Evaluation and physiotherapeutic management of the greater major trochanteric pain syndrome: integrative review

Avaliação e manejo fisioterapêutico na síndrome da dor trocantérica maior: revisão integrativa

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ABSTRACT

BACKGROUND AND OBJECTIVES: The greater trochanteric pain syndrome is a painful condition that involves changes in the gluteus medius and gluteus minimus, which can interfere with the performance of functional tasks. The study aimed to analyze the conservative treatment strategies for pain management, the instruments, and provocative tests used in the evaluation of this syndrome.

CONTENTS: A systematic search for articles published in indexed journals in the Medline, Scielo, PEDro, Cochrane Library, VHL Regional Portal, ScienceDirect database was conducted, using AND and OR Boolean operators for the primary "Gluteal tendinopathy" crossing with the secondary descriptors "AND conservative treatment; AND rehabilitation; AND physiotherapy; AND management; AND physiotherapy treatment; OR greater trochanteric pain; OR trochanteric syndrome", in English and Portuguese, from 2014 to 2019. The primary outcome aimed to identify the conservative treatment and/or combined for pain management, and the secondary outcome aimed to outline the instruments and tests to assess the greater trochanteric pain syndrome.

CONCLUSION: Given the lack of studies and the difficulty of consensus among authors, it was not possible to reach conclusions about the efficacy of the protocols.

Keywords: Conservative treatment, Femur, Pain, Physical therapy, Rehabilitation.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A síndrome da dor trocantérica maior é um quadro doloroso com alterações nos glúteos médio e mínimo, podendo interferir no desempenho de tarefas funcionais. O objetivo foi analisar as estratégias do tratamento conservador para o manejo da dor, e os instrumentos e testes provocativos para a avaliação dessa síndrome.

CONTEÚDO: Foi realizada busca sistemática por artigos publicados em revistas indexadas nas bases de dados Medline, Scielo, PEDro, *Cochrane Library,* Portal Regional da BVS*, ScienceDirect*, utilizando operadores booleanos *AND* e *OR*, para o descritor primário "Gluteal tendinopathy" cruzando com os descritores secundários "AND conservative treatment; AND rehabilitation; AND physiotherapy; AND management; AND physiotherapy treatment; OR greater trochanteric pain; *OR* trochanteric syndrome", em inglês e português, de 2014 a 2019. O desfecho primário visou identificar o tratamento conservador e/ou combinados no manejo da dor, e o desfecho secundário visou delinear os instrumentos e testes para a avaliação da síndrome da dor trocantérica maior.

CONCLUSÃO: A escassez de estudos e a dificuldade de consenso entre autores, inviabilizou conclusões acerca da eficácia dos protocolos.

Descritores: Dor, Fêmur, Fisioterapia, Reabilitação, Tratamento conservador.

INTRODUCTION

The greater trochanteric pain syndrome (GTPS), known as trochanteric bursitis or gluteal tendinopathy, is a condition characterized by pain in the greater trochanter of the hip or in underlying areas with local sensitivity, with changes in the tendons of the gluteus medius and minimus muscles, which can also result in the distension of the trochanteric bursa. This is a disabling condition with severe functional limitations, with an impact on the quality of life, impairing daily life and working activities[1-7].

Pain in the greater trochanter or adjacent areas can be intermittent or continuous, occurring in daily activities, such as walking, climbing stairs, sitting, standing, or lying in the lateral decubitus. The prevalence is 10 to 25% in the general population, affecting both genders, with an emphasis on women over 40 years old. Despite the higher occurrence in sedentary women, athletes are also affected by this clinical condition, more specifically in the running modality[6-10].

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The high incidence in women is possibly related to the levels of female sex hormones since estrogen reduces the production of collagen and influences the thickness and quality of the tendon. These changes can make it thicker, vulnerable to tendon disorders, and the chance of ruptures, in runner athletes, presumably, due to inadequate training and techniques[11,12].

With a multifactorial etiology, the exact mechanisms are known. It is plausible that the cause is the friction of the greater trochanter with the iliotibial band (ITB), causing repetitive microtrauma in the gluteal tendons that generate local inflammation, tendon degeneration, and tension increase on the ITB. In women, factors such as the morphology of the pelvis; greater trochanteric displacement, diaphysis of the neck of the lower femur, smaller insertion of the gluteus medius in the femur, causing mechanical disadvantage; enlarged pelvis, coxa vara, spinal changes; changes in the intensity and duration of physical activity, can be identified as causal or aggravating[8,10,12-14].

In athletes, factors include asymmetrical wear on shoes, running on uneven and rigid surfaces, inadequate training, and weakness of the hip abductors. On the other hand, when the hip adopts higher levels of flexion that can modify the tension on the iliotibial band through the connection between the iliotibial band, gluteal and lumbodorsal fasciae, it can cause compression of the gluteal tendons and recurrent painful symptoms[15,16].

Physiotherapists need scientific support for clinical practice, as the evidence in the scientific literature is still incipient about the usual tools for early clinical diagnosis and the necessary strategies for rehabilitation actions in proper management. This review article aims to answer the question: "what are the usual provocative tests for early diagnosis and the conservative intervention strategies used in the management of pain and functionality in GTPS"? In the analysis of the guidelines for physical therapy in pain management and functionality, the primary outcome aimed at outlining the conservative treatment strategies with isolated intervention techniques associated with the use of drugs or other non-surgical approaches, indicated based on the available scientific evidence, whereas the secondary outcome aimed to relate the instruments or tests used in the early clinical evaluation, relevant to the diagnosis and consistent guidelines for the treatment of GTPS.

This study aimed to evaluate the different researches on the assessment and physiotherapeutic management of the greater trochanteric pain syndrome so that they become evidence-based practical initiatives[17,18].

CONTENTS

A systematic search was performed for articles published in journals indexed in the Medline, Scielo, PEDro, Cochrane Library, Portal Regional da BVS, and ScienceDirect databases, using the Boolean operators AND and OR, for the primary keyword "Gluteal tendinopathy" intersecting with secondary descriptors "AND conservative treatment; AND rehabilitation; AND physiotherapy; AND management; AND physiotherapy treatment; OR greater trochanteric pain; OR trochanteric syndrome", in English and Portuguese, between 2014 and 2019.

Theses and dissertations that exclusively addressed the use of invasive and surgical methods, imaging-guided procedures and endoscopy results were excluded. Studies published in annals of events; studies available in other languages not defined in the mentioned criteria were ineligible.

Randomized clinical trials, studies conducted only in humans, presenting outcomes aimed at conservative treatment with isolated intervention techniques, combined treatment with conservative interventions associated with the use of drugs or other non-surgical approaches and assessment tools useful for clinical diagnosis with provocative tests and assessment instruments in GTPS were included.

Initially, the title and abstracts of 213 articles were analyzed, excluding articles in duplicate or those that did not meet the inclusion criteria. After the critical reading of the title/abstract, 23 articles eligible for the study were selected, and after the full reading of the remaining articles, four were selected that met all the prerequisites (Figure 1).

An analytical framework was designed to outline the treatments established, consisting of the identification of authors, intervention protocol, duration, predominant modality, and outcomes, following the PRISMA criteria.

The survey was conducted from July 2018 to May 2019. The data were collected and analyzed by one single evaluator. The Cochrane tool was used to assess the risk of bias in the articles in relation to the seven domains: generation of random sequence, blinding of allocation, reporting of the selective outcome, blin-

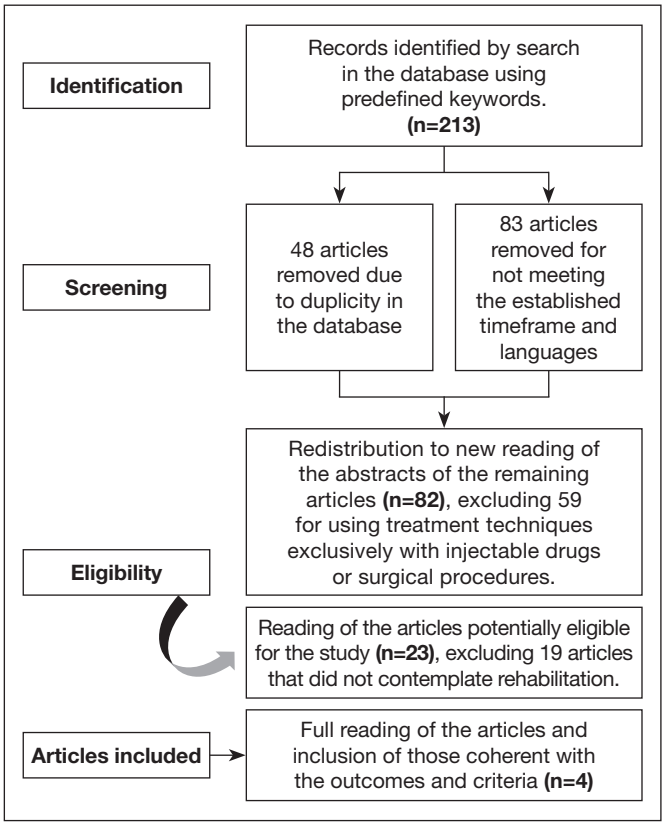

Figure 1. Article selection process
Source: Research data, 2019.

ding participants and professionals, blinding outcome evaluators and incomplete outcomes.

Regarding the sensitivity and reliability analysis of the orthopedic tests mentioned in the articles or with equivalent nomenclatures, the information used is from the articles. When specific data were not presented, the collection of evidence-based orthopedic tests was used[19], to establish the usability criteria.

The analytical framework was designed to outline the provocative instruments mentioned in the articles and the evaluation tests used, outlined as follows: authors, evaluation instruments, provocative tests, sensitivity (SE), reliability (CO), specificity (ES).

RESULTS

The GTPS treatment can be conservative, rehabilitation, and pharmacological or surgical. As conservative, it was considered non-invasive strategies for pain management, changes in the behavior of daily activities, muscle strengthening of spine and lumbopelvic stabilizers, hip abductors, and gluteus[16,20,21]. The main focus in rehabilitation is to minimize the compressive load on the greater trochanter and to educate on how to curb the activities that intensify pain since the position of excessive adduction of the hip generates compression in the gluteal tendons.

The pharmacological treatment can act as an adjunct with corticosteroids, local anesthetics, and local or systemic non-steroidal anti-inflammatory drugs[3,6,10]. The surgical treatment requires invasive procedures such as bursectomy, release and refixation, repair or reconstruction of the gluteal tendon, and trochanteric osteotomy, being recommended only for cases considered more severe and chronic when the conservative treatment is not successful.

The approach of the conservative treatment, only rehabilitation and/or combined (rehabilitation associated with drugs), for the management of the GTPS pain, was established as a priority in the articles.

Recent studies[2,16,22,23] pointed out that rehabilitation strategies must include muscle strengthening for abductors, extensors, and external rotators of the hip, which have been shown to be effective in improving the functional capacity, favoring pain relief, and exercise programs aimed at using concentric and eccentric loads are encouraged[6,10]. In the acute phase, use cryotherapy on the injured area and recommend a home exercise program that includes the stretching of the iliotibial band, the piriformis muscle, the tensor fasciae latae, knee extensors, hip flexors and rotators[2,6,11].

These approaches need to be further explored in new studies. Although GTPS is a highly limiting and disabling condition, significantly affecting the quality of life, there is still little evidence related to pain management with conservative treatment. Likewise, the combined treatment, integrating conservative interventions associated with the use of drugs or other non-surgical approaches, is considered a beneficial resource for the management of the GTPS pain (Table 1).

Regarding the conservative treatment, there were significant improvements within the group in the measurements of pain and function both for the Globe group (exercise program Gluteal La Trobe University) and for the simulated interventions, thus highlighting the importance of an exercise program that emphasizes the strengthening of the gluteus and hip abductor muscles[9]. The study[8] confirmed that exercise promoted biochemical changes that benefited the tendon when it received mechanical stimulation.

Study[11] mentioned that exercise, together with load management, is a strategy considered effective in the non-surgical management of tendinopathy. Another study[5] found that individuals with gluteal tendinopathy had weakness in the abductor musculature, and this weakness implies an inadequate functioning of the adduction control, which in turn starts to have an excessive action in unilateral loading situations, compromising functionality.

In a comparative study[6], the Globe protocol was used, a program of simulated exercises with rehabilitation, associating the transdermal cream with exercises not directed at the gluteal tendons with exercises for gluteal activation, knee joint extension and calf elevation in sitting, comparing the effect among them. Thus, the same protocol used in a later study of exercises associated with the loading of the gluteal tendons, with the Globe protocol, can have superior effects to those presented in a simulated exercise program, which does not emphasize the tendon management.

Table 1. GTPS interventional protocols and study outcomes on the effects on pain and functionality

Authors	Intervention protocol	Duration	Predominant modality	Outcomes
Ganderton et al.[9]	**Characteristics of the sample:** Postmenopausal women with lateral hip pain. (n = 94) **Intervention:** G1: Globe intervention group (n=46) (Gluteal La Trobe University exercise program) Globe Group (GLOBE Protocol) Therapy with isometric exercises of gluteus medius and minimus, quadriceps, and triceps sural being performed in 4 stages G2: Placebo - Group of simulated exercises (n=48) Performed seated exercises not directed to the therapeutic loading of the gluteal tendons or the strengthening of the kinetic chain. Exercises aimed at gluteal activation, extension of the knee joint, and elevation of the calf (sitting).	Initial duration: 12 weeks Reassessed after: 52 weeks	Conservative	There was improvement in pain and functional capacity in both groups, being more effective in the Globe intervention group, with respect to pain and functionality.

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Table 1. GTPS interventional protocols and study outcomes on the effects on pain and functionality

Authors	Intervention protocol	Duration	Predominant modality	Outcomes
Ganderton et al.[6]	**Characteristics of the sample:** 116 participants were recruited, considering possible dropouts. Postmenopausal women with GTPS randomly allocated to the exercise group and the transdermal cream/hormone therapy group (n=100) **Intervention:** All participants received guidance on their condition, necessary care, and procedures to be performed at home when performing their duties. (I) Globe exercises and placebo cream (n=25) (II) Simulated exercise and MHT transdermal cream (menopause hormone therapy) - (n=25) (III) Simulated exercise and placebo cream - (n=25) (IV) Globe exercises and MHT transdermal cream - (n=25) **Exercise group with intervention *:** Globe Protocol (Gluteal La Trobe Protocol). It consists of isometric exercises of the gluteus medius and minimus, quadriceps, triceps sural, **Group of simulated exercises *:** A simulated exercise program not intended for the rehabilitation of gluteal tendons and transdermal cream. It consists of exercises for the kinetic chain without load, in the sitting position. *Received transdermal cream and placebo cream.	12 weeks Gradual progression of exercises over 4, 8, 12 weeks Results evaluated in these periods	Conservative	A study identified whether an exercise program aimed at loading gluteal tendons, in addition to strengthening the kinetic chain, has superior effects than a simulated exercise program for low-load lower limbs.
Mellor et al.[11]	**Characteristics of the sample:** Females with GTPS (n=201) **Intervention:** G1: Exercise group and load management with functional training exercises, strengthening of the hip and thigh muscles, with an emphasis on the adductors hip muscles; self-management of the dynamic control of adduction during function and educational guidelines related to the care of tendons in the affected area, through printed leaflets, verbal explanations and audiovisual resources (n=67). G2: Local corticosteroid injection group (n=67) G3: Control group with spontaneous improvement (n=67)	12 months Results evaluated in: 4, 8, 12, 26, 26, 52 weeks	Combined	The corticosteroid injection is effective in improving pain in the short term when compared to the control group. However, in the short or long term, it has better results and a lower recurrence rate when an exercise and load management program is established. (Ongoing study)
Morton et al.[28]	**Characteristics of the sample:** Participants diagnosed with GTPS aged 18 to 80 years (n=31). Retrospective group (Age range: 46 to 55) and Prospective group (Age range: 56 to 65) **Intervention:** - Injection of *marcaine and hydrocortisone*; - Educational exercises program with postural guidelines to avoid positions compressing the gluteal tendons (recommendations regarding lateral posture and excessive adduction in the sitting position); - Exercises with isometric and concentric-eccentric resistance for hip extensors, endurance with central body control exercises and emphasis on lateral trunk control; The established protocol was directed to 8 prospective individuals (attended by a radiofrequency specialist in the medical clinic for 5 months, evaluated after 6 weeks) and 23 retrospective ones (extracted from a database of 2 years before) of the short and medium-term treatment with the high-volume image-guided injections with structured rehabilitation.	5 months (both groups)	Combined	Both retrospective and prospective groups showed improvement in pain after the injection of corticosteroids, followed by structured rehabilitation. The combination of injection and structured rehabilitation provides short, medium, and long-term benefits, although further studies are necessary to confirm the long-term effects. The sample is considered insufficient to reach decisive conclusions, and the established protocol requires more information.

Source: Research data, 2019.

The study[24] concluded that the treatment of tendinopathy must include tendon loading with adequate gradual loading exercises. Studies concerning conservative treatment strategies are still scarce. However, this review guides these practices based on research that has shown effectiveness[6,13,25]. Nevertheless, studies that apply other conservative methods and protocols in clinical practice for the treatment of GTPS are needed.

As for the combined treatment, although conservative treatments are considered the gold standard in the mid and long term, they should include instructions on how to modify the activities,

avoiding those positions that aggravate this clinical condition, among other managements. Corticosteroids and local anesthetics injections have been under the spotlight because they can relieve painful conditions. However, they have been effective in the combined strategies, when early administered, showing signs of recurrence when used in more advanced stages[16,26].

However, study[11] emphasized that the conservative treatment concomitant with the use of local corticosteroids injection (CSI) produced long-term effects, thus reducing the chances of recurrence.

While the studies[16,27,28] showed that lateral injections of glucocorticoids alleviated the symptoms in the short term, with improvement in pain and function, in the long term, their effect is minimal. Regarding the importance of pain management, in a conservative combined way (rehabilitation and drugs), the most frequent treatment for tendinopathy is exercise, recommended as the main form of physiotherapy treatment (gold standard), and the effectiveness can be enhanced when associated with interventions with the use of local injection[6,13].

Corroborating another study[29] that confirmed a significant improvement in pain after the corticosteroid injection associated with the exercise program, with improvement in the short and medium-term. However, the exercise program resulted in long--term improvement when compared to corticosteroid injections, with significant improvement in the individuals' quality of life.

As a result, it is necessary to analyze when the combined protocol should be used, and when exclusive rehabilitation or surgical treatment should be prioritized. These directions need to be well defined in order to adopt the most coherent approach with the individual's needs. Self-management, health education, early access to information, can be helpful in conservative treatment strategies. Although there is no consensus in the scientific literature on what is effective in the management of GTPS, the search at this moment is for strategies capable of favoring treatment protocols whose results last for the short, medium and long term.

To assess the risks of bias in the selected studies, the Cochrane tool was used to establish the criteria to analyze its quality. Thus, among the domains contained in the tool, it was observed that in the generation of random sequence, articles 1, 2, 3 and 4 obtained control of the selected participants, either by allocation by the professional's judgment, screening of database with records of diagnosis, or allocation through previous test results, with a high risk of bias.

Regarding the blinding of the allocation, it is not clear in articles 1, 2 and 3 whether there was the risk of uncertain bias or not. However, article 4 established the consultation of the records of the medical clinic in the last five months, and the patients' database of the last two years, to compose the two groups, identifying them, with a high risk of bias. As for the report of the selective outcome, the outcome protocol was previously specified in all articles cited, with a low risk of bias.

Regarding the blinding of the participants and professionals, in articles 1, 2, 3, the authors described it in relation to the participants. However, the information regarding the professionals involved is not described, and in general analysis, there is a probability of low risk of bias, whereas, in article 4, the information is insufficient to consider the low or high risk of bias. As for the blinding of the outcome evaluators and incomplete outcomes, in the authors' considerations, it is assured that the unblinding of the outcome assessment does not compromise the results, with a low risk of bias.

Evaluative clinical trials

The scientific literature points out that clinical trials are essential for the investigation, evaluation, and early identification of the lesion. In this sense, there are different provocative tests and evaluation instruments that collaborate with the investigation of GTPS, usual in the clinical practice, as described in table 2.

Studies[11,15,22,26,27-31] show the use of several clinical tests and questionnaires as an outcome measure to assess pain and function. The most commonly referred to are the greater trochanter palpation tests, screening for extra-articular disease, one-foot support test for 30 seconds, which assesses the greater trochanter pain syndrome, and the modified Ober and Ober tests, which assess the iliotibial band restriction, FABER that assesses the presence of an intra-articular lesion, resistance abduction test and the Trendelenburg sign, which assesses the integrity of the gluteus medius. These tests can provoke the pain symptoms on the greater trochanter, which makes the test a positive finding.

Table 2. Evaluative instruments and tests cited in the selected studies

Authors	Evaluation tools	Provocative tests	CO	SE	ES
Ganderton et al.[9]	VISA-G	FABER (Patrick)	0.90 (inter-rater) movement assessment; 0.47 (inter-rater) Kappa evaluation of the final sensation	57	71
		One-foot Support (30s)	---	100	97.3
		OBER	0.90 ICC for OBP 0.91 ICC for Modified OBP	---	---
		ABD Resistance	0.625 (intra-tester) kappa	73	46
Ganderton et al.[6]	VISA-G; Lateral Hip Pain questionnaire; AQoL-8D questionnaire	---	---	---	---
Mellor et al.[11]	VISA-G	Trendelenburg	0.67(intra-tester) kappa	73	77
		PTM	0.66 (interrater) kappa	80	---
Morton et al.[28]	HAGOS; VAS;	---	---	---	---

SE = sensitivity; CO = reliability; ES = specificity; VAS = visual analog scale; VISA-G = Victorian Institute of Sport Australian Questionnaire; HAGOS = Hip and Groin Outcome Score; PTM = palpation of the greater trochanter; OBP = standardized ober; OBM = modified ober; ABD Resistance = Resistance Hip Abduction.

Assessment techniques are essential to the physiotherapist, and, when done well, they can facilitate the design of more targeted and effective strategies in rehabilitation. The levels of reliability, sensitivity, and specificity mentioned in table 2 were established by several studies cited in the book[19], a reference used in clinical physiotherapy, where at least two of the clinical tests present high sensitivity and specificity in GTPS.

Study[22] pointed out that the direct palpation on the greater trochanter and the one-foot support test have a positive prognostic value for magnetic resonance imaging (MRI) findings, as well as the one-foot support test has a high sensitivity for MRI, and it also emphasizes that these two tests, simultaneously with the FADER test, FADER associated with adduction, increase the diagnostic accuracy since it causes traction load that reproduces painful symptoms[22].

The ADD test causes a compression load in the insertions of the gluteal tendons, which promotes pain laterally to the hip. Therefore, the one-foot support test for 30 seconds has higher sensitivity. They can have specificity evidenced by the MRI findings. According to study[15], the PATRICK or FABER tests are considered key tests since they infer signs of pain over the greater trochanteric region[15].

The study[11] described that the FADER test causes tension of the medius and minimum gluteus tendons on the greater trochanter, compared to the FABER test that generates traction load on the anterior portions of the medius and minimum gluteus, which causes a pain response. It also mentions that the latter has a high sensitivity, specificity, and positive and negative predictive value in the differential diagnosis of GTPS and other hip disorders.

The Trendelenburg sign emphasizes a weakness of abductors, and the Ober test aims to verify the presence of contractures of the medius and maximum gluteus and the iliotibial tract (ITB)[30].

Authors[25] reported that the manifestation of pain could be triggered by tests of direct palpation, resistance abduction, external rotation, and the Trendelenburg sign.

Corroborating, study[15] reports that more studies are necessary to confirm the exact efficacy of clinical trials established for diagnosis, even being considered usual to evaluate GTPS. In study[11], some tests have limited validation. However, they are pointed out as provocative tests in the reproduction of the GTPS symptoms. Another study[22] states that, together, these tests provide a diagnosis accuracy, despite the insufficient consensus among researchers.

Among the evaluative instruments is the VISA-G questionnaire, important for measuring pain together with the tendon load, and allows to estimate functional limitations. The score ranges from zero to 100 points, where a higher score means less pain and better functionality[15,32]. Study[11] mentions that VISA-G is an instrument capable of measuring the degree of disability in individuals with gluteal tendinopathy, based on the VISA questionnaires that have already been developed for other tendinopathies. It stresses that there are reliability and validation of the VISA-G questionnaire regarding the level of disability in the population with gluteal tendinopathy. Following the same line, the study[33] states that the VISA questionnaire is a valid instrument for individuals who have this syndrome.

Another questionnaire used to assess changes in the hip and investigate pain and function called Hip and Groin Outcome Score (HAGOS) check over the peculiar functions or dysfunctions of the hip. The visual analog scale (VAS) is also referred to as an assessment resource, taking an important role with regard to quantifying pain, reports another study[29].

Although the accuracy of clinical trials is limited in view of the diagnosis of GTPS, they are the most common in the clinical practice, with levels of sensitivity, reliability, and specificity that allow their use as an auxiliary resource in an early investigation. In the most current scientific evidence, it was possible to identify the clinical signs and characteristics of the lesion, given the responses obtained with the treatments proposed in the protocols of the included studies.

New studies should be carried out with larger samples, in different socio-cultural and regional realities, to identify the behavior and the influence of the generating factors among the groups, as well as the repercussions of the protocols established for the management of pain and functionality.

CONCLUSION

The scarcity of studies precluded conclusions about the efficacy of the protocols, but they allow to suggest that conservative treatment should be the first choice with specific exercises in conjunction with tendon management and gradual load increase. The combined treatment with corticosteroids or transdermal creams is more effective in the short term. The limitations found in the studies are related to the difficulty of consensus among authors regarding specific criteria of load increment and the use or not of combined therapies.

REFERENCES

1. Mellor R, Bennell K, Grimaldi A, Nicolson P, Kasza J, Hodges P, et al. Education plus exercise versus corticosteroid injection use versus a wait and see approach on global outcome and pain from gluteal tendinopathy: prospective, single blinded, randomized clinical trial. BMJ. 2018;2(361):k662.
2. Nurkovic J, Jovasevic L, Konicanin A, Bajin Z, Ilic KP, Grbovic V, et al. Treatment of trochanteric bursitis: our experience. J Phys Ther Sci. 2016;28(7):2078-81.
3. Habib G, Elias S, Abu-Elhaija M, SakasF, Khazin F, Artul S, et al. The effect of local injection of methylprednisolone acetate on the hypothalamic-pituitary-adrenal axis among patients with greater trochanteric pain syndrome. Clin Rheumatol. 2017;36(4):959-63.
4. Seo KH, Lee JY, Yoon K, Do JG, Park HJ, Lee SY, et al. Long-term outcome of low-energy extracorporeal shockwave therapy on gluteal tendinopathy documented by magnetic resonance imaging. PLoS One. 2018;13(17):e019460.
5. Allison K, Vicenzino B, Wrigley TV, Grimaldi A, Hodges PW, Bennell KL. Hip abductor muscle weakness in individuals with gluteal tendinopathy. Med Sci Sports Exerc. 2016;48(3):346-52.
6. Ganderton C, Semciw A, Cook J, Pizzari T. Does menopausal hormone therapy (MHT), exercise or a combination of both, improve pain and function in post-menopausal women with greater trochanteric pain syndrome (GTPS)? A randomised controlled trial. BMC Womens Health. 2016;16:32.
7. Fearon AM, Cook JL, Scarvell JM, NeemanT. Cormick W, Smith PN. Greater trochanteric pain syndrome negatively affects work, physical activity and quality of life: a case control study. J Arthroplasty. 2014;29(2):383-6.
8. Grimaldi A, Mellor R, Hodges P, Bennell K, Wajswelner H, Vicenzino B. Gluteal tendinopathy: a review of mechanisms, assessment and management. Sports Med. 2015;45(8):1107-19.
9. Ganderton C, Semciw A, Cook J, Moreira E, Pizzari T. 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. 2018;27(6):815-29.
10. Grimaldi A, Fearon A. Gluteal tendinopathy: integrating pathomechanics and clinical

features in its management. J Orthop Sports PhysTher.2015;45(11):910-22.
11. Mellor R, Grimaldi A, Wajswelner H, Hodges P, Abbott JH, Bennell K, et al. Exercise and load modification versus corticosteroid injection versus 'wait and See' for persistent gluteus medius/minimus tendinopathy (the LEAP trial): a protocol for a randomized clinical trial. BMC Musculoskelet Disord. 2016;17:196.
12. Mulligan EP, Middleton EF, Brunette M. Evaluation and management of greater trochanter pain syndrome. PhysTher Sport. 2015;16(3):205-14.
13. Reid D. The management of greater trochanteric pain syndrome: a systematic literature review. J Orthop.2016;13(1):15-28.
14. Schwartsmannr CR, Loss F, de Freitas Spinelli L, Furian R, Silva MF, Zanatta JM, et al. Associação entre bursite trocantérica, osteoartrose e artroplastia total do quadril. Rev Bras Ortop. 2014;49(3):267-70.
15. Ganderton C, Semciw A, Cook J, Pizzari T. Demystifying the clinical diagnosis of greater trochanteric pain syndrome in women. J Womens Health. 2017;26(6):633-43.
16. Lin CY, Fredericson M. Greater trochanteric pain syndrome: an update on diagnosis and management. Curr Phys Med Rehabil Rep. 2015;3:60-6. DOI: 10.1007/s40141-014-0071-0.
17. Whittemore R, Knafl K. The integrative review: updated methodology. J Adv Nurs. 2005;52(5):546-53.
18. Hopia H, Latvala E, Liimatainen L. Reviewing the methodology of an integrative review. Scand J Caring Sci. 2016;30(4):662-9.
19. Cook CE, Hegedus EJ. Orthopedic physical examination tests: an evidence-based approach. 2nd Pearson; 2013.
20. Hirschmann A, FalkowskiAL, Kovacs B. Greater trochanteric pain syndrome: abductors, external rotators. Semin Musculoskelet Radiol. 2017;21(5):539-46.
21. Grimaldi A. Conservative management of lateral hip pain: the future holds promise. Br J Sports Med. 2017;51(2):72-3.
22. Speers CJ, Bhogal GS. Greater trochanteric pain syndrome: a review of diagnosis and management in general practice. Br J Gen Pract. 2017;67(663):479-80.
23. Park KD, Lee WY, Lee J, Park MH, Ahn JK, Park Y. Factors associated with the outcome of ultrasound-guided trochanteric bursa injection in greater trochanteric pain syndrome: a retrospective cohort study. Pain Physician. 2016;19(4):547-57.
24. Vicenzino B. Tendinopathy: Evidence-informed physical therapy clinical reasoning. J Orthop Sports PhysTher.2015; 45(11):816-8.
25. Torres A. Fernández-Fairen M, Sueiro-Fernández J. Greater trochanteric pain syndrome and gluteus medius and minimus tendinosis: nonsurgical treatment. Pain Manag. 2018;8(1):45-55.
26. Fitzpatrick J, Bulsara MK, O'Donnel J, McCrory PR, Zheng MH. The effectiveness of platelet-rich plasma injections in gluteal tendinopathy: a randomized, double-blind controlled trial comparing a single platelet-rich plasma injection with a single corticosteroid. Am J Sports Med. 2018;46(4):933-9.
27. Chowdhury R, Naaseri S, Lee J, Rajeswaran G. Imaging and management of greater trochanteric pain syndrome. Postgrad Med J. 2014;90(1068):576-81.
28. Morton S, Chan O, Price J, Pritchard M, Crisp T, Perry JD, Morrissey D. High volume image-guided injections and structured rehabilitation improve greater trochanter pain syndrome in the short and medium term: a combined retrospective and prospective case series. Muscles Ligaments Tendons J. 2015;5(2):73-87.
29. Redmond JM, Chen AW, Domb BG. Greater trochanteric pain syndrome. J Am Acad Orthop Surg. 2016;24(4):231-40.
30. French HP, Jong CC, McCallan M. Do features of central sensitisation exist in Greater trochanteric pain syndrome (GTPS)? a case control study. Musculoskelet Sci Pract. 2019;43:6-11.
31. Fearon AM, Ganderton C, Scarvell JM, Smith PN, Neeman T, Nash C, Cook JL. Development and validation of a VISA tendinopathy questionnaire for greater trochanteric pain syndrome, the VISA-G. Man Ther. 2015;20(6):805-13.

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