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Review article

Endoscopic treatment of gluteus medius tendon tear

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ABSTRACT

Tears in the gluteus medius and minimus tendons are a common cause of greater trochanter pain syndrome (GTPS). Given the non-specific clinical signs and imaging findings, they are often misdiagnosed, with delayed treatment. The lesions can show several aspects: trochanteric bursitis, simple tendinopathy, partial or full-thickness tear, tendon retraction, or fatty degeneration. Non-surgical treatment associates physical rehabilitation and activity modification, oral analgesics, anti-inflammatories and peri-trochanteric injections (corticosteroids, PRP). In the event of symptoms recalcitrant to medical treatment, surgery may be indicated. A 5-stage classification according to intraoperative observations and elements provided by MRI is used to guide technique: isolated bursectomy with microperforation, single or double row tendon repair, or palliative surgery such as muscle transfer (gluteus maximus with or without fascia lata). The development of conservative hip surgery now makes it possible to perform all of these surgical techniques endoscopically, with significant improvement in functional scores and pain in the short and medium term and a lower rate of complications than with an open technique. However, tendon retraction and fatty degeneration have been reported to be factors of poor prognosis for functional results and tendon healing and palliative tendon transfer gives mixed results for recovery of tendon strength. It is therefore preferable not to wait for the onset of Trendelenburg gait to propose endoscopic repair of the gluteus medius tendon in case of pain with a tear visible on MRI and failure of more than 6 months' medical treatment. Based on expert opinion, this article provides an update on the diagnosis of gluteus medius lesions, treatment, and in particular the place of endoscopy, indications and current results.
Level of evidence: V.

1. Introduction

Greater trochanter pain syndrome (GTPS) mainly affects 40–60 year-old females and accounts for 20% of painful hips seen in consultation [1]. The term covers etiologies underlying lateral peritrochanteric pain aggravated by lying on the affected side and by activity [2]. Symptoms can often be resolved medically, associating rest, analgesics, anti-inflammatories and shock-wave rehabilitation [3]. In case of persistent pain, ultrasonography or MRI classically screen for peritrochanteric bursitis, found in 4–46% of cases, associated with tendinopathy or gluteus medius and/or minimus tear in 18–50% of cases [2,4–6] or else isolated secondary to lateral hip snapping. Tendinopathies range from simple chronic tendinopathy without tear to partial tears of varying length and depth or full tear. By analogy with shoulder tendinopathy, inspiring the term "hip rotator cuff tendinopathy", tear leads to progressive fatty degeneration, which is an essential prognostic factor for reparability [7]. Diagnosis of tear is often delayed [8–10] and it may be confused with simple trochanteric bursitis as clinical signs are not specific [11]. In case of failure of medical treatment, surgery may be proposed, adapted to pre- and intra-operative findings, ranging from simple isolated bursectomy to palliative gluteus maximus transfer with or without *fascia lata* [12] or microperforation and single- or double-row repair [13]. The development of conservative hip surgery now allows all these procedures to be performed endoscopically.

We shall deal with the following questions:
How to diagnose gluteus medius tendinopathy?
Which classification to use?
What are the treatment options?

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How to perform endoscopic treatment?

To supplement the authors' personal experience, in May 2022 we conducted a literature review on MEDLINE via PubMed, with the search-terms: *gluteus, tear, endoscopic, repair*. The review included all clinical studies assessing the results of endoscopic treatment of gluteus medius tear. Systematic reviews, case reports and studies using non-endoscopic techniques were excluded. Results are shown in the flowchart of Fig. 1 and in Table 1.

2. How to diagnose gluteus medius tendinopathy?

2.1. Clinical examination

Clinical examination often finds sensitivity in the trochanteric region, with variable loss of strength in the hip abductors. Patients' main complaint is progressive inflammatory-type peritrochanteric pain, developing sometimes over several years, often radiating to the thigh and sometimes to the groin. Symptom aggravation due to trauma occurs, but rarely.

Pain can be evoked by direct palpation of the tendon or by abduction against resistance. However, the 3 main signs are:

- the single-leg stance or Lequesne test: ≥30 seconds' unipodal stance evokes trochanteric pain;
- pain evoked by internal rotation of the knee against resistance and hip in 90° flexion, in supine position [28];
- trendelenburg gait [29,30]: painful lateral tilt of the trunk at each step, compensating failure of a torn medius gluteus tendon. This is the most specific sign, revealing either, rarely, sudden post-traumatic aggravation of a full-thickness tear, or longstanding tear associated with amyotrophy or significant fatty degeneration.

2.2. Complementary examinations

2.2.1. AP pelvic X-ray

This examination is indispensable, above all enabling differential diagnosis, especially of osteoarthritis of the hip. It also screens for periarticular calcifications or ossifications indicating enthesopathy. No hip parameters have been shown to be mechanical factors indicating tendon tear. X-ray also identifies calcifying gluteus medius tendinopathy and aggressive osteophytes on the deep facet of the lateral lamina of gluteus medius in the bald zone of the tip of the greater trochanter.

2.2.2. Ultrasound

Ultrasonography is easy to apply in GTPS. It is useful differentially, to screen for bursopathy or gluteal tendinopathy. It also analyzes amyotrophy and can guide injection therapy. Although it is contributive to exploration of gluteal tendinopathy, especially in case of metallic artifacts in MRI, it is less reliable than MRI, especially in obese subjects [31].

2.2.3. MRI

MRI is the examination of choice for exploring the peritrochanteric region and analyzing the size and location of the tear [32–34]. It can in some cases determine whether the tear is full-thickness or not and rule out other causes of hip pain. However, it is sometimes difficult to differentiate tendinopathy from partial tear in an image of the lateral lamina of the gluteus medius enthesis in T2 hypersignal and some full tears can be overlooked. T1 axial slices can assess trophicity of the three distinct heads of the gluteus medius and gluteus minimus, and determine the fatty degeneration index (Fig. 2).

3. Which classification to use?

Gluteus medius tendon tear is more frequent than gluteus minimus tendon tear [31]. It tends to begin at the anterior edge of the gluteus medius and involves both tendons in 30–46% of cases [35,36].

Lall et al. [37] described a 5-stage classification of GTPS based on intraoperative and MRI findings, guiding surgical technique (Table 2).

4. What are the treatment options?

First-line treatment of gluteal tendinopathy consists of rest, non-steroidal anti-inflammatory drugs, rehabilitation and identifying and correcting risk factors such as tendon strain, impingement by a trochanteric spur or osteophytes. Other treatments such as shock-wave, stretching or local corticosteroid injection in the trochanteric region can also be beneficial [38]. Corticosteroid injection should target the trochanteric bursa; if it proves effective, the pain is probably due to bursitis. Repeated injection is not recommended, however, so as not to weaken a degenerative tendon.

The advent of platelet-rich plasma (PRP) and leukocyte-rich platelet-rich plasma (LR-PRP) injected under ultrasound has provided enduring efficacy superior to a single corticosteroid injection in terms of pain and function [39,40].

In case of recurrent pain, endoscopic bursectomy can be proposed. The patient needs warning of the frequency of associated gluteus medius lesions, which can be repaired in the same surgical step.

Lequesne [30] advocated surgical repair under 4 conditions:

- recurrence or persistence of GTPS beyond 6 months' well-conducted medical treatment;
- imaging suggesting tendinopathy, even without obvious tear on MRI or ultrasound, given the frequency of partial lesions that are hard to detect;
- positive ultrasound-guided infiltration test;
- absence of retraction of fatty degeneration in the gluteus medius and minimus (Fig. 3).

5. How to perform endoscopic treatment?

5.1. Installation

The patient is positioned in lateral decubitus with the hip in 20° abduction. The whole limb is included in the surgical field, enabling rotation. Instrumentation is the same as for rotator cuff repair in the shoulder: standard 30° or 70° arthroscope, arthropump to maintain constant 30–50 mmHg pressure, coblation electrode and 4.5 mm shaver.

5.2. Portals

Classically, 3 or 4 portals are used, with extra portals according to the procedure. The optical portal is in the axis of the femur, 5 cm distal to the tip of the greater trochanter. The instrumental portal or portals are about 3 cm proximal to the tip of the greater trochanter, to triangulate and position anchors perpendicular to the lateral facet of the greater trochanter.

5.3. Exposure

The first step is to locate the *fascia lata* and open it longitudinally along its fibers. It is sometimes necessary to create a work chamber, using the shaver and radiofrequency electrode so as to locate the

Table 1
Articles on endoscopic gluteus medius repair.

Author, date	Number of treated hips	Gender F/M	Mean age (range) [Years]	Mean symptom duration (range) [months]	Minimum follow-up (mean) [years]	Lesion extent		Lesion location			Mean score			Complications	
						Partial	Full	GMed	GMed and GMin	GMin	Type of score	Preoperative	Postoperative	Infection	Retear
Voos et al. 2009 [14]	10	8/2	50.4 (33-66)	NR		5	5	10	0	0	mHHS HOS	NR NR	94 93	0	0
Domb et al. 2013 [15]	15	14/1	58 (44-74)	38.7 (1-240)		6	9	15	0	0	mHHS NAHS HOS-ADL HOS-SSS	48.95 46.02 47.47 28.18	84.6 76.74 88.1 78.83	1	0
Thaunat et al. 2013 [16]	04	N	68.4 (64-79)	38.4 (12-120)		4	0	2	2	0	mHHS NAHS	35.7 38.3	74 83	NR	NR
McCornick et al. 2013 [17]	10	7/3	65.9 (60-74)	11.7 (1.5-40.9)		0	10	5	5	0	mHHS HOS-ADL HOS-SSS	NR NR NR	84.7 89.1 76.8	0	0
Chandrasekaran et al. 2015 [18]	34	32/2	57 (20.1-78.8)	NR	2 yrs (27.2 months)	24	10	34	0	0	mHHS NAHS HOS-ADL HOS-SSS VAS pain	54 48 52 26 6.6	81 80 84 70 2.4	0	0
Perets et al. 2017 [19]	14	13/1	57.4 (46.3-74.8)	NR	5 yrs (68.8 months)	11	3	14	0	0	mHSS NAHS HOS-SSS iHOT-12 VAS pain	52.4 48.0 30.1 NR 6.2	81.2 82.5 66.4 73.8 2.6	0	0
Hartignan et al. 2018 [20]	25	24/1	53.5 (38-71)	NR	2 yrs (33 months)	25	0	25	0	0	mHHS NAHS HOS-ADL HOS-SSS VAS pain	54.9 51.9 50.2 30.9 7.1	76.2 82.4 80.6 67.3 2.7	0	0

Table 1 (*Continued*)

Author, date	Number of treated hips	Gender F/M	Mean age (range) [Years]	Mean symptom duration (range) [months]	Minimum follow-up (mean) [years]	Lesion extent		Lesion location			Mean score			Complications	
						Partial	Full	GMed	GMed and GMin	GMin	Type of score	Preoperative	Postoperative	Infection	Retear
Thaunat et al. 2018 [7]	20	17/3	66	3.5	2 yrs (31.7 months)	14	6	NR	NR	NR	mHHS NAHS VAS pain	33.7 47.7 7.2	80.2 76.8 3.2	0	1
Okoroha et al. 2019 [21]	60	55/5	57.9	NR	2 yrs	NR	NR	51	9	0	mHHS HOS-ADL HOS-SSS VAS pain	46.2 48.4 24.5 67.6	74.6 79.3 64.5 27.3	NR	NR
Kirby et al. 2020 [22]	20	15/4	51.3	NR	2 yrs (28.8 ± 11.3 months)	12	8	20	0	0	mHHS NAHS	37.7 42.8	75.8 78.1	0	0
Meghpara et al. 2020 [23]	43	40/3	53 (17.2-74.8	NR	5 yrs (73.5 months)	30	13	NR	NR	NR	mHHS NAHS HOS-SSS VAS pain	54.6 49 31.2 6.7	82.7 82.2 65.1 2.4		
Nazal et al. 2020 [24]	15	12/3	66.9 (48-81)	22.2 (1-60)	2 yrs (31.2 months)	0	15	10	5	0	mHHS HOS-ADL HOS-SSS NAHS iHOT-33 LEFS	54.2 33.8 9.67 53.8 31.8 33	82.8 50.7 19.1 78.8 63.3 52.6	0	0
Meghpara et al. 2020 [25]	52	39/13	59.1	NR	2 yrs	40	12	NR	NR	NR	mHHS NAHS HOS-SSS VAS pain	61.41 58.9 33.7 5.2	84.3 84.1 65.8 1.9		

Table 1 (*Continued*)

Author, date	Number of treated hips	Gender F/M	Mean age (range) [Years]	Mean symptom duration (range) [months]	Minimum follow-up (mean) [years]	Lesion extent		Lesion location			Mean score			Complications		
						Partial	Full	GMed	GMed and GMin	GMin	Type of score	Preoperative	Postoperative	Infection	Retear	
Kocaoglu et al. 2021 [13]	50	39/11	53.1 (38-68)	16 (± 6)	2 yrs (30 months)	45	5	NR	NR	NR	DR	mHHS	48.9	81.6	0	5
												HOS-ADL	52.7	81.3		(31.3%)
											SR	HOS-SSS				
												VAS	43.8	76.1		5
											SRM	mHHS				(35.7%)
												HOS-ADL	7.94	2.3		
												HOS-SSS	48.2	70.5		3
												VAS	46.7	71		(15.0%)
												mHHS				
												HOS-ADL	42	68.4		
												HOS-SSS				
												VAS	8	3.1		
													47.8	86.9		
													47.6	86.4		
													44.7	83.8		
													8.1	1.6		
Meghpara et al. 2021 [26]	23	22/1	62.7 (36.9-74.4	NR	2 yrs (38.3 months)	19	4	NR	NR	NR	mHHS	55.7	75.4	0	3	
											NAHS	58.8	79.2			
											HOS-SSS	30.9	41.8			
Thaunat et al. 2021 [27]	46	43/3	62.7	3.6	2 yrs	33	13	NR	NR	NR	mHHS	45	74			
											NAHS	50	76			
											VAS	7	3			
Bauwens et al. 2021 [12]	6	4/2	73.3	NR	2 yrs	0	6	4	2	0	mHHS	40.2	69.2			
											NAHS	46.2	63.2			
											WOMAC	48.7	25.2			
											Oxford	21	35.2			

DR: double-row repair; SR: single-row repair; SRM: single-row repair + microfractures.

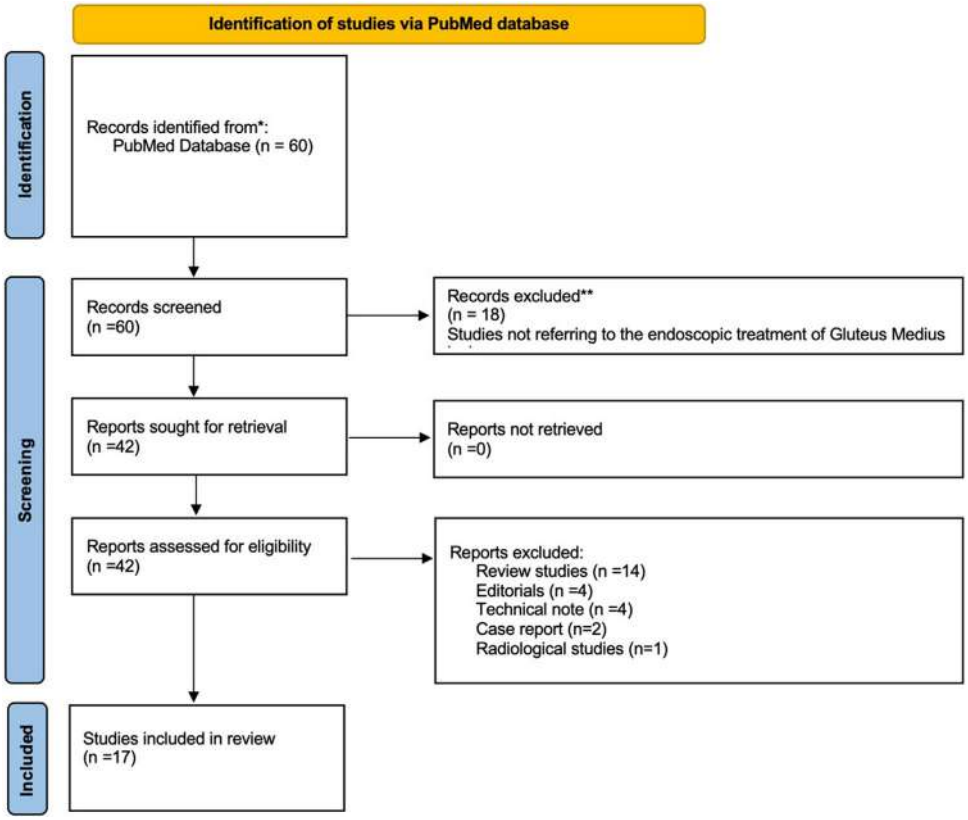

Fig. 1. Flowchart of PubMed research on endoscopic gluteus medius repair.

Table 2
Greater Trochanteric Pain Syndrome (GTPS) classification system (Lall et al. [37]).

Type	Intraoperative findings	Examination	MRI	Surgical technique
I	Bursitis	Normal sensitivity on palpation of greater trochanter	Trochanteric bursitis	Endoscopic bursectomy
II	Bursitis + 'fraying' of muscle surface	Sensitivity on palpation of greater trochanter	Tendinopathy	Endoscopic bursectomy with microperforations
IIIA	Partial lesion < 25%	Partial abductor weakness	Low-grade partial tear	Endoscopic micro-perforations + repair
IIIB	Partial lesion > 25%	Moderate abductor weakness	High-grade partial tear	Endoscopic repair (single row)
IV	Full tear	± Trendelenburg gait	Full tear	Endoscopic repair (double row)
V	Full tear ± retraction	Abductor weakness + Trendelenburg gait	Retracted full tear ± fatty degeneration	Open repair or gluteus maximus transfer

structure. The tip of the greater trochanter is palpated by needle and the *fascia lata* is opened 5 cm proximally and about 3 cm distally using the coblation probe or a n°11 lancet. The gluteus maximus is dissected along its fibers for about 3 cm, providing access to the trochanteric bursa, which is resected by shaver so as to expose the tendon lamina.

In isolated trochanteric bursitis, treatment may consist solely in this bursectomy. However, it is important to distinguish isolated bursitis with calcified tendinopathy, which requires complementary calcification resection to optimize results (Fig. 4).

5.4. Locating the tear

Full-thickness tears are easier to locate. It is sometimes necessary to "unroll" the cuff in internal and external rotation so as to visualize the lesion, which is usually at the junction of the anterior and lateral trochanter facets where the lateral gluteus maximus tendon lamina meets the gluteus minimus insertion. It is not unusual to find an aggressive exostosis here (protruding greater trochanter or osteophyte), which has to be removed when freshening the greater trochanter. Less often, the lesion is in the posterior part of the gluteus medius tendon, which is thicker than the anterior part.

Partial tear is very frequent, similar to the PASTAs (partial articular supraspinatus tendon avulsions) found in the shoulder. The main difficulty is that, unlike in the shoulder, the lesion cannot be visualized on the deep side without performing bursoscopy of the gluteus medius or minimus bursa, which would require opening the apparently intact cuff. In grade 3B tear, involving >25% of tendon thickness, the lesion is easily discovered by hook palpation: the pathologic fibers tear spontaneously, revealing the greater trochanter. The degenerative tissue is resected until healthy tissue appears. In these cases, the technique described by Domb [41] should be performed, opening the tendon by lancet along its fibers. The deep pathologic and degenerative part is then revealed.

5.5. Preparation

Pathologic tissue is debrided by shaver down to healthy tissue. The greater trochanter is freshened by motorized burr, and

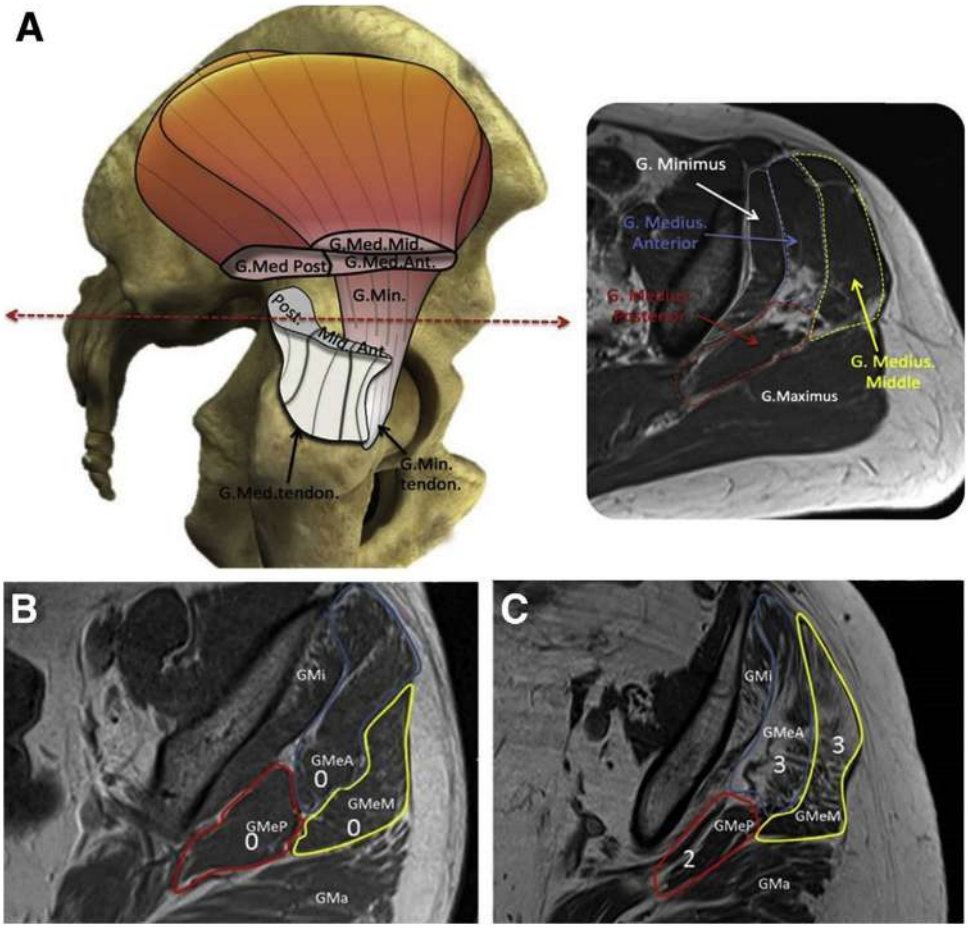

Fig. 2. Fatty degeneration assessment of the gluteus medius and minimus muscles. (A) Gluteus medius and minimus fatty degeneration were assessed on the first transverse non-fat-suppressed T1-weighted slice below the ipsilateral sacroiliac joint. Fatty degeneration was graded on the Goutallier-Fuchs classification for all of the gluteus minimus and for each of the 3 distinct parts of the gluteus medius. Gluteus medius fatty degeneration index (FDI) was evaluated by adding the mean grade of each part of the muscle. (B) Normal aspect of the gluteus minimus (GMi), gluteus maximus (GMa) and the 3 distinct parts of the gluteus medius (anterior [GMeA] circled in blue, middle [GMeM] circled in yellow and posterior [GMeP] circled in red). FDI was 0.2. (C) Example of grade 3 fatty degeneration (as much fat as muscle) involving the anterior and the middle parts of the gluteus medius muscle. FDI was 2.7.

all osteophytes are resected. This freshening is essential: aggressive osteophytes must be removed and the bald zone of the tip of the greater trochanter must be freshened. Most lesions are located on the deep side of the lateral gluteus medius lamina, making the greater trochanter aggressive for the tendon, contributing to partial lesion by a "wiper" effect during rotation.

5.6. Repair

Edge-to-edge repair uses an anchor or 2 in case of incomplete closure. We use 6.5 mm bioabsorbable screwed anchors. Suture passing is no different from classical cuff repair; either bird-beak or automatic forceps can be used. In retracted full tear, double-row suture bridge provides more stable biomechanical repair with lower risk of retear. The *fascia lata* is left open at end of procedure to limit repeated friction against the greater trochanter. No drainage is needed.

5.7. Muscle transfer

In irreparable or only partially reparable tear (retracted, with or without fatty degeneration), palliative transfer of the gluteus maximus and/or *tensor fasciae latae*, depending on tear location (anterior, posterior or both) is an option. The greater trochanter is freshened for tendon healing, the flap or flaps are released, anteriorly for *tensor fasciae latae* or posteriorly for gluteus maximus, down to the muscle fibers, then reinserted by anchors on the lateral facet of the greater trochanter (Fig. 5).

5.8. Postoperative course

Postoperative course varies between surgeons, as literature recommendations are lacking. Six weeks' non-weight-bearing is classical. Rehabilitation is not systematic, as there is no joint stiffening. Some surgeons advocate an abduction brace for a few weeks. Recovery often takes more than 6 months or up to 1 year.

6. Discussion

Gluteal pathology in GTPS ranges from simple trochanteric bursitis to retracted tear with fatty degeneration. In the former, endoscopic bursectomy with *fascia lata* release is minimally invasive and suited to grade I or II GTPS after failure of medical treatment. However, the patient should be informed of the frequency of persistent pain [42]. In grade I associated with lateral hip snapping, satisfaction is greater and the snap is fully resolved without recurrence [43].

The clinical benefit of repair of non-retracted tendon tear without fatty degeneration is well-established [7,44,45]. Alpaugh et al. [35] showed that open and endoscopic repair techniques

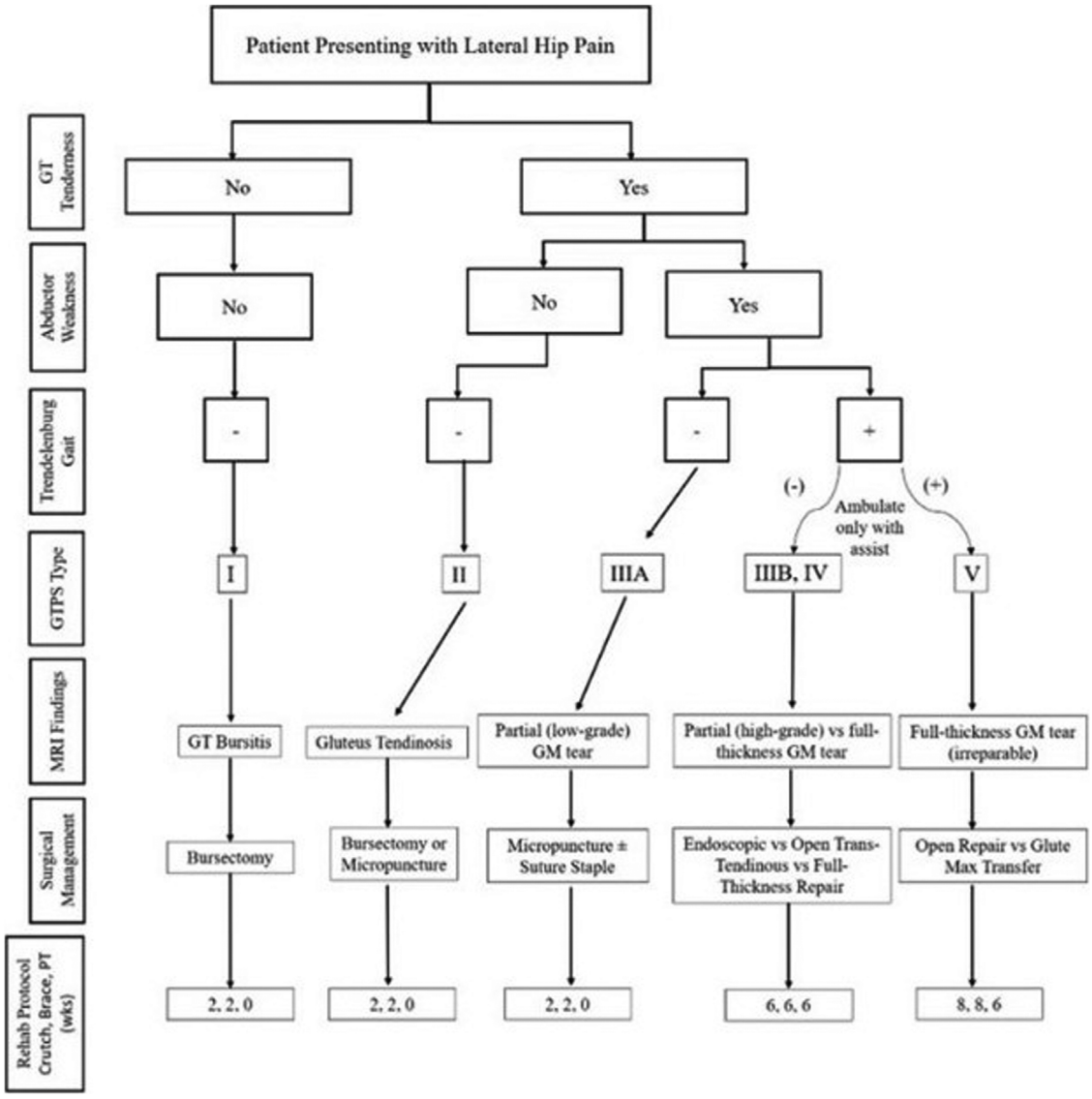

Fig. 3. Algorithm of therapeutic management of Greater Trochanteric Pain Syndrome (GTPS) according to Lall and Domb. PT: postoperative physical therapy; Wks: duration (weeks); GM: gluteus minimus or medius; GT: Greater trochanter; MRI: magnetic resonance imaging.

are both reliable, with good to excellent results and reduced pain; endoscopic techniques entail fewer complications (0.7% vs. 7.8% excluding retear and 3.4% vs. 4.1% retear) [36]. Domb et al. [15] several times reported significant improvement in functional scores and pain after endoscopic repair, whether for deep partial tear [20] or more extensive tear [24,27]: either isolated gluteus medius plus minimus repair [26] or combined repair with associated correction of intra-articular pathology [18,23]. Meghpara et al. [23] reported that results were maintained over time, at a minimum 5 years and mean 73.4 months follow-up. Comparing 3 endoscopic repair techniques (single row vs. double row vs. single row + microfracture), Kocaoglu et al. [13] found significantly better functional results and lower retear rate (35.7 % vs. 31.3 % vs. 15%) with single row + microfracture, suggesting that healing biology is more important than fixation stability.

Makridis et al. [46] reported that, of the 4 potential predictive factors for outcome (age, body-mass index, fatty degeneration, muscle atrophy), only muscle atrophy actually showed negative impact. More recently, we showed that grade ≥2 fatty degeneration is a negative factor for tendon healing [7].

In chronic lesions with tendon retraction and/or muscle atrophy associated with limping implicating gluteus medius failure, few treatment options are currently available. Whiteside et al. [47] suggested open gluteus maximus and/or *tensor fasciae latae* transfer for such muscle failure after total hip arthroplasty. Gluteus maximus transfer reinforces the posterior part of the gluteus medius, while *tensor fasciae latae* transfer reinforces the anterior part. The two can be associated depending on lesion extent and/or overlying muscle fatty degeneration. To our knowledge, only 3 cases have been reported in native hips, with only moderate recovery of strength [48]. We advocate an original technique of endoscopic gluteus maximus and *tensor fasciae latae* transfer to the greater trochanter, which can be combined with endoscopic gluteus medius repair. Our series [12] showed that endoscopic treatment gave relatively satisfactory results for pain and abduction strength, on condition that the gluteus medius tendon could be repaired. If the gluteus medius tendon can be partially repaired, endoscopic tendon repair can be associated to partial transfer of either *tensor fasciae late* anteriorly or gluteus maximus posteriorly, depending on tear location. The patient has to be informed that the treatment is likely to be more effective on pain than on abduction strength and limp. When

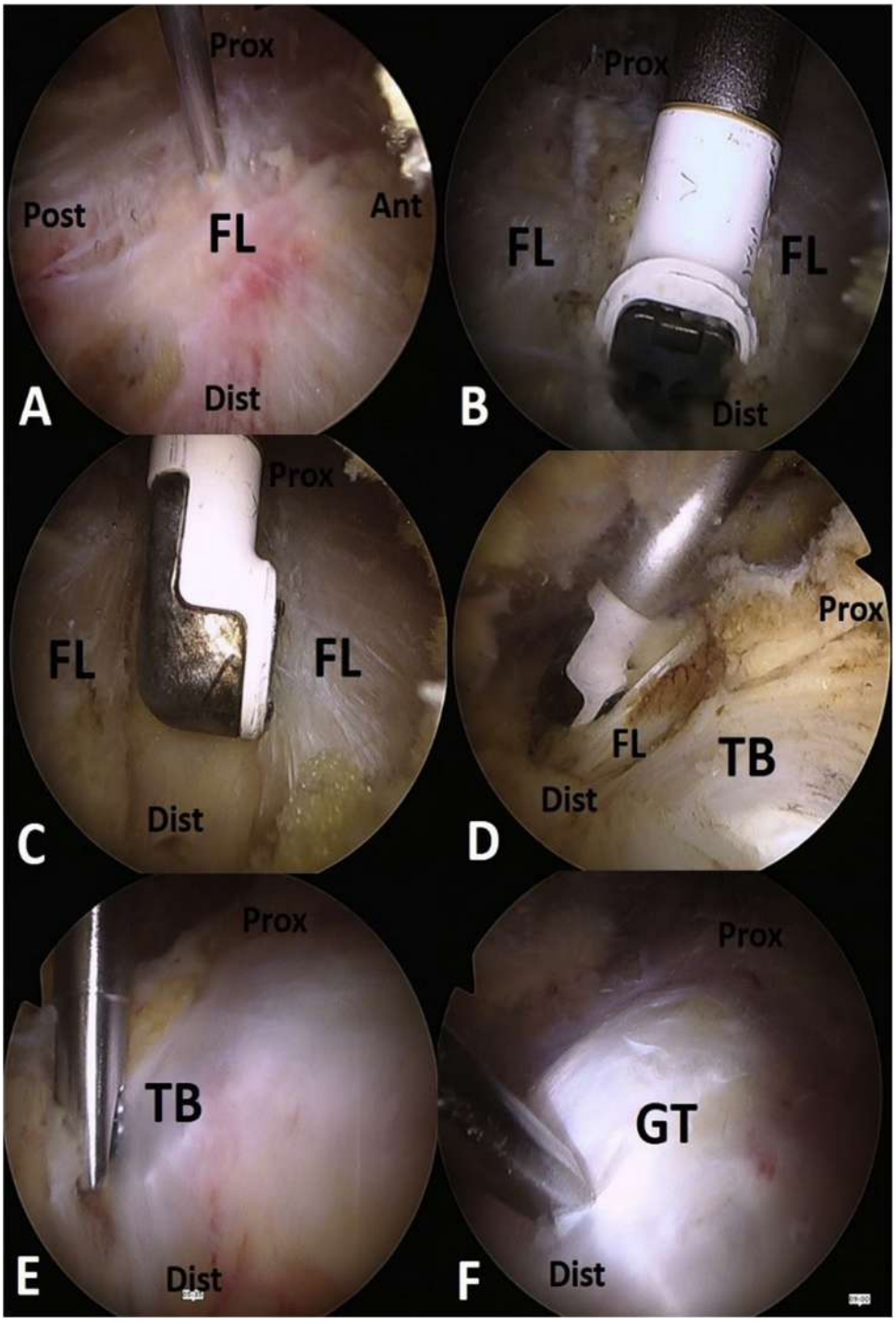

Fig. 4. Endoscopic views of the various surgical steps: A: Identification of the greater trochanter under endoscopic control by a distal lateral approach, making it possible to dispense with the image intensifier. Creation of a subcutaneous working chamber by maintaining low pressure and performing hemostasis step by step. B, C, D: Cross lengthening tenotomy of the *fascia lata* using the coblation probe, with decompression effect in the trochanteric bursa. E: Excision of the trochanteric bursitis using the coblation probe and shaver. Careful exploration of the rotator cuff tendons. F: Microperforation of the tip of the greater trochanter with a slow drill in case of chronic enthesopathy (type II GTPS) (Ant: anterior; Dist: distal; GM: gluteus medius tendon; GT: greater trochanter; Pos: posterior; Prox: proximal; FL: fascia lata; TB: trochanteric bursitis).

the complaint focuses exclusively on loss of abduction strength and the tendon is totally retracted and irreparable, endoscopic gluteus maximus and *tensor fasciae latae* transfer incurs a risk of major failure, and is not recommended (Tables 1 and 3).

7. Conclusion

Gluteal tendon tear is a major cause of greater trochanter pain syndrome. Lesion aspect varies: tendinopathy without tear, partial

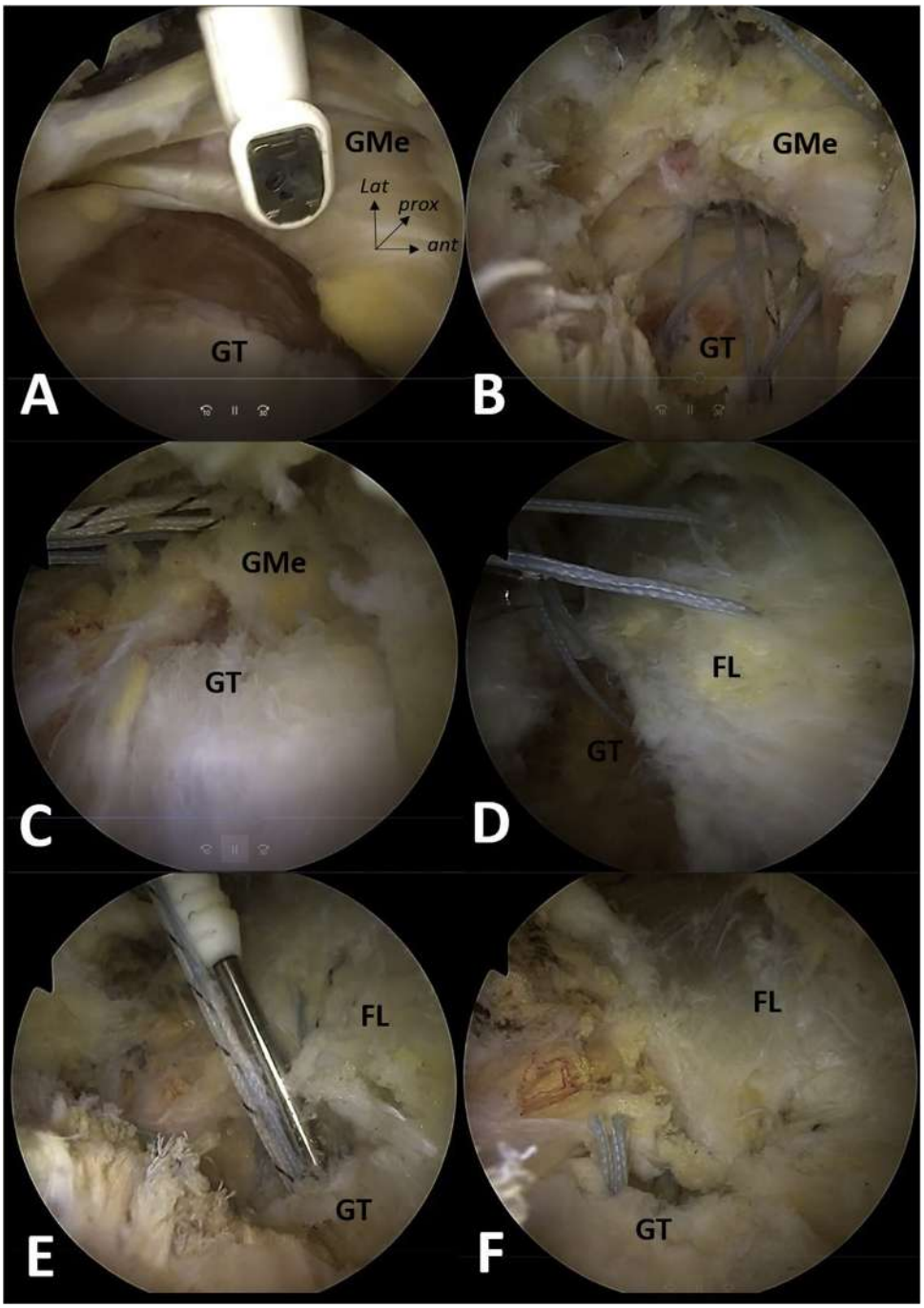

Fig. 5. Example of gluteus medius reinsertion with anterior tensor fasciae latae flap repair for a re-insertable right hip gluteus medius tear in a 68-year-old patient (patient 2). A. Chronic re-insertable right hip gluteus medius tear, the gluteus medius tendon (Gme) shows a partially retracted tear with reducible anterior insertion on the greater trochanter (GT). B. The gluteus medius tendon is prepared to be sutured on the first row of 2 Biocorkscrew anchors attached on the greater trochanter. C. Appearance of the gluteus medius tendon suture onto the greater trochanter using Mason Allen stitches on the first anchor row. D. U-shaped suture performed on the *tensor fasciae latae* (FL) flap using the sutures used for the gluteus medius suture. E. After additional freshening of the GT, fixation of the anterior FL flap using a second-row Pushlock anchor. F. Final appearance after suturing the fascia lata (FL) flap on the greater trochanter (GT).

Table 3
Studies of isolated bursectomy.

Study	*n*	GTPS grade	VAS		HHS		Satisfaction
			Preoperative	Follow-up	Preoperative	Follow-up	
Wiese	37	-	7.2	3.8			
Baker	25	Grade III	7.2	3.1	51	77	72
Coulomb	17	Grade III	7.2	3.3	53.5	79.8	52.9
Fox	28	-	-	-			85
Dominguez	23	-	-	-			91
Thomassen	11	-	-	-			91
Thaunat (in press)	20		7	4	57	74	70

or full tear, or tendon retraction and fatty degeneration. The development of conservative hip surgery now enables all the techniques to be performed endoscopically, with significantly better functional results and short- and medium-term pain relief, with all the advantages of minimally invasive surgery. However, tendon retraction and fatty degeneration were reported to be factors of poor functional prognosis, and palliative transfer gives only moderate results. Thus it is advisable not to wait for onset of Trendelenburg gait before proposing gluteus medius surgery in case of failure of more than 6 months' medical treatment.

Disclosure of interest

M. Thaunat is a consultant for Arthrex.

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Author contributions

All authors contributed to article writing.

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