Greater Trochanteric Pain Syndrome

Eric J. Strauss, MD, Shane J. Nho, MD, MS,* and Bryan T. Kelly, MD†*

Abstract: Originally defined as "tenderness to palpation over the greater trochanter with the patient in the side-lying position," greater trochanteric pain syndrome (GTPS) as a clinical entity, has expanded to include a number of disorders of the lateral, peritrochanteric space of the hip, including trochanteric bursitis, tears of the gluteus medius and minimus and external coxa saltans (snap ping hip). Typically presenting with pain and reproducible tenderness in the region of the greater trochanter, buttock, or lateral thigh, GTPS is relatively common, reported to affect between 10% and 25% of the general population. Secondary to the relative paucity of information available on the diagnosis and management of components of GTPS, the presence of these pathologic entities may be underrecognized, leading to extensive workups and delays in appropriate treatment. This article aims to review the present understanding of the lesions that comprise GTPS, discussing the relevant anatomy, diagnostic workup and recommended treatment for trochanteric bursitis, gluteus medius and minimus tears, and external coxa saltans.

Key Words: abductor tears, trochanteric bursitis, gluteus medius, gluteus minimus

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The evaluation and management of patients who present with hip pain can be difficult, as the differential diagnosis of pain about the hip joint is broad, including intra-articular pathology, extraarticular pathology and referred symptoms from the lumbar spine and pelvis.[1,2] Advances in magnetic resonance imaging (MRI) and knowledge gained from improvements and experience with hip arthroscopy, have led to an improved understanding of the functional anatomy about the hip joint and the ability to identify soft tissue causes of hip pain.[1,3] Originally defined as "tenderness to palpation over the greater trochanter with the patient in the side-lying position,"[4–7] greater trochanteric pain syndrome (GTPS) as a clinical entity, has expanded to include a number of disorders of the lateral, peritrochanteric space of the hip, including trochanteric bursitis, tears of the gluteus medius and minimus and external coxa saltans (snapping hip).[3]

Typically presenting with pain and reproducible tenderness in the region of the greater trochanter, buttock, or lateral thigh, GTPS is relatively common, reported to affect between 10% and 25% of the general population.[2,4,8] Some investigators have shown an increased incidence of GTPS in patients with musculoskeletal low back pain and an increased prevalence in women compared with men.[4,9–12] Secondary to the relative paucity of information available on the diagnosis and management of components of GTPS, the presence of these pathologic entities may be underrecognized, leading to extensive workups and delays in appropriate treatment.[4,13] This article aims to review the present understanding of the lesions that comprise GTPS, discussing the relevant anatomy, diagnostic workup and recommended treatment for trochanteric bursitis, gluteus medius and minimus tears, and external coxa saltans.

RELEVANT ANATOMY

The greater trochanter arises from the junction of the femoral neck and shaft. It is the site of attachment for 5 muscles, the gluteus medius and gluteus minimus tendons laterally and the piriformis, obturator externus and obturator internus more medially. As recently noted by Robertson et al,[14] the gluteus medius tendon has 2 distinct and consistent insertion sites on the greater trochanter, one on the lateral facet and the other on the superoposterior facet. The tendinous portion inserted on the superoposterior facet was noted to be stout with a circular shape, while that inserted on the lateral facet was larger and rectangular in shape. Anterior to the gluteus medius insertion lies the insertion of the capsular and long heads of the gluteus minimus tendon on the anterior facet of the greater trochanter.[15] Superficial to the gluteus medius and minimus tendons lies a fibromuscular sheath composed of the gluteus maximus, tensor fascia lata, and iliotibial band (ITB).

Three bursas have been described to be consistently present around the lateral aspect of the greater trochanter, believed to function as cushioning for the gluteus tendons, the ITB, and the tensor fascia latae.[2,16] They are the subgluteus maximus bursa, the subgluteus medius bursa and the gluteus minimus bursa. The subgluteus maximus bursa is lateral to the greater trochanter, between the tendons of gluteus maximus and medius. Although variable, the subgluteus maximus is typically subdivided into up to 4 separate bursas. The deep subgluteus maximus bursa is the largest and most consistent of these subdivisions, often referred to as the "trochanteric bursa" and is often implicated in cases of symptomatic bursitis.[2] Other reported components of the subgluteus maximus bursas include the secondary deep, superficial, and gluteofemoral bursas. Deep to the gluteus medius tendon up to 3 separate bursas have been identified in anatomic studies, with the largest typically being present on the anterior surface of the greater trochanter, near its apex.[17] The gluteus minimus bursa is a minor bursa located deep to the minimus insertion on the anterior aspect of the greater trochanter.

The increased popularity of hip arthroscopy and advances in technique have improved the understanding

From the *Division of Sports Medicine, Department of Orthopedic Surgery, Rush University Medical Center, Rush Medical College of Rush University, Chicago, IL; and †Hospital for Special Surgery, Weill Medical College of Cornell University, New York, NY.
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Reprints: Bryan T. Kelly, MD, Hospital For Special Surgery, Weill Medical College of Cornell University, 535 East 70th Street, New York, NY 10021 (e-mail: kellyb@hss.edu).

of the anatomy of the peritrochanteric space.[3,18] The borders of the arthroscopic lateral, peripheral, or peritrochanteric compartment consist of the tensor fascia lata and ITB laterally, the abductor tendons superomedially, the vastus lateralis inferomedially, the gluteus maximus muscle superiorly and its tendon posteriorly. Typically, the peripheral compartment is viewed with the operative leg off traction through the anterior portal, which is created 1-cm lateral to the anterior superior iliac spine in the interval between the sartorius and the tensor fascia lata.[3,18] The cannula is directed toward the greater trochanter with the leg in full extension, neutral adduction/abduction and 10 to 15 degree of internal rotation. The initial arthroscopic view includes the insertion of the gluteus maximus into the posterior border of the ITB, the longitudinal fibers of the vastus lateralis and bursal tissue overlying the greater trochanter. In cases of severe trochanteric bursitis, this tissue may be hypertrophied, thick, and very vascular. Subsequent to the clearing of the bursal tissue with a motorized shaver and/or radiofrequency probe (through a distal posterior portal placed halfway between the tip of the greater trochanter and the vastus tubercle along the posterior one-third of the greater trochanteric midline), continued inspection will identify the fibers of the gluteus medius as it inserts onto the greater trochanter. This insertion is carefully examined for evidence of full or partial-thickness tears. Finally, the ITB is assessed, particularly the posterior one-third, looking for evidence of abrasive wear consistent with external coxa saltans.

TROCHANTERIC BURSITIS

Trochanteric bursitis is a commonly diagnosed inflammatory condition that presents with pain localizing to the region of the greater trochanter, often with radiation down the lateral aspect of the thigh or into the buttock. Believed to occur secondary to repetitive friction between the greater trochanter and the ITB with hip flexion and extension, trochanteric bursitis is often associated with overuse, trauma, or other conditions that may alter normal gait patterns.[1,19] In an observational study including 72 patients followed for 2 years, Schapira et al[5] reported that 91.6% of patients diagnosed with symptomatic trochanteric bursitis had other associated pathology affecting adjacent areas, such as osteoarthritis of the ipsilateral hip or lumbar spine. Typically, trochanteric bursitis presents in middle-aged patients, with females more commonly affected than males (4:1), however, the incidence of symptomatic disease has been increasing in younger, active patients, especially runners.[19–21] In addition to chronic, activity-related pain about the greater trochanter, patients often report symptoms with prolonged standing, sitting with the affected leg crossed, and difficulty lying on their affected side secondary to symptoms from direct compression of the inflamed bursa.

On physical examination, patients with symptomatic trochanteric bursitis have tenderness to palpation about the greater trochanter, predominantly posterolaterally. In 1985, Ege Rasmussen and Fano described diagnostic criteria for trochanteric bursitis.[22] These criteria included lateral hip pain, distinct tenderness at the greater trochanter, pain on hip abduction against resistance, pain radiating down the lateral aspect of the affected lower extremity and a positive Patrick-FABERE test (flexion, abduction, external rotation, and extension). Additionally, the Ober test for ITB tightness is often positive. Selective anesthetic/corticosteroid injections can be used for both diagnostic and therapeutic purposes, injecting at the point of maximal tenderness or under fluoroscopic guidance.[23] Secondary to the number of pathologic conditions presenting with similar symptoms and physical exam findings, besides point tenderness at the greater trochanter and symptom relief from trigger point injection there are few signs with a high specificity for trochanteric bursitis.[2]

Although not required to make a diagnosis of trochanteric bursitis, imaging studies used in the workup of patients usually begin with plain radiographs of the affected hip, looking for intraarticular sources of the presenting symptomatology. Although calcifications may occasionally be evident within the bursal space around the greater trochanter, plain x-rays are often negative.[1] In a review of 15 cases of trochanteric bursitis diagnosed based on clinical presentation and point tenderness at the greater trochanter, Karpinski et al[24] reported that 12 patients had completely normal hip radiographs whereas 3 had evidence of minimal soft tissue calcification present. Dynamic ultrasound may be another imaging modality with utility in the evaluation of trochanteric bursitis. In addition to ruling out other components of greater trochanteric pain syndrome, including gluteus medius and minimus tears and evidence of snapping hip, ultrasound can help identify an inflamed trochanteric bursa.[1] Similarly, an MRI for the evaluation of trochanteric bursitis can be used as an exclusionary tool while potentially showing inflammation in the region of the greater trochanter.[19] Bird et al[25] in a retrospective review of MRI findings in 24 women with greater trochanteric pain syndrome presenting with lateral hip pain and point tenderness at the greater trochanter reported that whereas 62.5% had evidence of gluteus medius tendonitis and 45.8% had gluteus medius tears, only 2 patients (8.3%) had objective evidence of trochanteric bursitis.

Typically, cases of trochanteric bursitis are self-limited and usually respond to nonoperative management including rest, ice, antiinflammatory medications, and physical therapy focusing on stretching, flexibility, strengthening, and gait mechanics.[1,2,5] When symptoms persist despite these interventions, bursal injections of local anesthetic and corticosteroid have been shown to provide effective pain relief in 60% to 100% of affected patients.[2,22,26,27] In a study of 75 patients with trochanteric bursitis treated with lidocaine/bethamethasone injections, Shbeeb et al[27] reported that 77.1% had pain relief at 1 week of follow-up with 61.3% of patients continuing to be symptom free at 6 months. For patients who respond to an initial injection but have later return of their symptoms, a repeat injection into the peritrochanteric space may be used successfully.[2]

For cases of recalcitrant trochanteric bursitis in which other potential sources of the patient's symptoms have been ruled out, surgical intervention is warranted. Surgical options include open or arthroscopic bursectomy and ITB release. In a recent prospective evaluation of the efficacy of arthroscopic bursectomy for persistent trochanteric bursitis, Baker et al[19] reported significant improvements in pain scores (7.2 preoperatively compared with 3.1 postoperatively) and Harris Hip Scores (51 preoperatively compared with 77 postoperatively) in 30 patients followed for a mean of 26.1 months. Similar good results were reported by Fox et al[28] in their retrospective review of 27 patients treated with arthroscopic bursectomy. At a minimum of 1 year of follow-up, the investigators reported that 23 of the 27 patients had good or excellent results immediately after the procedure and had no postoperative complications. Symptom recurrence was reported in 2 patients (7.4%) at 5 years of clinical follow-up. Believing that the ITB is a major contributor to the pain, inflammation, and impingement leading to trochanteric bursitis, Farr et al[20] describe including an IT band release with their arthroscopic bursectomy. In 2 patients treated with this technique, the investigators report that both had complete symptom relief and returned to their occupational and recreational activities without recurrence. The outcome of ITB z-lengthening in 15 patients (17 hips) was reported by Craig et al.[29] The investigators found that at a mean follow-up of 47 months complete symptom resolution was present in 8 hips, partial resolution in 8 hips and 1 patient experienced no improvement postoperatively.

In our experience, bursectomy alone is sufficient if there is no evidence on clinical exam of mechanical external snapping or a tight ITB. If there is palpable or visible snapping of a tightened ITB over the greater trochanter, or if there is clinically significant ITB tightness based upon a positive Ober test, then a release of the posterior one-third of the IT band should be included with the bursectomy.

GLUTEUS MEDIUS AND MINIMUS TEARS

Secondary to the use of MRI in the evaluation of patients with greater trochanteric pain syndrome and findings from hip arthroscopy cases, tears of the abductor tendons have been noted with increasing frequency as a major source of patient symptoms.[25,30] The insertion of the tendons of the gluteus medius and minimus on the greater trochanter have recently been equated to the insertion of the rotator cuff tendons on the greater tuberosity of the humerus.[1,14,31–33] As in the shoulder, a process of injury and subsequent degeneration starting with tendonitis, tendinosis, and eventual tear may occur in the components of the rotator cuff of the hip, more commonly occurring in the gluteus medius than the gluteus minimus. Tears of the gluteus medius can be interstitial, partial thickness or full thickness, with full-thickness tears tending to be large in size.[14,34]

Tears of the hip abductor tendons have been reported to occur more commonly in women than men, possibly secondary to the wider female pelvis.[1,32–35] Although the true incidence and prevalence of gluteus medius and minimus tears are not known, recent studies have suggested that tears will occur in up to 25% of late middle-aged women and 10% of similarly aged men.[14] Bunker et al[32] prospectively evaluated 50 patients with femoral neck fractures and identified tears of the gluteus medius and minimus in 22% of their cases. In a prospective evaluation of 176 patients undergoing total hip arthroplasty for osteoarthritis, Howell et al[33] identified evidence of degenerative tears in 20% of cases.

Patients with symptomatic gluteus medius and minimus tears typically present with lateral hip pain, tenderness to palpation at the gluteal insertion on the greater trochanter, and weakness of hip abduction.[1,35] Although some may report a prior traumatic, the majority of affected patients describe an atraumatic, insidious onset of symptoms. On physical examination, patients may show pain and weakness with active, resisted abduction in extension and external rotation with the hip flexed to 90 degrees. Pain may also be reproduced with single leg stance lasting 30 seconds or longer.[35] Diagnostic imaging in the workup of suspected abductor tendon pathology usually starts with plain radiographs of the affected hip. Although plain x-rays are typically negative, calcification may be seen at the insertion site on the greater trochanter. Ultrasound can also be used to evaluate the abductor tendons, identifying thickening and fluid consistent with tendinosis or the presence of partial or full thickness tears.[34,36] MRI has shown to be an effective diagnostic tool for cases of suspected pathology of the gluteus medius and minimus tendons. An MRI can differentiate between partial and full-thickness tears, in addition to showing calcification at the tendon insertion and fatty atrophy within the muscle substance. In a retrospective evaluation of 74 hip MRIs comparing findings from 15 surgically proven cases of abductor tears and 59 controls, Cvitanic et al[30] have shown a 91% accuracy in the MRI diagnosis of gluteus medius and minimus tears. In this review, consistent signs of abductor tears were MRI evidence of increased T2 signal superior and lateral to the greater trochanter and evidence of tendon discontinuity on T1 images.

The initial management of patients who present with symptomatic abductor tears is typically nonoperative consisting of rest, antiinflammatory medications, and physical therapy focusing on range of motion and strengthening exercises. Persistent symptoms of pain and weakness adversely affecting activities of living can prompt surgical intervention. Although open techniques have been reported for gluteus medius and minimus tears noted during femoral neck fracture fixation and total hip arthroplasty, recent advances and experience with hip arthroscopy have led to endoscopic techniques for abductor tendon repair.[3,14,31] Although only one outcome study is available in the orthopedic surgery literature, early results look promising. In a review of 10 patients treated with arthroscopic gluteus medius repair, Voos et al[31] reported that all 10 patients had complete resolution of their pain whereas 90% had regained full abductor strength at a mean follow-up of 1 year.

EXTERNAL COXA SALTANS (SNAPPING HIP SYNDROME)

Coxa saltans is described as an audible and potentially painful snapping of the hip during activities that require repetitive flexion, extension, and abduction.[37–39] The external variety of snapping hip syndrome involves the soft tissues overlying the greater trochanter, most typically the ITB but also the anterior border of the gluteus maximus. When the hip is in a position of extension, the ITB lies posterior to the greater trochanter. Snapping of the IT band can occur during hip flexion activities when the IT band glides over the greater trochanter to lie in an anterior position. Although gliding of the IT band over the greater trochanter is physiologic and a benign, asymptomatic snapping hip can be present especially in athletes, occasionally the snapping leads to inflammation and pain, significantly limiting affected patients activities.[38,39] Patients with symptomatic external snapping hip tend to be in their late teenage years or early twenties and frequently report active lifestyles.

A diagnosis of symptomatic external coxa saltans is typically evident based on the patient's presenting history. The typical case presents with a painful, snapping sensation

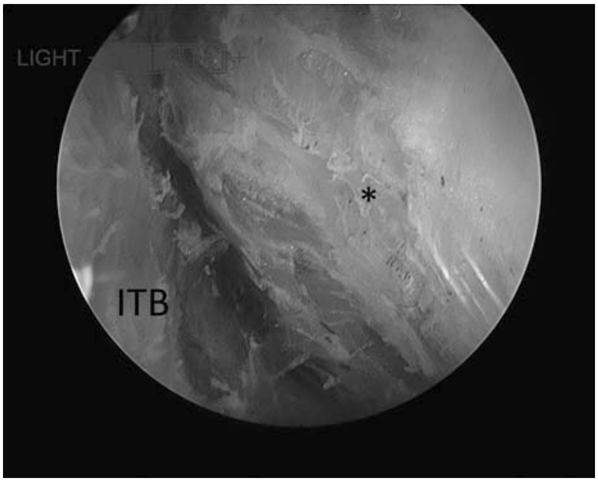

FIGURE 1. Arthroscopic visualization of the peritrochanteric space after complete bursectomy. Gluteus medius muscle and tendon (*) and ITB can be visualized. ITB indicates iliotibial band.

localizing to the region about the greater trochanter. Although a history of a traumatic event precipitating the snapping may be present, this is less common than an atraumatic insidious symptom onset. Physical examination of suspected cases of external snapping hip usually starts with placing the patient on their side with the affected leg up.[38] The patient is then asked to actively flex their hip whereas the examiner palpates the greater trochanter feeling the snapping of the IT band. The diagnosis can be confirmed if pressure applied over the proximal aspect of the greater trochanter prevents snapping with repeated hip flexion. Diagnostic imaging usually begins with plain radiographs of the affected hip looking for evidence of loose bodies or synovial chondromatosis, which can be causes of the internal variety of coxa saltans. However, similar to cases of trochanteric bursitis or abductor tendon

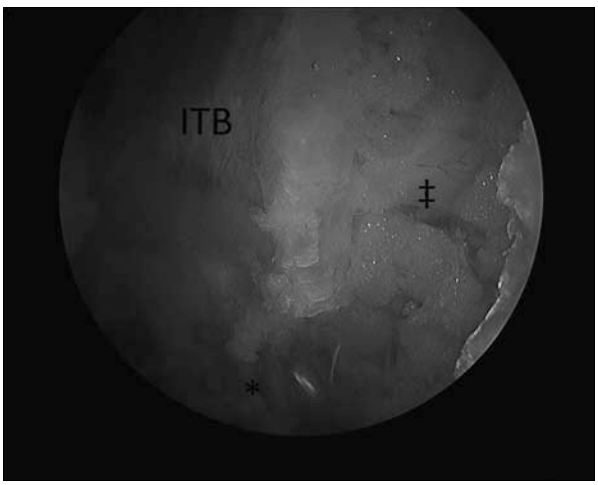

FIGURE 2. Partial release of the ITB for external coxa saltans or abrasive wear of the abductor tendons is conducted at the most prominent part of the greater trochanter. The release is conducted with an 11 blade scalpel from the junction of the middle and posterior one-third and continued posterior to the level of the gluteus maximus muscle. ITB, iliotibial band; *, gluteus maximus muscle; ‡, subcutaneous fat.

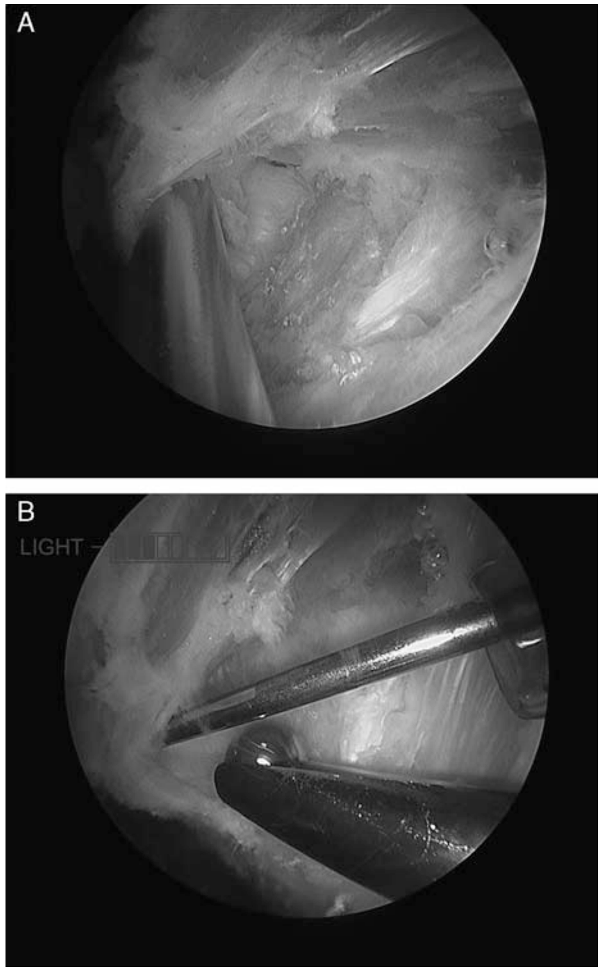

FIGURE 3. Arthroscopic gluteus medius tear. A, Recognition of the gluteus medius tear with a probe. B, Decortication of the greater trochanter with a motorized burr.

pathology, plain x-rays are typically negative. Real-time dynamic ultrasound can be used to visualize the snapping phenomenon and associated bursitis whereas at the same time ruling out other sources of pain.[1] Besides helping to exclude intraarticular causes of snapping hip and other components of greater trochanteric pain syndrome, MRI is of little use in the workup of suspected cases of external coxa saltans.

The vast majority of cases of external coxa saltans respond to nonoperative management including stretching, activity modification, antiinflammatory medications, and physical therapy.[38–40] In patients who fail to respond to these conservative management strategies, injections of local anesthetic and corticosteroid can be administered about the greater trochanter in an effort to reduce the inflammation of the IT band and underlying bursa that is believed to contribute to symptoms with repetitive snapping episodes. For the rare patient with refractory snapping hip after an extensive attempt at nonoperative management, surgical intervention may be indicated. A variety of surgical options have been reported in the orthopedic literature, however, secondary to the relative rarity of the need for surgery most of the procedures are case reports or limited series with mixed results.[39] Z-plasty of the ITB is one

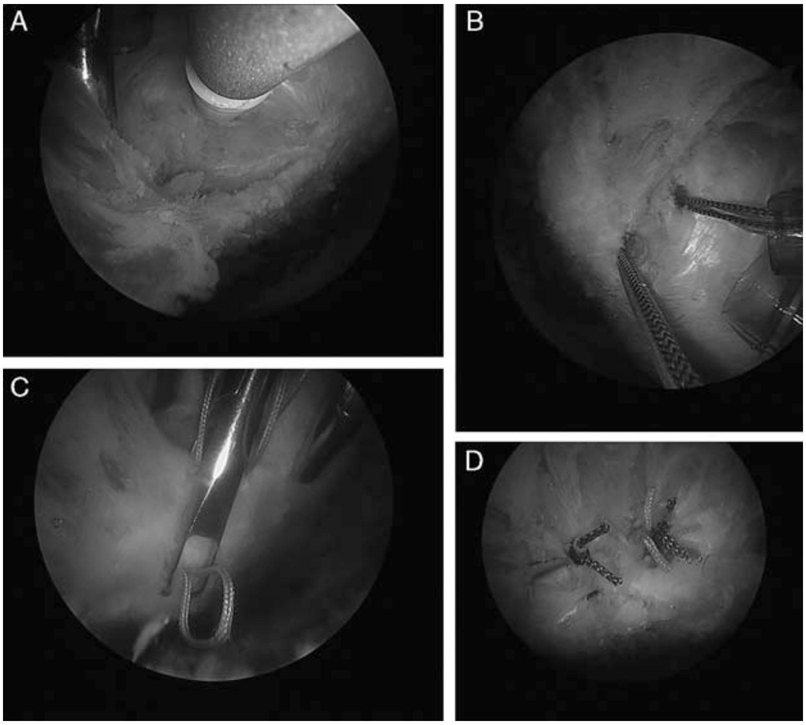

FIGURE 4. Arthroscopic gluteus medius repair. A, Suture anchor insertion. B, Two suture anchors inserted into the greater trochanter. C, Suture passing device is used to pass the sutures through the torn tendon. D, Final appearance of a repaired gluteus medius tendon.

surgical option that has shown benefit. Brignall and Stainsby reported good results in 8 patients treated with z-plasty, with all 8 having complete resolution of pain and snapping at a mean follow-up of 3 years.[41] In a review of 9 symptomatic snapping hips in 8 patients with a mean age of 25.6 years, Provencher et al[39] described the results of IT band z-plasty. At a mean follow-up of 22.9 months the investigators reported that all 8 patients had complete resolution of their snapping hip symptoms, with 7 of the 8 returning to full, unrestricted activities. White et al[37] described a new surgical approach for the treatment of refractory external coxa saltans, relaxing the resting tension in the IT band through transverse step cuts made along a 10-cm longitudinal incision placed in line with the fibers overlying the greater trochanter. In a review of 16 patients treated with this technique, the investigators reported that 14 of the 16 (87.5%) remained asymptomatic at a mean of 32.5 months after surgery (although 2 patients required a second release before becoming asymptomatic).

SURGICAL TECHNIQUE

After routine evaluation of the central and peripheral compartments, the arthroscope is introduced into the lateral compartment. The anterior portal is best portal to access the peritrochanteric space and is created 1-cm lateral to the anterior superior iliac spine and in the interval between the tensor fascia lata and the sartorius. The leg is placed in complete extension and roughly 15 degree of abduction. A 5.0-mm metallic cannula is positioned between the ITB and the lateral aspect of the greater trochanter, and the tip of the cannula can be used to sweep proximal and distal to ensure placement in the proper location. Fluoroscopy can also be used to confirm that the cannula is located immediately adjacent to the greater trochanter. The 70-degree arthroscope can be introduced into the cannula and the lens is directed to view distally. The initial view should visualize the insertion of the gluteus maximus into the posterior border the ITB. The distal peritrochanteric space portal (DPSP) can be established under needle localization and approximately midway between the tip of the greater trochanter and vastus tubercle along the posterior one-third of the greater trochanter midline. A mechanical shaver can be placed into the peritrochanteric space through the DPSP to begin the bursectomy, and radiofrequency energy device can be used intermittently for hemostasis. The arthroscope can be directed more proximally to visualize the longitudinal fibers of the vastus lateralis and its insertion into the vastus tubercle. The gluteus minimus tendon and muscle is visualized anteriorly with the arthroscope and light source directed anterosuperior. When the arthroscope is directed superiorly, the gluteus medius tendon insertion into the greater trochanter can be visualized lying posterior to the gluteus minimus (Fig. 1). Any overlying bursa should be debrided, which will also facilitate exposure of the gluteus medius and minimus insertions.

The arthroscope should also be directed toward the ITB, and the posterior one-third ITB can be evaluated for evidence of snapping ITB or abrasive wear or erythema to the tendons overlying the greater trochanter. Release of the ITB may be necessary for either external coxa saltans or abnormal contact across the greater trochanter. Localize the area of the ITB that corresponds with the most prominent part of the greater trochanter (posterolateral aspect at the level of the vastus tubercle) with a spinal needle. Use an 11 blade scalpel to create a vertical incision to match the width of the blade. Advance the blade so that the tip penetrates the ITB at the junction of the middle and posterior one-third. Turn the blade 90 degrees so that it is directed posterior and continue posteriorly until the muscular fibers of the gluteus maximus is visible (Fig. 2).

A probe can be used to palpate the abductor tendons to identify the location of the torn tendon (Fig. 3A). Once the tear has been identified, the mechanical shaver can be used to debride the edges. For high-grade partial tears, the tear may have to be completed for an adequate repair to be carried out. A motorized burr can be used to decorticate the greater trochanter and prepare the bone to facilitate healing (Fig. 3B). An arthroscopic grasper can be used to determine the tissue quality and the tendon mobility. A spinal needle can be used to localize proper placement of the suture anchor into the greater trochanter (Fig. 4A). The number of anchors will be determined by the size of the tear (Fig. 4B). A 5.5×90-mm clear cannula can be placed in DPSP to facilitate suture passage and a 8.0×110-mm clear cannula can be placed portal that was used for anchor placement. Any suture passing device can be used to deliver the sutures through the tendon (Fig. 4C). The investigators' prefer to place 2 mattress stitches that are perpendicular to one another from a single suture anchor. The final appearance should show anatomic repair of the torn gluteus medius or minumus tendon over the anatomic footprint of the greater trochanter (Fig. 4D). If there seems to be excessive contact from the ITB over the abductor tendons, the ITB release can be conducted at this time as described earlier.

SUMMARY

Greater trochanteric pain syndrome is a relatively common source of hip symptoms presenting to the orthopedic surgeon. Improved knowledge regarding the functional anatomy about the greater trochanter has been obtained through advances in diagnostic imaging tools and from recent experience with hip arthroscopy. Components of GTPS include trochanteric bursitis, tears of the gluteus medius and minimus and external coxa saltans. An understanding of the common presentation, physical examination, and radiographic findings associated with GTPS will enable the treating physician to sort through the broad differential diagnosis that accompanies a patient presenting with hip pain. Although these disorders are often successfully managed nonoperatively, when indicated, the appropriate surgical intervention can lead to symptom relief and a return to normal function.

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