

# FABREX: A NEW CLINICAL TEST FOR DIAGNOSIS GLUTEAL TENDINOPATHY

## FABREX: UM NOVO TESTE CLÍNICO PARA DIAGNÓSTICO DE TENDINOPATIAS GLÚTEAS

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### ABSTRACT

**Objective:** This study aims to describe a simple and accurate semiological method executing a specific maneuver with the lower limb to direct the semiological investigation towards the tendinopathies in the gluteus medius and minimus. **Methods:** Fifty patients participated in the study, with a mean age of  $44.1 \pm 13$  years, with persistent pain on the side of the hip for more than three months. To compare the FABREX (proposed test) and Lequesne semiological tests, in the diagnosis of tendinopathies in the gluteus medius and minimus, Magnetic Resonance Imaging (MRI) was adopted as the gold standard. **Results:** FABREX presented high sensitivity and moderate specificity for tendinopathy in the gluteus medius and high sensitivity and specificity for tendinopathy in the gluteus minimus. **Conclusion:** The proposed test, when positive, can be used to determine the diagnosis of gluteal tendinopathies (high specificity). Moreover, it has high sensitivity, excluding the diagnosis when negative. This study represents the initial step for validating the FABREX test, and can therefore be considered a simple and accurate procedure to identify patients with or without gluteal tendinopathies. **Level of Evidence III, Case Control Study.**

**Keywords:** Hip. Gluteal Region. Tendinopathy.

### RESUMO

**Objetivo:** Esse estudo propõe descrever um método semiológico simples e acurado, por meio de uma manobra específica com o membro inferior, a fim de direcionar a investigação semiológica para as tendinopatias dos glúteos médio e mínimo. **Métodos:** Participaram do estudo 50 pacientes, com média de idade de  $44,1 \pm 13,0$  anos, apresentando dor persistente na face lateral do quadril há mais de 3 meses. A RM foi adotada como padrão ouro, para fins de comparação entre as duas manobras semiológicas (FABREX (teste proposto) e teste de Lequesne) no diagnóstico das tendinopatias do glúteo médio e mínimo. **Resultados:** O FABREX apresentou alta sensibilidade e moderada especificidade para tendinopatia de glúteo médio e alta sensibilidade e especificidade para tendinopatia do glúteo mínimo. **Conclusão:** A manobra proposta, quando positiva, pode ser utilizada para determinar o diagnóstico de tendinopatias glútea (alta especificidade). Além disso, possui alta sensibilidade, descartando o diagnóstico quando negativa. O presente trabalho constitui o passo inicial para validação do teste de FABREX, podendo assim, ser considerado um procedimento simples e acurado para identificar pacientes com ou sem tendinopatias glúteas. **Nível de Evidência III, Estudo de Caso Controle.**

**Descritores:** Quadril. Região Glútea. Tendinopatia.

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### INTRODUCTION

Physical examination of patients with hip pain is not simple.<sup>1-3</sup> The process is quite complex due to a wide range of differential diagnoses that include intra-articular and extra articular pathologies, besides pains in other regions, such as pelvic and vertebral.<sup>2</sup> The Greater Trochanteric Pain Syndrome (GTPS) is a common problem found in clinical practice and its main characteristic is chronic pain on the lateral region of the affected hip, exacerbated when lying on the affected side and in activities such as ascending and descending stairs and long periods of standing.<sup>4</sup> Originally defined as “tenderness to palpation over the greater

trochanter,” this syndrome includes trochanteric bursitis, tendinopathies of the gluteus medius and minimus and the external snapping hip, being more prevalent in women<sup>1,2</sup> and affecting up to 25% of the general population.<sup>2,5,6</sup> The pathogenesis of this syndrome is uncertain and multifactorial, but the tendinopathy of the muscles gluteus medius and minimus, with or without reactive bursitis, is the main cause of pain in the lateral region of the hip.<sup>2-4,6</sup>

Regarding the diagnostic process, anamnesis and physical examination are preponderant at the clinical level, complemented with magnetic resonance imaging (MRI), when possible, which is

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The study was conducted at Hospital Ortopédico e Medicina Especializada (Home).

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considered the gold standard for investigation, since it provides precious details of the relevant soft tissue structures.<sup>7</sup> Lequesne et al.<sup>8</sup> described the main semiological maneuvers used to aid in the diagnosis of gluteus medius and minimus tendinopathies. In the evaluation, the hip and knee are flexed at 90°, with subsequent external rotation of the hip and request of force generation towards internal rotation by the patient.<sup>8</sup>

The anatomical descriptions of the insertions of the mean and minimum glutes and their functions are important information for the functional evaluation and for the development of semiological tests.<sup>9,10</sup> Thus, the lack of an abduction movement during hip flexion in the Lequesne test does not allow the relaxation of the iliotibial complex, and may produce painful sensations related to other reasons that are not associated to the disorders of the gluteus medius and minimus.<sup>11,12</sup> Moreover, at the time of muscle contraction, the patient may not understand the correct movement of the maneuver, directly influencing its outcome. Given the context, finding a more effective and easy-to-implement approach becomes mandatory. Thus, our study proposes a simple and accurate test that can contribute to clinical decision-making. It presents two details which are different from the test proposed by Lequesne: the abduction of the hip in flexion, which is a maneuver that will make the iliotibial complex relax, and the fact that it is a strictly passive test, with no influence on the patient's poor execution on the outcome of the maneuver.

Therefore, this study aimed to describe a semiological method, by means of a specific maneuver, with the lower limb that can direct the semiological investigation to the most common painful cause in GTPS, such as tendinopathies of the gluteus medius and minimus, accurately and with easy execution.

## METHODS

### Study design and participants

This is a cross-sectional study, conducted between 2018 and 2019, involving 50 patients, 42 women and 8 men, with a mean age of 44.1 ± 13 years, diagnosed with Greater Trochanteric Pain Syndrome (GTPS) by experienced specialists in hip disorders. The participants had persistent pain in the lateral face of the hip for more than three months and were treated at the Orthopedic offices of the Orthopedic Hospital and Specialized Medicine (HOME) and Santa Luzia, in the municipality of Brasília, Federal District, Brazil. Among the patients, 26 had tendinopathy in the gluteus minimus, 14 tendinopathy in the gluteus medius and 17 trochanteric bursitis (trochanteric bursitis and tendinopathy in the gluteus minimus: three; trochanteric bursitis, tendinopathy in the gluteus medius, and tendinopathy in the gluteus minimus: 13 and isolated trochanteric bursitis: one), according to the MRI assessment performed (Table 1).

The inclusion criteria were the presence of pain in the anterior, lateral, or posterior region of the trochanter major, pain to the external rotation of the flexed hip at 90° with the remainder of joint mobility without alterations. Participants with the presence of joint pathologies such as coxarthrosis, avascular osteonecrosis of the femoral head, pain from spinal disorders or any arthropathy detected on radiographic examination, as well as undergoing hip surgery or who presented rupture of the tendons were excluded.

All patients were evaluated at the Orthopedic Hospital and Sports Medicine (HOME) or Hospital Santa Luzia. Before participation, the objectives, procedures, and risks of the study were explained to each participant. This study was approved by the Ethics Committee of the University Center of Brasília (UnICEUB) with protocol number 1,800,385. All participants signed an Informed Consent Form before the study.

**Table 1.** Sample characterization. Age (in years) was expressed by mean, standard deviation (SD), minimum and maximum, and categorical data by frequency (n) and percentage (%).

Age (years)	
Average ± SD (minimum - maximum)	44.1 ± 13 (19 – 67)
Gender (n)	
Male	8 16%
Female	42 84%
Injured Hip Side (n)	
Right	25 50%
Left	25 50%
Lequesne Test (n)	
Positive Lequesne	20 40%
Difficulty in achieving the Lequesne	27 54%
FABREX test (n)	
Positive proposal	23 46%
Difficulty in conducting the proposed	2 4%
Pathologies of Great Trochanter Painful Syndrome (n)	
Tendinopathy in the gluteus medius	14 28%
Tendinopathy in the gluteus minimus	26 52%
Trochanteric bursitis	17 34%
Trochanteric bursitis and tendinopathy in the gluteus minimus	3 6%
Trochanteric Bursitis and Tendinopathy in the gluteus medius and minimus	13 26%
Trochanteric bursitis	1 2%

### Instruments

Anthropometric data and clinical variables were initially collected via questionnaire.

MRI was used in the evaluation of the affected hip in all patients who presented the inclusion criteria, seeking to clarify the presence of tendinopathy and specifying the affected tendon.

In the physical evaluation, Lequesne test was applied to each participant of the research, considering itself as positive when the patient reported pain in the lateral region of the hip during the maneuver.<sup>8</sup>

The FABREX test (flexion, abduction, and external rotation), semiological evaluation proposed by our study, was then applied and documented in a simple questionnaire to evaluate the phases of the test.

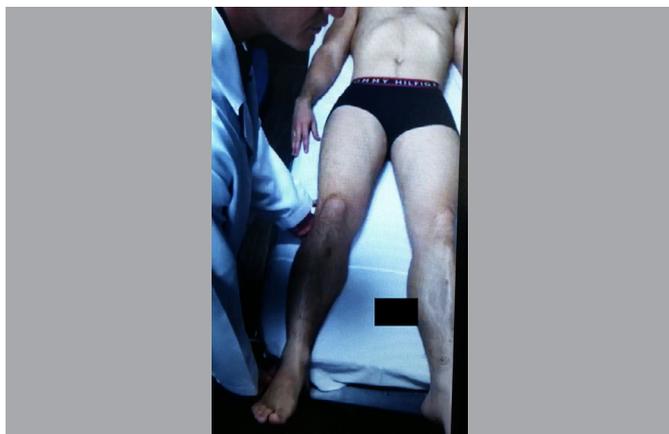
### Procedures

Initially, the participants were evaluated using a questionnaire containing the following analysis variables: name, age, gender, clinical complaint, and time of clinical complaint.

The MRI examination was evaluated by a specialist in musculoskeletal radiology, which was blinded to the results of clinical examinations. The two parts of the tendon of the middle gluteus, the tendon of the gluteus minimus, the trochanteric and subgluteal bursas were systematically analyzed on the images. Tendinopathy was defined as a thickening or signal increase in the tendon area seen on T2-weighted images, without discontinuity of the tendon. Bursitis was defined as a fluid collection in T2-weighted image located in a place containing bursa. MRI was adopted as the gold standard for comparison between the two semiological maneuvers (FABREX (proposed test) and Lequesne test) in the diagnosis of tendinopathies of the gluteus medius and minimus.

The physical evaluation was made by an orthopedist with long-standing experience in semiology, blinded to the results of the imaging examination. Lequesne test was applied leading the hip and knee to a flexion of 90°, with external hip rotation, requesting the patient to perform strength in the direction of internal rotation. The test result was considered positive when the patient reported pain in the lateral region of the hip during the maneuver.

Subsequently, the examiner applied the maneuver proposed by our study (FABREX). In phase one of the maneuver, the patient was positioned in supine position, with the lower limbs in full extension and the examiner positioned next to the hip to be evaluated (Figure 1). In phase 2 of the evaluation, the examiner holds the ankle with one hand and supports the patient's knee with the other, passively performing a 90° flexion of the hip and knee on the side to be examined. Upon completing hip and knee flexion, the examiner performed a hip abduction at 50° (Figure 2). In phase 3 of the proposed examination, the examiner stabilizes the knee and performs a passive external rotation smoothly (Figure 3).



**Figure 1.** FABREX test phase 1. Patient positioned in supine position, with the lower limbs in full extension and the examiner positioned next to the hip to be examined.



**Figure 2.** FABREX test phase 2. The examiner holds the ankle with one hand and supports the patient's knee with the other, passively performing a 90° flexion of the hip and knee on the side to be examined. Upon completing hip and knee flexion, the hip was passively abducted at 50°.



**Figure 3.** FABREX test phase 3. Examiner stabilizes the knee and smoothly performs a passive external rotation.

The evaluation was considered positive when the patient referred to pain in the topography of the large trochanter, suggesting tendinopathy of the glutes medius and minimus. The participants were evaluated again by the same evaluator after 30 days.

### Statistics

The normality of data distribution was determined by the Shapiro-Wilk test. Descriptive statistics (mean and standard deviation) was used to describe anthropometric and clinical characteristics. The first step of the analysis was to evaluate the accuracy of the FABREX and Lequesne test. Subsequently, the two semiological evaluations were compared regarding the difficulty of performance, analyzed by the Fisher's exact test.

The significance determination criterion adopted was the level of 5%. Statistical analysis was performed by SPSS software v. 22.0.

### RESULTS

Table 1 shows the anthropometric and clinical characteristics of the 50 patients used in the accuracy analysis of the FABREX test. FABREX was positive in 12 out of 14 patients (sensitivity of 85.7%, specificity of 69.4% and agreement of 74%) for tendinopathy in the gluteus medius (Table 2) and 21 out of 26 (sensitivity of 80.8% specificity of 91.7% and agreement of 86%) for tendinopathy in the gluteus minimus (Table 3).

**Table 2.** Reliability analysis of the Lequesne and FABREX tests for the diagnosis of middle gluteus tendinopathy. Accuracy measures and coefficient Kappa.

Test/Result	Tendinopathy gluteus medius		Sens. (%)	Spec. (%)	PPV+ (%)	NPV- (%)	Accuracy (%)	Kappa	
	present	absent						value	p-value
LEQUESNE	pos	11	78.6	75	55	90	76	0.47	0.0005
	neg	3							
Proposed PHASE 3	pos	12	85.7	69.4	52.2	92.6	74	0.46	0.0004
	neg	2							

Sens: sensitivity; Spec: specificity; PPV+: positive predictive value; NPV-: negative predictive value; Accuracy: percentage of positive and negative concordances.

**Table 3.** Reliability analysis of the Lequesne and FABREX tests for the diagnosis of middle gluteus tendinopathy. Accuracy measures and coefficient Kappa.

Test/Result	Tendinopathy gluteus minimus		Sens. (%)	Spec. (%)	PPV+ (%)	NPV- (%)	Accuracy (%)	Kappa	
	present	absent						value	p-value
LEQUESNE	pos	17	65.4	87.5	85	70	76	0.52	0.0001
	neg	9							
Proposed PHASE 3	pos	21	80.8	91.7	91.3	81.5	86.0	0.72	<0.0001
	neg	5							

Sens: sensitivity; Spec: specificity; PPV+: positive predictive value; NPV-: negative predictive value; Accuracy: percentage of positive and negative concordances.

Regarding Lequesne test, the positive diagnosis was found in 11 out of 14 patients (sensitivity of 78.6%, specificity of 75%, with the percentage of agreement of 76%) for tendinopathy in the gluteus medius (Table 2) and 17 out of 26 (sensitivity of 65.4%, specificity of 87.5% and agreement of 76%) for tendinopathy in the gluteus minimus (Table 3).

Finally, FABREX showed 4% of difficulty in performing, while Lequesne test showed 54% ( $p < 0.0001$ ) (Table 4). This analysis indicates that FABREX test presented less difficulty in execution, according to the hypothesis raised by our study.

**Table 4.** Comparison between the difficulty of the FABREX and Lequesne test. It provides the frequency (n) and the percentage (%) of the difficulty of performing the Proposed test according to the difficulty of performing Lequesne test (with difficulty and without difficulty). The inferential analysis was composed by Fisher's exact test.

PROPOSED	LEQUESNE				Total
	with difficulty		without difficulty		
	n	%	n	%	
with difficulty	2	7.4	0	0	2
without difficulty	25	92.6	23	100	48
Total	27		23		50

## DISCUSSION

Semiological maneuvers have significant importance in orthopedic clinical practice, since they contribute to the diagnosis of lesions, confirming or eliminating specific musculoskeletal problems.<sup>13</sup> Lequesne et al.,<sup>8</sup> described the main semiological methods used to direct the diagnostic investigation of tendinopathies in the gluteus medius and minimus,<sup>8</sup> most common painful cause in GTPS<sup>14-16</sup>. However, the movement of the lower limbs in the resistance internal rotation maneuver described by the author does not allow the relaxation of the iliotibial complex and may generate symptomatology for other reasons not related to the gluteus medius and minimus.<sup>11-13</sup> Thus, this study aimed to describe a simple and accurate test to assist in clinical decision-making and compare it with the resistance internal rotation maneuver described by Lequesne and with MRI findings.

The anthropometric and clinical characteristics of the population in our study were like those found in previous investigations,<sup>6,8,13-15</sup> presenting female as the predominant gender and the presence of tendinopathies of the gluteus medius and minimus as the greatest cause of pain in the Greater Trochanteric Pain Syndrome (GTPS). Trochanteric bursitis was indicated in 17 hips, but this pathology was identified in association with gluteal pathology in 16 hips, like the study conducted by Bird et al.,<sup>13</sup> in which trochanteric bursitis was a common and unidentified finding in the absence of gluteal pathology.<sup>13</sup>

FABREX showed high sensitivity and moderate specificity for tendinopathy in the gluteus medius and high sensitivity and specificity for tendinopathy gluteus minimus. As previously mentioned, the relaxation of the iliotibial complex, in association with the strictly passive performance of the test which exclude

the patient's poor execution on the outcome of the maneuver, seem to be the main factors to the accurate results obtained.<sup>11,12</sup> Lequesne et al.,<sup>8</sup> in their study involving 17 patients, evaluated the tests of unipodal support for 30 seconds and resisted internal rotation.<sup>8</sup> The evaluations showed high sensitivity and specificity (100%/97.3% and 88%/97.3%). However, the author indicates that these accuracy values can be associated to the presence of severe gluteal pathology (tendon rupture), present in 15 of the 17 patients evaluated. According to the study by Ganderton et al.,<sup>6</sup> maneuvers used for the diagnosis of gluteal tendinopathies, which involve muscle contraction against resistance of the therapist, demonstrate little sensitivity for pain reproduction. Bird et al.<sup>13</sup> reported that the resistance hip abduction test showed sensitivity of 72.7% and specificity of 46.2%; and the resistance internal rotation showed sensitivity of 54.5% and specificity of 69.2% for the diagnosis of gluteal tendinopathies.<sup>13</sup>

Based on the results of this study, the FABREX test, when positive, can be used to determine the diagnosis of gluteal tendinopathy (high specificity). Besides, it has high sensitivity, discarding the diagnosis when negative. Moreover, our analyses show that the proposed test presented less difficulty in execution, according to the hypothesis raised by this study. Since it is a passive maneuver, we believe that there is no influence of poor execution or non-understanding of the patient, thus generating less difficulty compared to the resistance internal rotation test described by Lequesne. The limitations of this study may serve as guidance to determine future studies. Intra-examiner and inter-examiner reproducibility should be evaluated to consolidate the accuracy of FABREX. Although blinded to the MRI results, the evaluator knew that the patient had a diagnosis of GTPS, and this fact can be considered a bias. Future studies should be conducted with a homogeneous number of men and women.

## CONCLUSION

This study constitutes the initial step to validate the proposed test. The FABREX test showed high sensitivity and moderate specificity for tendinopathy in the gluteus medius and high sensitivity and specificity for tendinopathy in the minimus gluteus, thus being considered a simple and accurate procedure to identify patients with or without gluteal tendinopathies.

However, further studies will be needed to evaluate its reproducibility to contribute to greater precision in the semiological evaluation of gluteal tendinopathy.

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