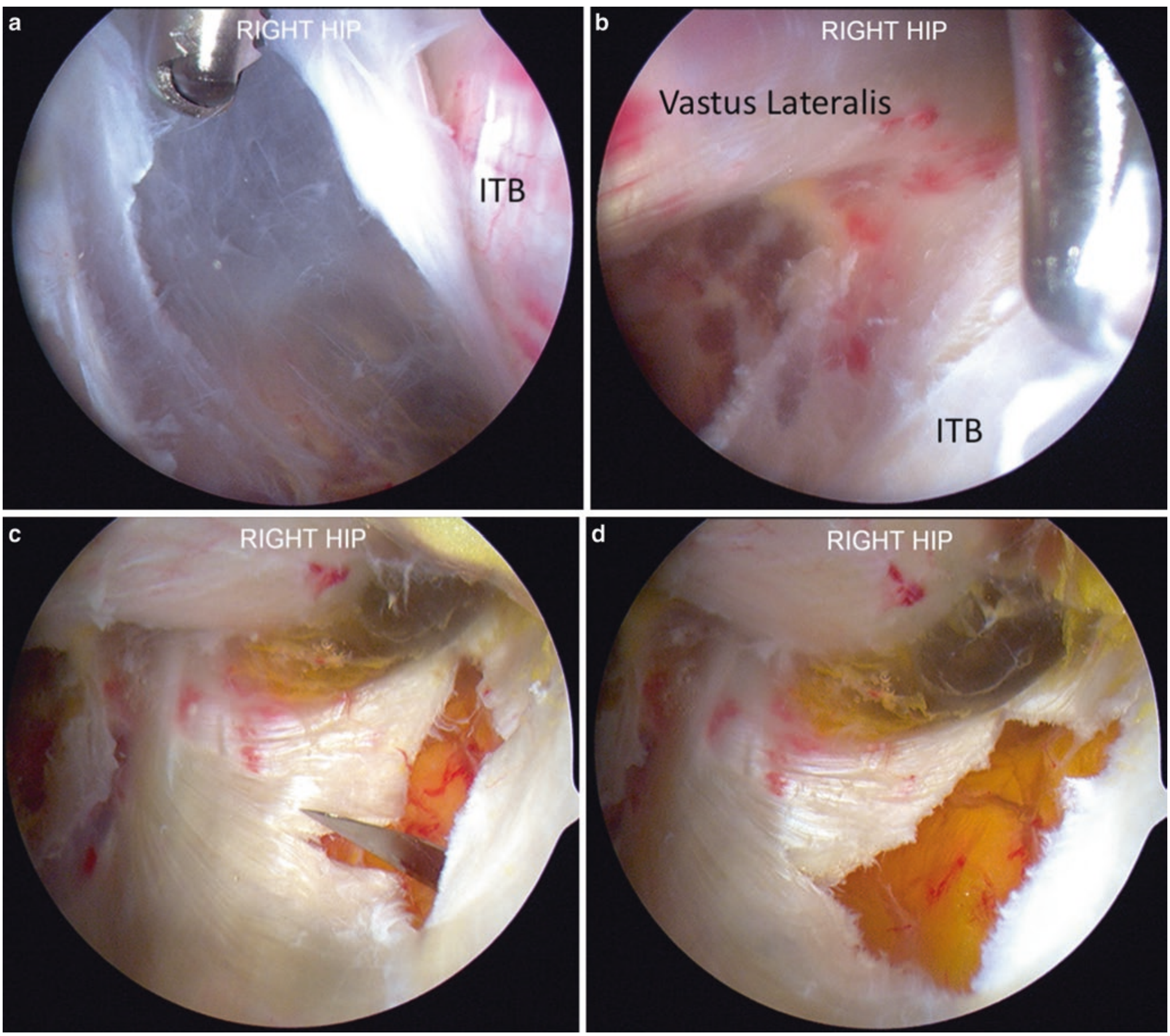

Fig. 57.2 Iliotibial Band Lengthening. (**a**) Endoscopic trochanteric bursectomy in the peritrochanteric space. ITB, Iliotibial band. (**b**) Complete exposure of the ITB and the insertion of the gluteus maximus tendon under the vastus lateralis. (**c**) Scalpel used to percutaneously incise parallel with the ITB then perpendicular to the ITB. (**d**) Final appearance of ITB lengthening with diamond configuration

Table 57.2 Result of endoscopic and open ITB release for external snapping hip

Author, year	Approach	Patient #/age	Mean follow-up/results
Provencher et al. [31], 2004	Open ITB Z-plasty	8 consecutive hips, 1 bilateral; mean age 25.6 years old	22.9 months f/u. 8/9 (89 %) complete resolution of snapping hip, all but one returned to unrestricted activities due to persistent groin pain, but no snapping
White et al. [32], 2004	Open ITB release consisting of single longitudinal cut with 6 stepwise transverse cuts	16 patients (13 female, 3 male); mean age 33 years old	32.5 months f/u. 14/16 (88 %) had ultimate resolution of snapping including 2 revisions due to recurrence. 12/12 patients contacted via phone were satisfied with procedure
Ilizaliturri et al. [3], 2005	Endoscopic ITB release	11 hips (9 f one bilateral, 1 m); mean age 26 years old	24 months f/u. 10/11 (91 %) complete resolution of hip pain, 1/11 (9 %) had nonpainful snapping
Zini et al. [33], 2013	Endoscopic ITB release	15 hips (12 f, 3 m); mean age 25 years old	33 months f/u. Resolution of snapping in all patients, but only 9/15 (60 %) pain free. VAS score improved from 5.5 to 0.53 postop ($p < 0.0001$). HHS 97.5 postop
Polesello et al. [34], 2013	Endoscopic release of gluteus maximus tendon on ITB	9 hips (7 f one bilateral, 1 m); mean age 35 years old	32 months f/u. 7/9 (78 %) complete resolution of pain. 1/9 (11 %) needing reoperation for no symptom relief. HHS preop 61–78 postop. All returned to previous level of activity including one revision

The clinical studies on the endoscopic treatment of external coxa saltans have been reported to be promising (Table 57.2). Ilizaliturri et al. reported on 11 patients with ITB release—10/11 had complete resolution of painful snapping [22]. In 15 patients who underwent endoscopic ITB release, Zini et al. saw average visual analog scale (VAS) improvement from 5.5 to 0.53 with 9/15 patients having complete resolution of pain [cite ZINI].

Coxa Saltans Interna (Internal Snapping Hip)

Internal snapping hip, another etiology of snapping hip syndrome, was first described by Nunziata and Blumenfeld in 1954 as a slippage of the iliopsoas tendon over the iliopectineal line [35]. It has since been described as snapping of the iliopsoas tendon as it crosses the femoral head and anterior capsule during hip flexion to extension [6]. Internal snapping hip can be thought of as an audible and painful displacement of the iliopsoas tendon over bony pelvic or femoral prominences [4, 36]. The typical patient with internal snapping hip syndrome will present with a snapping sensation during walking, long distance running, and other physical activities [6].

Physical exam can reproduce the snapping sensation by extending a flexed, abducted, and externally rotated hip with the patient in a supine position [5–7]. Diagnosis is confirmed when the physician uses finger pressure over the area of the snapping sensation and successfully blocks or palpates the snapping [4, 5].

Iliopsoas bursography, once a popular modality, has been supplanted by more dynamic imaging tools to visualize the snapping of the iliopsoas [5–7, 37]. Recently, the inexpensive combination of radiographs and ultrasound has shown to be effective in diagnosis [5–7, 37, 38]. Nonetheless, MRI also continues to be the most effective diagnostic tool.

Internal snapping hip syndrome can be treated conservatively with a period of rest and activity modification. Physical therapy is the mainstay for the treatment of internal coxa saltans with an emphasis on deep tissue massage or active release therapy and stretching [4, 5]. For patients with persistent painful internal snapping, an image-controlled cortisone injection in the iliopsoas bursa can be effective. In rare cases, iliopsoas lengthening can be performed when refractory to nonsurgical treatment. Compared to open techniques, arthroscopic or endoscopic techniques have been shown to be equal to or better than open techniques. Given the comparable outcomes, endoscopic techniques tend to avoid the complications of open treatment including recurrence, hip flexor weakness, cosmetic disturbances, and loss of sensation [6]. In addition, arthroscopic techniques allow for visualization of the intra-articular space, allowing for a comprehensive diagnostic examination [39]. There is no endoscopic technique proven to be more effective than another [40].

There are currently three described locations for iliopsoas lengthening, and the more distal the lengthening the greater the proportion of tendon to muscle (Table 57.3). The iliopsoas tendon can be released through the central compartment at the reflection of the rectus femora's head and acetabular rim while the leg is in traction through the anterior portal with anterolateral visualization [45]. An arthroscopic psoas tendon release is also possible from the peripheral compartment at the femoral head neck junction, proximal to the zona orbicularis and anterior to the medial synovial fold insertion. This is best done with traction removed, the leg

Table 57.3 Results of open and endoscopic treatment for internal snapping hip

Author, year	Technique	Patient #/age	Results/complications
Dobbs et al. [41], 2002	Open modified iliofemoral approach, fractional lengthening at musculotendinous junction	9 adolescent patients (11 hips), means age 15 years old	1/9 (11 %) had recurrence of nonpainful snapping. 9/9 returned to preop level of activities with no detectable loss of hip flexion strength. 2/9 (22 %) had transient anterolateral numbness
Gruen et al. [42], 2002	Open ilioinguinal intrapelvic approach, fractional tendon lengthening	11 patients, 12 hips; mean age 31.5 years old	11/11 resolution of snapping without recurrence, 9/11 (82 %) satisfactory pain relief, 7/11 (64 %) total resolution of pain, 3/11 (27 %) could not return to previous level of activity, 3/11 (27 %) returned but to a lesser level of activity, 5/11 (45 %) reported subjective hip flexion weakness
Hoskins et al. [4], 2004	Open iliofemoral approach, iliopsoas lengthening	92 consecutive hips (80 patients); mean age 27.3 years old	40/92 (43 %) hips had complications: 6/92 (7 %) had recurrent pain, 20 (22 %) failures/recurrences of snapping, 8 (9 %) anterior thigh sensory deficits, 11/92 (12 %) wound problems. Still, overall satisfaction rate was 89 %
Flanum et al. [43], 2007	Endoscopic release of iliopsoas tendon	6 hips/patients; mean age 38.8 years old	Preop HHS avg 58, postop 6 weeks scores 62, 12 weeks 85, 6 months 90, 12 months HHS 96. 2/5 (40 %) had occasional slight pain at 1 year but 6/6 reported no painful snapping
Ilizaliturri et al. [40], 2009	Endoscopic: iliopsoas release at lesser trochanter (LT) vs. transcapsular (TC) release from peripheral compartment	– LT:10 hips (5 male, 5 female); mean age 29.5 years old – TC: 9 hips (8 f, 1 m); mean age 32.6 years old	LT: preop WOMAC improved 70.1 ± 10.7 to 83.7 ± 7.1 (p = 0.0001). TC: preop WOMAC 67 ± 11.4 to 83.5 ± 5.9 (p = 0.001). No statistical difference in preop Western Ontario MacMaster (WOMAC) scores, every patient in all groups had statistically significant improvement in WOMAC scores, no complications in either group
Ilizaliturri et al. [44], 2014	Endoscopic: peripheral/lesser trochanter (LT) release vs. central compartment/ transcapsular (CC)	– LT: 6 hips (4 m, 2 f); mean age 35.7 years old – CC: 14 hips (5 m, 9 f); mean age 30.9 years old	LT: preop WOMAC 46.33 ± 21.83 improved to 89.33 ± 1.36. CC: preop WOMAC 56 ± 13.21 improved to 89.57 ± 3. One patient in CC group had recurrence of snapping that required surgical intervention. All have improvement of WOMAC scores

flexed 30°, with the anterolateral portal used for visualization [46]. Finally, an endoscopic iliopsoas tendon release is done at the lesser trochanter insertion, with the leg externally rotated and flexed 30° [47]. The surgeon should be aware of the proximity of the MFCA during this procedure [48].

Surgical Technique

Once the patient is placed in appropriate distraction, a standard ALP is established as previously described. An anterior portal is established at the intersection of the vertical line from the ASIS and the horizontal line from the tip of the greater trochanter. A guide wire is passed through the spinal needle and a 5.0 mm metal cannula is passed. In most cases labral contusion is visualized at the 3 o'clock position and most pronounced at the capsular side of the labrum (Fig. 57.3a). At this location, the capsulotomy is widened to about 1 cm and the tendinous portion of the iliopsoas is visualized. Next, a bipolar radiofrequency device is used to lengthen the tendinous portion without releasing the muscular portion of the iliopsoas (Fig. 57.3b, c). The tendinous portion can extend more distal but adjacent to the anterior hip capsule and needs to be recognized. There are case reports of bifid tendons of the iliopsoas and the entire tendinous portion needs to be addressed to prevent recurrent snapping [49]. Meticulous hemostasis must be performed and the area of the middle third between the proximal head neck junction and the lesser trochanter much be avoided to prevent injury to a branch of the medial femoral circumflex artery [48].

Ischiofemoral Impingement

Ischiofemoral impingement (IFI) is described as the entrapment of the quadratus femoris muscle between the ischial tuberosity and the lesser trochanter of the femur. Johnson [8] first described this pathology in a study that found profound symptomatic relief in patients with prior hip surgery after removal of the lesser trochanter. More recently, it has been discovered that IFI can be found in a native hip as a result of trauma, diseases that alter bone architecture such as hereditary multiple exostoses, or congenital abnormalities [8–11]. In older patients, IFI may be acquired through fractures involving the lesser trochanter, valgus-producing intertrochanteric osteotomy, and osteoarthritis that can lead to superior and medial migration of the femur [10, 50].

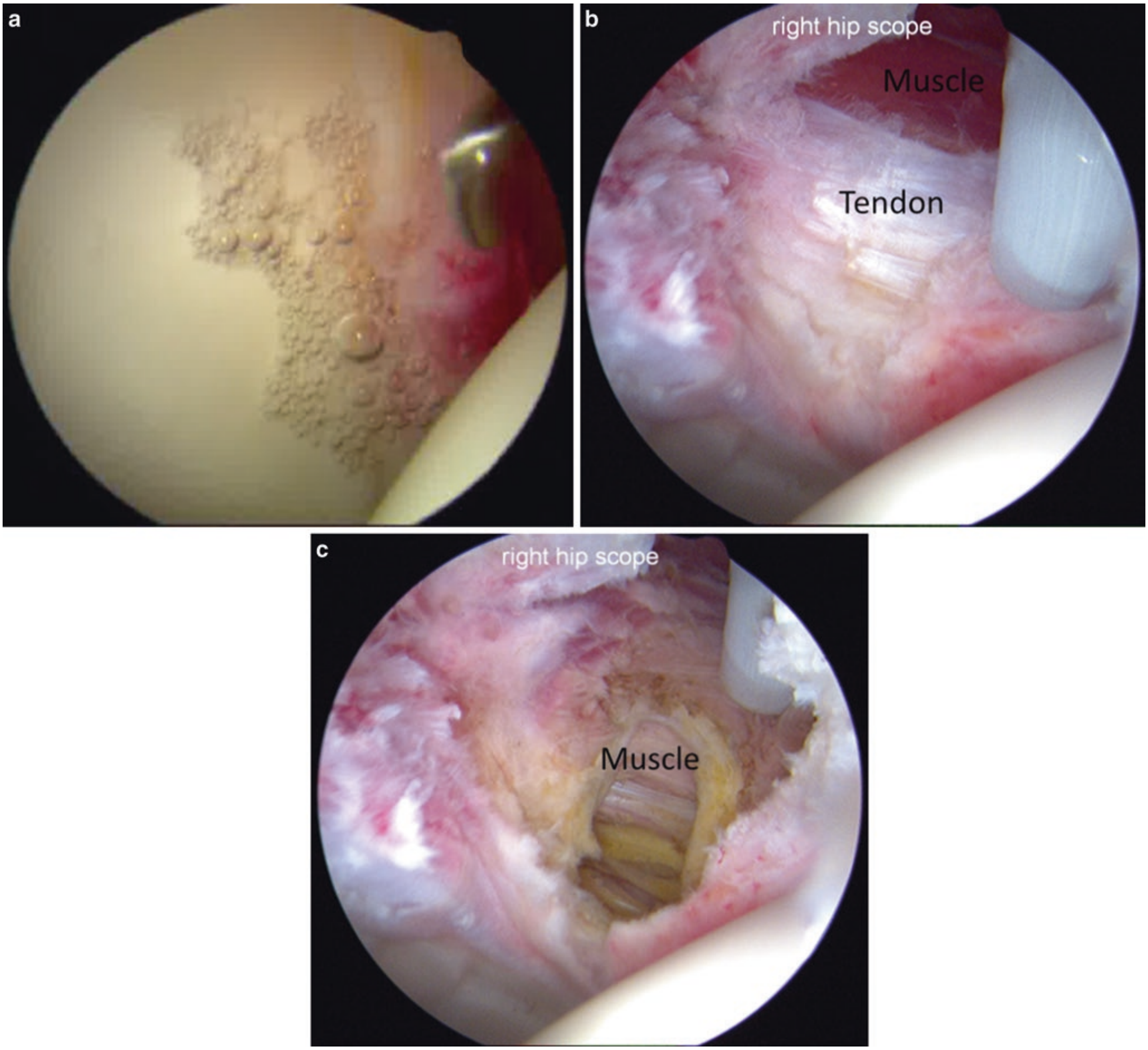

Fig. 57.3 Iliopsoas Impingement. (**a**) Labral contusion at the 3 o'clock position that suggests external compression from snapping iliopsoas tendon. (**b**) Iliopsoas tendon and muscle unit at the central compartment. (**c**) Iliopsoas lengthening of the tendon at the central compartment

Ischiofemoral impingement is more commonly found in females. This has been thought to be due to ischiofemoral space narrowing secondary to wider and shallower pelvises [10] typical of females, as well as larger lesser trochanter prominences [51].

There is no classical examination finding with IFI. Case reports have shown that pain can be elicited with hip flexion/extension, internal/external rotation, and abduction/adduction [8–12]. The most recent retrospective study by Tosun et al. [13] showed findings of pain with internal rotation, flexion, and abduction, with pain being localized to the posterior aspect of the hip in most patients. Diagnosis of this process is more helpful by examining the clinical picture and diagnostic imaging.

Magnetic resonance imaging (MRI), in a study by Torriani et al. [12], showed abnormal MR signal intensity of the quadratus femoris muscle and a narrowing of the space between the ischial tuberosity and lesser trochanter. This space narrowing is thought to be due to congenital ischiofemoral narrowing with bilateral involvement of 25 % of patients.

The diagnosis of IFI can be complicated, as there is minimal literature and discussion on to develop the proper diagnostic tools. To date, there is no gold standard diagnostic tool or exam to diagnose IFI. It is important to correlate physical exam findings with MR imaging when IFI is suspected as the cause of hip pain. Once a diagnosis is established, physicians can apply conservative management or surgical techniques for correcting IFI.

Addressing the impingement endoscopically is currently investigational. Surgical approaches can entail partial resection of the hip external rotators at the site of impingement, or bony recession at the lesser trochanter and ischium at the site of impingement.

Subspine (Anterior Inferior Iliac Spine) Hip Impingement

Cam and pincer femoroacetabular impingement (FAI) have been well researched in recent years [52–54]; however extra-articular impingement conditions have been increasingly recognized as a source of hip and groin pain and restriction [14, 55]. Rectus bony impingement or anterior inferior iliac spine (AIIS)/subspine hip impingement, as described by Larson and Kelly, is the impingement of the direct head of the rectus femoris tendon with the distal femoral neck [15]. While AIIS impingement can be developmental, it is often secondary to prior AIIS avulsion or pelvic osteotomy [14]. Developmental AIIS impingement is commonly seen in the setting of acetabular retroversion and can be mistaken for acetabular retroversion in certain radiographs. In a study using an osteology collection of 3954 hemipelvi, there was found to be a prevalence of 6.4 % with a higher prevalence in males and African Americans, and three subtypes were described: columnar, bulbous, and hooked (Fig. 57.4) [56]. In a study by Hetsroni et al. three-dimensional CT reconstructions were used to classify AIIS morphology into three morphological types that correlated to hip range of motion [57]. In type I AIIS variant, there is smooth ilium between the caudad level of the AIIS and the labrum. Type II variant has either bony prominence between the caudad area and the acetabular rim, or the caudad area is at the level of the acetabular rim. In the type III variant, the caudad level extends distally to the anterosuperior acetabular rim. Type II and III variants result in decreased hip flexion and internal rotation supporting AIIS decompression in certain cases of subspine impingement [57].

The patient generally presents with anterior hip and groin pain exacerbated by straight hip flexion as well as prolonged hip flexion, noticed when sitting. This pain and limited range of motion can also be elicited with hip adduction and internal rotation. A “grinding” sensation is noted on hip flexion and lateral movements. Palpation of the tender AIIS can recreate the typical pain.

Radiographic findings consistent with AIIS impingement include AIIS avulsion, acetabular retroversion with anterior rim sclerosis calcific deposits at the rectus femoris origin as well as impingement cysts at the distal femoral neck [15]. The distal location of these impingement cysts can help differentiate cam and pincer FAI from AIIS impingement. AP pelvis radiograph can show extension of the AIIS below the acetabular sourcil while anterior and distal extension can be seen on false-profile radiograph. Similarly, three-dimensional computed tomography can show AIIS avulsion deformities, excessive anterior and distal extension of the AIIS below the acetabular rim. Larson and Kelly cited the three-dimensional imaging as an invaluable diagnostic tool in evaluating cases of developmental AIIS impingement [15].

Treatment is arthroscopic or open decompression of the AIIS. This is achieved with extension of the acetabuloplasty superiorly with the use of the shaver, radiofrequency device and burr, above the capsule to the insertion of the rectus femoris. In a recent case series, the authors report both modified Harris Hip Score (HSS) and visual analog scale (VAS) improved. On average, the HHS increased from 75.6 preoperatively to 93.3 postoperatively and VAS improved from 6.18 to 1.13 [15]. Further work is warranted to identify risk factors, radiographic findings, and surgical techniques.

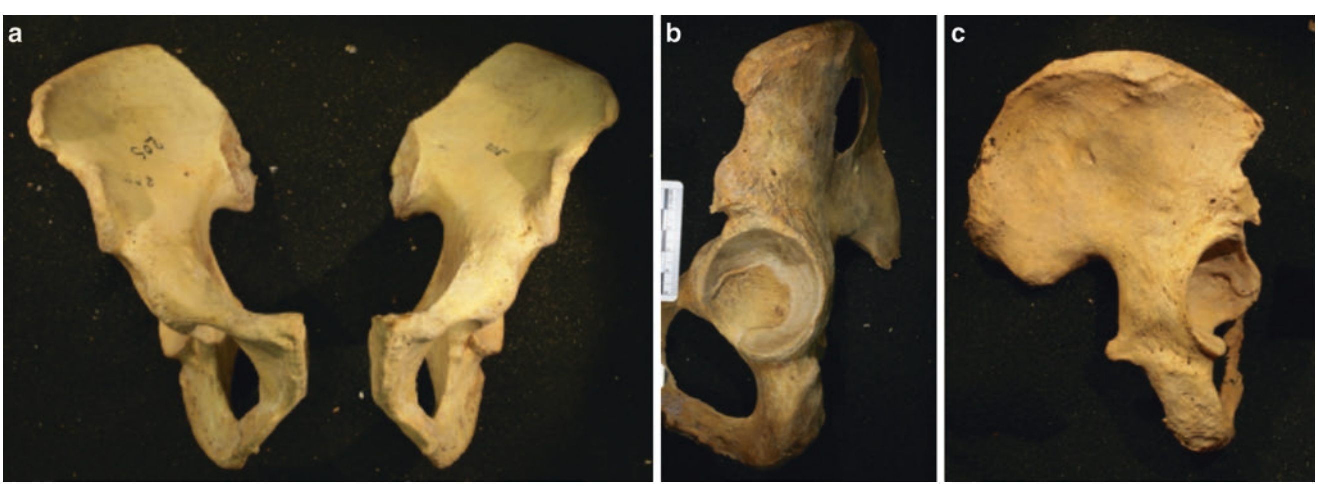

Fig. 57.4 Subspine (AIIS) Impingement. (**a**) Columnar Type. (**b**) Bulbous Type. (**c**) Hooked Type

Limitations and Potential Complications of the Technique

Endoscopy of the extra-articular hip conditions is a relatively new frontier. Techniques and instruments should continue to evolve to allow broader adoption and greater efficiency. Possibly the greatest limitation is understanding of the disease processes and patient selection. Further clinical and scientific research will be critical to advancing the treatment of extra-articular hip conditions.

Complications after endoscopy of extra-articular hip conditions have not been well described but thought to be less frequent and less severe than complications after intra-articular hip arthroscopy. The peritrochanteric space is outside the pelvis, and therefore, potentially severe complications such as fluid extravasation have not been reported. Other major complications such as avascular necrosis, femoral neck fracture, postoperative instability, or adhesions have also not been reported. Iatrogenic injury to the gluteal vessels or sciatic nerve is a possibility if entry into the space is either too proximal or too posterior. Walsh et al. [58] reported a study of 89 patients receiving endoscopic repair for abductor tendon tears from 2000 to 2008, in which the most frequent complication (6 %) was deep vein thrombosis, which is low relative to other lower extremity orthopedic procedures.

Summary

Extra-articular hip disorders are a rapidly evolving field in terms of diagnosis and treatment. There is a considerable amount of excitement as indications for surgery begin to expand and our understanding of conditions that are effectively treated with minimally invasive surgery [59]. Although the treatment of extra-articular hip diseases is becoming more widely performed, the procedures are considered to be relatively safe with few reported complications. Additional clinical and scientific research will be paramount to determining which patients will benefit from the treatment of extra-articular hip conditions and for the advancement of the field.

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