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Review

UNDERSTANDING GLUTEAL TENDINOPATHY: DIAGNOSIS AND TREATMENT. A NARRATIVE REVIEW

D. Tarantino[1], R. Pellegrino[2,3*], A. Di Iorio[4], R. Mottola[5], R. Saggini[6], C. Ruosi[7] and R. Aicale[8]

[1]Department of Public Health, University of Naples Federico II, Naples, Italy;
[2]Department of Medicine, LUM University, 70010 Casamassima, Italy;
[3]Santa Chiara Institute, Lecce, 73100, Italy;
[4]Department of Innovative Technologies in Medicine & Dentistry, University "G. d'Annunzio", Chieti-Pescara, 66100, Italy;
[5]Department of Public Health, University of Naples Federico II, 80131 Naples, Italy;
[6]Faculty of Psychology, ECampus University, Novedrate, Italy;
[7]Department of Public Health, University of Naples Federico II, Naples, Italy;
[8]Department of Orthopaedic and Trauma Surgery, Casa di Cura di Bernardini, 74121 Taranto, Italy.

**Corresponding author:*
Raffaello Pellegrino, MD
Department of Medicine,
LUM University,
70010 Casamassima, Italy.
e-mail: r.pellegrino@lum.it

ABSTRACT

Gluteal tendinopathy, a prevalent cause of lateral hip pain, primarily affects the tendons of the gluteus medius (GMed) and minimus (GMin). This condition is commonly seen in middle-aged women and athletes, often resulting from repetitive stress, overuse, or biomechanical abnormalities. Diagnosing gluteal tendinopathy requires a comprehensive approach including patient history, physical examination, and imaging modalities such as ultrasound (US) or magnetic resonance imaging (MRI), which are essential for confirming tendon pathology and ruling out other hip pathologies. Management strategies focus on conservative treatments as the first line of intervention. These include patient education, activity modification, drugs, and structured physiotherapy programs emphasizing load management and progressive strengthening exercises. Adjunct therapies like extracorporeal shockwave therapy (ESWT) and corticosteroid (CS) injections can be considered in persistent cases. Surgical intervention is reserved for refractory cases where conservative treatments fail. This review aims to consolidate current diagnostic criteria, highlight effective management protocols, and discuss emerging treatments for gluteal tendinopathy to optimize patient outcomes.

KEYWORDS: *tendinopathy, gluteal tendinopathy, gluteal tendinitis, gluteal tendinosis, gluteal bursitis, hip tendinopathy, greater trochanteric pain*

INTRODUCTION

Tendon disorders encompass tears and chronic diseases, representing a very common musculoskeletal issue (1). The term "tendinopathy" includes all the situations in which there are chronic clinical conditions characterized by pain, swelling and functional limitations of tendons and nearby structures (1–7). Both intrinsic and extrinsic factors play a key

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role in the pathogenesis of tendinopathy; age, gender and gender are the most prominent non-modifiable factors, while excessive and/or improper loading, disuse, drugs and smoking habit are the most influent modifiable factors (6,8-12). Although the term "tendinitis" is often associated with the concept of tendinopathy, in recent years it has been shown that the inflammatory process only affects the initial stages of the disease, while degenerative and apoptotic phenomena prevail afterwards because of long-lasting overuse condition related to work and/or sports (7,13-15). Tendinopathy can be viewed as a failure of the cell matrix to adapt to a variety of stresses as a result of an imbalance between matrix degeneration and synthesis (16-18).

Gluteal tendinopathy (GT), widely regarded as the primary condition underlying greater trochanteric pain syndrome (GTPS), and often associated with trochanteric bursitis (19-22), is the most prevalent lower limb tendinopathies (up to 24% of middle-aged women) (23-25). The condition predominantly arises within individuals in their fifth and sixth decade of life, affecting both active and sedentary individuals (26), with an annual incidence of 1.8 per 1000 individuals (27), and a global prevalence of 20.2% (28). It affects individuals with an age range of 15–87 years and an average age of 54 to 63 years (17). Women are typically more affected when compared to men (21,23,28).

Although GTPS is a complex condition of uncertain etiology, contemporary thought supports degenerative changes about the gluteus medius (GMed) and minimus (GMin) tendon insertions; inflammation within the greater trochanteric, subgluteus medius, and/or subgluteus minimus bursae; and proximal iliotibial band pathology being primary contributors to the condition (29,30).

It is reasonable to assume that the pathomechanics underlying the development of GT are similar to those proposed for other insertional tendinopathies: relatively increased (overload) (31,32) or decreased (stress/load shielding) (33,34) tensile load applied longitudinally along the tendon, excessive transverse load applied across the tendon (compression, mostly at or near the bony insertion) (33,35), and most often a combination of these factors (36). The combination of tensile and compressive overload appears to be particularly damaging (37). Matrix degradation associated with any of these adverse loading scenarios can reduce the tensile load-bearing capacity of the tendon and predispose it to tearing at relatively lower tensile load (33).

Patients with GTPS experience pain originating in the structures of the lateral hip (22) that can manifests itself chronically, intermittently or continuously, and may radiate to the distal thigh (38-40) (Fig.1).

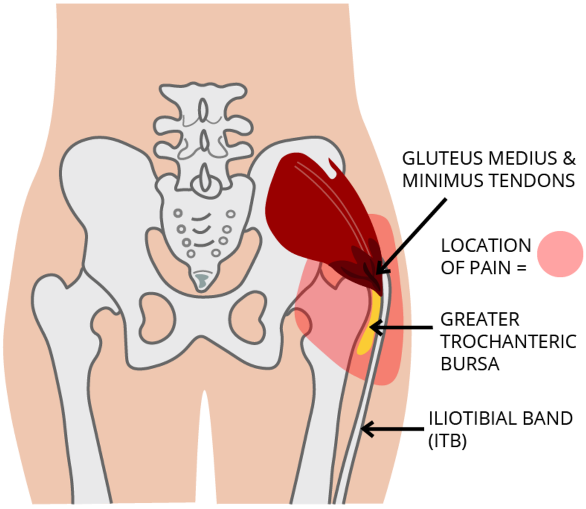

Fig. 1. *Pain location in gluteal tendinopathy. Retrieved from: https://www.upsidehealth.com.au/blog/pain-profile-gluteal-tendinopathy*

Pain and tenderness on palpation of the greater trochanter are regarded as the main diagnostic criteria for gluteal tendinopathy (29,40), while the use of imaging techniques such as ultrasound (US) and magnetic resonance imaging (MRI) is usually reserved for those cases in which severe conditions such as partial or full-thickness tears are suspected (41,42) (Fig.2).

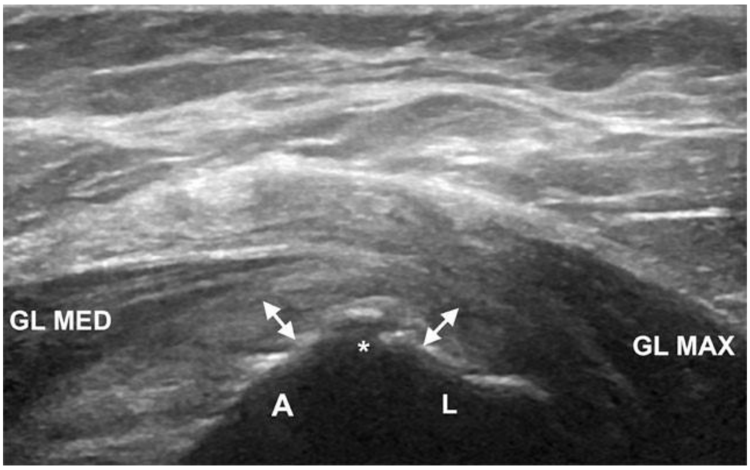

Fig. 2. *Transverse image over the greater trochanter showing the bony apex (asterisk) between the GMin tendon (double arrow) insertion onto the anterior facet* ***(A)*** *and the GMed tendon (double arrow) insertion onto the lateral facet* ***(L)****. Retrieved from: Yeap PM, Robinson P. Ultrasound Diagnostic and Therapeutic Injections of the Hip and Groin. J Belg Soc Radiol. 2017 Dec 16;101(Suppl 2):6.*

Gluteal tendinopathy/GTPS can substantially affect a patient's quality of life (22,26,39). Sleep disturbances are a common symptom because direct pressure on the lateral hip while lying on one's side can cause substantial discomfort (43,44). Moreover, the pain commonly experienced with weight-bearing activities, such as walking and stair climbing, can result in reduction of overall physical activity levels, placing patients at risk for the development of general disability and potentially affecting employment status (39,45).

Current literature suggests that excessive compression and high tensile loads within tendons (46), excessive hip adduction, and poor muscle and bone quality with increased age can exacerbate abnormal hip biomechanics (26). Furthermore, a temporal relationship between gluteal tendinopathy and the development of femoroacetabular osteoarthritis has also been postulated (47). As the average life expectancy continues to rise, there has been growing clinical recognition of gluteal tendinopathy and expanding interest in treatment options and their scientific support (26).

Several treatments have been described for managing gluteal tendinopathy/GTPS, including topical or systemic analgesics (38), physical therapy (PT) and exercise programs (29,45,48), extracorporeal shockwave therapy (ESWT) (49-52), and injections (autologous tenocyte, corticosteroids [CS], and platelet-rich plasma [PRP]) (45,48,53,54). Surgical management is typically reserved for intractable cases or individuals with imaging findings consistent with substantial partial-thickness or full-thickness tears of the gluteal tendons (26).

The aim of this narrative review is to give readers a comprehensive overview of the diagnosis and management of GT.

METHODS

All the procedures related to this review were organized and reported after performing a search in the main scientific electronic databases (PubMed, Scopus, and Web of Science) to identify the available scientific articles about the diagnosis and management of GT, with no restrictions of time. Only articles written in English were included. Two independent reviewers (R.A. and R.P.) extracted and evaluated the data. The included articles reported on the diagnosis and treatment of GT.

The authors also evaluated the reference lists of the included articles but eventually found no extra articles to be included.

For the purposes of our review, we used several combinations of the following keywords: gluteal tendinopathy, gluteal tendinopathy diagnosis, gluteal tendinopathy management, gluteal tendinopathy treatment, etc., in combination or using Boolean operators, such as “gluteal” AND “tendinopathy” AND (“management” OR “treatment”).

All kinds of articles, such as systematic reviews and meta-analyses, randomized clinical trials (RCTs), prospective, retrospective, and case-series studies were included to give readers the most comprehensive overview about GT’s diagnosis and management.

DISCUSSION

Diagnosis

The differential diagnosis of lateral hip pain may be challenging because of the possibility of referral from sources other than the local soft tissues of the greater trochanter—most commonly, the lumbar spine and hip joint (38,55,56). The patient interview provides important clues for the differential diagnosis and directs the subsequent physical examination. Imaging may be required where the diagnosis is unclear, and the patient fails to progress (38).

The most useful features in differentiating GT are the area of pain, behavior of symptoms and absence of other features that are more indicative of hip osteoarthritis or lumbar-related pain (57).

GT is characterized by pain and tenderness over the greater trochanter, sometimes extending down the lateral thigh and upper leg. The onset of pain is frequently insidious, tends to worsen over time and is sometimes associated with changes in training load or physical activity, though it can occur acutely after a strong contraction of the abductor musculature, such as that occurring during a slip or fall or a forceful sporting action, such as a sidestep (38,58,59). Pain is often worse at night, with those affected having difficulty sleeping on their side (20).

The impact of this condition can be debilitating, as it typically disturbs sleep and causes functional difficulties associated with pain on single-leg loading (stair-climbing, walking, dressing) (44,58,59).

Pain on palpation (direct compression) of the soft tissues overlying the greater trochanter is generally regarded as the most important sign in the diagnosis of GT. There is a consensus that this represents a cardinal sign for the diagnosis of lateral hip tendinous or bursal pathology (44,56,60-63). An absence of tenderness on palpation of the greater trochanter should raise suspicion that the source of the pain may be different and would warrant a search for an alternative diagnosis (38).

Several clinical diagnostic tests are available for the diagnosis of GT: however, a recent meta-analysis of the diagnostic accuracy of clinical hip tests found only three studies of GT of adequate quality (44,60,61) and reported that the tests generally possessed weak diagnostic properties (64).

The three studies, considered of adequate quality, included the single-leg stance test and resisted medial and lateral rotation and abduction (40,60,61). These studies all had imaging evidence of local pathology at the greater trochanter as the reference test, with a predominance of findings indicating GT. The flexion/abduction/external rotation (FABER) and Ober tests were evaluated in addition to the above tests (36,38). These diagnostic tests generally impart either a tensile or compressive load (or a combination of both) across the gluteal tendons. The most useful diagnostic properties were reported by Lequesne et al. (61), who tested resisted hip internal rotation at 90° hip flexion and maximal external rotation (Fig.3).

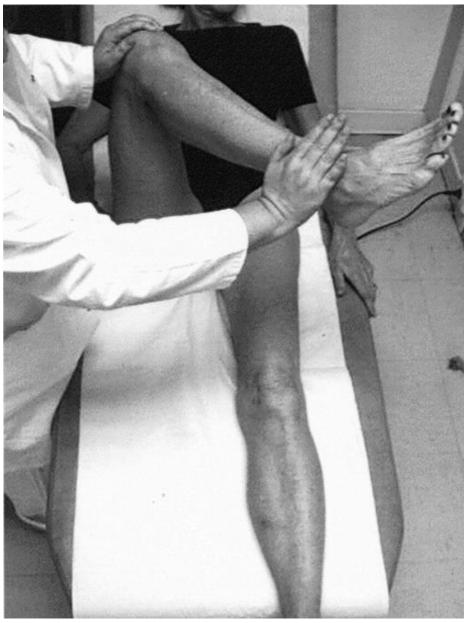

Figure 3. *Resisted external derotation test. The hip is flexed 90°, and the patient is asked to return the leg to the axis of the table against resistance. The test result is positive when the usual pain is reproduced. Retrieved from: Lequesne M, Mathieu P, Vuillemin-Bodaghi V, Bard H, Djian P. Gluteal tendinopathy in refractory greater trochanter pain syndrome: diagnostic value of two clinical tests. Arthritis Rheum. 2008 Feb 15;59(2):241-6.*

Radiography, MRI, US, and scintigraphic imaging have all been reported in the literature as helpful adjuncts in clarifying the diagnosis of GT (36).

Early imaging may be required following acute trauma and/or a marked loss of function (38). Imaging of the hip and lumbar spine may also assist if the differential diagnosis is unclear. Caution is required, as tendon and lumbar pathology often coexist and occur frequently in the asymptomatic population (19,65). To be relevant, diagnosis should not rely solely on imaging studies but should correlate with clinical features (36,38).

US and MRI are the predominant investigations for lateral hip pain. US is usually offered first, because of cost and availability (38). US is less sensitive than MRI for detection of minor changes in tendon structure, as a consequence of limitations in the resolution of greyscale imaging (66).

US has been reported to have a high sensitivity of 79% to 100% and a positive predictive value of 95% to 100% for gluteal tendon tears but requires a skilled practitioner (42,67). MRI has been shown to be an accurate means of diagnosing gluteal tendon tears, with a reported sensitivity of 73% and specificity of 95% for the presence of tears (68).

Distention of the bursa is readily evident on ultrasound (56), and ultrasound is superior to MRI with respect to imaging calcifications within the tendon (69) (Fig.4).

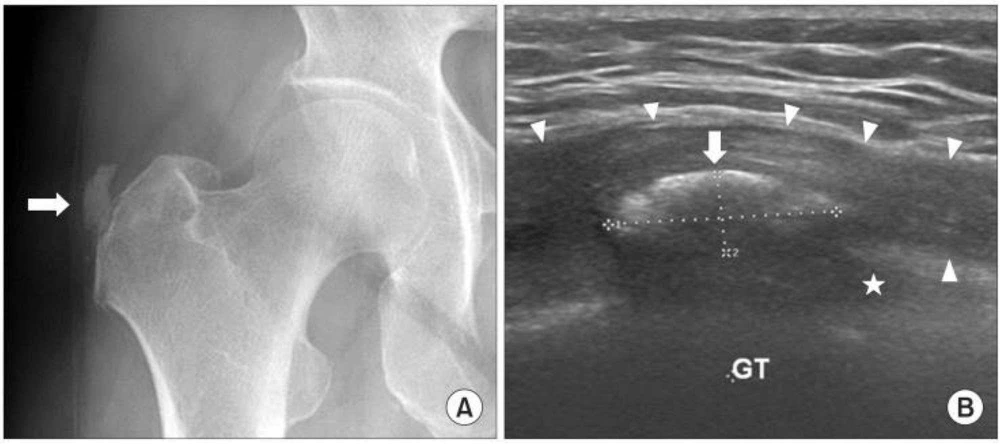

Fig. 4. ***(A)*** *An anteroposterior radiograph of the right hip showing an amorphous calcification (white arrow) adjacent to the greater trochanter.* ***(B)*** *Ultrasonography of the right hip showing a solid calcific nodule (white arrow) at 2.0 cm×0.7 cm in size adjacent to the insertion site of the gluteus medius tendon (asterisk) between the greater trochanter (GT) and the iliotibial band (arrowheads). Retrieved from: Jo H, Kim G, Baek S, Park HW. Calcific Tendinopathy of the Gluteus Medius Mimicking Lumbar Radicular Pain Successfully Treated With Barbotage: A Case Report. Ann Rehabil Med. 2016 Apr;40(2):368-72.*

Treatment

The best management of GT is still under debate, since the proposed treatments lack strong evidence-based support.

A recent review could not draw definitive conclusions, because of limited availability of studies of adequate quality (70). Many of the proposed treatment modalities are yet to be tested in randomized clinical trials. Management techniques include exercise and strategies to manage tendon load, ESWT, CS and PRP injections, and surgical interventions.

Physical therapy is usually advocated as a first-line therapy given the well reported outcomes in the treatment of lower limb tendinopathies (71-74). In the context of GT, physical therapy is aimed at reducing compression on the greater trochanter and to control provocative tensile load. The most useful exercises include isometric, low-velocity, high-tensile load, strengthening exercises (36) (Fig.5).

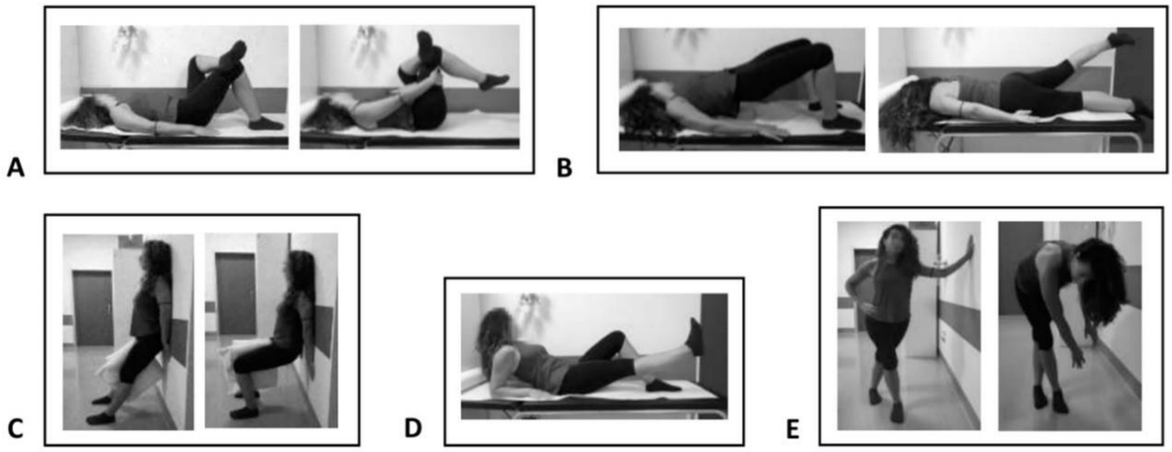

Fig. 5. *Eccentric therapeutic exercise: Piriformis muscle stretching (**A**); gluteal muscle stretching (**B**); wall squat with a ball (**C**); leg lift (**D**); and iliotibial band stretching (**E**). Retrieved from: Notarnicola A, Ladisa I, Lanzilotta P, Bizzoca D, Covelli I, Bianchi FP, Maccagnano G, Farì G, Moretti B. Shock Waves and Therapeutic Exercise in Greater Trochanteric Pain Syndrome: A Prospective Randomized Clinical Trial with Cross-Over. J Pers Med. 2023 Jun 10;13(6):976.*

Especially regarding GT, a recent systematic review and meta-analysis by Patricio Cordeiro et al. (29) showed that exercise therapy is superior to minimal intervention (sham exercise or wait-and-see) for function/symptom severity in patients with GT in the short- and long-term. However, this difference was not observed between these interventions for short- and long-term quality of life.

Similarly, the effect of physical therapy was no different from CS injections for pain intensity in the short- and long-term, however, exercise showed a higher treatment success rate when compared to CS infiltration both in the short- and long-term in individuals with GT. However, the authors found low or very low certainty of evidence for these comparisons.

ESWT was reported as effective in reducing lateral hip pain from grades 1 to 3 GT according to the classification of tendinopathy made by Bhabra et al. (75) and revised by Ladurner et al. (76) (Fig.6).

Fig. 6. *The patient is positioned on the side and the treatment probe is placed on the trochanteric area. Retrieved from: Notarnicola A, Ladisa I, Lanzilotta P, Bizzoca D, Covelli I, Bianchi FP, Maccagnano G, Farì G, Moretti B. Shock Waves and Therapeutic Exercise in Greater Trochanteric Pain Syndrome: A Prospective Randomized Clinical Trial with Cross-Over. J Pers Med. 2023 Jun 10;13(6):976.*

In the study by Carlisi et al. (49), pain was significantly lower in both short- and- mid-term using focused ESWT, also achieving better pain reduction compared with therapeutic ultrasound at short- and mid-term follow-up. However, no significant benefit in functional scores between the groups was detected.

Seo et al. (50) assessed the tendon abnormality and outcome for patients with GT documented by MRI. In their study, the use of low-energy ESWT led to a significant decrease of pain at immediate and long-term follow-up. Success rates, measured with Roles-Maudsley score, also were 83.3% and 55.6% at immediate and long-term follow-up, respectively. The authors then suggested that low-energy ESWT can be an effective treatment for pain relief in chronic GT. However, its long-term effect appears to decrease with time.

Although SWT might be effective for management of GT, high-quality trials are required to test its efficacy, and cost and availability may also limit its clinical applicability (38).

Furthermore, no standard protocol for ESWT in GT has been established yet according to the current available literature.

Injections represent another option for the treatment of GT (Fig.7).

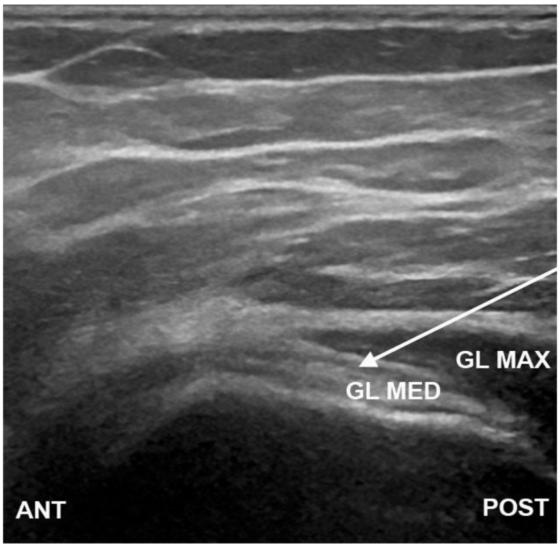

Fig. 7. *Transverse plane over the greater trochanter. The needle is advanced into the tissue plane between the gluteal maximus-iliotibial band and GMed tendon from a posterior approach (arrow). Retrieved from: Yeap PM, Robinson P. Ultrasound Diagnostic and Therapeutic Injections of the Hip and Groin. J Belg Soc Radiol. 2017 Dec 16;101(Suppl 2):6.*

CS injection provides a substantial early reduction in pain for those with GMed tendinopathy, with a 72–75 % positive response at 4 weeks (77,78). As patients and their medical practitioners aim to achieve early pain relief, it is not surprising that CS injections are commonly recommended (63,77,79). However, CS injection does not completely alleviate the pain (average pain reduction 55 % (77), and medium- and longer-term responses are much lower than its initial effects. Positive responses drop to 41–55 % at 3–4 months (40,63,80), and after 12 months, Brinks et al. (40) showed no difference in outcomes between subjects receiving CS injection and those receiving usual care (analgesics as required). This pattern of poorer outcomes in the longer term, with high rates of recurrence, has been shown for other insertional tendinopathies (38). Furthermore, the way CS injections work for treatment of tendinopathy, and the safety, particularly of repeated use, remain unclear, given the absence of substantial signs of inflammation in tendinopathies and the tenotoxicity revealed in several studies (81,82).

Two studies performed by Fitzpatrick et al. (83,84) compared the outcomes of a single leukocyte-rich PRP (LR-PRP) injection to those of a single CS. The Authors reported favorable 2-year outcomes of a single LR-PRP injection for patients with grades 1, 2, and 3 tendinopathy. While an equal effect size for LR-PRP and CS was seen up to the 6-week follow-up, the outcomes were significantly higher in the LR-PRP group at 12 weeks and thereafter from baseline. An ongoing benefit was observed over a period of 2 years. Instead, the effect of a single CS declined at 24 weeks.

Lee et al. (85) reported favorable results for a single PRP injection with concomitant needle tenotomy of the gluteal tendons. Statistically significant and clinically important (greater than the minimal clinically important difference) improvements in the evaluated scores were shown over a mean follow-up time of 19.7 months.

Jacobson et al. (86) found that a PRP injection or sonography-guided tendon fenestration led to an alleviation of pain in patients with grades 1 and 2 tendinopathy, with no statistical difference between the two treatment methods. However, the short follow-up of only 2 weeks does not sufficiently support its use.

A retrospective cohort analysis conducted by the same group (87) concluded that 54% of patients treated using tendon fenestration for grade 2 or 3 tendinopathy of the GMed or GMin tendon reported marked improvement of their symptoms.

The treatment effect of a single PRP injection plus tendon fenestration as reported by Lee et al. (85) was not superior to the effect of a single PRP injection alone shown by Fitzpatrick et al. (84).

A promising intervention was performed by Bucher et al. (88) who investigated the effect of autologous tenocyte injections on clinical outcomes in patients with grade 1, 2, or 3 GT. The authors showed significant improvements in the considered scores at 12 months from baseline, and clinical outcomes were sustained to 24 months.

For those with GT who have failed conservative treatment, surgical intervention is considered (38). The evidence for outcomes of surgical repair of gluteal tendon tears is limited to case reports, which provide only weak evidence. Patients who have failed conservative rehabilitation, had significant abductor muscle weakness and had a muscle tear identified on MRI are generally reported to do well in the 1- to 2-year follow-up period following surgery.

Gluteal tendon repairs can now be performed endoscopically (89-91), which is less invasive and is associated with reduced post-operative infection, scarring and pain, and more accelerated rehabilitation (89). Endoscopic techniques, however, require greater surgical skills and are generally unsuitable for larger tears or tendon detachments where there is retraction of the muscle and greater visualization is required (91). Endoscopic repairs have returned good to excellent results in the limited case series available (90,91), but no randomized clinical trials have compared outcomes of open and endoscopic techniques.

Endoscopic gluteal tendon repair was reported by Thaunat et al. (92) and Hartigan et al. (93) and both achieved significant improvements in pain and function. The follow-up time was 32 and 38 months, respectively. The reported failure rate of repair was 4.5%. Complication rates varied. Makridis et al. (94) reported a surgical failure rate of 16%, while Walsh et al. (91) reported a rate of 19%.

Good results for open repair of partial- and full-thickness tears were also found by Fearon et al. (67), Walsh et al. (91) and Davies et al. (95), who reported overall high satisfaction after open repair, with postoperative improvements maintained over 5 years.

Open tendon repair using synthetic augmentation was proposed for high-grade partial- and full-thickness tears by Ebert et al. (96) The Authors reported good clinical and functional outcomes and meaningful improvements in PROM scores (96% patient satisfaction) at 12 months. The retear rate was 2.7%, and the overall complication rate was 6.3% (revision surgery in 1.8%). Bucher et al. (97) and Huxtable et al. (98) achieved excellent results using the same technique.

Surgical interventions performed either as an open or an arthroscopic procedure have also been adopted for patients without gluteal tears, with the main aim being to remove the trochanteric bursa (especially in case of recalcitrant bursitis) and usually release the iliotibial band (ITB). All studies (case series) have reported good to excellent short- to medium-term outcomes.

CONCLUSIONS

GT is a degenerative condition in both sedentary and athletic adults, particularly females aged over 40 years. GT has major implications on patients' quality of life. Overall, 10% to 40% of patients with GT have unsuccessful nonoperative treatment (91).

As the treatment method of choice may change with deterioration of the tendon, early diagnosis of the stage of the disease and the initiation of a stage-adjusted treatment are fundamental (76).

The evidence for the best management is poor, and the underlying mechanisms of the condition are only beginning to be understood. Compression and stress shielding of the deep fibers of the gluteal tendons in hip adduction are likely to be central to the development of tendon degeneration (38).

Nonoperative measures should be applied to treat low-grade GT. According to the available scientific evidence, a single LR-PRP injection seems to be a reasonable option. ESWT shows promising results. Exercise therapy improves patient satisfaction; anyway, specific treatment protocols for ESWT and physical therapy are lacking. CS show good short-term outcomes, while the long-term effect is inferior to results obtained using PRP (76).

Endoscopic or open bursectomy with or without ITB release is a valuable option in low-grade tendinopathy refractory to nonoperative treatment. The reported complication rates for these soft tissue interventions are low. Surgical interventions showed favorable outcomes for the treatment of partial- and full-thickness tears (76).

High-quality trials are required to test the short- and long-term efficacy and safety of current and emerging methods of management. Clarification of underlying mechanisms may guide development of more robust management strategies (38).

Conflict of interest
The authors declare that they have no conflicts of interest regarding this study.

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