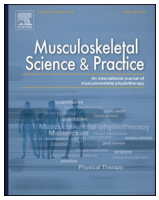
Musculoskeletal Science and Practice 76 (2025) 103253



Contents lists available at ScienceDirect

Musculoskeletal Science and Practice

journal homepage: www.elsevier.com/locate/msksp





Gluteal tendinopathy masterclass: Refuting the myths and engaging with the evidence

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ARTICLE INFO

Keywords:
Hip
Buttocks
Gluteal tendinopathy
GTPS
Trochanteric bursitis

ABSTRACT

Introduction: Gluteal tendinopathy is a prevalent and impactful condition. For many decades clinical practice has been guided by 'myths' that developed around clinical beliefs. It's time to examine these myths and engage with the substantial evidence base.
Purpose: This masterclass aims to: (i) engage with the evidence to refute the most common myths associated with gluteal tendinopathy and trochanteric pain, and (ii) provide clinicians with guidance around contemporary, evidence-based clinical practice.
Implications: It is time to put aside traditional beliefs that focused on anti-inflammatory treatments, including rest and corticosteroid injections as first line management for trochanteric pain. Contemporary management of tendinopathy takes an active approach that empowers the individual to manage their own condition through education, load management, progressive exercise and optimisation of their general health. The body of evidence for gluteal tendinopathy supports health professionals in employing such principles with greater confidence.

1. Introduction

Gluteal tendinopathy (GT) is a prevalent and impactful condition (Albers et al., 2016; Fearon et al., 2014a). In the absence of clear scientific evidence, clinical practice was for many decades strongly guided by clinical beliefs. However, emerging evidence has proven many of these beliefs to be myths. A substantial body of research has been generated over the last decade, providing the foundation for evidence-based practice in the diagnosis and management of trochanteric pain of soft tissue origin, primarily GT.

This masterclass aims to engage with the evidence to refute common myths associated with GT, and provide clinicians with guidance around contemporary, evidence-based clinical practice. Section A will bust myths around the topics of pathology, prevalence, clinical tests and imaging in diagnosis, causes of trochanteric soft tissue pathology, prognosis and management approaches. Section B will provide guidelines and clinical tips for diagnosis and management of GT, including measurement of outcomes. Section C will address advanced practice considerations.

2. SECTION A: Refuting the myths

2.1. Myth 1: Trochanteric pain is related to an inflammatory condition of the trochanteric bursa

Imaging and surgical studies have demonstrated that the primary pathology associated with trochanteric pain involves abductor tendon pathology (specifically, of the gluteus medius (GMed) and minimus (GMin) tendons) (Blankenbaker et al., 2008; Fearon et al., 2010; Lange et al., 2022; Long, Surrey & Nazarian 2013). A pathological enlargement or distension of the bursae may be present in trochanteric pain, though this most commonly co-exists with adjacent gluteal tendon pathology (Gordon, 1961; Ruangchaijatuporn et al., 2017). Bursal distension, with or without other pathology, has been reported to occur in only 20–30% of people with trochanteric pain and clinical signs of a local soft tissue pathology (Blankenbaker et al., 2008; Lange et al., 2022). Isolated bursal change is relatively rare, with only 2–8% of these populations reported to have bursal distention in the absence of gluteal tendon pathology (Blankenbaker et al., 2008; Lange et al., 2022).

When bursal distension is present, it does not necessarily indicate an

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https://doi.org/10.1016/j.msksp.2025.103253
Received 1 November 2024; Received in revised form 30 December 2024; Accepted 1 January 2025
Available online 3 January 2025
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inflammatory process. Histological examination of the bursae has found primarily fibroadipose tissue with no signs of acute or chronic inflammation (Fearon et al., 2014b; Silva et al., 2008). Furthermore, objective signs of inflammation including redness, warmth, swelling and erythema are rare in GT (Segal et al., 2007a).

Thickening of insertional tendons in those with tendinopathy is thought to be a cell-driven adaptation to excessive compression or combinations of high compressive and tensile (longitudinal) loads (Cook and Purdam, 2012; Cook et al., 2016). Such mechanisms may also underpin bursal thickening at the greater trochanter. Compression of the gluteal tendons is highest in positions of hip adduction (Birnbaum et al., 2004), influenced also by bony factors such as coxa vara and increased femoral offset (Birnbaum, Prescher & Niethard 2010; Viradia et al., 2011). In addition, systemic or metabolic factors can contribute to the development to soft tissue pathology and pain (Leblanc et al., 2017; Sheridan et al., 2022).

2.1.1. Key practice point

Trochanteric pain is not due to an inflammatory condition of the local bursae. Tendinopathy of the GMed and/or GMin tendons (GT) is the primary pathology associated with trochanteric pain. First-line management of GT should focus on reducing pain by using evidence-based management strategies (e.g., education and exercise) to address an individual's contributing local and systemic factors (Cowan et al., 2022; Ganderton et al., 2018b; Mellor et al., 2018a) (Fig. 1).

2.2. Myth 2: Gluteal tendinopathy only occurs in post-menopausal females

A diagnosis of GT is most likely to be considered in post-menopausal women, but the condition may also occur in males, younger females, and in association with other musculoskeletal conditions. The LEAP (LatErAl hip Pain) randomised clinical trial (RCT) cohort included 204 participants (mean age 55 years) with trochanteric pain, clinical signs and Magnetic Resonance Imaging (MRI) evidence of GT. Whilst 167 (82%) were female, 37 (18%) of the cohort with a positive diagnosis of GT were male (Mellor et al., 2018b). One cross-sectional study that examined 2954 older adults (50–70 years) with knee osteoarthritis (OA) or at high risk of knee OA, found that almost 1 in 4 females and nearly 1 in 10 males had trochanteric pain and tenderness (Segal et al., 2007b).

In clinical practice, younger post-partum females returning to exercise may also present with trochanteric pain. Similar to menopause, a notable drop in oestrogen levels during breastfeeding may have a temporary influence on tendon health and load tolerance (Leblanc et al., 2017).

GT is also seen in those with hip OA (Sheridan et al., 2022) and following total hip replacement surgery (THR), with the reported incidence following THR ranging from as low as 1.7% (Skibicki et al., 2021) to as high as 22% (Moerenhout et al., 2021). In active young (49.9 ± 7.1 years) patients who have undergone hip resurfacing or THR, an even higher prevalence of 35–37% has been reported (Nam et al., 2015).

GT may also co-exist with acetabular dysplasia due to the high loads placed on the hip abductors in those with reduced bony stability. Of 100 patients with symptomatic dysplasia (mean age 29 ± 9 years; 17 men), 42% had abductor-related pain (Jacobsen et al., 2018b) and 27% had gluteal tendon pathology on ultrasound (Jacobsen et al., 2018a).

2.2.1. Key practice point

The pre-assessment probability of GT in a patient with trochanteric pain is likely to be higher if the patient is a post-menopausal female. However, clinicians should not dismiss the diagnosis in other populations, such as males, younger females, particularly active runners in the post-partum period, in those with other hip conditions and following THR (Fig. 2).

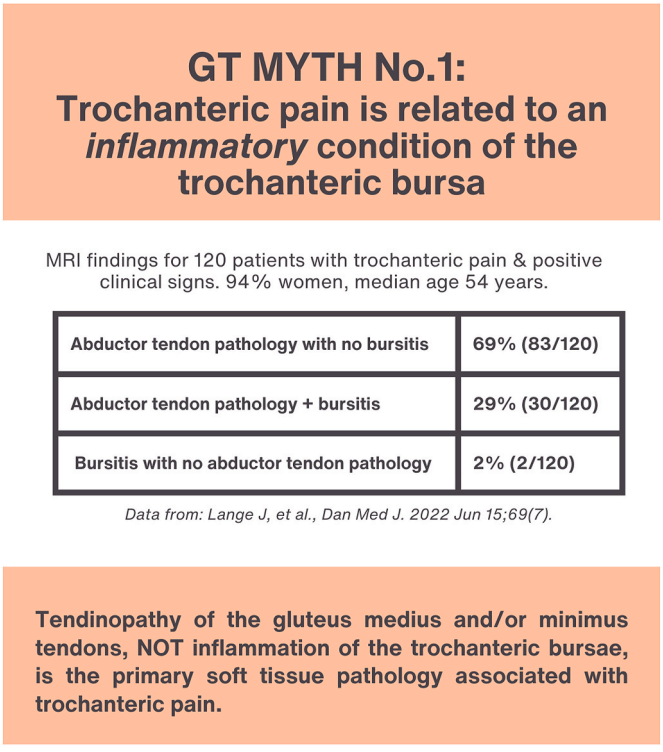


Fig. 1. GT Myth No 1: Trochanteric pain is related to an inflammatory condition of the trochanteric bursa.

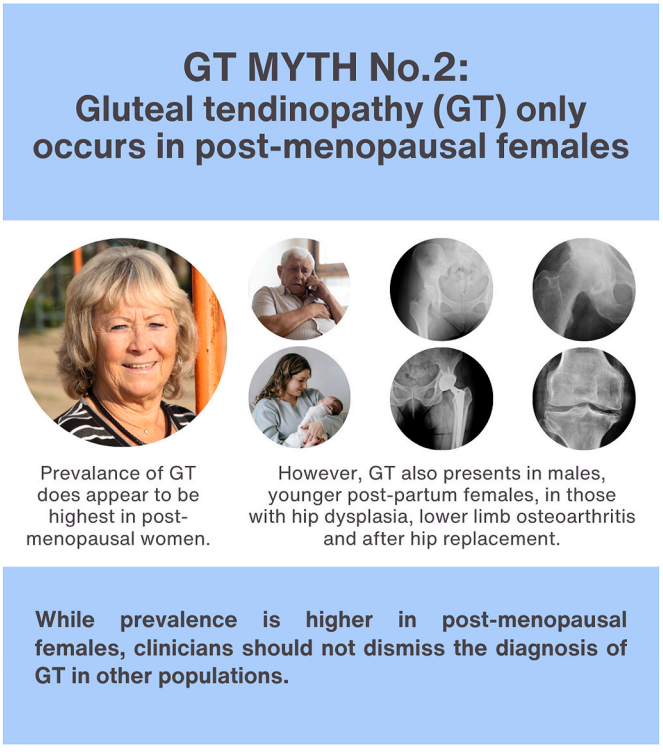


Fig. 2. GT Myth No 2: Gluteal tendinopathy only occurs in post-menopausal females.

2.3. Myth 3: Palpation of the greater trochanter is adequate for the diagnosis of gluteal tendinopathy

Palpation of the greater trochanter is highly sensitive with the best negative likelihood ratio, meaning that it is the best for ruling out GT when the greater trochanter is not tender (Ganderton et al., 2017b; Grimaldi et al., 2016; Kinsella et al., 2024). However, it should be noted that many asymptomatic individuals are tender on palpation of the greater trochanter, and therefore the test should not be used in isolation to rule in GT (Lequesne et al., 2008).

Combining diagnostic tests can further improve the accuracy of refuting or diagnosing GT. A lack of tenderness on palpation of the greater trochanter and pain-free resisted hip abduction reduces the likelihood (post-test probability) of having gluteal tendon pathology on MRI from 59% to 14%. Similarly, positive palpation (tenderness of the greater trochanter) together with trochanteric pain on either resisted hip abduction or a 30-s single leg stance test increases the likelihood of having gluteal tendon pathology on MRI from 59% to 96% and 99% respectively (Kinsella et al., 2024).

2.3.1. Key practice point

If a clinician suspects GT following the patient interview, palpation of the greater trochanter should be paired with active loading of the abductor mechanism (resisted hip abduction or 30 s single leg stance test) to improve diagnostic accuracy (Fig. 3).

2.4. Myth 4: Diagnosis and management planning for trochanteric pain should be based on imaging findings

The use of imaging in isolation is problematic for diagnosing and planning the management of GT, as pathology is often evident in asymptomatic individuals and does not always correlate with pain (Ganderton et al., 2017b; Kinsella et al., 2024; Lequesne et al., 2008). In one retrospective radiology study, peritrochanteric abnormalities were observed on MRI in 88% of asymptomatic hips and all hips with trochanteric pain (Blankenbaker et al., 2008). With respect to the hip abductor tendons specifically, tendinopathic changes have been reported on MRI in 50–88% of asymptomatic individuals over the age of 45 years, compared with 88–100% of those with trochanteric pain (Blankenbaker et al., 2008). Those with pain are more likely to have greater levels of tendon pathology (moderate tendinosis, partial or full thickness tear), than those without trochanteric pain – 63% versus 24% (Ganderton et al., 2017b). The absence of trochanteric soft tissue pathology on imaging makes a diagnosis of GT unlikely, however the presence of such changes is a poor predictor of symptoms as they are common in those without trochanteric pain (Blankenbaker et al., 2008).

2.4.1. Key practice point

Degenerative changes in the gluteal tendons and thickening of the trochanteric bursae are common and can occur in both symptomatic and asymptomatic adults. Imaging findings must be paired with clinical examination to determine the relevance of trochanteric pathology within diagnostic and management processes (Fig. 4).

2.5. Myth 5: Gluteal tendinopathy is a self-limiting condition

A common myth shared with patients is that trochanteric pain (GT) will resolve by itself over time. Few high-quality studies have reported on the natural history of GT. One small prospective observational study followed 24 GT patients and 20 control participants over 11 years (Bicket et al., 2021). At 11 years, 9 of 20 (45%) of the GT group available for follow up still had symptoms of GT. Seven (35%) had developed hip OA, compared to no participants in the control group, suggesting a possible temporal relationship between GT and hip OA (Bicket et al., 2021).

No clinical trials on GT have embedded true no-treatment groups (Garzón et al., 2024). Some insight can be drawn from the LEAP RCT, which included a wait-and-see group who received minimal treatment

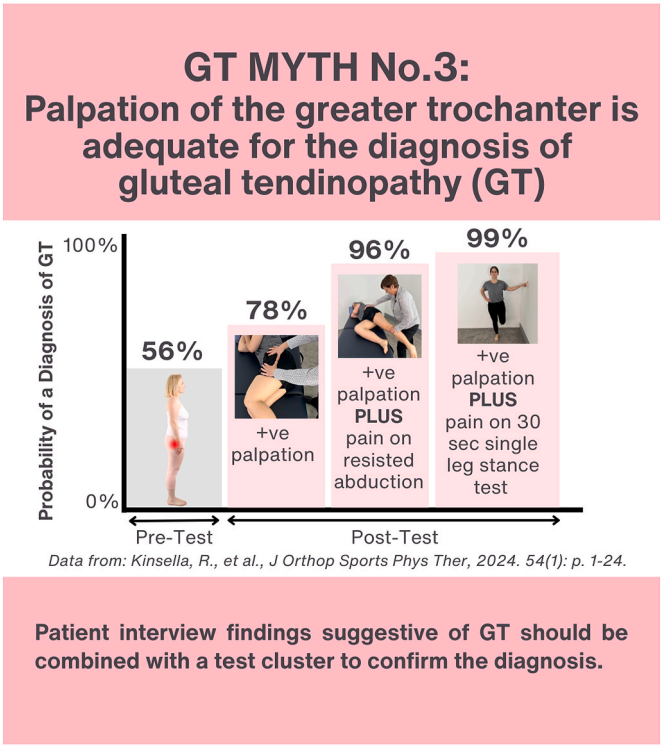


Fig. 3. GT Myth No 3: Palpation of the greater trochanter is adequate for the diagnosis of gluteal tendinopathy.

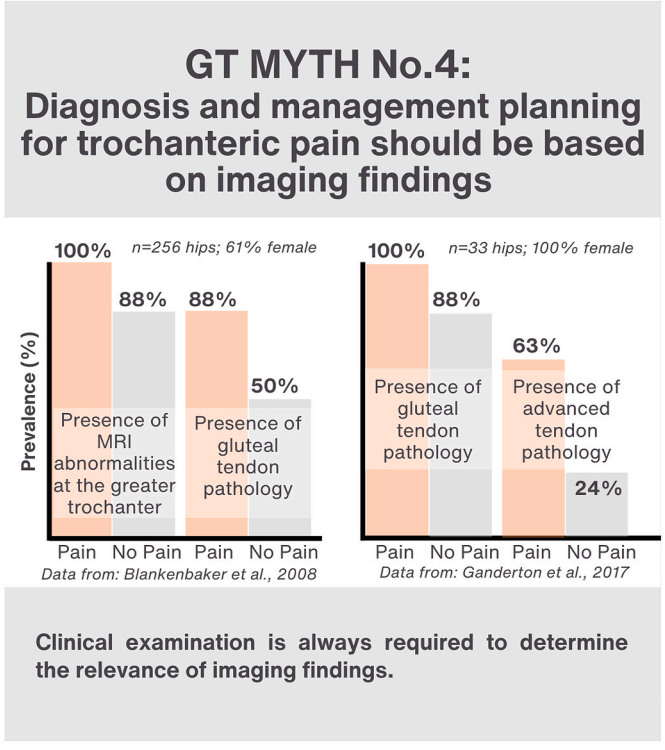


Fig. 4. GT Myth No 4: Diagnosis and management planning for trochanteric pain should be based on imaging findings.

(a single session of basic advice only). In the wait-and-see group, 71% of individuals did not recover in the short term (8 weeks) and almost half (48%) did not recover in the longer term (1 year) (Mellor et al., 2018b).

2.5.1. Key practice point

While around 50% of GT patients may slowly recover over 12 months with basic advice, there are just as many who experience persistent or recurrent symptoms (Mellor et al., 2018b). Early intervention may be warranted to reduce the chances of chronicity and possible wider impacts on the adjacent joint (Fig. 5).

2.6. Myth 6: Gluteal tendinopathy is due to a tight ITB and treatment should include ITB stretches

A short iliotibial band (ITB) has historically been thought to be a key driver of trochanteric pain. This has resulted in the prescription of treatments aimed at increasing the length of the ITB such as stretching (Rompe et al., 2009a) and surgery (ITB Z band lengthening) (Craig et al., 2007). There is no evidence supporting the theory that reduced length of the ITB, reduced range of motion on Ober's test, or reduced length in the abductor mechanism are more common in individuals with GT.

Stretching as an intervention is not supported by the evidence or current expert advice on management of insertional tendinopathies due to the potential pain provocation related to compressive tendon loading (Cardoso et al., 2019). Even in the presence of reduced hip adduction range, stretching as an intervention for insertional tendinopathies is more likely to be provocative than helpful (Cook and Purdam, 2012).

Current evidence and theories around the pathomechanics of GT highlight several factors that should be preferentially considered (Grimaldi and Fearon, 2015). These include the impact of morphology (Fearon et al., 2012), joint position, muscle structure (Cowan et al., 2020) and capacity (Allison et al., 2016a), and kinematic factors such as hip adduction, pelvic position, and the external hip adduction moment (Allison et al., 2018; Allison et al., 2016b).

2.6.1. Key practice point

Stretching into hip adduction is more likely to be provocative than helpful. Treatment should be tailored to the individual patient, based on a comprehensive clinical assessment (Fig. 6).

2.7. Myth 7: Corticosteroid injection is best first-line management for GT

Corticosteroid injection (CSI) is commonly delivered as a first-line intervention for tendinopathy (Nissen et al., 2019). The rationale is to address inflammatory processes underpinning 'trochanteric bursitis', although histological studies have shown an absence of typical cellular inflammation (Silva et al., 2008).

Corticosteroids do appear to be potent short-term analgesics, but the long-term benefits are usually no better than wait-and-see or other treatments (Mellor et al., 2018b; Nissen et al., 2019; Reid, 2016). The LEAP RCT demonstrated the superiority of education-and-exercise over CSI for global improvement of GT, both in the short and long-term (Mellor et al., 2018b). In the longer term, CSI proved no more successful in improving global outcomes than a wait-and-see approach (Mellor et al., 2018b).

Despite the short-term pain relief provided for many, CSI may hinder rather than enhance rehabilitative efforts in the long term. CSI may have adverse tissue effects, including reduced cell viability, cell proliferation and collagen synthesis, and increased collagen disorganisation and necrosis (Dean et al., 2014). From a behavioural standpoint, CSI may reduce the opportunity for patients to learn pain management techniques and receive positive reinforcement through load management. CSI may also decrease compliance with exercise plans and promote behaviours that seek 'quick fixes,' leading patients to believe they need another injection when the effect wears off, even if the pain relief is only of short duration.

2.7.1. Key practice point

Despite some early effects on pain, considering the potential negative effects of CSI on tendon health and health behaviours and the

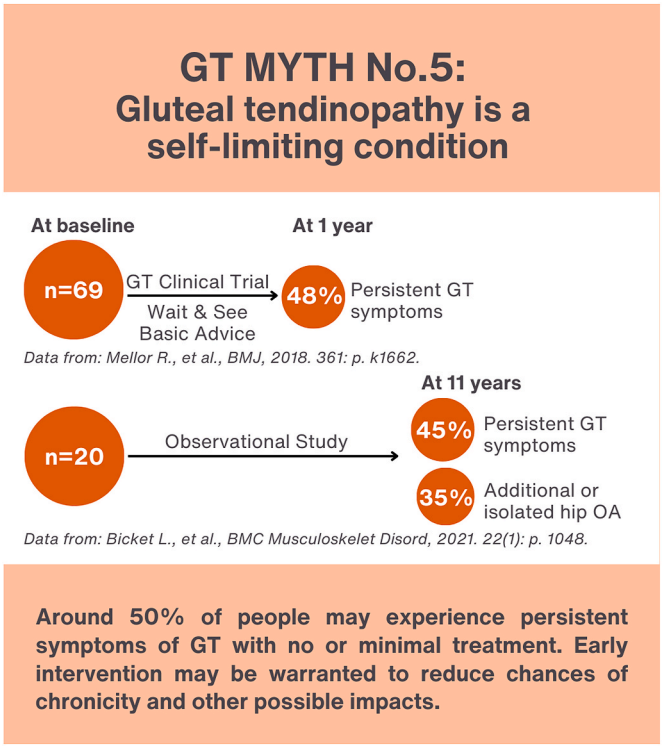


Fig. 5. GT Myth No 5: Gluteal tendinopathy is a self-limiting condition.



Fig. 6. GT Myth No 6: Gluteal tendinopathy is due to a tight ITB and treatment should include ITB stretches.

availability of superior alternatives (Mellor et al., 2018b), CSI as a first-line intervention may be best avoided (Visser et al., 2023) (Fig. 7).

2.8. Myth 8: The 'clam' exercise is the best exercise to address abductor deficits in those with GT

Although the clam/clamshell exercise is commonly used as a 'gluteus medius strengthening' exercise, there is a lack of evidence to support its prescription in GT. Clams have been omitted from exercise intervention programs in all RCTs targeting GT (Ganderton et al., 2018b; Mellor et al., 2016; Rompe et al., 2009b). Performance of the side-lying clam involves moving the hip in and out of a position of adduction and internal rotation, imparting both compressive and frictional loads across the greater trochanter. These alternating compressive and frictional loads may provoke trochanteric pain in those with GT.

Furthermore, the clam is unlikely to induce optimal stimulus to adequately address abductor muscle weakness, atrophy and fatty infiltration present in those with GT (Allison et al., 2016b; Cowan et al., 2020). This exercise elicits only low levels of GMin (Ganderton et al., 2017a), and anterior and middle GMed activity, regardless of the intensity with which the exercise is performed (2.0–26.7% of maximum voluntary isometric contraction), and moderate activity in the posterior GMed (Ganderton et al., 2017a; Moore et al., 2019; Selkowitz et al., 2013; Semciw et al., 2013).

Peak muscle forces within GMed and GMin are elicited in weightbearing exercise, such as single leg biased squats or hip hinge (deadlift) actions, especially with external resistance (Collings et al., 2023). This aligns with the functional roles of GMin and GMed (Al-Hayani, 2009) and provides an opportunity to improve femoropelvic control and boost confidence in performing functional tasks. Read more on exercise choices in Section B.

2.8.1. Key practice point

The clam exercise is likely inadequate to stimulate positive adaptation of the GMed and GMin. Furthermore, the compressive and frictional loads imposed on the tendons and adjacent bursae at the greater trochanter may be provocative for trochanteric pain (Fig. 8).

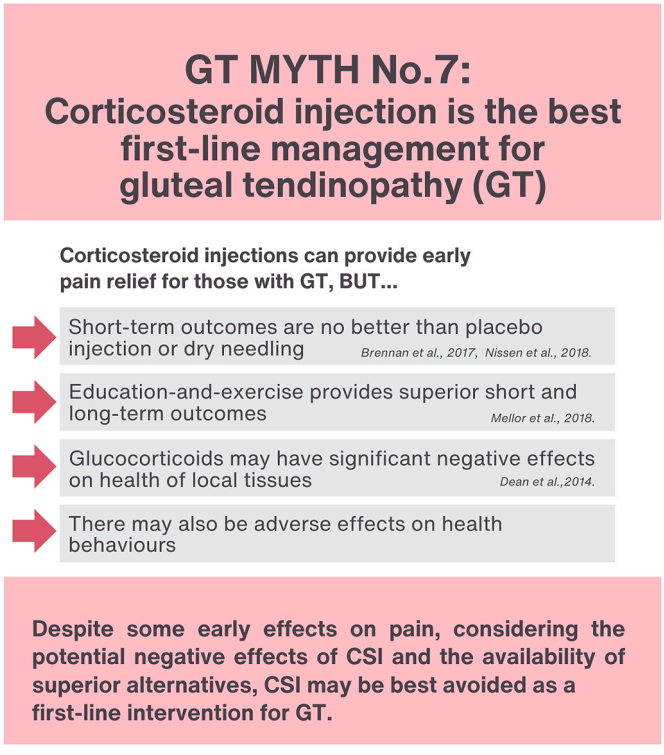


Fig. 7. GT Myth No 7: Corticosteroid injection is best first-line management for GT.

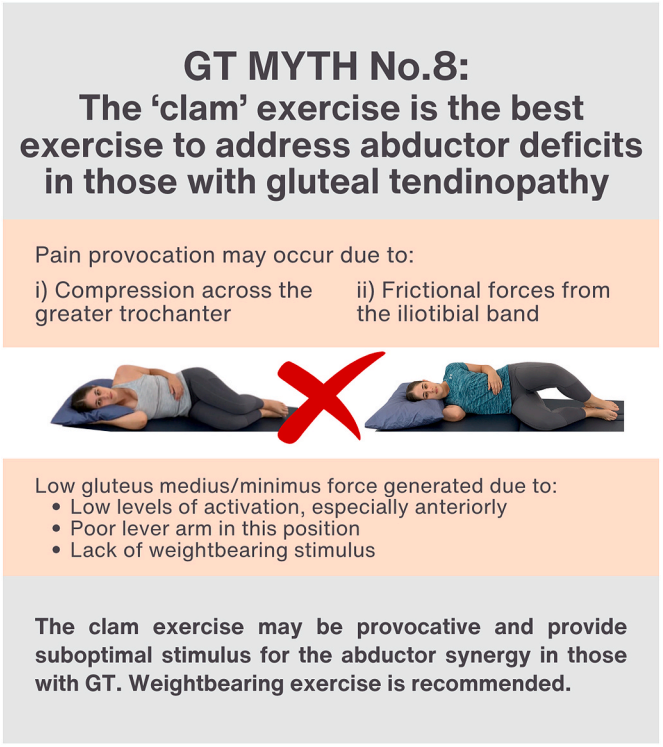


Fig. 8. GT Myth No 8: The 'clam' exercise is the best exercise to address abductor deficits in those with GT.

2.9. Myth 9: All gluteal tendon tears need to be surgically repaired

Many patients and health professionals read the words 'tendon tear' on an imaging report and assume that the tendon may require surgical repair. This can cause understandable concern for the patient and may result in early and often unnecessary referral for surgical review. Tendinosis (tendon degeneration) may progress to partial-thickness tear and then full-thickness tear, representing a pathologic continuum (Kong et al., 2007).

A partial-thickness tear extends only partway through the depth of the tendon, usually originating on the deep surface of the tendon, akin to rotator cuff pathology (Morgan et al., 2024). Partial-thickness tears are common in those aged more than 50 years (Chi et al., 2015), and have a low risk of clinically relevant progression, supporting the selection of non-surgical treatment approaches (Schenk et al., 2023).

Full-thickness tears that extend through the full depth of the tendon, may still only represent tendon deficiency in a relatively small area of the tendon. Those with substantial areas of GMed tendon avulsion may be surgical candidates, with the strongest clinical features predicting surgery being the persistence of Trendelenburg gait and abductor strength deficits (<4/5) after 3 months of rehabilitation (Chandrasekaran et al., 2015). Patients with more substantial tendon deficits may also present with a positive hip lag sign (inability to sustain the hip in abduction in a side-lying position) (Kaltenborn et al., 2014).

A thorough trial of evidence-based non-operative treatment should be undertaken before surgery is considered. The LEAP trial demonstrated successful outcomes of non-surgical management for a cohort of people with GT, partial and full-thickness tendon tears (Mellor et al., 2018a). Treatment effects were not moderated by the severity of pathology (Mellor et al., 2022).

2.9.1. Key practice point

Most gluteal tendon tears do not require surgical intervention. Surgery is more likely to be warranted in those with substantial tendon detachment, with non-responsive Trendelenburg gait, abductor deficiency, pain and disability after at least 3 months of rehabilitation (Fig. 9).

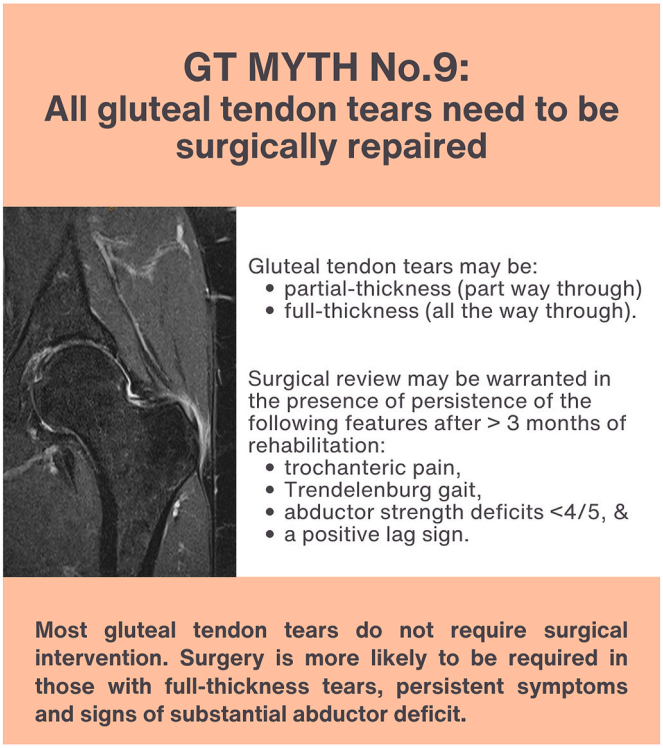


Fig. 9. GT Myth No 9: All gluteal tendon tears need to be surgically repaired.

3. SECTION B: Guidelines and clinical tips for diagnosis and management of gluteal tendinopathy

3.1. Diagnosing Gluteal Tendinopathy

A patient's demographics (e.g., age, gender and body habitus) can provide clues regarding the most likely diagnoses associated with lateral hip pain. In the group with the highest prevalence of GT—older females with higher BMI—degenerative hip joint and lumbar conditions should also be considered primary differential diagnoses for lateral hip pain (Grimaldi et al., 2024).

Within the patient interview, area of pain, aggravating factors and absence of other features that are more commonly associated with hip OA or lumbar-related pain provide helpful direction. For GT, the primary area of pain and tenderness will be in the trochanteric region, with pain extending commonly down the lateral thigh (Grimaldi and Fearon, 2015). Those with isolated hip OA will not usually present with focal trochanteric pain. Instead, the pain is generally broader and deeper, with focal areas of pain usually above the greater trochanter, typically in a 'c' shape around the anterolateral hip, or deep mid-inguinal, lateral and/or mid buttock pain (Lesher et al., 2008; Metcalfe et al., 2019). Somatic lumbar related pain will usually be a deep diffuse ache across the back and or buttock/lateral hip region, also without focal trochanteric pain (Buckland et al., 2017). Radicular pain tends to be more superficial and may pass from the buttock over the lateral hip area and down into the thigh and more distally to the leg and foot, often in a dermatomal distribution (Buckland et al., 2017).

Patients with GT experience trochanteric pain in sidelying, standing on one leg to dress, during walking stairclimbing, running and other physical activity, and on prolonged sitting or rising to stand after sitting. Distal symptoms, particularly extending to the foot, and paraesthesia or dysaesthesia would prompt the clinician to consider lumbar referred pain (Buckland et al., 2017). Similarly, those with isolated GT do not commonly report hip stiffness as a feature of their condition. Reports of difficulty manipulating shoes and socks or cutting toenails, would suggest hip OA as a primary or co-morbid diagnosis (Fearon et al., 2013). Pain on bending, lifting or lumbar-related motions increases the suspicion of lumbar related pain.

Other rarer pain sources include local peripheral nerves and vascular structures. The suspicion of nerve-related pain will increase with

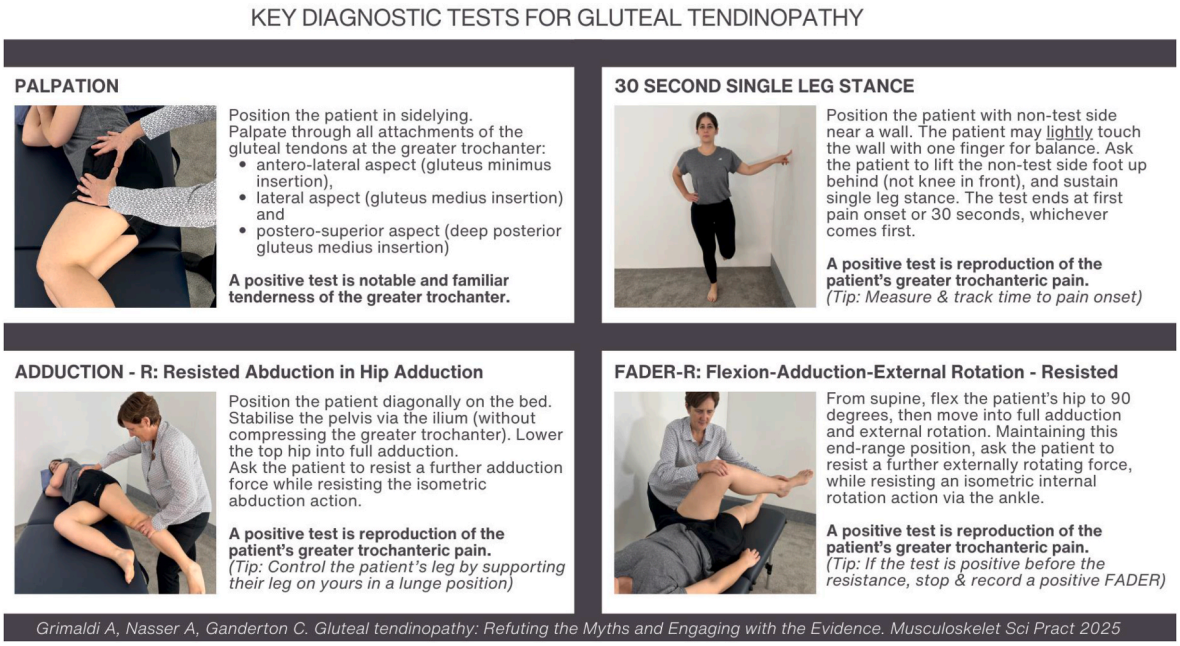


Fig. 10. Key diagnostic tests for gluteal tendinopathy.

neuralgic symptoms in the distribution of the subcostal, iliohypogastric or lateral femoral cutaneous nerves, particularly if there has been a history of local trauma or iatrogenic injury (McCrory and Bell, 1999). Vascular related lateral hip pain will present as claudication-type pain with activity, easing with rest (Feller et al., 2022). Bone stress injury or insufficiency fracture must be excluded in those with low BMI, low bone density and/or a recent history of trauma or overload e.g., endurance runner (Clough, 2002).

Physical tests for diagnosing GT are described in Fig. 10. Palpation alone is inadequate for a diagnosis of GT, with diagnostic accuracy increasing when combined with resisted hip abduction (Kinsella et al., 2024) (Myth 3). The 30-Second Single Leg Stance Test and the FADER-R test can assist with confirming a positive diagnosis (Kinsella et al., 2024). In addition, painful restriction of hip flexion, rotation and hip flexion-abduction-external rotation in the FABER test may increase suspicion of primary or co-morbid hip OA (Fearon et al., 2013). The lumbar spine should always be screened in patients presenting with hip pain, at a minimum including active range of motion assessment and palpation. Where the diagnosis is unclear, a trial of lumbar treatment to assess effects on the hip pain may be useful.

Imaging should never be used alone in the diagnosis of GT but may be employed where the patient is not responding as expected to treatment, or if the diagnosis is unclear and there are symptoms of concern e.g., severe or non-mechanical symptoms (Myth 4).

3.2. Managing Gluteal Tendinopathy

Physiotherapist-led education-and-exercise has been shown to be an effective first-line intervention for GT (Ganderton et al., 2018a; Mellor et al., 2018b) and superior to both CSI and basic advice with a wait-and-see approach (Mellor et al., 2018b). While the most useful elements of education-and-exercise approaches are still to be elucidated, education is considered a key component of such interventions. This component involves education around the condition and self-management strategies.

Self-management includes control of exposure to potentially provocative sustained positions or activities. Positions or activities that impose high compressive loads on the gluteal tendons, especially with added tensile (longitudinal) loading can be provocative. Compression of the gluteal tendons at the greater trochanter occurs with direct pressure or in positions of hip adduction (Birnbaum, Prescher & Niethard 2010), which occurs in side-lying, sitting with the knees crossed, hip adduction stretches and various weightbearing functional tasks where control of hip adduction may be inadequate (Fig. 11).

Load management advice also includes information on overall loading, encouraging patients to avoid rapid increases in activity levels, instead allowing their tendons time to adapt. Limiting increases to 10% or less per week is a useful general rule (Gabbett, 2016). Patients are also taught to monitor their 24-h response to activity or exercise, with increases in pain that night and/or the next morning an indication that loads may need to be adjusted.

More specific load management advice around particular types of loads is also provided. Activities with rapid stretch-shortening cycles, such as running and plyometric activity may be provocative for lower limb tendinopathy (Cook and Purdam, 2014). Depending on the severity of symptoms, such activities may need to be paused or limited (Fig. 12).

Those with GT have been shown to move with altered frontal plane hip and pelvic control, increasing loads imposed on the gluteal tendons (Allison et al., 2016a). Movement training aimed at reducing excessive hip adduction, lateral pelvic drop or lateral trunk lean may be useful in reducing hip abductor overload. Key targets will be gait, stair climbing and any other task that is problematic and meaningful to the patient (Fig. 12).

Exercise programs usually include isometric abductor loading, that is generally well tolerated and may induce pain relief in some patients (Ganderton et al., 2018a; Mellor et al., 2018b). Other elements include frontal plane abductor loading, bridging and functional loading progressions that incorporate loading of the whole lower kinetic chain while maintaining optimal movement control (Fig. 13). Exercises are progressed as soon as the patient can perform the exercise with good

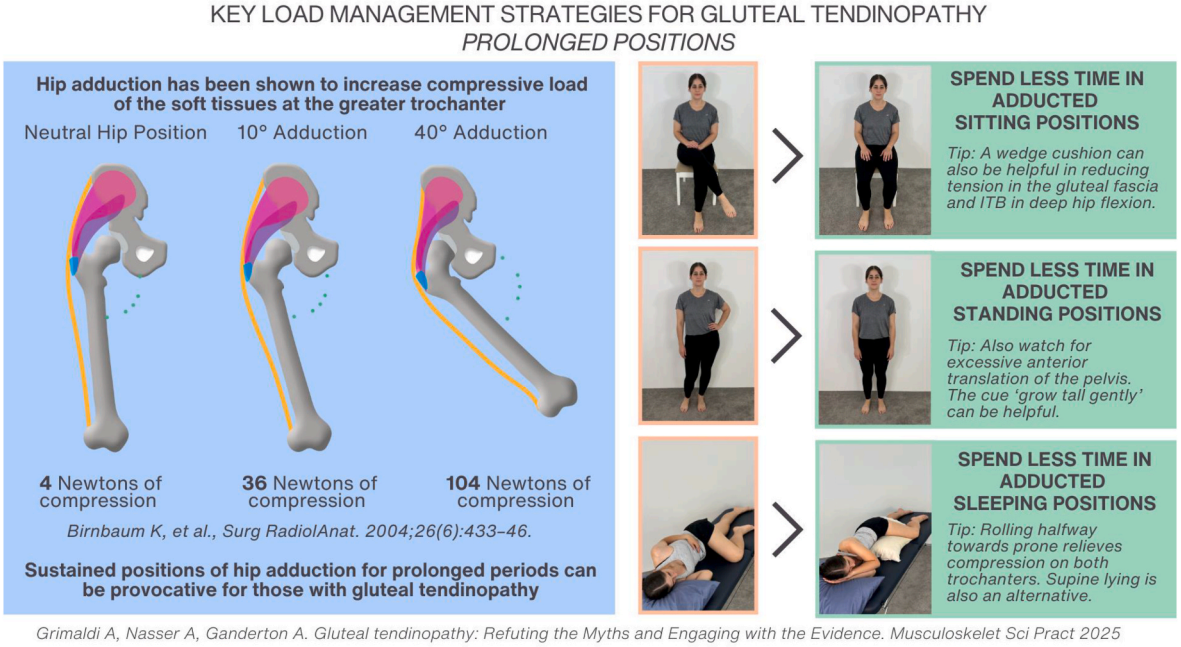


Fig. 11. Key load management strategies for gluteal tendinopathy: Prolonged positions.

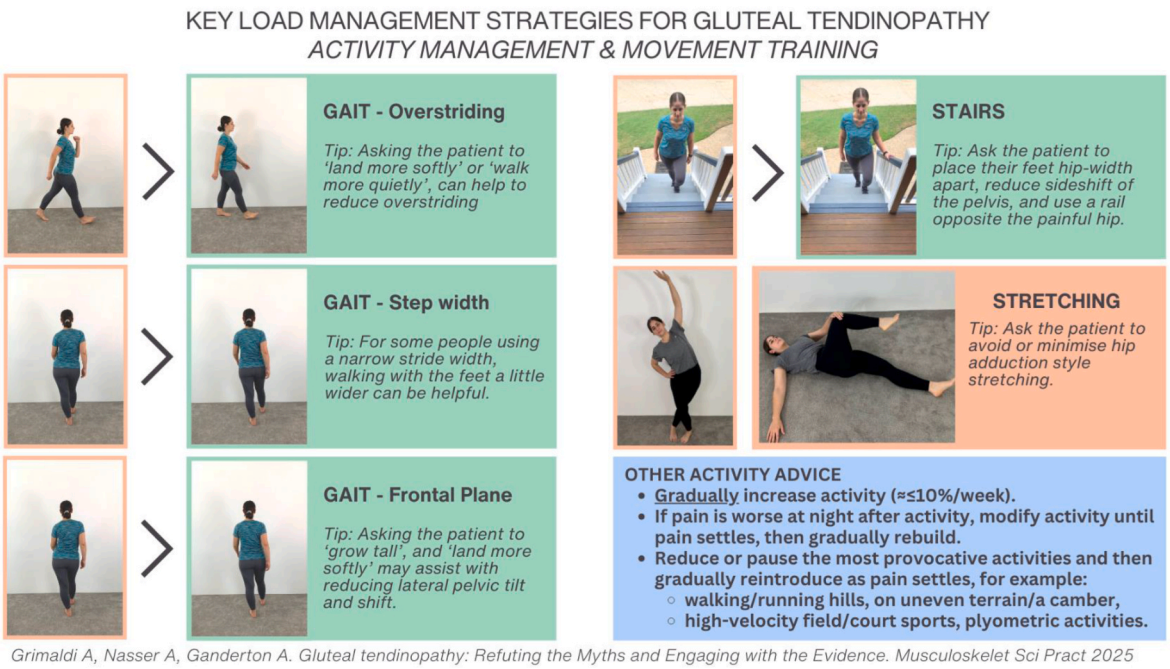


Fig. 12. Key load management strategies for gluteal tendinopathy: Activity management and movement training.

technique, no-to-minimal pain and their rating of perceived exertion falls below a moderate level. How far exercises are progressed towards higher loads and dynamic landing and plyometric activity will depend on an individual's capacity and needs.

Other adjunct strategies may assist in early pain control in those with more severe pain. For example, temporary use of a single stick/crutch may be useful for patients presenting with an antalgic limp. Oral pain medication may be preferable to CSI due to possible adverse soft tissue and behavioural effects (Dean et al., 2014) (Myth 7).

3.3. Measuring outcomes

Efforts have been recently made to improve the understanding of outcome measures used to evaluate tendinopathy (Vicenzino et al., 2020). A recent consensus project involving researchers, clinicians and patients attempted to develop a core outcome set for patients with GT (Fearon et al., 2024). A core outcome set represents a standardised set of outcome measures that should be used, as a minimum, in clinical trials. Unfortunately, no measurement tools for GT demonstrated sufficient measurement properties to be recommended (Nasser and Grimaldi, 2024; Nasser et al., 2022). For pragmatic reasons, an interim outcome set was recommended while further research is being conducted (Fearon et al., 2024). The outcome measures recommended for each of the ICON domains are summarised in Table 1.

4. SECTION C: Advanced practice considerations

4.1. The recalcitrant case

After confirming the diagnosis, it is essential to gather detailed information about previous management. The patient interview should elicit information on duration and adherence to exercise and load management strategies, and whether the program included appropriately progressed hip abductor loading. Exercise technique must be carefully reviewed, with particular attention to frontal plane mechanics. For instance, prematurely prescribing single-leg exercises may be problematic if the patient lacks sufficient lower limb and pelvic control.

Higher pain catastrophisation and depression scores, and lower pain self-efficacy, have been associated with increased GT symptom severity (Plinsinga et al., 2018). Whilst referral to a psychologist may be required, a physiotherapist can address concerns related to a need to 'fix' pathology seen on imaging (e.g., tendon tears) and fear-avoidance behaviours related to pain. Education that pain is not necessarily harmful, and that some pain during rehabilitation is acceptable, is important. Patients should be empowered to monitor their 24-h response to activity to facilitate self-managed activity based on loading response (e.g., incremental walking program), and given strategies to reduce symptoms during functional tasks (Fig. 12). Knowledge of realistic timeframes for rehabilitation is important to manage expectations and may help prevent escalation to more invasive treatments.

Oestrogen supplementation may be considered in post-menopausal women, a time when oestrogen levels decline. The effects of oestrogen supplementation on GT symptoms are contradictory and inconsistent (Ganderton et al., 2016). One recent RCT reported a reduction in GT symptoms in post-menopausal women with a BMI less than 25 who used a hormone therapy cream in combination with exercise, when compared to a placebo cream and exercise (Cowan et al., 2022). Therefore, where GT symptoms are persistent, an endocrinologist may assist with the management of contributing metabolic and/or hormonal factors. A dietitian can also support individuals with a high BMI, or where concomitant metabolic disorders exist (e.g., diabetes).

4.2. Other treatment options

Alternative treatments like Shockwave Therapy (SWT) and Platelet-rich-plasma injections are often considered when patients do not progress adequately with rehabilitation. Despite the growing use of these modalities, there is currently no high-level evidence to support their use and therefore injection therapies and SWT should be reserved for cases where high-value non-invasive treatments (education and exercise) have failed to achieve an individual's goals (Arthur Vithran et al., 2023; Barman et al., 2022; Masiello et al., 2023). Further high-quality research is required to elucidate whether earlier application of such treatments, or combinations of interventions are more efficacious for some populations.

Surgical interventions for GT and gluteal tendon tears are considered a last resort. Surgical case series show promising outcomes over time; however, the level of evidence is low due to limitations in study design.



Fig. 13. An example exercise program for gluteal tendinopathy.

Table 1
Recommended interim outcome measures for gluteal tendinopathy.

ICON Domain	Measurement instrument
Health practitioner and patient participants' interim recommendations	
Patient Overall Rating of Condition	Global Rating of Change (7-point scale rating of overall change in the condition from the beginning of treatment until now)
Pain Over a Specified Time	Pain at night via 0–10 numerical rating scale
Pain on activity or loading	Single leg stance (time to pain onset or change in pain, up to 30 s) via 0–10 numerical rating scale Pain on walking one flight of stairs via 0–10 numerical rating scale
Psychological factors	Pain Self Efficacy Questionnaire
Physical Function Capacity	Hip abduction strength measured in supine, using a fixed dynamometer
Health practitioners' additional interim recommendations	
Pain over a specified time	Pain at night (pain interference at night where 0 is no interference and 10 is completely interferes and worst pain measured via an NRS, where 0 is no pain and 10 is worst imaginable pain)
Disability	Victorian Institute of Sport Assessment - Gluteal tendinopathy
Quality-of-life	European Quality of Life-5 dimensions-5 Levels

ICON = International Scientific Tendinopathy Symposium Consensus group
Fearon AM, Grimaldi A, Mellor R et al. Br J Sports Med 2024 Mar 8; 58(5):245–254. https://doi.org/10.1136/bjsports-2023-107150.

Evidence suggests open and endoscopic gluteal tendon repair have similar outcomes (functional improvement and pain relief), however, endoscopic techniques have lower complication rates (Longstaffe et al., 2021). General recommendations for surgical intervention in upper and lower limb tendinopathy, suggest exercise-based management should be trialled for at least a year before considering surgery (Challoumas et al., 2019). Until comparator studies are available, these recommendations could also be applied to GT.

5. Conclusion

GT is recognised as a prevalent and recalcitrant condition that impacts an individual's pain, function, physical activity, work, and quality of life. Over the last decade, a substantial body of scientific evidence has been generated. This evidence base has provided a better understanding of the condition and guidelines on which to base diagnostic and management strategies. It's time for all clinicians to set aside the myths and engage with the evidence.

CRediT authorship contribution statement

Alison Grimaldi: Writing – review & editing, Writing – original draft, Conceptualization. **Charlotte Ganderton:** Writing – review & editing, Writing – original draft, Conceptualization. **Anthony Nasser:** Writing – review & editing, Writing – original draft, Conceptualization.

References

Al-Hayani, A., 2009. The functional anatomy of hip abductors. Folia Morphol (Warsz) 68 (2), 98–103.

Albers, I.S., Zwerver, J., Diercks, R.L., Dekker, J.H., Van den Akker-Scheek, I., 2016. Incidence and prevalence of lower extremity tendinopathy in a Dutch general practice population: a cross sectional study. BMC Muscoskel. Disord. 17 (1), 16.

Allison, K., Hall, M., Hodges, P.W., Wrigley, T.V., Vicenzino, B., Pua, Y.H., Metcalf, B., Grimaldi, A., Bennell, K.L., 2018. Gluteal tendinopathy and hip osteoarthritis: different pathologies, different hip biomechanics. Gait Posture 61, 459–465.

Allison, K., Vicenzino, B., Wrigley, T.V., Grimaldi, A., Hodges, P.W., Bennell, K.L., 2016a. Hip abductor muscle weakness in individuals with gluteal tendinopathy. Med. Sci. Sports Exerc. 48 (3), 346–352.

Allison, K., Wrigley, T.V., Vicenzino, B., Bennell, K.L., Grimaldi, A., Hodges, P.W., 2016b. Kinematics and kinetics during walking in individuals with gluteal tendinopathy. Clin. Biomech. 32, 56–63.

Arthur Vithran, D.T., Xie, W., Opoku, M., Essien, A.E., He, M., Li, Y., 2023. The efficacy of platelet-rich plasma injection therapy in the treatment of patients with achilles tendinopathy: a systematic review and meta-analysis. J. Clin. Med. 12 (3).

Barman, A., Sinha, M.K., Sahoo, J., Jena, D., Patel, V., Patel, S., Bhattacharjee, S., Baral, D., 2022. Platelet-rich plasma injection in the treatment of patellar tendinopathy: a systematic review and meta-analysis. Knee Surg Relat Res 34 (1), 22.

Bicket, L., Cooke, J., Knott, I., Fearon, A., 2021. The natural history of greater trochanteric pain syndrome: an 11-year follow-up study. BMC Musculoskelet Disord 22 (1), 1048.

Birnbaum, K., Prescher, A., Niethard, F.U., 2010. Hip centralizing forces of the iliotibial tract within various femoral neck angles. J. Pediatr. Orthop. B 19 (2), 140–149.

Birnbaum, K., Siebert, C.H., Pandorf, T., Schopphoff, E., Prescher, A., Niethard, F.U., 2004. Anatomical and biomechanical investigations of the iliotibial tract. Surg. Radiol. Anat. 26 (6), 433–446.

Blankenbaker, D.G., Ullrick, S.R., Davis, K.W., De Smet, A.A., Haaland, B., Fine, J.P., 2008. Correlation of MRI findings with clinical findings of trochanteric pain syndrome. Skeletal Radiol. 37 (10), 903–909.

Buckland, A.J., Miyamoto, R., Patel, R.D., Slover, J., Razi, A.E., 2017. Differentiating hip pathology from lumbar spine pathology: key points of evaluation and management. J. Am. Acad. Orthop. Surg. 25 (2), e23–e34.

Cardoso, T.B., Pizzari, T., Kinsella, R., Hope, D., Cook, J.L., 2019. Current trends in tendinopathy management. Best Pract. Res. Clin. Rheumatol. 33 (1), 122–140.

Challoumas, D., Clifford, C., Kirwan, P., Millar, N.L., 2019. 'How does surgery compare to sham surgery or physiotherapy as a treatment for tendinopathy? A systematic review of randomised trials'. BMJ Open Sport & Exercise Medicine 5 (1), e000528.

Chandrasekaran, S., Vemula, S.P., Gui, C., Suarez-Ahedo, C., Lodhia, P., Domb, B.G., 2015. Clinical features that predict the need for operative intervention in gluteus medius tears. Orthop J Sports Med 3 (2), 2325967115571079.

Chi, A.S., Long, S.S., Zoga, A.C., Read, P.J., Deely, D.M., Parker, L., Morrison, W.B., 2015. Prevalence and pattern of gluteus medius and minimus tendon pathology and muscle atrophy in older individuals using MRI. Skeletal Radiol. 44 (12), 1727–1733.

Clough, T.M., 2002. Femoral neck stress fracture: the importance of clinical suspicion and early review. Br. J. Sports Med. 36 (4), 308.

Collings, T.J., Bourne, M.N., Barrett, R.S., Meinders, E., GonçAlves, B.A.M., Shield, A.J., Diamond, L.E., 2023. Gluteal muscle forces during hip-focused injury prevention and rehabilitation exercises. Med. Sci. Sports Exerc. 55 (4), 650–660.

Cook, J.L., Purdam, C., 2012. Is compressive load a factor in the development of tendinopathy? Br. J. Sports Med. 46 (3), 163–168.

Cook, J.L., Purdam, C.R., 2014. The challenge of managing tendinopathy in competing athletes. Br. J. Sports Med. 48 (7), 506–509.

Cook, J.L., Rio, E., Purdam, C.R., Docking, S.I., 2016. Revisiting the continuum model of tendon pathology: what is its merit in clinical practice and research? Br. J. Sports Med. 50 (19), 1187–1191.

Cowan, R.M., Ganderton, C.L., Cook, J., Semciw, A.I., Long, D.M., Pizzari, T., 2022. Does menopausal hormone therapy, exercise, or both improve pain and function in postmenopausal women with greater trochanteric pain syndrome? A 2 × 2 factorial randomized clinical trial. Am. J. Sports Med. 50 (2), 515–525.

Cowan, R.M., Semciw, A.I., Pizzari, T., Cook, J., Rixon, M.K., Gupta, G., Plass, L.M., Ganderton, C.L., 2020. Muscle size and quality of the gluteal muscles and tensor fasciae latae in women with greater trochanteric pain syndrome. Clin. Anat. 33 (7), 1082–1090.

Craig, R.A., Jones, D.P., Oakley, A.P., Dunbar, J.D., 2007. Iliotibial band Z-lengthening for refractory trochanteric bursitis (greater trochanteric pain syndrome). ANZ J. Surg. 77 (11), 996–998.

Dean, B.J.F., Lostis, E., Oakley, T., Rombach, I., Morrey, M.E., Carr, A.J., 2014. The risks and benefits of glucocorticoid treatment for tendinopathy: a systematic review of the effects of local glucocorticoid on tendon. Semin. Arthritis Rheum. 43 (4), 570–576.

Fearon, A., Stephens, S., Cook, J., Smith, P., Neeman, T., Cormick, W., Scarvell, J., 2012. The relationship of femoral neck shaft angle and adiposity to greater trochanteric pain syndrome in women. A case control morphology and anthropometric study. Br. J. Sports Med. 46 (12), 888–892.

Fearon, A.M., Cook, J.L., Scarvell, J.M., Neeman, T., Cormick, W., Smith, P.N., 2014a. Greater trochanteric pain syndrome negatively affects work, physical activity and quality of life: a case control study. J. Arthroplasty 29 (2), 383–386.

Fearon, A.M., Grimaldi, A., Mellor, R., Nasser, A.M., Fitzpatrick, J., Ladurner, A., Vicenzino, B., 2024. ICON 2020-International Scientific Tendinopathy Symposium Consensus: the development of a core outcome set for gluteal tendinopathy. Br. J. Sports Med. 58 (5), 245–254.

Fearon, A.M., Scarvell, J.M., Cook, J.L., Smith, P.N., 2010. Does ultrasound correlate with surgical or histologic findings in greater trochanteric pain syndrome? A pilot study. Clin. Orthop. Relat. Res. 468 (7), 1838–1844.

Fearon, A.M., Scarvell, J.M., Neeman, T., Cook, J.L., Cormick, W., Smith, P.N., 2013. Greater trochanteric pain syndrome: defining the clinical syndrome. Br. J. Sports Med. 47 (10), 649.

Fearon, A.M., Twin, J., Dahlstrom, J.E., Cook, J.L., Cormick, W., Smith, P.N., Scott, A., 2014b. Increased substance P expression in the trochanteric bursa of patients with greater trochanteric pain syndrome. Rheumatol. Int. 34 (10), 1441–1448.

Feller, D., Giudice, A., Faletra, A., Salomon, M., Galeno, E., Rossettini, G., Brindisino, F., Maselli, F., Hutting, N., Mourad, F., 2022. Identifying peripheral arterial diseases or flow limitations of the lower limb: important aspects for cardiovascular screening for referral in physiotherapy. Musculoskelet Sci Pract 61, 102611.

Gabbett, T.J., 2016. The training—injury prevention paradox: should athletes be training smarter and harder? Br. J. Sports Med. 50 (5), 273.

Ganderton, C., Pizzari, T., Cook, J., Semciw, A., 2017a. A comparison of gluteal muscle activity during isometric and dynamic exercises in older women. J. Orthop. Sports Phys. Ther. 47 (12), 914–922.

Ganderton, C., Semciw, A., Cook, J., Moreira, E., Pizzari, T., 2018a. Gluteal loading versus sham exercises to improve pain and dysfunction in postmenopausal women with greater trochanteric pain syndrome: a randomized controlled trial. J Womens Health (Larchmt) 27 (6), 815–829.

Ganderton, C., Semciw, A., Cook, J., Moreira, E., Pizzari, T., 2018b. Gluteal loading versus sham exercises to improve pain and dysfunction in postmenopausal women with greater trochanteric pain syndrome: a randomized controlled trial. J. Wom. Health 27 (6).

Ganderton, C., Semciw, A., Cook, J., Pizzari, T., 2016. The effect of female sex hormone supplementation on tendon in pre and postmenopausal women: a systematic review. J. Musculoskelet. Neuronal Interact. 16 (2), 92–104.

Ganderton, C., Semciw, A., Cook, J., Pizzari, T., 2017b. De-mystifying the clinical diagnosis of lateral hip pain in women. J. Wom. Health 26 (6), 633–643.

Garzón, M., Balasch-Bernat, M., Cook, C., Ezzatvar, Y., Álvarez-Lliso, Ó., Dueñas, L., Lluch, E., 2024. How long does tendinopathy last if left untreated? Natural history of the main tendinopathies affecting the upper and lower limb: a systematic review and meta-analysis of randomized controlled trials. Musculoskeletal Science and Practice 72, 103103.

Gordon, E., 1961. Trochanteric bursitis and tendinitis. Clin. Orthop. Relat. Res. 20, 193–202.

Grimaldi, A., Fearon, A., 2015. Gluteal tendinopathy: integrating pathomechanics and clinical features in its management. J. Orthop. Sports Phys. Ther. 45 (11), 910–922.

Grimaldi, A., Mellor, R., Nasser, A., Vicenzino, B., Hunter, D.J., 2024. Current and future advances in practice: tendinopathies of the hip. Rheumatol Adv Pract 8 (2), rkae022.

Grimaldi, A., Mellor, R., Nicolson, P., Hodges, P., Bennell, K., Vicenzino, B., 2016. Utility of clinical tests to diagnose MRI-confirmed gluteal tendinopathy in patients presenting with lateral hip pain. Br. J. Sports Med.

Jacobsen, J.S., Bolvig, L., Hölmich, P., Thorborg, K., Jakobsen, S.S., Søballe, K., Mechlenburg, I., 2018a. Muscle-tendon-related abnormalities detected by ultrasonography are common in symptomatic hip dysplasia. Arch Orthop Trauma Surg 138 (8), 1059–1067.

Jacobsen, J.S., Hölmich, P., Thorborg, K., Bolvig, L., Jakobsen, S.S., Søballe, K., Mechlenburg, I., 2018b. Muscle-tendon-related pain in 100 patients with hip

dysplasia: prevalence and associations with self-reported hip disability and muscle strength. J Hip Preserv Surg 5 (1), 39–46.
Kaltenborn, A., Bourg, C.M., Gutzeit, A., Kalberer, F., 2014. The Hip Lag Sign–prospective blinded trial of a new clinical sign to predict hip abductor damage. PLoS One 9 (3), e91560.
Kinsella, R., Semciw, A.I., Hawke, L.J., Stoney, J., Choong, P.F.M., Dowsey, M.M., 2024. Diagnostic accuracy of clinical tests for assessing greater trochanteric pain syndrome: a systematic review with meta-analysis. J. Orthop. Sports Phys. Ther. 54 (1), 1–24.
Kong, A., Van der Vliet, A., Zadow, S., 2007. MRI and US of gluteal tendinopathy in greater trochanteric pain syndrome. Eur. Radiol. 17 (7), 1772–1783.
Lange, J., Tvedesøe, C., Lund, B., Bohn, M.B., 2022. Low prevalence of trochanteric bursitis in patients with refractory lateral hip pain. Dan Med J 69 (7).
Leblanc, D.R., Schneider, M., Angele, P., Vollmer, G., Docheva, D., 2017. The effect of estrogen on tendon and ligament metabolism and function. J. Steroid Biochem. Mol. Biol. 172, 106–116.
Lequesne, M., Mathieu, P., Vuillemin-Bodaghi, V., Bard, H., Djian, P., 2008. Gluteal tendinopathy in refractory greater trochanter pain syndrome: diagnostic value of two clinical tests. Arthritis Rheum. 59 (2), 241–246.
Lesher, J.M., Dreyfuss, P., Hager, N., Kaplan, M., Furman, M., 2008. Hip joint pain referral patterns: a descriptive study. Pain Med. 9 (1), 22–25.
Long, S.S., Surrey, D.E., Nazarian, L.N., 2013. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. AJR Am. J. Roentgenol. 201 (5), 1083–1086.
Longstaffe, R., Dickerson, P., Thigpen, C.A., Shanley, E., Kissenberth, M.J., Folk, J., Pill, S.G., 2021. Both open and endoscopic gluteal tendon repairs lead to functional improvement with similar failure rates: a systematic review. Journal of ISAKOS 6 (1), 28–34.
Masiello, F., Pati, I., Veropalumbo, E., Pupella, S., Cruciani, M., De Angelis, V., 2023. Ultrasound-guided injection of platelet-rich plasma for tendinopathies: a systematic review and meta-analysis. Blood Transfus 21 (2), 119–136.
McCrory, P., Bell, S., 1999. Nerve entrapment syndromes as a cause of pain in the hip, groin and buttock. Sports Med. 27 (4), 261–274.
Mellor, R., Bennell, K., Grimaldi, A., Nicolson, P., Kasza, J., Hodges, P., Wajswelner, H., Vicenzino, B., 2018a. Education plus exercise versus corticosteroid injection use versus a wait and see approach on global outcome and pain from gluteal tendinopathy: prospective, single blinded, randomised clinical trial. BMJ 361, k1662.
Mellor, R., Bennell, K., Grimaldi, A., Nicolson, P., Kasza, J., Hodges, P., Wajswelner, H., Vicenzino, B., 2018b. Education plus exercise versus corticosteroid injection use versus a wait and see approach on global outcome and pain from gluteal tendinopathy: prospective, single blinded, randomised clinical trial. Br. J. Sports Med. 52 (22), 1464–1472.
Mellor, R., Grimaldi, A., Wajswelner, H., Hodges, P., Abbott, J.H., Bennell, K., Vicenzino, B., 2016. Exercise and load modification versus corticosteroid injection versus 'wait and see' for persistent gluteus medius/minimus tendinopathy (the LEAP trial): a protocol for a randomised clinical trial. BMC Musculoskelet Disord 17, 196.
Mellor, R., Kasza, J., Grimaldi, A., Hodges, P., Bennell, K., Vicenzino, B., 2022. Mediators and moderators of education plus exercise on perceived improvement in individuals with gluteal tendinopathy: an exploratory analysis of a 3-arm randomized trial. J. Orthop. Sports Phys. Ther. 52 (12), 826–836.
Metcalfe, D., Perry, D.C., Claireaux, H.A., Simel, D.L., Zogg, C.K., Costa, M.L., 2019. Does this patient have hip osteoarthritis?: the rational clinical examination systematic review. JAMA 322 (23), 2323–2333.
Moerenhout, K., Benoit, B., Gaspard, H.S., Rouleau, D.M., Laflamme, G.Y., 2021. Greater trochanteric pain after primary total hip replacement, comparing the anterior and posterior approach: a secondary analysis of a randomized trial. J. Orthop. Traumatol.: Surgery & Research 107 (8), 102709.
Moore, D., Pizzari, T., McClelland, J., Semciw, A.I., 2019. Rehabilitation exercises for the gluteus medius muscle segments: an electromyography study. J. Sport Rehabil. 28 (8).
Morgan, A., Moore, M., Derry, K., Bi, A., Brown, J., Youm, T., Kaplan, D., 2024. Surgical treatment and outcomes for gluteal tendon tears. Curr Rev Musculoskelet Med 17 (6), 157–170.
Nam, D., Nunley, R.M., Sauber, T.J., Johnson, S.R., Brooks, P.J., Barrack, R.L., 2015. Incidence and location of pain in young, active patients following hip arthroplasty. J. Arthroplasty 30 (11), 1971–1975.
Nasser, A., Grimaldi, A., 2024. Clinimetrics: the victorian institute of sport questionnaire - gluteal tendinopathy (VISA-G). J. Physiother. 70 (2), 153.
Nasser, A.M., Fearon, A.M., Grimaldi, A., Vicenzino, B., Mellor, R., Spencer, T., Semciw, A.I., 2022. Outcome measures in the management of gluteal tendinopathy: a systematic review of their measurement properties. Br. J. Sports Med. 56 (15), 877–887.
Nissen, M.J., Brulhart, L., Faundez, A., Finckh, A., Courvoisier, D.S., Genevay, S., 2019. Glucocorticoid injections for greater trochanteric pain syndrome: a randomised double-blind placebo-controlled (GLUTEAL) trial. Clin. Rheumatol. 38 (3), 647–655.
Plinsinga, M.L., Coombes, B.K., Mellor, R., Nicolson, P., Grimaldi, A., Hodges, P., Bennell, K., Vicenzino, B., 2018. Psychological factors not strength deficits are associated with severity of gluteal tendinopathy: a cross-sectional study. Eur. J. Pain 22 (6), 1124–1133.
Reid, D., 2016. The management of greater trochanteric pain syndrome: a systematic literature review. J. Orthop. 13 (1), 15–28.
Rompe, J.D., Segal, N.A., Cacchio, A., Furia, J.P., Morral, A., Maffulli, N., 2009a. Home training, local corticosteroid injection, or radial shock wave therapy for greater trochanter pain syndrome. Am. J. Sports Med. 37 (10), 1981–1990.
Rompe, J.D., Segal, N.A., Cacchio, A., Furia, J.P., Morral, A., Maffulli, N., 2009b. Home training, local corticosteroid injection, or radial shock wave therapy for greater trochanter pain syndrome. Am. J. Sports Med. 37 (10), 1981–1990.
Ruangchaijatuporn, T., Gaetke-Udager, K., Jacobson, J.A., Yablon, C.M., Morag, Y., 2017. Ultrasound evaluation of bursae: anatomy and pathological appearances. Skeletal Radiol. 46 (4), 445–462.
Schenk, P., Dimitriou, D., Rahm, S., Zimmermann, S.M., Finsterwald, M., Higashigaito, K., Sutter, R., Zingg, P.O., 2023. Natural history of degenerative hip abductor tendon lesions. Am. J. Sports Med. 51 (1), 160–168.
Segal, N.A., Felson, D.T., Torner, J.C., Zhu, Y., Curtis, J.R., Niu, J., Nevitt, M.C., 2007a. Greater trochanteric pain syndrome: epidemiology and associated factors. Arch. Phys. Med. Rehabil. 88 (8), 988–992.
Segal, N.A., Felson, D.T., Torner, J.C., Zhu, Y., Curtis, J.R., Niu, J., Nevitt, M.C., 2007b. Greater trochanteric pain syndrome: epidemiology and associated factors. Arch. Phys. Med. Rehabil. 88 (8), 988–992.
Selkowitz, D.M., Beneck, G.J., Powers, C.M., 2013. Which exercises target the gluteal muscles while minimizing activation of the tensor fascia lata? Electromyographic assessment using fine-wire electrodes. J. Orthop. Sports Phys. Ther. 43 (2), 54–64.
Semciw, A.I., Pizzari, T., Murley, G.S., Green, R.A., 2013. Gluteus medius: an intramuscular EMG investigation of anterior, middle and posterior segments during gait. J. Electromyogr. Kinesiol. 23 (4), 858–864.
Sheridan, G.A., Neufeld, M.E., Moshkovitz, R., Garbuz, D.S., Masri, B.A., 2022. Tendinopathies and allied disorders of the hip. Orthop. Clin. N. Am. 53 (4), 393–401.
Silva, F., Adams, T., Feinstein, J., Arroyo, R.A., 2008. Trochanteric bursitis: refuting the myth of inflammation. J. Clin. Rheumatol. 14 (2), 82–86.
Skibicki, H.E., Brustein, J.A., Orozco, F.R., Ponzio, D.Y., Post, Z.D., Ong, A.C., 2021. Lateral trochanteric pain following primary total hip arthroplasty: incidence and success of nonoperative treatment. J. Arthroplasty 36 (1), 193–199.
Vicenzino, B., de Vos, R.J., Alfredson, H., Bahr, R., Cook, J.L., Coombes, B.K., Fu, S.N., Gravare Silbernagel, K., Grimaldi, A., Lewis, J.S., Maffulli, N., Magnusson, S.P., Malliaras, P., Mc Auliffe, S., Oei, E.H.G., Purdam, C., Rees, J.D., Rio, E.K., Scott, A., Speed, C., Akker-Scheek, I.V.D., Weir, A., Wolf, J.M., Zwerver, J., 2020. ICON 2019-International Scientific Tendinopathy Symposium Consensus: there are nine core health-related domains for tendinopathy (CORE DOMAINS): delphi study of healthcare professionals and patients. Br. J. Sports Med. 54 (8), 444–451.
Viradia, N.K., Berger, A.A., Dahners, L.E., 2011. Relationship between width of greater trochanters and width of iliac wings in tronchanteric bursitis. Am J Orthop (Belle Mead NJ) 40 (9), E159–E162.
Visser, T.S.S., van Linschoten, R., Vicenzino, B., Weir, A., de Vos, R.J., 2023. Terminating Corticosteroid Injection in Tendinopathy? Hasta la Vista, Baby. J. Orthop. Sports Phys. Ther. 54 (1), 1–4.

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