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Review Article

Gluteus Medius Partial Tear Repair with Collagen Patch Augmentation. Endoscopic Surgical Technique

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Abstract

Introduction: Gluteus medius (GM) partial and total tears frequently cause lateral hip pain and can be highly disabling. These injuries are challenging to treat conservatively. Partial tears occur more often than total tears. If conservative management fails, open and endoscopic repair techniques can be used as treatment options. The use of collagen patches has been proposed as an augmentation for decreasing non-healing rates.

The purpose of this study is to describe our endoscopic technique for repairing partial tears of the GM tendon using a bioinductive collagen patch.

Surgical Technique: With the patient in the supine position on a table without traction, the proximal posterolateral accessory and distal posterolateral accessory portals previously described for deep gluteal pain syndrome are performed.

A wide bursectomy and a partial tenotomy of the distal insertion of the gluteus maximus are performed. The tendinopathic appearance of the GM tendon is identified on the lateral surface, evidencing the partial tear when palpating the tendon on its medial side.

The medium posterolateral accessory portal is made to perform 9 perforations on the greater trochanter at the level of the gluteus medius tendon. The collagen patch is placed over the perforations, placing the anchors to fix the patch. Finally, the stability of the patch is checked with hip movements.

Conclusion: Our endoscopic technique for the repair of the GM tendon, performing multiple perforations to the greater trochanter, and using a bioinductive collagen patch augmentation, is reproducible and safe. The partial tenotomy of the distal insertion of the gluteus maximus may decompress the iliotibial band over the repaired GM tendon. These endoscopic portals allow access to the entire lateral peritrochanteric space, in addition to allowing management of the deep gluteal space if necessary.

Keywords: Gluteus Medius; Partial Tear; Collagen Patch; Augmentation; Endoscopic Surgical

Introduction

Lateral hip pain is a clinical entity with an estimated prevalence of up to 25% of the population, with a predominance in middle-aged women [1,2], that encompasses processes of bursitis, tendinopathy, and/or partial and total tears of the hip abductor apparatus [3,4].

Classically, patients were treated symptomatically with non-surgical management, which included the use of anti-inflammatory drugs, physiotherapy, and multiple local infiltrations. This was due to the low diagnostic precision, little functional-anatomical knowledge, and limited available surgical options; all these factors are needed to perform surgical treatment [4-8].

Respecting the causes of long-term lateral hip pain, tears of the abductor muscles tendons are frequent, mostly compromising the gluteus medius (GM) tendon. These are frequently partial thickness tears [9-12].

Tears of the GM and minor tendons have been described by multiple authors as "the hip rotator cuff" [13,14], a consequence of a progressive degenerative process, as occurs with rotator cuff tears in the shoulder [10,15-17]. Owing to this, the anatomical precision of the hip abductor apparatus and the morphology of these tears has gained relevance among orthopedic surgeons. The insertional anatomy of the GM [18] and the characteristics of its tears have recently been described, allowing surgical repair to be developed.

In cases of not achieving satisfactory results with conservative treatment, surgical interventions are indicated. Open and endoscopic techniques have been described, reporting good clinical outcomes, and obtaining comparable results in terms of pain and functionality [19,20], nevertheless, higher complication rates are related to open techniques [21,22].

Although the clinical results have been auspicious with the use of these techniques, there are 5-25% of the repairs do not present healing [23,24], which could lead to a failed repair and worse clinical results.

To increase the healing rate of tendon repairs, the use of bioinductive collagen patches has been described, which have been initially used in rotator cuff repairs in the shoulder [25]. In recent years, this bioinductive collagen patch has been used in open repairs of the hip abductor apparatus [19], describing its safety and favorable clinical and imaging healing results.

The purpose of this study is to describe our endoscopic technique for the repair of partial ruptures of the GM tendon, with the use of augmentation with a bioinductive collagen patch.

Surgical technique

The procedure is performed on all patients on an outpatient basis. We use spinal anesthesia with sedation in all our cases. The patient is set in the supine position. Sterile fields covering the trochanteric area with Ioban® (Two Harbors, Minnesota, United States) are placed.

Without traction and with the limb on the surgical field for control and manipulation of the abduction position and rotations of the limb, two endoscopic portals are made for access to the lateral and posterior space, according to the previous description of endoscopic portals for the treatment of deep gluteal syndrome, published by the same author of the present study [26]. The distance between the anterior and posterior border of the greater trochanter at the level of the vastus tuberosity is demarcated, projecting this distance equidistantly in the posterior third of the femur towards proximally and distally, delimiting the proximal posterolateral accessory (PPLA) and distal posterolateral accessory (DPLA) portals (Figure 1). First, the DPLA portal is made through an incision in the skin, then opening the iliotibial band, introducing a blunt trocar to reveal the lateral virtual space using a warmed saline solution to avoid the complication of hypothermia [27-29] at a constant flow of 0.7 liters/minute and a pressure of 40 mmHg per bomb. Using endoscopic assistance with 70º optics, the PPLA is made.

The procedure is started by keeping the hip at 30º abduction and 0º internal rotation. Subsequently, a 3cm partial tenotomy of the distal insertion of gluteus maximus is performed at the proximal level on the linea aspera, from proximal to distal and anterior to posterior (Figure 2). This tenotomy allows access to the lateral space, increasing this virtual space, and helping to decrease the pressure of the iliotibial band over the greater trochanter. Once the greater trochanter has been identified, bursectomy is performed and the GM tendon is subsequently identified, which in these cases shows a tendinopathic appearance, with partial fatty infiltration. The tear is not visible on the lateral surface (Figure 3), since the tear is always found on the medial side, which is explored by palpation to rule out a complete tear. A third portal is made at the midpoint equidistant between the PPLA and DPLA, the medium posterolateral accessory portal (MPLA) (Figure 1 and 4). Through this MPLA portal, nine perforations are made in the greater trochanter at the level of the GM insertion with a 2.3mm Bioraptor® anchor drill bit (Smith and Nephew, London, United Kingdom) at a depth of 2.5cm, distributed symmetrically from proximal to distal and from anterior to posterior separated approximately 1cm from each other (Figure 5). Through the DPLA portal, an 8.25mm cannula specific to the implant is inserted, and then the Regeneten® bioinductive patch loaded is passed. Once the implant has been placed in the desired position, 6 anchors of the Regeneten® system for soft tissues (4.5 x 6.5mm) are placed through the MPLA portal to set the patch (Figure 6). Finally, the stability of the implant is confirmed by hip rotations and flexion-extension movements (Figure 7). Instruments are removed and the skin is sutured, concluding the surgical procedure. The patient is discharged from the hospital same day.

Discussion

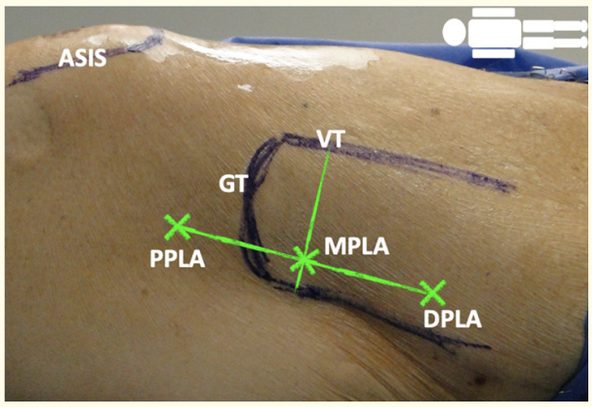

Figure 1: The anterior superior iliac spine (ASIS), greater trochanter (GT), and vastus tuberosity (VT) are identified. The proximal posterolateral accessory (PPLA), distal posterolateral accessory (DPLA), and medium posterolateral accessory (MPLA) portals are demarked.

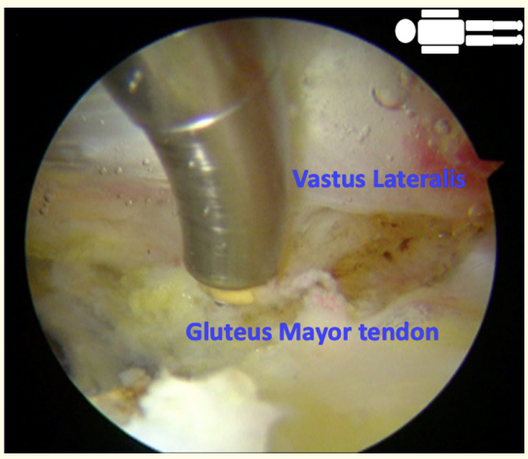

Figure 2: Partial tenotomy of the distal insertion of the gluteus maximus tendon.

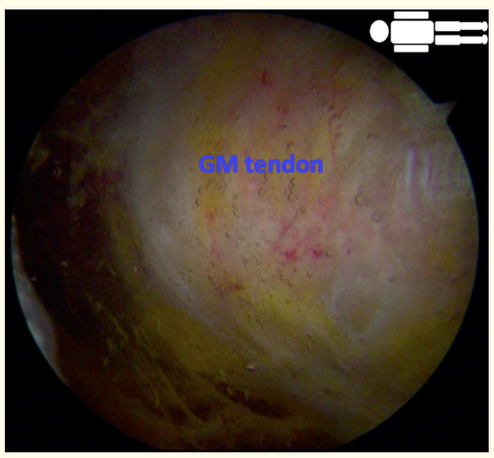

Figure 3: GM tendon showing a tendinopathic appearance. The tear is not visible on the lateral surface.

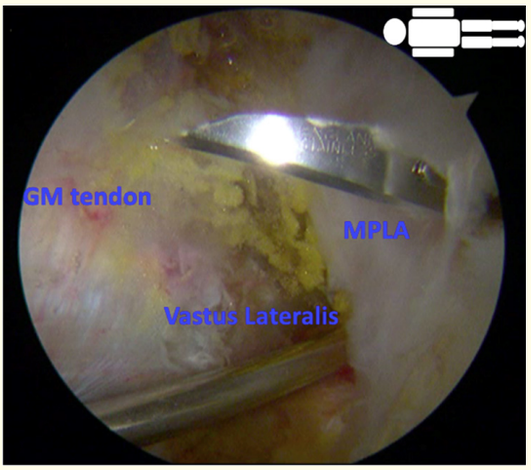

Figure 4: The medium posterolateral accessory portal (MPLA), equidistant to the PPLA and DPLA portals, is performed.

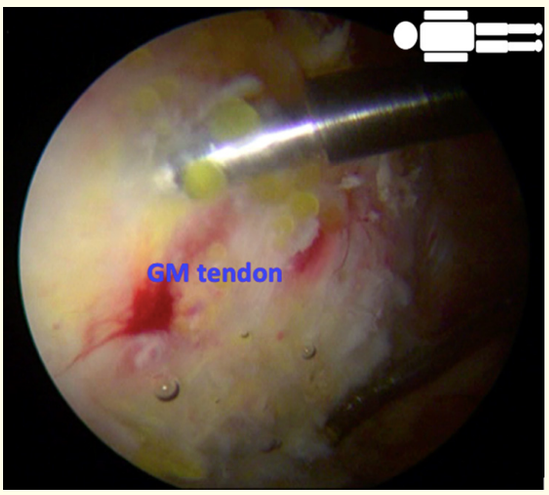

Figure 5: Nine perforations are made in the greater trochanter at the level of the GM insertion with a 2.3mm Bioraptor® anchor drill bit (Smith and Nephew, London, United Kingdom) at a depth of 2.5cm through the MPLA portal, viewing from the PPLA portal.

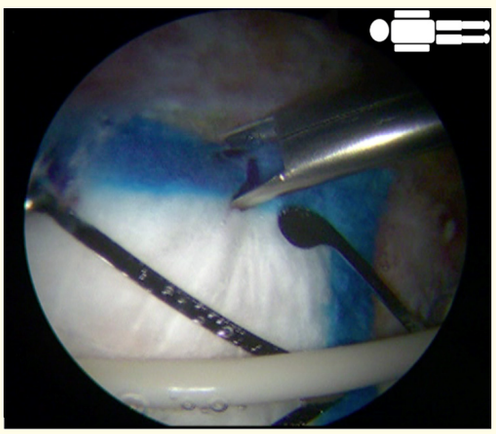

Figure 6: Viewing from the PPLA portal, the implant is inserted through the DPLA portal. It is fixed with 6 anchors (4.5x6.5mm) through the MPLA portal.

In our study, we aimed to introduce our endoscopic technique for GM tendon repair. Initially, the technique was developed to manage deep gluteal pain syndrome, now also being used to repair partial ruptures of the GM tendons. The procedure involves creating multiple perforations on the lateral side of the tendon at the level of the greater trochanter without completing the tear of the tendon. This increases blood supply and allows for better healing. Finally, a bioinductive collagen patch is added over the perforations to help with the healing process.

The GM tendon partial tears are one of the most common causes of chronic lateral pain and functional limitations. Patients with these partial tears who have not responded to non-surgical treatments and those with complete tears are eligible for surgical intervention. Repair procedures are beneficial in various studies [30-38], with both open and endoscopic techniques yielding good to excellent functional results. However, the endoscopic repair is preferred due to its less invasive nature, ability to be performed as an outpatient procedure, and lower recurrence rate of tendon rupture [37].

In 2007, Voos., *et al*. described the endoscopic repair of the GM tendon [32]. In 2009, they presented a group of 10 patients who had 50% partial tears of the GM tendon. The portals used were the anterior portal positioned 1cm lateral to the anterior superior iliac spine within the gap between the tensor fascia lata and sartorius muscles, the distal posterior portal placed halfway between the tip of the greater trochanter and the vastus tubercle along the midline of the greater trochanter posterior one-third, and additionally, a third portal can be placed proximal to the tip of the greater trochanter in alignment with the distal posterior portal. The injury was completed before repair and then sutured with one anchor in the footprint (36). Our approach preserves the enthesis of the GM tendon without completing the lesion.

McCormick., *et al*. conducted a study on a group of 10 patients who had complete tears of the gluteus medius (GM) tendon. The study excluded partial lesions. Endoscopic repair was performed using the transosseous-equivalent technique. The procedure involved making two direct lateral portals on a line parallel to the long axis of the femur, which was about 5 to 10cm proximal and distal to the gluteal footprint of the greater trochanter. Additionally, accessory anterolateral and posterolateral portals were made just distal to a cross-sectional imaginary line through the gluteal footprint at an angle of 45º [30].

In a study carried out by Chandrasekaran., *et al*. 24 cases of partial tears were observed in a group of 34 patients. They used four different portals, the anterolateral, posterolateral, midanterior, and accessory distal lateral portals. The surgery began with palpation of the insertion of the GM to confirm instability on its medial surface over the lateral facet. Then, a transtendinous window by making a longitudinal incision in the tendon in line with its fibers was performed. This helped in identifying the torn fibers on the medial surface, which were then debrided before performing a side-to-side repair [33].

Kirby., *et al*. recently conducted a study on 20 hips. Out of these, they treated 12 partial and 8 total lesions endoscopically. The diagnostic hip arthroscopy involved standard anterolateral and midanterior approaches, adding accessory proximal and distal peritrochanteric portals for GM repair. In case of partial injuries, they made a longitudinal incision in the GM tendon, removed the degenerated fibers, decorticated the lateral facet bone to create bleeding bone, and then performed a knotless anchor repair using non-absorbable sutures for all GM repairs [38].

Domb., *et al*. have introduced an endoscopic technique that involves the use of anterolateral and midanterior arthroscopic portals, along with a distal accessory and a posterolateral portal. For partial gluteus tendon tears, they perform a side-to-side repair. The repair of the gluteal tendon can be carried out either through an iliotibial band window or by directly inserting the arthroscope into the peritrochanteric compartment from the midanterior portal. It is mentioned that the creation of an iliotibial band window has the potential advantage of decompressing the greater trochanter and the gluteal insertion, but the biomechanical effect of the window remains unclear, being possible that disrupting the iliotibial band may adversely affect the abductor function of the gluteus maximus and tensor fascia lata [39]. For this reason, we prefer performing a partial tenotomy of the gluteus maximus distal insertion, which achieves decompression in the lateral space while maintaining the biomechanical continuity of the gluteus maximus and tensor fascia lata mechanism.

Regarding the use of collagen patches in hip surgery, Day., *et al.* have recently reported the use of a Regeneten® collagen patch on 9 partial lesions of the GM tendon using a traditional open approach. The lesion was located on the medial side of the GM tendon, and a longitudinal incision was made over the defect. The footprint was identified, debrided, and repaired with double-row sutures. Finally, the patch was placed over the repair [19].

We believe that a non-invasive endoscopic technique suggests the best approach for GM tendon repair. The best way to promote healing is by creating multiple perforations at the greater trochanter, rather than completing the lesion during the procedure. Using a collagen patch along with this technique provides the best chance for healing. Moreover, our portals were initially developed to manage deep gluteal pain syndrome, which enables access to the deep

gluteal space when needed.

Conclusions

Endoscopic repair of the GM tendon with bioinductive collagen patch augmentation, associated with multiple perforations to the greater trochanter, through our modified portals and without completing the lesion, is a reproducible and safe technique.

The partial tenotomy of the distal insertion of the gluteus maximus may decompress the iliotibial band over the repaired GM tendon, without affecting the biomechanics of the abductor mechanism.

Our portals allow the lateral peritrochanteric space to be managed completely, as well as access to the deep gluteal space if necessary.

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