Peritrochanteric Space Disorders: Anatomy and Management

32

Austin W. Chen, John M. Redmond, Kevin F. Dunne, and Benjamin G. Domb

Introduction

The peritrochanteric space is an important area to be considered in the differential diagnosis of hip pain. Classically, trochanteric bursitis has been defined as "tenderness to palpation over the greater trochanter with the patient in the side-lying position" [1–3]. However, recent studies have shown that adjacent structures are also involved, and bursal inflammation itself is rare [4–6]. The term, greater trochanteric pain syndrome (GTPS), encompasses all involved pathology in this region. Improved knowledge of the anatomy, pathology, advances in magnetic resonance imaging (MRI), evolution of hip arthroscopy and endoscopy, and more specific diagnostic criteria has led to better recognition and understanding of this disease process [7].

Greater trochanteric bursitis, external coxa saltans (snapping hip), and gluteus medius and minimus pathology are distinct etiologies of GTPS [8, 9]. GTPS is a very common clinical entity with an incidence ranging from 10 to 25 % of the general population and a prevalence of 17.6 % [9, 10]. Patients usually present with a dull pain on the lateral aspect of the hip, occasionally with radiation posteriorly and into the thigh. Pain is typically exacerbated by excessive activity and direct pressure over the greater trochanter. Patients may have an antalgic gait or limp; however, range of motion is usually preserved.

A.W. Chen, MD
Department of Orthopedic Surgery, University of Illinois Hospital at Chicago, Chicago, IL, USA
e-mail: Achen9@uic.edu

J.M. Redmond, MD • K.F. Dunne, BS
American Hip Institute, Westmont, IL, USA
e-mail: John.redmond@live.com; Kfdunne11@gmail.com

B.G. Domb, MD (✉)
American Hip Institute, Westmont, IL, USA

Adventist Hinsdale Hospital, Hinsdale, IL, USA
e-mail: drdomb@americanhipinstitute.org

Multiple risk factors for GTPS have been identified. The most commonly affected age groups are those in the fourth to sixth decade of life. Gender appears to play a role, as women are affected three to four times more frequently than men [10]. It has been associated with ipsilateral knee osteoarthritis, obesity, and low back pain among many others [9, 10]. A trochanter further lateral than the lateral border of the iliac crest has been shown to be a predisposing risk factor for GTPS [11].

The etiology of GTPS is frequently due to overuse or acute direct trauma, especially falls [10]. Rarely, it may be due to crystal deposition or infection, especially tuberculosis [12, 13]. Although a significant portion of patients with trochanteric pain will respond to conservative management, with success rates reported at 60–90 %, a portion of patients will continue to experience disabling symptoms despite treatment directed at the trochanteric bursa [14]. Those afflicted with GTPS confer levels of disability and quality of life similar to those with end-stage hip osteoarthritis and are even less likely to be in full-time work [7]. Thus, an accurate diagnosis and timely treatment are of the utmost importance [15].

Anatomy

The anatomy of the peritrochanteric space has been well described [9, 16]. The precise anatomy of the tendon insertions, bursae, and bony facets of the greater trochanter can be seen in Fig. 32.1a–c. Most individuals have three bursae peripheral to the greater trochanter, though four have been consistently described. The function of these fluid-filled sacs is to provide cushion and aid in smooth motion of the gluteus tendons, iliotibial band (ITB), and tensor fascia lata [17]. The subgluteus maximus bursa is the largest. Located between the gluteus maximus muscle and gluteus medius tendon, lateral to the greater trochanter, it is most frequently implicated in GTPS and referred to as the "trochanteric bursa" [18].

S.F. Brockmeier (ed.), *MRI-Arthroscopy Correlations: A Case-Based Atlas of the Knee, Shoulder, Elbow and Hip*, DOI 10.1007/978-1-4939-2645-9_32, © Springer Science+Business Media New York 2015

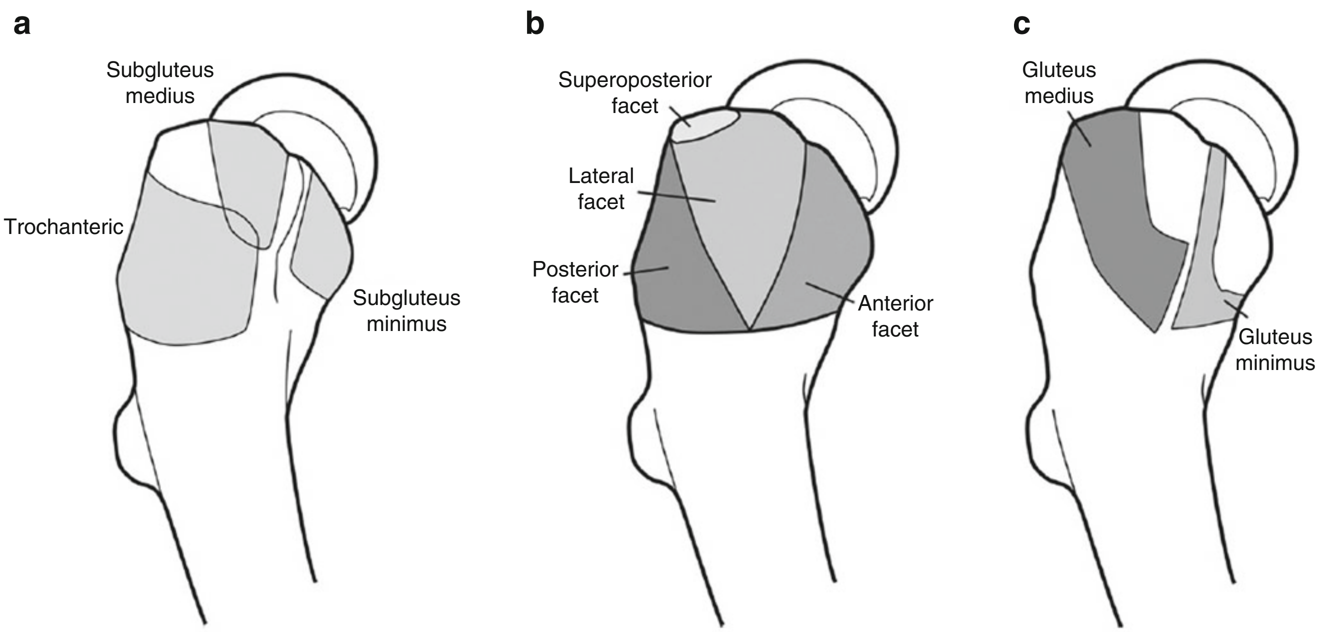


Fig. 32.1 (**a–c**) Anatomy of greater trochanter with tendinous insertion sites and bursae. (**a**) The three main bursae and their positions. (**b**) Geometry of greater trochanter with different facets. (**c**) Footprints of gluteus medius and minimus tendon insertions (**a–c**: Used with permission from Domb BG, Nasser RM, Botser IB. Partial-thickness tears of the gluteus medius: rationale and technique for trans-tendinous endoscopic repair. Arthroscopy. 2010; 26(12):1697–1705)

Table 32.1 Similarities and differences between shoulder and hip rotator cuffs

	Shoulder rotator cuff	Hip rotator cuff
Functional anatomy		
Internal rotator	Subscapularis	Iliopsoas
Stabilizers and rotators, initiation and assistance in abduction	Supraspinatus and infraspinatus	Gluteus medius and minimus
Abduction	Deltoid	Tensor fascia lata
Clinical presentation	Pain with motion	Tenderness over lateral aspect of hip
	Tenderness	Weakness in abduction
	Weakness in abduction	
MRI/ultrasound	Visualized on MRI and ultrasound	Visualized on MRI and ultrasound
Mechanism	Degenerative tearing	Degenerative tearing
	Acute trauma	Acute trauma
Arthroscopic evaluation	Articular tears can be visualized as either exposed footprint or delamination	Undersurface tears cannot be easily visualized

Used with permission from Domb BG, Nasser RM, Botser IB. Partial-thickness tears of the gluteus medius: rationale and technique for trans-tendinous endoscopic repair. Arthroscopy. 2010; 26(12):1697–1705

The most superficial structure of the peritrochanteric space is a fibromuscular sheath composed of the gluteus maximus, tensor fascia lata, and ITB. The gluteus maximus inserts into the posterior aspect, while the tensor fascia lata inserts into the superior and anterior aspects of the ITB. The fascia lata that encloses these structures extends superiorly without muscle attachment to the tubercle of the iliac crest. Just distal to the hip joint, the ITB has a thick expansion—the gluteus maximus sling—that inserts on the posterolateral femur. The ITB crosses the knee joint distally and inserts onto Gerdy's tubercle on the anterolateral aspect of the proximal tibia.

The hip abductors consisting of the gluteus medius and minimus have been referred to as the "rotator cuff tears of the hip" [14, 19]. Table 32.1 shows similarities and differences between shoulder and hip rotator cuffs. The smaller gluteus minimus originates from the anterior inferior iliac spine (AIIS) to the posterior inferior iliac spine (PIIS), runs parallel to the femoral neck, and inserts into both the hip capsule and lateral facet beneath the gluteus medius [20]. The fan-shaped gluteus medius originates from the anterior superior iliac spine (ASIS), outer edge of the iliac crest, and back to the posterior superior iliac spine (PSIS). Depending on the source, it has two or three insertion points on the greater trochanter: the superoposterior facet has a thick insertion from the central posterior portion of the muscle, a thin, broad lateral component inserts onto the lateral facet, and a continuation onto the anterior facet that is not visible macroscopically [16, 21, 22].

Using electromyography (EMG), Gottschalk et al. describe the primary function of the gluteus minimus and posterior gluteus medius as a stabilizer of the femoral head in the acetabulum during motion and gait [23]. The anterior and middle portions of the gluteus medius have a vertical pull and help initiate abduction, whereas the tensor fascia lata is the major abductor of the hip.

Differential Diagnosis

The diagnosis of GTPS can be complicated due to the multiple possible sources of pain surrounding the hip girdle. The differential diagnosis includes intra-articular hip pathology, extra-articular hip pathology, and sources outside of the hip. Intra-articular sources include labral tears, loose bodies, femoroacetabular impingement, capsular laxity, ligamentum teres rupture, and chondral damage. Extra-articular sources include stress fractures, piriformis syndrome, and neoplasm [24]. Sources of hip pain that are outside the hip include pathology of the superior gluteal nerve, meralgia paresthetica, lumbar spondylosis, and lumbar radiculopathy [20]. In regard to the latter two, a limp and hip abductor weakness may be present along with radiating pain, similar to GTPS. Also, patients with a history of total hip arthroplasty, especially through an anterolateral approach, may have iatrogenic injury to the abductor mechanism or its innervations [20]. A detailed history, physical exam, and the appropriate imaging will help to narrow the differential.

Imaging

Imaging has long been thought to be largely unnecessary for the diagnosis of GTPS. However, with cases refractory to standard conservative management, imaging can be very helpful. The most common imaging modalities include plain radiographs, ultrasound, and MRI.

Radiographs do not typically show specific abnormalities with regard to GTPS. A trochanter further lateral than the lateral border of the iliac crest has been shown to be a predisposing risk factor for GTPS [11]. Intrabursal calcifications, abductor calcific tendinosis, or enthesophytes of the greater trochanter may be seen but are not specific. Radiographs are also useful to rule out fracture or osteoarthritis of the hip.

Ultrasound can also aid in the diagnosis of GTPS. It can be especially useful in diagnosing abductor tendon pathology, as it has been shown to have a sensitivity of 79 % and positive predictive value of 100 %, rivaling that of MRI [25]. Dynamic ultrasound can be used to visually confirm the diagnosis of external snapping hip [26].

MRI is currently considered the gold standard for diagnosing GTPS [9, 27]. In the setting of GTPS, patients with abnormalities seen in T2-weighted images are significantly more likely to have abductor tendinopathy [28]. Kingzett-Taylor et al. reviewed 250 hip MRIs for pain involving the buttock, lateral hip, and groin [29]. Gluteus medius and minimus tears were seen in 35 studies. They concluded that tendinopathy is a frequent cause of GTPS and likely associated with trochanteric bursitis. However, another study cautioned that MRI might have a false-positive rate as high as 88 % when evaluating abductor tendon tears [30].

Treatment

Conservative management is effective for the great majority of greater trochanteric pain syndrome cases. Treatment begins with rest, refraining from pain exacerbating activities, ice, nonsteroidal anti-inflammatory medications (NSAIDs), and physical therapy. Therapy focuses on stretching and strengthening of the iliotibial band (ITB) and gluteal muscles. Independent or a combination of these measures can have a cure rate of greater than 90 % [31]. For refractory cases, glucocorticoid injections have been shown to return patients to their baseline activity level 49–100 % of the time [32]. Low-energy shock-wave therapy has also been shown to have superior improvement in visual analog scale and Harris hip scores compared with the primary outcome of other conservative measures [33, 34]. All of these options should be exhausted before surgical options are considered.

As with many surgical procedures, open techniques have given way to arthroscopic and endoscopic solutions. Hip arthroscopy has made significant advances since its introduction in 1931 and popularization during the late 1980s and early 1990s [35–37]. These surgical techniques and other technological achievements have helped expand hip arthroscopy to extra-articular anatomic regions, which is considered peritrochanteric endoscopy. The peritrochanteric endoscopic borders are the tensor fascia lata and ITB laterally, the abductor tendons superomedially, the vastus lateralis inferomedially, and the gluteus maximus muscle superiorly and its tendon posteriorly [8].

Hip arthroscopy and peritrochanteric endoscopy can be utilized based on surgical goals; however, portal placement, visualization pearls, and other procedural nuances have been described. Voos et al. suggest using the same portals used for evaluation of central and peripheral compartment disorders with the anterior portal offering best access to the peritrochanteric space [38]. This portal is made 1 cm lateral to the anterior superior iliac spine within the interval of the tensor fascia lata and sartorius. For optimal access, safety, and hemostasis, balloon dissection has been shown to be superior to blunt dissection [39]. A standard 30° or 70° arthroscope is sufficient for peritrochanteric endoscopy.

Case-based examples of common causes of greater trochanteric pain syndrome will be outlined in this chapter. Multiple figures will be utilized to reveal the relationship between MRI imaging and intraoperative arthroscopy for each case. The three cases include:

1. Recalcitrant trochanteric bursitis
2. External snapping hip
3. Gluteus medius tear

Case 1: Recalcitrant Trochanteric Bursitis

History/Exam

A 45-year-old female presented to orthopedic clinic with an 18-month history of right hip pain. The patient stated that the pain began while running. Initially, running was the only activity that bothered her; however, she began to experience pain with prolonged standing, sitting with the affected leg crossed, or lying on the affected side. She had an active lifestyle that included running 2 miles 6 days per week but has since stopped. She located the pain to the lateral aspect of her hip and noted that it radiated down the lateral aspect of the thigh. She quantified her pain as a 5 on a scale of 0–10. The pain was intermittent in nature.

She was initially seen by a chiropractor and was prescribed a course of physical therapy that included range of motion and strengthening exercises. This, however, exacerbated the patient's pain to a 9 out of 10, and she discontinued physical therapy after 1 month. She subsequently sought treatment by her primary care physician who again recommended physical therapy with the addition of NSAIDs. However, due to the prior failure of physical therapy and an allergy to NSAIDs, she could not complete her recommendations.

On physical examination, her gait was normal without signs of Trendelenburg. The skin was normal—no ecchymosis, erythema, or swelling. There was point tenderness to palpation over the greater trochanter. Her hip range of motion was as follows: 120° of flexion, 10° of internal rotation with pain, 30° of external rotation, and 30° of abduction. She experienced pain with resisted abduction and internal rotation, but there were no signs of weakness. She had a positive FABER test and Ober's test. Anterior impingement and internal snapping were also evident. She was otherwise neurovascularly intact throughout the lower extremity.

After failing physical therapy and other conservative measures, the patient was offered a corticosteroid injection with local anesthetic into her right trochanteric bursa. The injection was conducted under ultrasound guidance. Within 30 min, the patient's pain had substantially improved. The injection provided 3–4 weeks of pain relief before symptoms began to return.

Imaging

Standard X-rays were obtained. Views including anterior/posterior pelvis, right hip false profile, bilateral Dunn views, and a right hip cross-table lateral. The joint spaces were well preserved. The patient did have a mild femoral cam lesion and a small crossover sign. There was no sign of antecedent trauma to the trochanter.

Typically, the diagnosis of trochanteric bursitis is clinical; however, due to the recalcitrant nature of the problem and signs of both intra- and extra-articular pathology, an MRI arthrogram was obtained to delineate other possible pathology. Coronal fat-saturated T2-weighted images are shown in Fig. 32.2a–d, and axial fat-saturated T2-weighted images are shown in Fig. 32.3a–d.

Figure 32.2a denotes the anatomic structures being scrutinized. A moderate amount of fluid and edema is seen lateral to the greater trochanter suggesting bursitis as shown by the long thin arrow in Figs. 32.2a–d and 32.3b–d. In addition to bursitis, mild signal heterogeneity can be seen in the substance and at the insertion of the abductor tendons indicating tendinosis without evidence of tear evidenced by the short fat arrow in Fig. 32.2b–d. A labral tear was also identified.

The patient's clinical and radiographic presentation was consistent with trochanteric bursitis, although she also had mild signs and symptoms of femoroacetabular impingement. Given her failure to improve with conservative treatment, the patient elected to proceed with surgery and was consented for right hip arthroscopy with labral treatment, femoral osteoplasty, acetabuloplasty, and peritrochanteric endoscopy with trochanteric bursectomy and debridement. The patient was counseled that if a gluteus medius tear was identified, it would be repaired.

Arthroscopy

The patient was brought to operating room placed in the supine position on a traction table extension with a well-padded perineal post. Traction was applied to the hip under fluoroscopy. An anterolateral portal was created first, followed by a more distal lateral accessory portal. A capsulotomy was made parallel to the acetabular rim connecting the two portals. Diagnostic arthroscopy and intra-articular procedures were completed first.

A blunt obturator was used to reinsert the arthroscope into the peritrochanteric compartment through the mid-anterior portal. A thickened band of bursa is seen being probed in Fig. 32.4. The shaver was introduced via the anterolateral portal and trochanteric bursectomy, and peritrochanteric debridement was performed. The remainder of the peritrochanteric space was examined, including the gluteus medius and maximus tendon insertions, which were found to be intact.

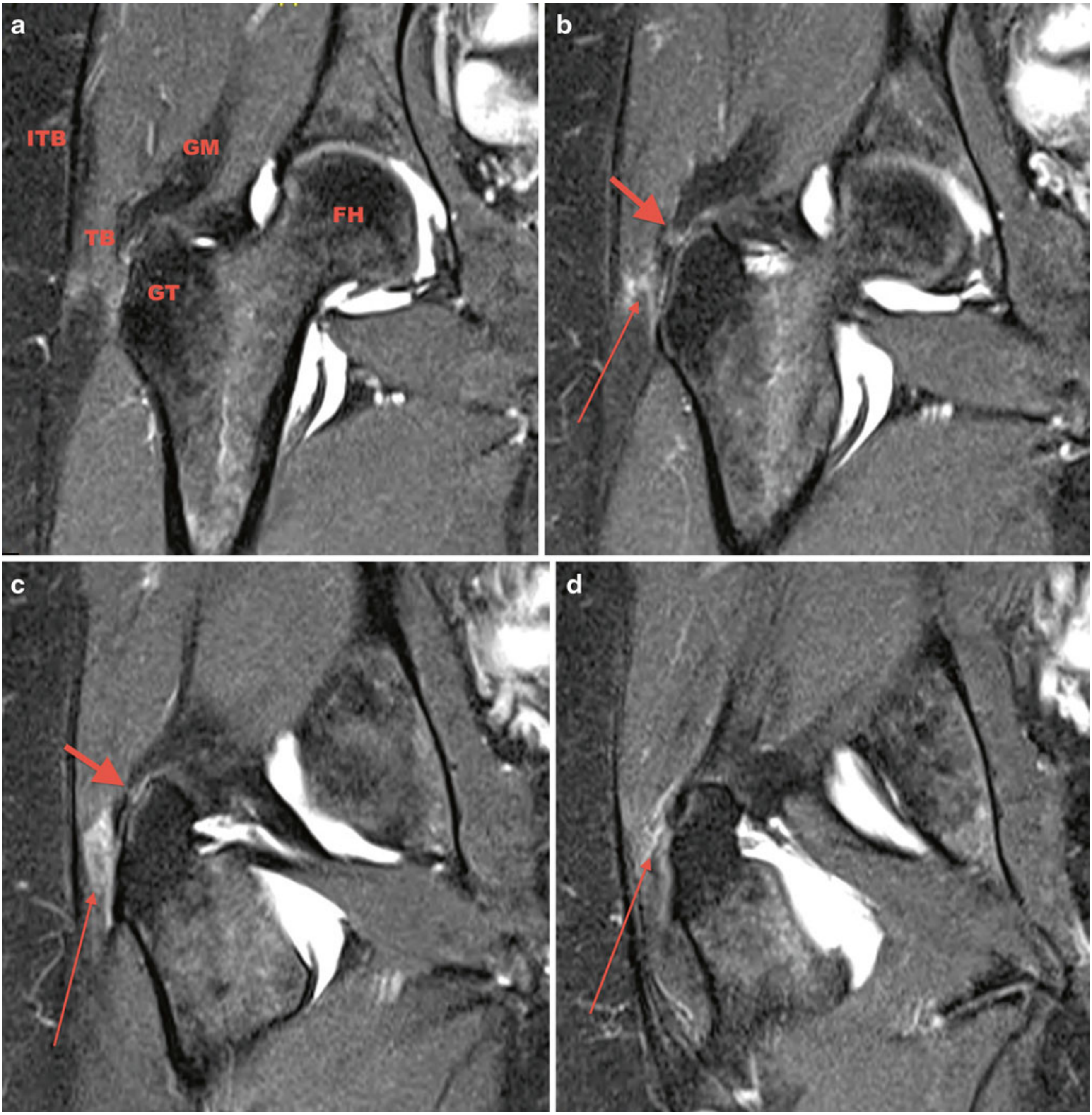


Fig. 32.2 (**a**) Coronal fat-saturated T2-weighted image. The anatomic structures being scrutinized: *GM* gluteus medius, *FH* femoral head, *GT* greater trochanter, *TB* trochanteric bursa, *ITB* iliotibial band. (**b, c**) Mild signal heterogeneity can be seen in the substance and at the insertion of the abductor tendons indicating tendinosis without evidence of tear evidenced by the *short fat arrow*. (**b–d**) A moderate amount of fluid and edema is seen lateral to the GT suggesting bursitis as shown by the *long thin arrow*

Discussion

Trochanteric bursitis is usually self-limited and responds well to conservative treatment [2, 40]. Open or arthroscopic surgical management of this condition is effective but rarely necessary lending to a paucity of high-level research. Fox et al. retrospectively reported on 27 patients treated with arthroscopic bursectomy for recalcitrant trochanteric bursitis. At a minimum of 1 year, 23 out of 27 patients had "good or excellent" results immediately postoperative with no complications. Symptoms recurred in one patient at 1 year and two patients at 5 years.

A tight ITB rubbing over the greater trochanter is a documented etiology of trochanteric bursitis [41]. Thus, there are reports of modifying the ITB in addition to trochanteric bursectomy during arthroscopic surgery. Farr et al. performed

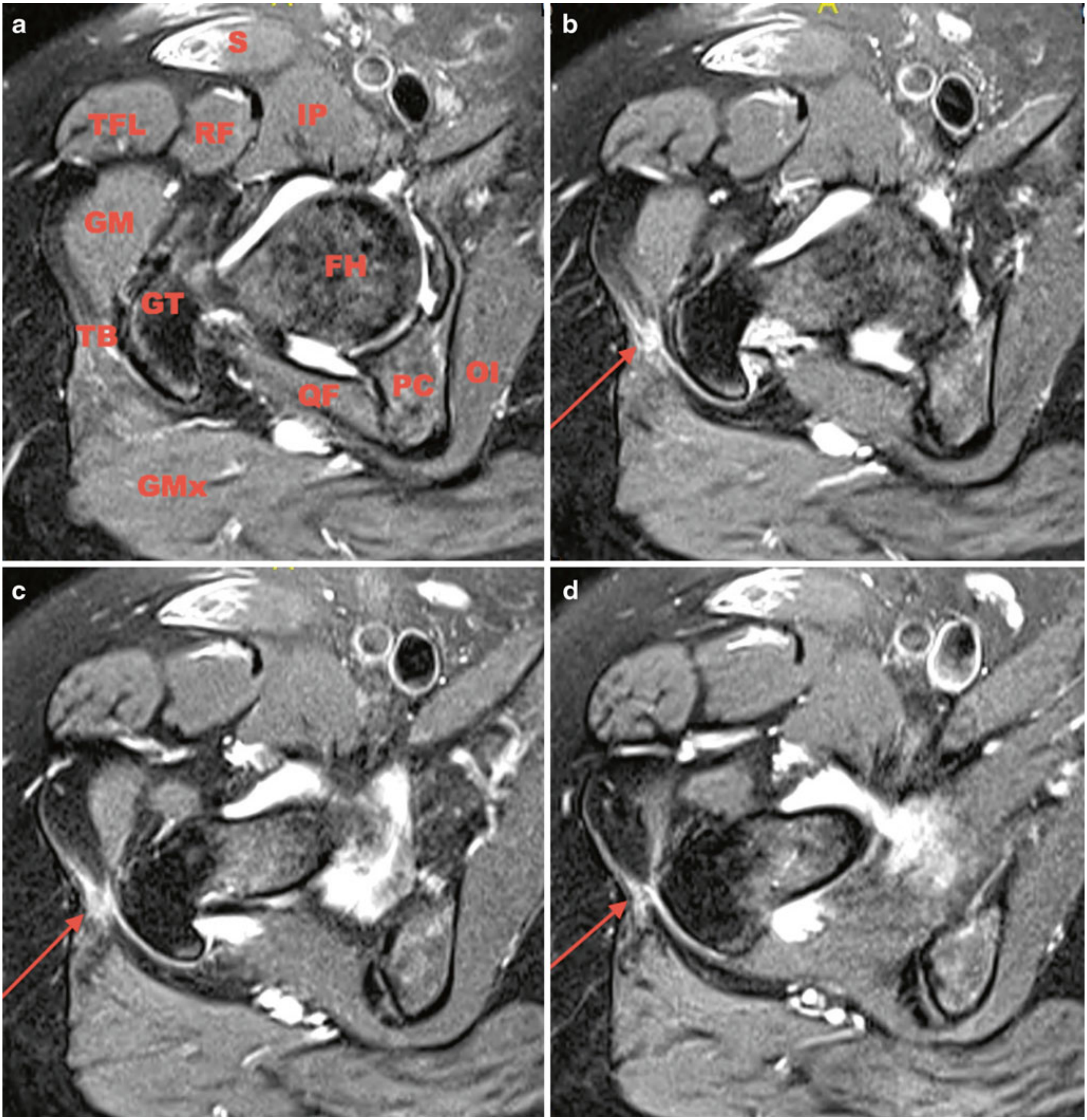


Fig. 32.3 (**a**) Sagittal fat-saturated T2-weighted image. Surrounding anatomic structures in clockwise direction: *S* sartorius, *IP* iliopsoas, *FH* femoral head, *OI* obturator internus, *PC* posterior column, *QF* quadratus femoris, *GMx* gluteus maximus, *TB* trochanteric bursa, *GT* greater trochanter, *GM* gluteus medius, *TFL* tensor fascia lata, *RF* rectus femoris. (**b–d**) A moderate amount of fluid and edema is seen lateral to the GT suggesting bursitis as shown by the *long thin arrow*

arthroscopic bursectomy along with an ITB release in two patients. They reported that both had complete relief of symptoms and returned to their preoperative occupational and recreational activities without recurrence. Govaert et al. also advocated for release of the ITB during surgical management of GTPS [42]. They treated five patients with a follow-up of 6 weeks in which three were "satisfied" and two were "very satisfied." One patient, however, developed a large hematoma that required open evacuation. Weinrauch et al. describe ultrasound-assisted arthroscopy to ensure adequate decompression of the peritrochanteric space [43]. Strauss et al. believe releasing the posterior one third of the

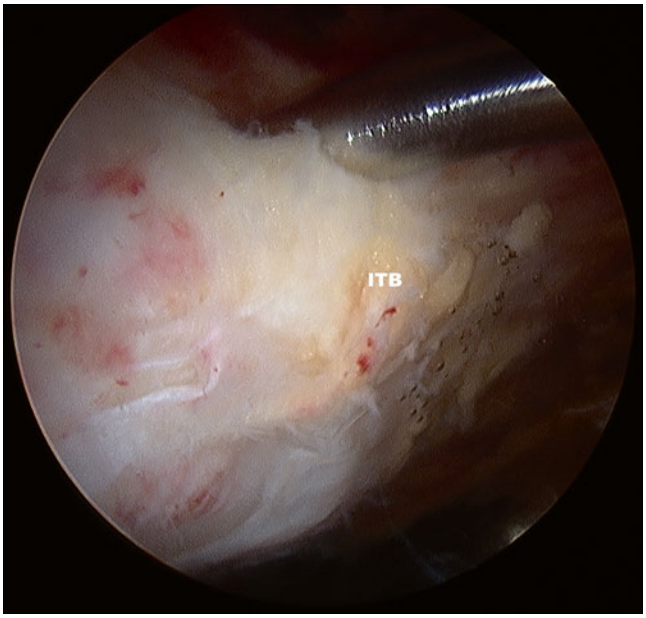


Fig. 32.4 Thickened band of bursa is seen being probed

ITB is only necessary when there is clinical evidence of external snapping or ITB tightness (positive Ober's test); otherwise, bursectomy alone is sufficient [8].

Baker et al. prospectively evaluated 30 patients with recalcitrant trochanteric bursitis following arthroscopic bursectomy for a mean of 26.1 months [44]. Significant improvements in pain scores (7.2 preoperatively versus 3.1 postoperatively) and Harris hip scores (51 preoperatively versus 77 postoperatively) were noted in the 25 patients available for follow-up. Of note, the authors "often noted scuffing or irritation of the gluteus medius and minimus tendons and, occasionally frank tears of their insertions…that were treated with debridement of the edges and decompression of the area." The precise number of patients with these findings was not mentioned; therefore, it is difficult to apply their results to recalcitrant trochanteric bursitis, specifically. Their results should more appropriately be applied to patients with the general diagnosis of GTPS. In addition, the diagnostic criteria used in this study were mainly clinical. MRIs were not routinely obtained. Of those that were available, "no attempt to correlate the MRI results with the findings at the time of surgery" was made.

An isolated diagnosis of recalcitrant trochanteric bursitis is likely rare. Bird et al. reviewed the MRIs of 24 women with GTPS finding that 62.5 % had evidence of gluteus medius tendonitis, 45.8 % with gluteus medius tears, but only 8.3 % had objective evidence of trochanteric bursitis [4]. Additionally, Long et al. retrospectively reviewed the ultrasound findings of 877 patients with GTPS [5]. Nearly 80 % (700 patients) did not have bursitis on ultrasound, while 50 % (438 patients) had abductor tendinosis, and 28.5 % (250 patients) had a thickened ITB. The case presented here had concomitant abductor tendinosis and femoroacetabular impingement with labral damage, in addition to the trochanteric bursitis. Therefore, when preoperatively planning for surgical management of recalcitrant trochanteric bursitis, there should be a high degree of suspicion for coexisting pathology in the peritrochanteric space as well as intra-articularly.

Case 2: External Snapping Hip

History/Exam

A 23-year-old female presents to the orthopedic clinic with long-standing bilateral hip pain, left side greater than the right. She states that since childhood, she has been able to "take her hip out of its socket" referring to a snapping/clunking sensation. As an adult, her pain has been increasing and is associated with same snapping during the last 4 years. Of recent, it has also begun to affect her knees. The hip pain is located on the lateral aspect of the hip, is intermittent, and is rated at 8 out of 10. She locates her knee pain to the anterolateral aspect of the knee just inferior to the joint line. Both her hip and knee pains increase with activity level. The only relieving factor she has found is ice. She has completed three courses of physical therapy of 6–8 weeks each without relief of symptoms. She has also had corticosteroid injections into bilateral greater trochanteric bursas and knee joints without improvement.

On physical examination, she appears healthy. Examination of her gait and overall alignment reveals mild genu valgum but a normal heel-to-toe gait. Her bilateral hip range of motion is as follows: 120° of flexion, 30° of internal rotation with pain, 50° of external rotation with pain, and 50° of abduction. She denies pain directly over the greater trochanters, however, does admit to tenderness over the piriformis. With the patient lying on her side, affected side up, flexing the hip while palpating the greater trochanter reveals a snapping sensation of the IT band over the trochanter. Applying a firm pressure relieves the snapping. The patient also exhibits a positive Ober's test. Of note, the patient did also exhibit signs of internal impingement and internal snapping.

Examination of the patient's knees does not show any effusion or erythema. Bilateral knee range of motion is 130° flexion with pain to −5° extension. She is tender to palpation over Gerdy's tubercle of the bilateral tibias. There is no patellar instability, but there is crepitus and mild tenderness to palpation at the inferior pole of the patella. Muscle testing of the lower extremities reveals 5/5 strength bilaterally. Additionally, bilateral lower extremities are neurovascularly intact.

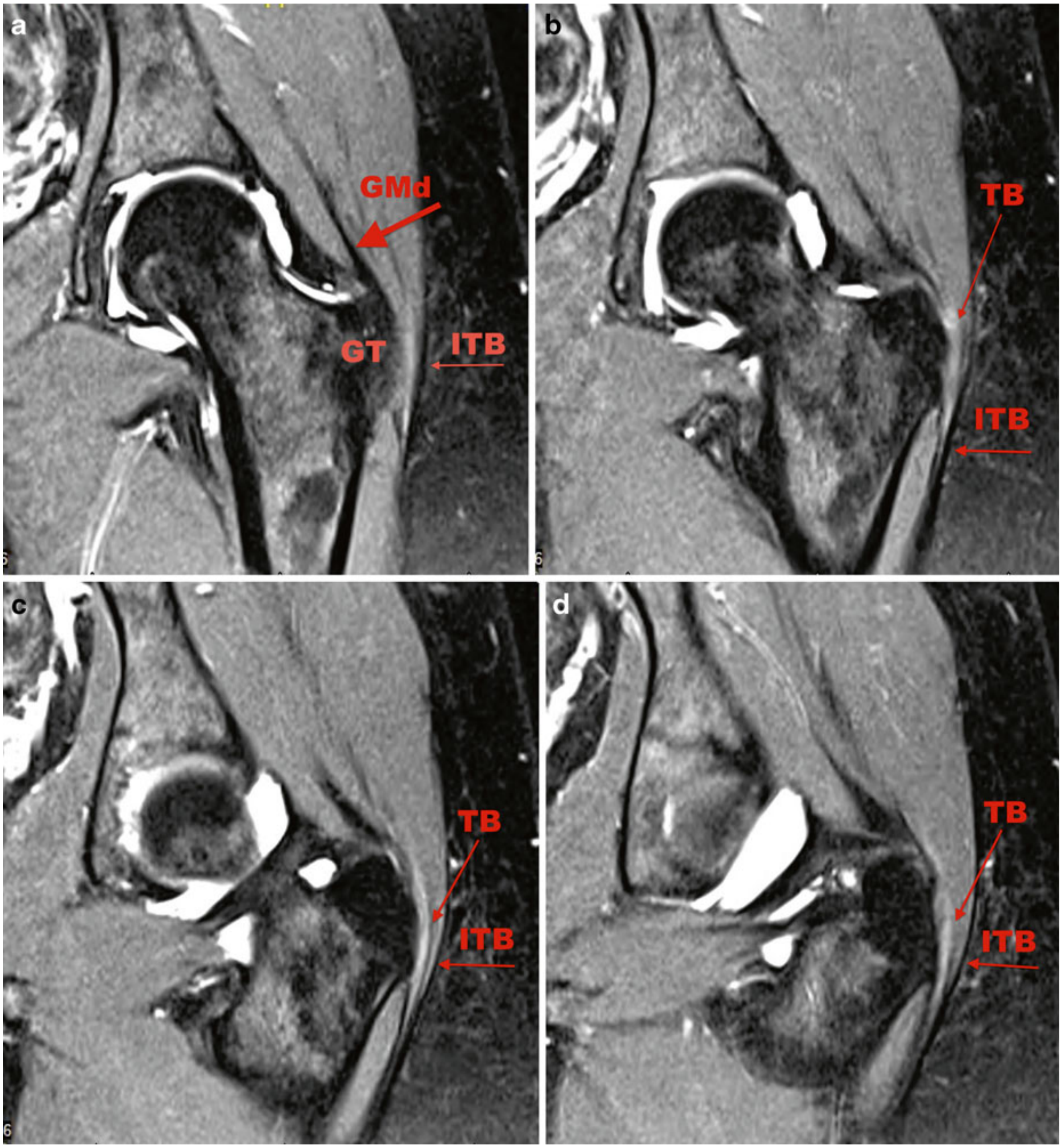


Fig. 32.5 (**a**) Coronal T2 fat-saturated weighted MRI. A *thin black line* lateral to the greater trochanter (GT) represents the iliotibial band (ITB). The gluteus medius tendon is also identified (GMd). (**b**–**d**) Coronal T2 fat-saturated weighted MRI. There is slight thickening of the trochanteric bursa (TB) with mild increase in signal intensity between the GT and ITB

Imaging

X-rays included a supine AP view of the pelvis, bilateral false profile and Dunn views, and a cross-table lateral view. Joint spaces are preserved bilaterally. There is a 20 % crossover sign bilaterally.

An MRI arthrogram was conducted due to the patient's anterior impingement symptoms in order to further delineate a labral tear—the pathology and treatment of the labral tear will not be discussed in this chapter. Figures 32.5a–d and 32.6a–d depicts coronal and axial T2 fat-saturated weighted MRI cuts moving from anterior to posterior and inferior to superior, respectively. A thin black line lateral to the greater trochanter (GT) represents the iliotibial band (ITB). The gluteus medius tendon is also identified (GMd) in Fig. 32.5a. Figure 32.5b–d depict slight thickening of the trochanteric bursa (TB) with a very mild increase in signal intensity. The iliotibial band (ITB) does not demonstrate significant abnormalities in these cuts. The axial sequences, however, are more useful to show areas of thickening of the iliotibial band

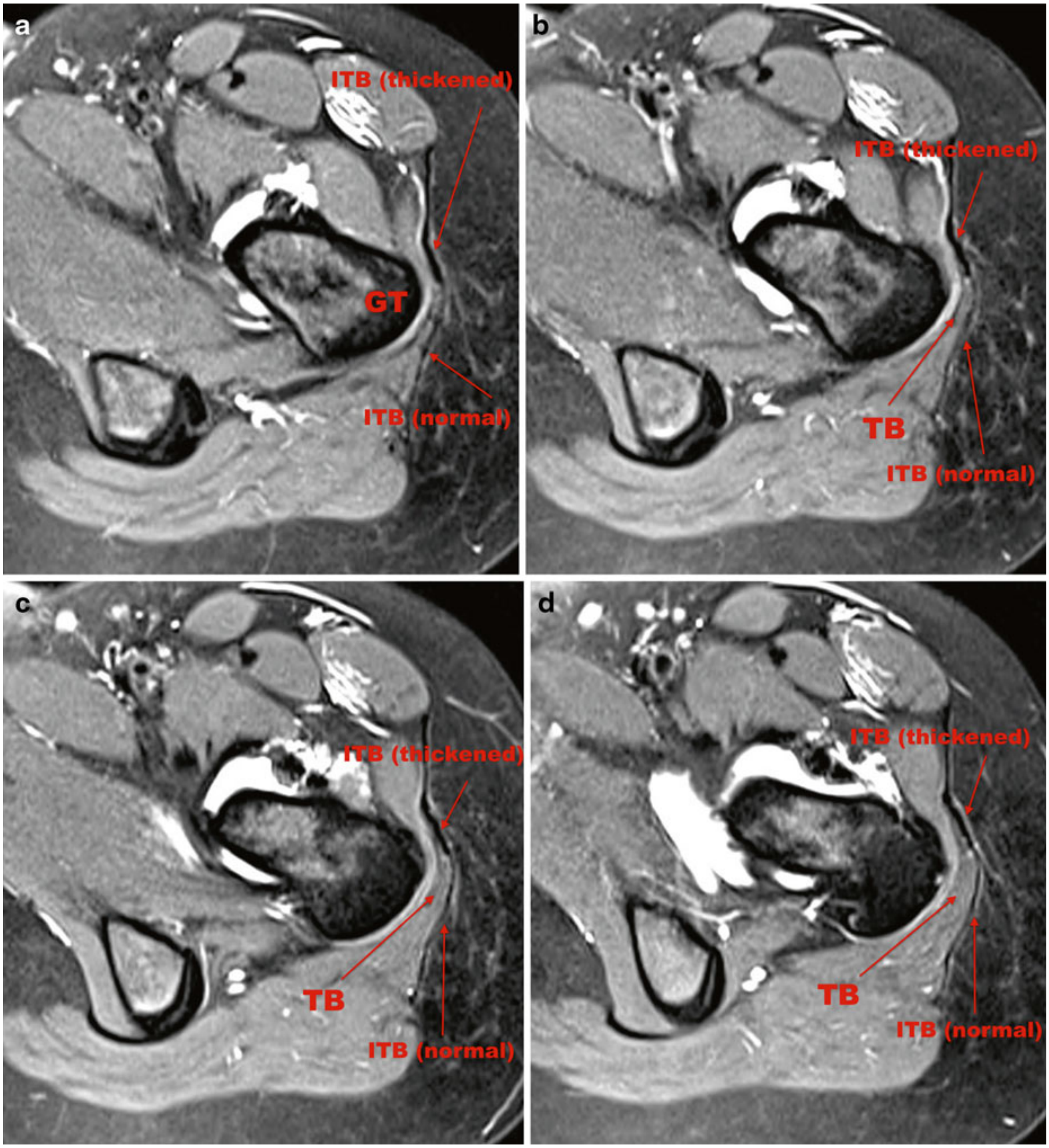


Fig. 32.6 (**a**) Axial T2 fat-saturated weighted MRI. An area of thickened ITB can be seen just anterolateral to the GT in contrast to the normal appearing posterolateral ITB. (**b–d**) Axial T2 fat-saturated weighted MRI. An area of thickened ITB can be seen just anterolateral to the GT in contrast to the normal appearing posterolateral ITB. There is slight thickening of the trochanteric bursa (TB) with mild increase in signal intensity between the GT and ITB

in the sagittal plane. An area of thickened ITB can be seen just anterolateral to the greater trochanter in contrast to the posterolateral ITB seen in Fig. 32.6a–d.

The patient failed all conservative management of the external snapping hip related to a contracted ITB. The decision was then made to proceed with surgery. The patient was informed of the risks, benefits, and alternatives of trochanteric bursectomy, IT band release, with possible labral repair, debridement, or reconstruction. The patient understood and agreed to proceed with surgery.

Arthroscopy

The patient was brought to operating room placed in the supine position on a traction table extension with a well-padded perineal post. Traction was applied to the hip under fluoroscopy. An anterolateral portal was created first, followed by a more distal lateral accessory portal. A capsulotomy was made parallel to the acetabular rim connecting the two portals. Diagnostic arthroscopy and intra-articular procedures were completed first. A capsular plication was

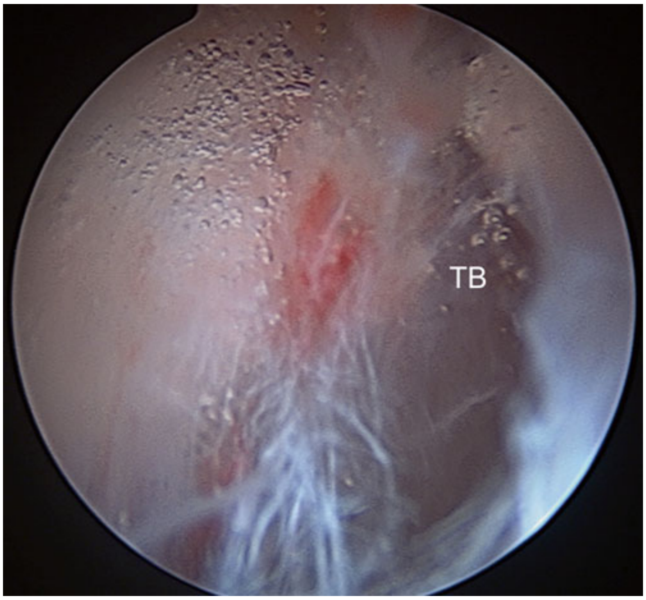


Fig. 32.7 Peritrochanteric endoscopy of the left hip. The arthroscope is inserted in the distal mid-anterior portal viewing cephalad. Note the trochanteric bursa (TB) present prior to shaver insertion and bursectomy

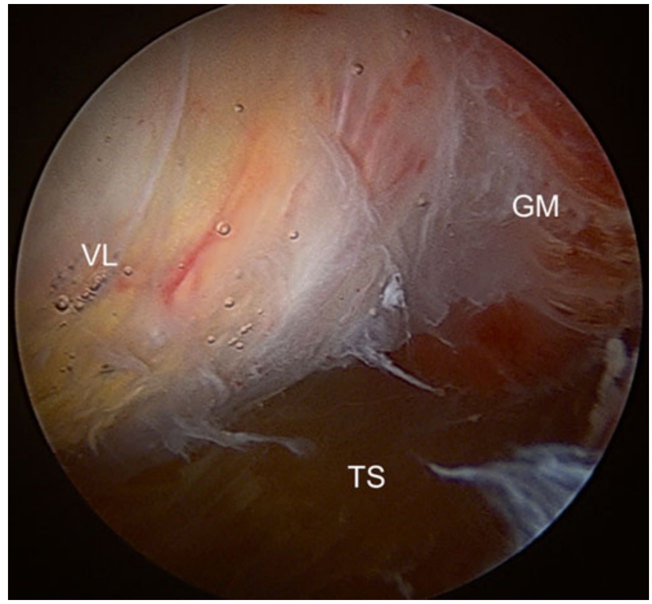


Fig. 32.8 Peritrochanteric endoscopy of the left hip. The arthroscope is inserted in the distal mid-anterior portal viewing cephalad. With the bursal tissue removed, the gluteus medius (GM), vastus lateralis (VL), and trochanteric space (TS) can be identified. No tears of the gluteus medius tendon are identified

completed prior to turning attention to the peritrochanteric space.

The arthroscope was placed into the peritrochanteric compartment via a mid-anterior portal and the shaver through the anterolateral portal (Fig. 32.7). Trochanteric bursectomy and debridement were performed (Fig. 32.8). The entire peritrochanteric space was examined, including the gluteus medius and maximus tendon insertions. No abductor pathology could be identified. Next, a radiofrequency wand was used to perform a cruciform-shaped incision in the IT band in the area overlying the greater trochanter to address the external snapping hip (Figs. 32.9, 32.10 and 32.11).

Discussion

External coxa saltans, or external snapping hip, is most commonly due to thickened portions of the posterior ITB or the anterior border of the gluteus maximus sliding over the greater trochanter [45]. Flexing the hip causes the posterior thickened band to snap anteriorly in relation to the greater trochanter. Asymptomatic snapping should be considered a normal occurrence [46]. The main cause for increased tension in the ITB is still unknown as the biomechanical repercussions of its modification [47].

Though modifying the ITB is an accepted treatment for refractory external snapping hip, the manner in which it is modified has various descriptions in the literature. Open Z-lengthening of the ITB was first described in 1983 with several modifications and reported outcomes in the following years [46, 48–50]. Until recently, only open procedures had been described.

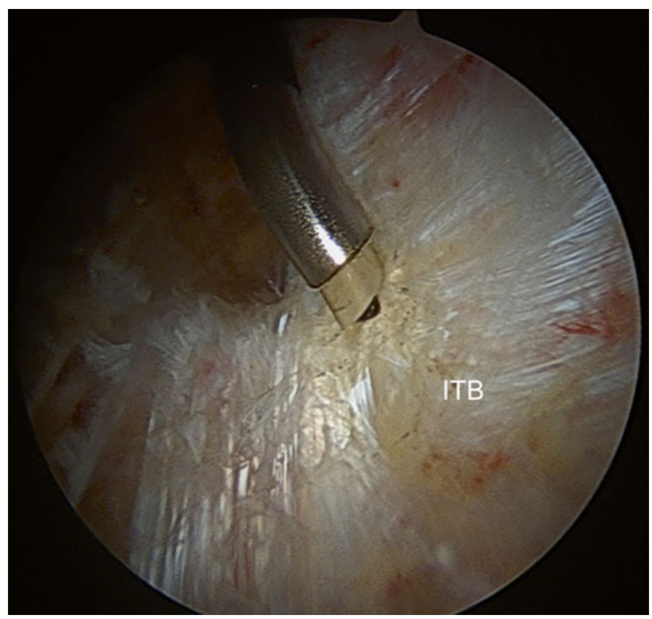


Fig. 32.9 Peritrochanteric endoscopy of the left hip. The arthroscope is inserted in the distal mid-anterior portal viewing cephalad and lateral. The electrocautery is being used to divide the iliotibial band (ITB) overlying the trochanter

Ilizaliturri et al. was first to describe an all-endoscopic technique in 2006 [51]. They prospectively reported on a consecutive series of 11 hips. All were clinically diagnosed with

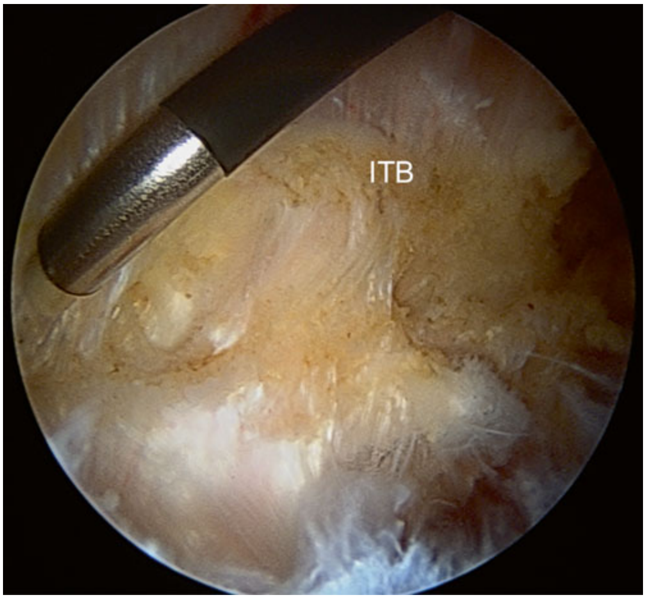


Fig. 32.10 Peritrochanteric endoscopy of the left hip. The arthroscope is inserted in the distal mid-anterior portal viewing cephalad and lateral. The electrocautery is being used to divide the iliotibial band (ITB) overlying the trochanter

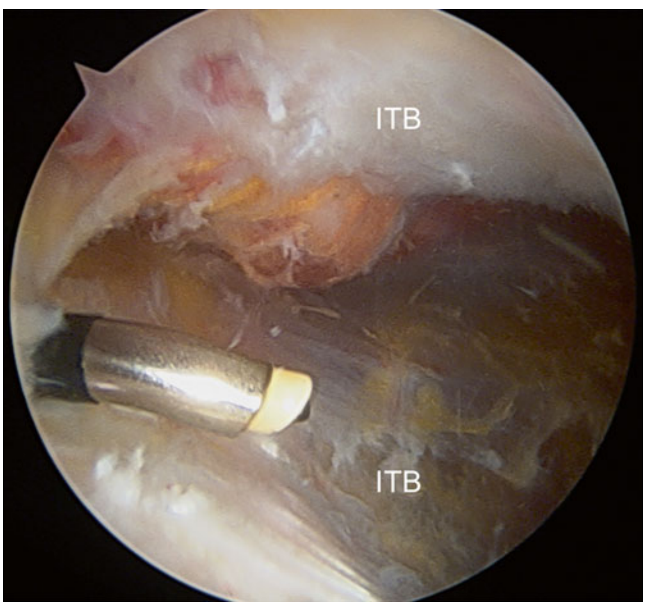


Fig. 32.11 Peritrochanteric endoscopy of the left hip. The arthroscope is inserted in the distal mid-anterior portal viewing cephalad and lateral. The electrocautery has divided the iliotibial band (ITB)

external snapping hip, had failed conservative management, and were treated with a diamond-shaped partial resection of ITB directly overlying the greater trochanter along with trochanteric bursectomy. At an average follow-up of 2 years, one patient had painless snapping, while the remainder had no complaints and returned to a preoperative level of activity. Zini et al. reported similar results on 15 retrospectively reviewed patients [52]. In contrast to Ilizaturi et al., the ITB was transversally released [51]. They report significant improvements in visual analog scale (VAS) scores. All patients returned to preoperative levels of activity without revisions or complications; however, 40 % did admit to "very slight" pain with strenuous sporting activities.

Polsello et al. hypothesized that endoscopic release of the gluteus maximus tendon (GMT) near its insertion at the linea aspera would have a similar effect on ITB tension and provide similar results for treating symptomatic external snapping hip [47]. Eight patients (nine hips) were treated with endoscopic GMT release and retrospectively reviewed with an average follow-up of 22 months. Seven of the eight patients achieved resolution of the pain and snapping after the initial procedure. One patient required a revision procedure for complete relief. All eight patients returned to their previous level of activity.

Voos et al. give a detailed description with specific dimensions of an ITB release [38]. They state it should be performed along the posterolateral portion of the greater trochanter, beginning at the vastus tubercle insertion extending to the tip of the greater trochanter. The release should be a Z-type of 1 cm anterior, 3 cm distal, and 1 cm posterior with slight variation based on the fibers under the greatest amount of tension.

The senior author (B.G.D.) prefers a cruciform incision of the ITB for external snapping hip along with trochanteric bursectomy. Though evidence is sparse regarding endoscopic modifications for treatment of external snapping hip, our early experience has demonstrated this to be a safe and effective treatment option.

Case 3: Gluteus Medius Tear

History/Physical

A 66-year-old female was referred by an orthopedic surgeon for evaluation of left lateral hip pain. The patient reports pain for 2 years that has progressively worsened. It is aggravated by bending to and sleeping on the left side as well as prolonged sitting. She has completed a 4-week course of physical therapy that exacerbated her pain. She received a corticosteroid injection into her trochanteric bursa that did help relieve her pain temporarily.

Physical examination reveals a left-sided Trendelenburg gait. Left hip range of motion is 120° of flexion, 30° of internal rotation, 50° of external rotation with pain, and 50° of abduction. She has significant tenderness to palpation over her greater trochanter, but the remainder of her bony landmarks is asymptomatic. She has a positive FABER sign but no signs of impingement or snapping. Ober's test is negative. Her strength is 5/5 throughout the right lower extremity with the exception of her abductors, which are 4/5 with pain. She is otherwise neurovascularly intact.

Imaging

Multiple X-ray views of the patient's pelvis and hips were obtained. Joint spaces are intact bilaterally; however, there is mild osteophyte formation on the lateral aspect of bilateral acetabulums. In addition, bilateral greater trochanters exhibit enthesophyte changes. Using the Tonnis classification of grading hip osteoarthritis, the patient's radiographic changes are consistent with grade 1.

MRI was obtained for suspicion of an abductor tendon tear. Osseous structures are without bony edema or abnormalities. Figures 32.12a–d and 32.13a–e depict coronal and

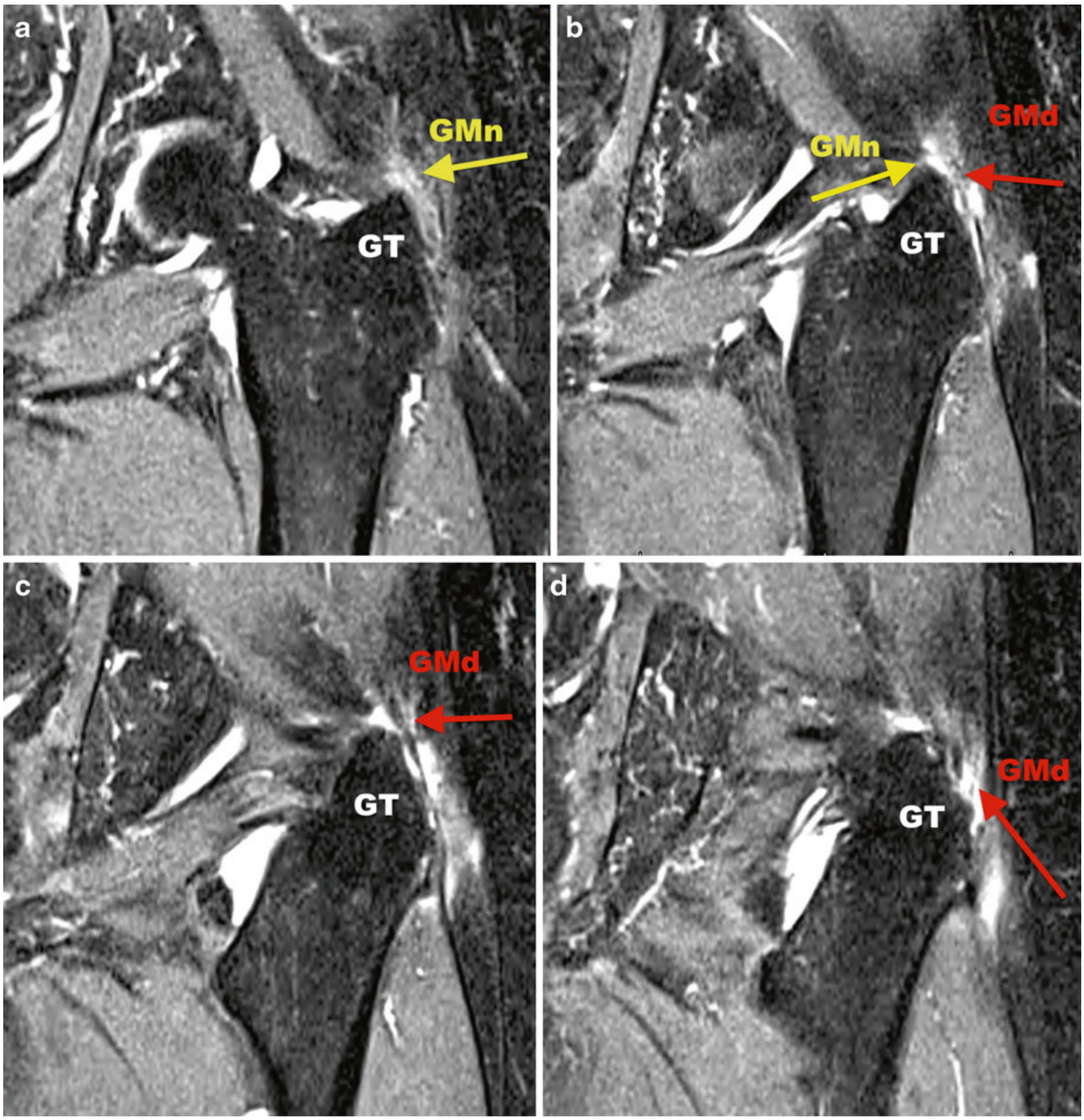
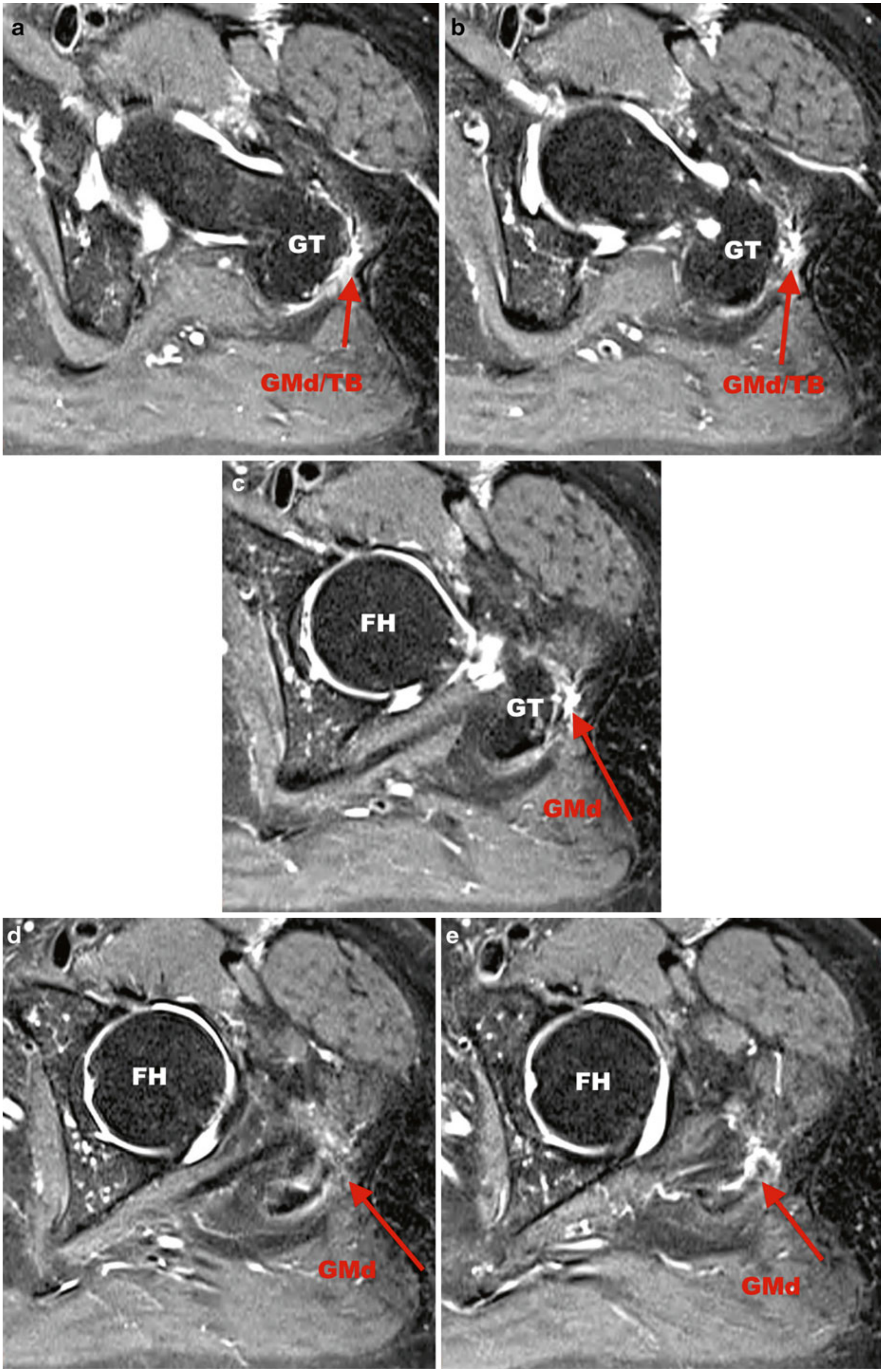


Fig. 32.12 (**a**) Coronal T2 fat-saturated weighted MRI. A high-grade partial-thickness tear of the gluteus minimus (GMn) is seen. (**b**) Coronal T2 fat-saturated weighted MRI. A high-grade partial-thickness tear of the gluteus minimus (GMn) and a full-thickness tear of the gluteus medius (GMd) tendon from its greater trochanteric (GT) insertion are seen. (**c**, **d**) Coronal T2 fat-saturated weighted MRI. A full-thickness tear of the gluteus medius (GMd) tendon from its greater trochanteric (GT) insertion is seen. Because the gluteus inserts onto the anterior facet of the greater trochanter, it is no longer seen as sequences progress posteriorly

Fig. 32.13 (**a**, **b**) Axial T2 fat-saturated weighted MRI. Increased signal intensity lateral to the greater trochanter can be attributed to tearing/tendinosis of the gluteus medius (GMd) tendon at its insertion as well as trochanteric bursitis. (**c**–**e**) Axial T2 fat-saturated weighted MRI. As sequences move superiorly, more of the femoral head (FH) and less of the GT are visible. Increased signal intensity superior to the greater trochanter can be attributed to intra-substance tearing/tendinosis of the gluteus medius (GMd) tendon


a
GT
GMd/TB
b
GT
GMd/TB
c
FH
GT
GMd
d
FH
GMd
e
FH
GMd

axial T2 fat-saturated weighted MRI cuts, respectively. A high-grade partial-thickness tear of the gluteus minimus (GMn) is seen in Fig. 32.12a–b, and a full-thickness tear of the gluteus medius (GMd) tendon from its greater trochanteric insertion is seen in Figs. 32.12b–d and 32.13b–e. Fraying of the acetabular labrum was noted with a small superior tear. Chondral surfaces were thinned but intact.

Arthroscopy

The patient continued to have debilitating pain despite conservative management of her abductor tendon tears. A decision was made to proceed with left hip peritrochanteric endoscopy with gluteus medius repair and trochanteric bursectomy. The plan also included diagnostic hip arthroscopy with treatment as indicated. The patient was made aware that the arthritis currently seen in her hip would not be treated by the procedure nor was there any evidence that it would slow the progression of arthritis.

Positioning, set-up, and portal placement were performed in a similar fashion as the previous cases in this chapter. The labral tear was found to be stable and was therefore selectively debrided. The peritrochanteric space was then entered. An additional posterolateral portal was also created in this case.

As in the previous cases, trochanteric bursectomy and debridement were carried out in a similar fashion with the arthroscope in the mid-anterior portal and shaver in the anterolateral portal. Examination of the gluteus medius tendon insertion confirmed a full-thickness tear (Fig. 32.14). In preparation for reinsertion, the lateral facet of the greater trochanter was decorticated to create a bleeding bed of bone for healing using the burr (Fig. 32.15). To complete the repair, an anchor was placed in the lateral facet under fluoroscopy, and two horizontal mattress sutures were passed through the tendon (Fig. 32.16). This was repeated with a second anchor for better tissue approximation (Fig. 32.17). The sutures were then tied down with standard arthroscopic knot-tying technique, achieving excellent closure of the tendon over the lateral facet (Fig. 32.18).

Discussion

Once thought of as a rare clinical entity, it is likely that the prevalence of gluteus medius and minimus tendon tear has been underdiagnosed [53]. The ever-increasing interest and possibilities in hip arthroscopy and endoscopy have teased this diagnosis out from under the broad category of GTPS and the mislabeling of it as "trochanteric bursitis." Many cases are labeled as "recalcitrant trochanteric bursitis" that have failed to improve with extensive conservative measures.

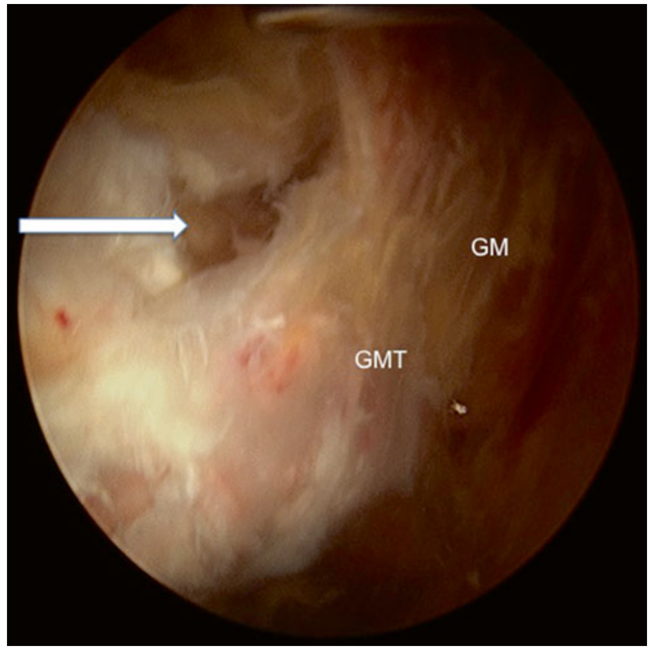


Fig. 32.14 Left hip peritrochanteric endoscopy viewing cephalad and medial from the distal mid-anterior portal. The gluteus medius (GM) muscle and tendon (GMT) are visible. Note the full-thickness tear (*arrow*) involving the gluteus medius tendon

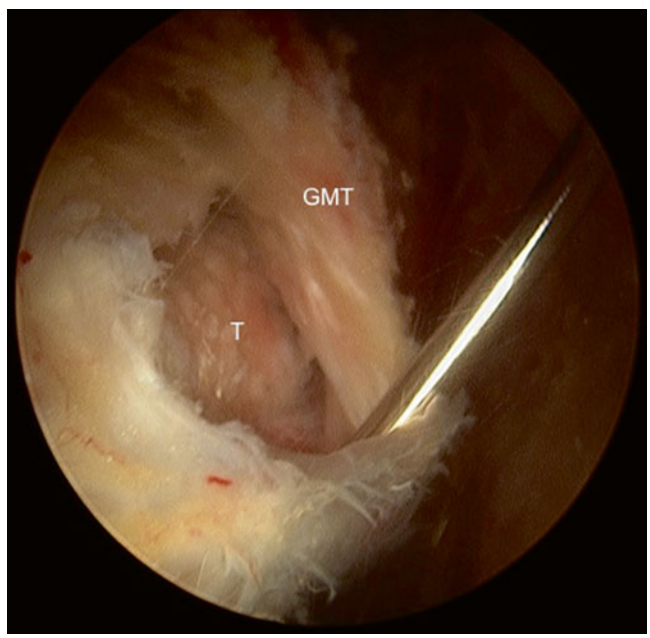


Fig. 32.15 Left hip peritrochanteric endoscopy viewing cephalad and medial from the distal mid-anterior portal. The underlying trochanter (T) can be visualized. The probe is elevating the fibers of the gluteus medius tendon (GMT)

While literature surrounding the treatment of gluteus medius tendon tears is lacking in comparison to the rotator cuff of the shoulder, indications for treatment may be similar [38].

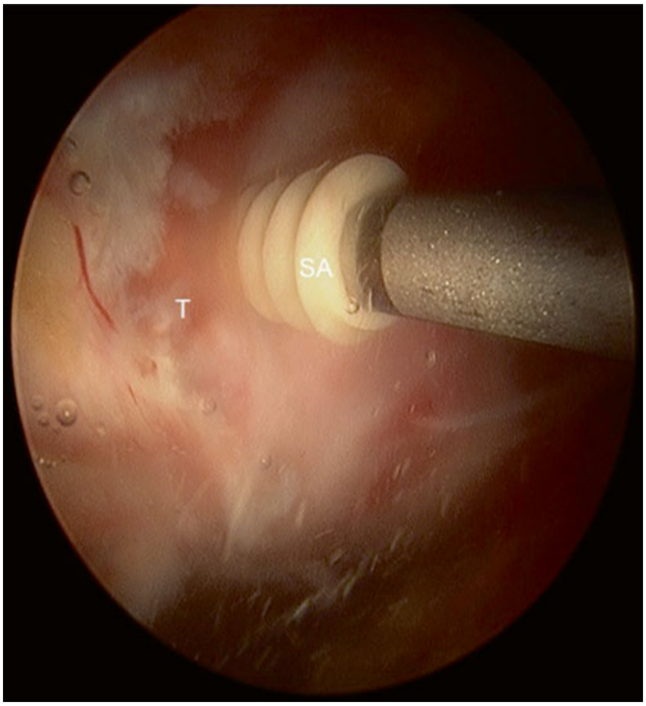


Fig. 32.16 Left hip peritrochanteric endoscopy viewing cephalad and medial from the distal mid-anterior portal. A suture anchor (SA) is being placed in the underlying trochanter (T)

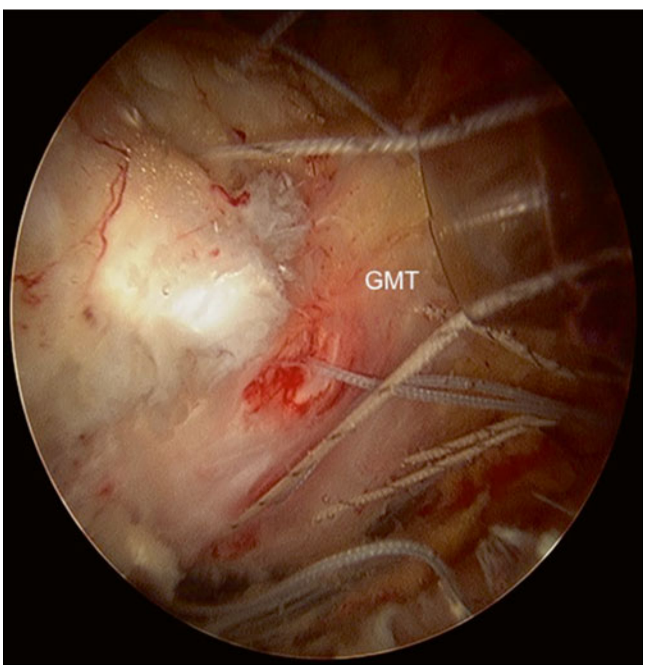


Fig. 32.17 Left hip peritrochanteric endoscopy viewing cephalad and medial from the distal mid-anterior portal after insertion of two double-loaded suture anchors and suture passage. Gluteus medius tendon (GMT)

Endoscopic treatment of these tears has only been described within the last decade. Voos et al. were the first to describe an endoscopic repair of the gluteus medius in 2007 [38]. Their technique mirrors that of an arthroscopic rotator cuff repair of the shoulder: the tendon edges and its attachment site were debrided. Suture anchors were placed into the tendon footprint (with or without fluoroscopic guidance). The sutures were then retrieved and passed through the tendon edges and tied under arthroscopic visualization. Voos et al. later reported outcomes of the procedure in 2009 [54]. They prospectively evaluated ten patients with gluteus medius tears diagnosed by physical exam and MRI that had failed extensive conservative measures. At a mean follow-up of 25 months, all ten patients had complete resolution of pain and regained 5 out of 5 motor strength with hip abduction.

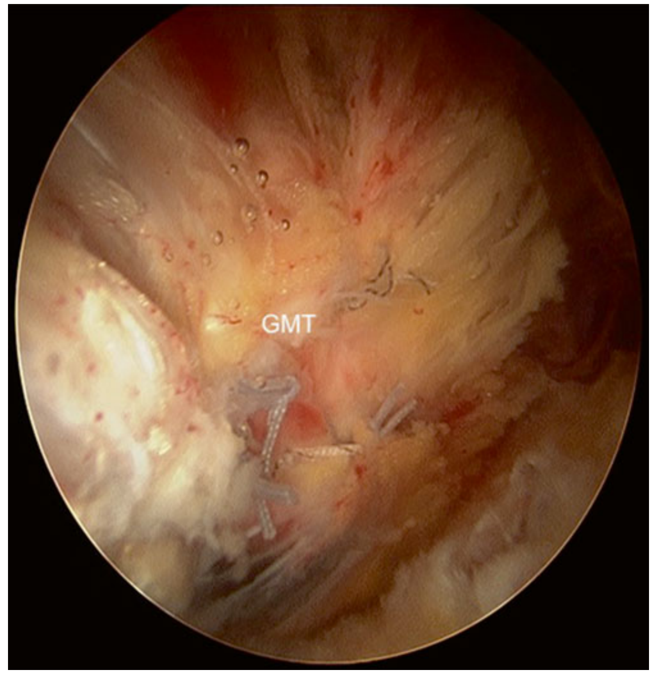


Fig. 32.18 Left hip peritrochanteric endoscopy viewing cephalad and medial from the distal mid-anterior portal after insertion of two double-loaded suture anchors and suture passage. The sutures are now tied which approximates the gluteus medius tendon (GMT) to the trochanter

Three other studies published in 2013 have shown comparable results (level IV evidence case series). Domb et al. identified 15 patients—six with partial-thickness and nine with full-thickness tears [55]. At an average f/u of 27.9 months, 14/15 patients had postoperative improvement of 30 or more points in four hip-specific scores, and satisfaction rated from good to excellent. It should be noted, however, that all patients had labral procedures (10 debridements, 4 repairs, 1 reconstruction), and nearly half of them were treated for femoroacetabular impingement (3 acetabuloplasty, 4 femoroplasty) as well. Thaunat et al. describe partial-thickness undersurface tears repaired in four patients [56]. At 6 months follow-up, the mean modified Harris hip score (mHHS) rose from 36.75 to 72.25. Finally, McCormick et al. reported the endoscopic treatment of ten patients with a mean follow-up of 23 months [57]. Average mHHS, hip outcome scores (HOS)—activities of daily living, and HOS—sports were 84.7, 89.1, and 76.8. All patients rated their level of activity as "normal or near normal," and 9 out of 10 said they would undergo the procedure again.

Surgical techniques, tear patterns, and biomechanical studies are all in their infancy. Byrd describes techniques for access to the peritrochanteric space, tear-specific gluteus medius repair akin to rotator cuff repair, and repair with double-row fixation [58]. Domb et al. describe a trans-tendinous approach for partial-thickness tears and the creation of an optional iliotibial window [59]. Yanke et al. also report a case of a musculotendinous junction tear repaired endoscopically [60].

Dishkin-Paset et al. compared biomechanical fixation stability of two specific gluteus medius arthroscopic repair techniques in cadaveric specimens [61]. The double-row repair with massive cuff stitches was not significantly different from the double-row repair with knotless lateral anchors.

Conclusion

Diagnosing lateral hip pain that is tender to palpation has become more sophisticated than "trochanteric bursitis." A careful history, physical exam, and appropriate imaging are crucial to initiate the proper treatment. The vast majority of cases of GTPS will resolve with appropriate conservative management. For refractory cases, endoscopic treatment has become a viable, safe, and effective method of treating these patients.

References

1. Anderson TP. Trochanteric bursitis: diagnostic criteria and clinical significance. Arch Phys Med Rehabil. 1958;39(10):617–22.
2. Gordon EJ. Trochanteric bursitis and tendinitis. Clin Orthop. 1961;20:193–202.
3. Karpinski MR, Piggott H. Greater trochanteric pain syndrome. A report of 15 cases. J Bone Joint Surg (Br). 1985;67(5):762–3.
4. Bird PA, et al. Prospective evaluation of magnetic resonance imaging and physical examination findings in patients with greater trochanteric pain syndrome. Arthritis Rheum. 2001;44(9): 2138–45.
5. Long SS, Surrey DE, Nazarian NL. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. AJR Am J Roentgenol. 2013;201(5):1083–6.
6. Silva F, et al. Trochanteric bursitis: refuting the myth of inflammation. J Clin Rheumatol. 2008;14(2):82–6.
7. Fearon AM, et al. Greater trochanteric pain syndrome negatively affects work, physical activity and quality of life: a case control study. J Arthroplasty. 2014;29(2):383–6.
8. Strauss EJ, Nho SJ, Kelly BT. Greater trochanteric pain syndrome. Sports Med Arthrosc. 2010;18(2):113–9.
9. Williams BS, Cohen SP. Greater trochanteric pain syndrome: a review of anatomy, diagnosis and treatment. Anesth Analg. 2009; 108(5):1662–70.
10. Segal NA, et al. Greater trochanteric pain syndrome: epidemiology and associated factors. Arch Phys Med Rehabil. 2007;88(8): 988–92.
11. Viradia NK, Berger AA, Dahners LE. Relationship between width of greater trochanters and width of iliac wings in trochanteric bursitis. Am J Orthop (Belle Mead NJ). 2011;40(9):E159–62.
12. Abdelwahab IF, et al. Atypical extraspinal musculoskeletal tuberculosis in immunocompetent patients: Part II, tuberculous myositis, tuberculous bursitis, and tuberculous tenosynovitis. Can Assoc Radiol J. 2006;57(5):278–86.
13. Butcher JD, Salzman KL, Lillegard WA. Lower extremity bursitis. Am Fam Physician. 1996;53(7):2317–24.
14. Kagan 2nd A. Rotator cuff tears of the hip. Clin Orthop Relat Res. 1999;368:135–40.
15. Craig RA, et al. Iliotibial band Z-lengthening for refractory trochanteric bursitis (greater trochanteric pain syndrome). ANZ J Surg. 2007;77(11):996–8.
16. Robertson WJ, et al. Anatomy and dimensions of the gluteus medius tendon insertion. Arthroscopy. 2008;24(2):130–6.
17. Shbeeb MI, Matteson EL. Trochanteric bursitis (greater trochanter pain syndrome). Mayo Clin Proc. 1996;71(6):565–9.
18. Woodley SJ, Mercer SR, Nicholson HD. Morphology of the bursae associated with the greater trochanter of the femur. J Bone Joint Surg Am. 2008;90(2):284–94.
19. Bunker TD, Esler CN, Leach WJ. Rotator-cuff tear of the hip. J Bone Joint Surg (Br). 1997;79(4):618–20.
20. Lachiewicz PF. Abductor tendon tears of the hip: evaluation and management. J Am Acad Orthop Surg. 2011;19(7):385–91.
21. Dwek J, et al. MR imaging of the hip abductors: normal anatomy and commonly encountered pathology at the greater trochanter. Magn Reson Imaging Clin N Am. 2005;13(4):691–704, vii.
22. Pfirrmann CW, et al. Greater trochanter of the hip: attachment of the abductor mechanism and a complex of three bursae—MR imaging and MR bursography in cadavers and MR imaging in asymptomatic volunteers. Radiology. 2001;221(2):469–77.
23. Gottschalk F, Kourosh S, Leveau B. The functional anatomy of tensor fasciae latae and gluteus medius and minimus. J Anat. 1989; 166:179–89.
24. Tibor LM, Sekiya JK. Differential diagnosis of pain around the hip joint. Arthroscopy. 2008;24(12):1407–21.
25. Westacott DJ, Minns JI, Foguet P. The diagnostic accuracy of magnetic resonance imaging and ultrasonography in gluteal tendon tears—a systematic review. Hip Int. 2011;21(6):637–45.
26. Reich MS. Hip arthroscopy for extra-articular hip disease. Curr Rev Musculoskelet Med. 2013;6(3):250–7.
27. McMahon S, Fleury J. External validity of physical activity interventions for community-dwelling older adults with fall risk: a quantitative systematic literature review. J Adv Nurs. 2012;68(10): 2140–54.
28. Blankenbaker DG. Correlation of MRI findings with clinical findings of trochanteric pain syndrome. Skelet Radiol. 2008;37(10):903–9.
29. Kingzett-Taylor A, et al. Tendinosis and tears of gluteus medius and minimus muscles as a cause of hip pain: MR imaging findings. AJR Am J Roentgenol. 1999;173(4):1123–6.
30. Kong A, Van der Vliet A, Zadow S. MRI and US of gluteal tendinopathy in greater trochanteric pain syndrome. Eur Radiol. 2007;17(7):1772–83.
31. Brooker Jr AF. The surgical approach to refractory trochanteric bursitis. Johns Hopkins Med J. 1979;145(3):98–100.
32. Lustenberger DP, et al. Efficacy of treatment of trochanteric bursitis: a systematic review. Clin J Sport Med. 2011;21(5):447–53.
33. Furia JP, Rompe JD, Maffulli N. Low-energy extracorporeal shock wave therapy as a treatment for greater trochanteric pain syndrome. Am J Sports Med. 2009;37(9):1806–13.
34. Rompe JD, et al. Home training, local corticosteroid injection, or radial shock wave therapy for greater trochanter pain syndrome. Am J Sports Med. 2009;37(10):1981–90.

35. Burman MS. Arthroscopy or the direct visualization of joints: an experimental cadaver study. 1931. Clin Orthop Relat Res. 2001;390:5–9.
36. Byrd JW. Hip arthroscopy utilizing the supine position. Arthroscopy. 1994;10(3):275–80.
37. Glick JM, et al. Hip arthroscopy by the lateral approach. Arthroscopy. 1987;3(1):4–12.
38. Voos JE, et al. Arthroscopic anatomy and surgical techniques for peritrochanteric space disorders in the hip. Arthroscopy. 2007;23(11):1246e1–5.
39. Audenaert E, Pattyn C. Balloon dissection for improved access to the peritrochanteric compartment. Arthroscopy. 2009;25(11):1349–53.
40. Schapira D, Nahir M, Scharf Y. Trochanteric bursitis: a common clinical problem. Arch Phys Med Rehabil. 1986;67(11):815–7.
41. Clancy WG. Runners' injuries. Part two. Evaluation and treatment of specific injuries. Am J Sports Med. 1980;8(4):287–9.
42. Govaert LH, et al. Endoscopic bursectomy and iliotibial tract release as a treatment for refractory greater trochanteric pain syndrome: a new endoscopic approach with early results. Arthrosc Tech. 2012;1(2):e161–4.
43. Weinrauch P, Kermeci S. Ultrasonography-assisted arthroscopic proximal iliotibial band release and trochanteric bursectomy. Arthrosc Tech. 2013;2(4):e433–5.
44. Baker Jr CL, et al. Arthroscopic bursectomy for recalcitrant trochanteric bursitis. Arthroscopy. 2007;23(8):827–32.
45. Allen WC, Cope R, Saltans C. The snapping hip revisited. J Am Acad Orthop Surg. 1995;3(5):303–8.
46. Provencher MT, Hofmeister EP, Muldoon MP. The surgical treatment of external coxa saltans (the snapping hip) by Z-plasty of the iliotibial band. Am J Sports Med. 2004;32(2):470–6.
47. Polesello GC, et al. Surgical technique: endoscopic gluteus maximus tendon release for external snapping hip syndrome. Clin Orthop Relat Res. 2013;471(8):2471–6.
48. Brignall CG, Stainsby GD. The snapping hip. Treatment by Z-plasty. J Bone Joint Surg (Br). 1991;73(2):253–4.
49. Dederich R. [The snapping hip. Enlargement of the iliotibial tract by Z-plasty]. Z Orthop Ihre Grenzgeb. 1983;121(2):168–70.
50. Nam KW, et al. A modified Z-plasty technique for severe tightness of the gluteus maximus. Scand J Med Sci Sports. 2011;21(1):85–9.
51. Ilizaliturri Jr VM, et al. Endoscopic iliotibial band release for external snapping hip syndrome. Arthroscopy. 2006;22(5):505–10.
52. Zini R, et al. Endoscopic iliotibial band release in snapping hip. Hip Int. 2013;23(2):225–32.
53. Davies JF, et al. Surgical treatment of hip abductor tendon tears. J Bone Joint Surg Am. 2013;95(15):1420–5.
54. Voos JE, et al. Endoscopic repair of gluteus medius tendon tears of the hip. Am J Sports Med. 2009;37(4):743–7.
55. Domb BG, Botser I, Giordano BD. Outcomes of endoscopic gluteus medius repair with minimum 2-year follow-up. Am J Sports Med. 2013;41(5):988–97.
56. Thaunat M, et al. Endoscopic repair of partial-thickness undersurface tears of the gluteus medius tendon. Orthop Traumatol Surg Res. 2013;99(7):853–7.
57. McCormick F, et al. Endoscopic repair of full-thickness abductor tendon tears: surgical technique and outcome at minimum of 1-year follow-up. Arthroscopy. 2013;29(12):1941–7.
58. Byrd JW. Gluteus medius repair with double-row fixation. Arthrosc Tech. 2013;2(3):e247–50.
59. Domb BG, Nasser RM, Botser IB. Partial-thickness tears of the gluteus medius: rationale and technique for trans-tendinous endoscopic repair. Arthroscopy. 2010;26(12):1697–705.
60. Yanke AB, et al. Endoscopic repair of a gluteus medius tear at the musculotendinous junction. Arthrosc Tech. 2013;2(2):e69–72.
61. Dishkin-Paset JG, et al. A biomechanical comparison of repair techniques for complete gluteus medius tears. Arthroscopy. 2012;28(10):1410–6.