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Clinical and Ultrasonographic evaluation of patients with Trochanteric Bursitis

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Abstract

Background: Trochanteric bursitis is an inflammation of the greater trochanteric bursa which is a recurrent source of lateral hip pain.

Objective: To assess the diagnostic value of 6 clinical tests that can be used to diagnose trochanteric bursitis and utilize ultrasound as an imaging modality to confirm the diagnosis.

Patients and Methods: This Cross-sectional study included 85 consecutive patients who had been experienced lateral hip pain in the greater trochanteric area for at least 6 weeks with at least one of the following features: pain on lying on the affected side, pain while climbing stairs or when sitting. Six clinical tests on examination that elicit pressure on the greater trochanteric region were performed to evaluate their value to diagnose trochanteric bursitis and then ultrasound was utilized to confirm the diagnosis.

Results: A total of 85 participants were enrolled in the study. Tenderness to deep palpation was the most accurate sign in predicting the diagnosis, with a sensitivity of 100% and specificity of 81.8%. There were no significant differences between its results and the ultra-sonographic findings (p=0.500). Regarding the other tests, there were significant differences between their results and the results of ultrasound (p< 0.001).

Conclusion: Tenderness to deep palpation of the greater trochanter, combined with ultrasound imaging modality, is likely to have the best diagnostic value for evaluation of trochanteric bursitis in patients complaining of lateral hip pain around the greater trochanter region.

Keywords: Trochanteric Bursitis, evaluation, clinical tests, ultrasound

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Introduction

Trochanteric bursitis (TB), also referred to as greater trochanteric pain syndrome (GTPS) or greater trochanteric bursitis (GTB), is a common disorder and a frequent source of lateral hip pain. The bursa is a sac filled with a thin fluid that serve as a lubricating medium during the physiological range of motion for nearby gluteal tendons to gracefully slide over. The trochanteric bursa is situated over the lateral portion of the hip, lying deep to the iliotibial band (ITB) and superficial to the hip abductor muscles. The trochanteric bursa can become inflamed due to its superficial location and proximity to the large tendons, is an ongoing pain concern and a frequent reason for consultation with an orthopedic surgeon or family physician [1]. Trochanteric bursitis can occurs due to

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repeated microtrauma, blunt trauma, or be idiopathic. Greater trochanteric pain syndrome is common disease that affects 15% of women and 8% of men [2]. Most commonly affected women are middle -age group [3]. Patients frequently complain of pain in the lateral aspect of the hip, around the greater trochanteric region that worsens when they bear weight or when they sleep on their side [4]. Occasionally, pain in the lateral thigh, radiate to the knee. The disease can be mistaken for typical hip pain triggers such as hip osteoarthritis, lumbar spine radiculopathy, and pelvic pathology [5,6]. The gold standard for diagnosing greater trochanteric bursitis is a physical examination. To increase the accuracy of the diagnosis, a combination of tests may be employed. Long-term activity or movements of muscles that stabilize the pelvis, like standing on one leg, might exacerbate pain7. The second-line examinations of value for confirming the diagnosis are ultrasound and MRI. For the diagnosis of GTPS [8], diagnostic ultrasonography has a good positive predictive value (PPV). The expected outcome includes a thickened, fluid-filled, and inflamed trochanteric bursa, torn gluteus medius or minimus tendons, or tendinopathic echogenic findings.

Patients and Methods

This study is an observational cross-sectional study and was carried out at the rheumatology consultation department at Rizgary Teaching Hospital and at outpatient rheumatology clinic in Erbil City during the period from 1st of November 2021 to 1st of April 2022 (five months). A total of 85 consecutive patients (age≥18 years) with features of lateral hip pain in the greater trochanteric area for at least 6 weeks with at least one of the subsequent features: pain during lying on the affected side; pain during climbing stairs or when sitting were included in the study. Exclusion criteria were: patient aged <18 years, patients with systemic diseases and other autoimmune diseases, steroid injection for the lateral hip in the last 12 months, previous back surgery, total hip or knee arthroplasty and patient on systemic steroids. The study protocol was approved by the ethical committee at the College of Medicine/ Hawler Medical University. Approval from the Erbil directorate of health also guaranteed through an official letter. The patients had been assured that the information obtained from them will not be used outside the research purpose and the information will not be disclosed to others. A signed consent was obtained from all patients for being included in the study.

Clinical examination

Six clinical examination tests that elicit pressure on the greater trochanteric region were performed to evaluate their value to diagnose trochanteric bursitis sequentially as described below; positive test was recorded if the patients reported pain while performing the clinical test.

Clinical Pain-Provocation Tests

Deep palpation: The patient is laid on his or her side with the afflicted hip on top, and then the hips and knees are flexed by roughly 60 degrees. To check for tenderness, the trochanteric region is palpated. The development of pain during palpation is reported as a positive test result.

FADER test: While the patient is lying supine, the hip is passively flexed to 90 degrees, abducted, and externally rotated as

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far as it could go. This test aims to increase both tensile and compressive stress on the gluteus medius and gluteus minimus tendons at the greater trochanter by positioning the hip and the overlying iliotibial band.

ADD test: The patient is positioned side-lying, with the lower leg supported, and the knee extended in neutral rotation, with the femur aligned with the trunk (0° hip extension), and the hip and knee beneath flexed 80–90 degrees. After that, the pelvis is stabilized with one hand while the hip is passively pushed through a frontal plane motion into end range hip adduction with overpressure. The test makes the lateral gluteal tendon insertion under strain and compressive force [9].

Resisted hip abduction: The patient is side-lying, and his testing leg is passively positioned in a 45° abduction. The patient is then instructed to maintain this position (abduction) against the examiner's hand which is placed 1 cm above the lateral malleolus and to exert resistance.

Test of FABER: The ipsilateral foot is placed on the opposite thigh, slightly above the knee, with the participant's hip bent and abducted. To maintain pelvic stability, an external rotation, force is given to the contralateral ASIS (anterior superior iliac spine) and the ipsilateral knee.

Single-leg stance test (SLS): The patient is instructed to balance on the wall for 30 seconds while standing on the injured leg with the contralateral knee flexed. A positive test result is noted as difficulty keeping in a stationary position [10].

Ultrasound examination

After performing the six diagnostic clinical tests, all patients were sent for ultrasonography examination of the lateral part of the affected hip; they were all performed by the same radiologist. The utilized US is Samsung HS50 using a device with a multi-frequency probe (3_14 MHz)[11]. Participants were assessed while lying flat on their backs with their legs straight and their hips externally rotated 15 to 20 degrees. With the patient lying on the opposite side and the hip and knee flexed 15 to 20 degrees, the trochanteric region was examined [8]. In all US tests, the hip was scanned longitudinally and transversely on both sides to assess the larger trochanteric area. The outcomes of US examination were Trochanteric bursitis (thick fluid collection) and/or other associated different pathologies [11].

Statistical Analysis

The statistical package for social sciences (SPSS, version 25) was utilized for data analysis. The categorical variables were presented using frequencies and percentages. The numerical variables were estimated as means and standard deviations (SDs). When the outcomes of the clinical examination were compared with the ultrasonographic findings of the same patients, as in the following table, the McNemar test was applied (in the 2x2 table):

		Ultra-sonography			P (By McNemar)
		Positive	Negative		
Clinical findings	Positive	TP	FP	TP+FP	
	Negative	FN	TN	FN+TN	
Total		TP+FN	FP+TN	Grand total	

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TP, TN, FP, and FN stand for true positive, true negative, false positive, and false negative, respectively.

Sensitivity calculated by TP / (TP+FN) *100

Specificity calculated by TN / (FP+TN) *100

Positive predictive value (PV+): TP / (TP+FP) * 100

Negative predictive value (PV -): TN / (FN+TN) * 100

Total agreement = (TP + TN) / Grand total

Statistical significance was determined by a P-value of ≤ 0.05

Results

The total number was 85 patients. Their mean age (SD) was 49.8 (11.6) years , the median was 50 years, and the age range was 20-72 years. More than half of the patients were aged 50 or older than 50 (30.6% were aged 50-59 years and 23.5% were aged ≥ 60 years). The majority (78.8%) were female, and more than half (56.5%) were housewives. The majority (83.5%) were living in urban areas, and 44.7% were obese as shown in Table (1).

Table (1): Basic characteristics

	No.	(%)
Age (years)		
< 40	15	(17.6)
40-49	24	(28.2)
50-59	26	(30.6)
≥ 60	20	(23.5)
Gender		
Male	18	(21.2)
Female	67	(78.8)
Occupation		
Employer	14	(16.5)
Housewife	48	(56.5)
Teacher	8	(9.4)
Worker	10	(11.8)
Retired	3	(3.5)
Student	2	(2.4)
Residency		
Urban	71	(83.5)
Rural	14	(16.5)
Body mass index (Kg/m^2)		
Normal	18	(21.2)
Overweight	29	(34.1)
Obese	38	(44.7)
Total	85	(100.0)

More than half (52.9%) of the patients presented with right sided lateral hip pain, and 44.7% presented with left sided pain, as presented in Table 2, which also shows that the pain was severe in 58.8% of the patients. More than one third (37.6%) of the patients mentioned that the pain radiates to the buttock, and 16.5% mentioned it radiates to the knee, while 42.4% mentioned it radiates to both buttock and knee. The majority

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(96.5%) of the patients had pain on prolonged sitting, and 94.1% had pain on climbing stairs. Regarding the risk factors for developing trochanteric bursitis it shows that history of excessive walking or running had presented in 29 patients (34.1%) as the commonest risk factor, History of repetitive falls or trauma had presented in 17 patients (20%) while none of the patients had leg length discrepancy. The other clinical signs and symptoms are presented in Table (2).

Table (2): Clinical characteristics

	No.	(%) n = 85
Side and site of the pain		
Right	45	(52.9)
Left	38	(44.7)
Both sides	2	(2.4)
Severity of the pain		
Moderate	35	(41.2)
Severe	50	(58.8)
Pain radiation		
Knee	14	(16.5)
Buttock	32	(37.6)
Both	36	(42.4)
No radiation	3	(3.5)
Pain on lying down on the affected side	52	(61.2)
Pain on climbing stairs	80	(94.1)
Pain during prolonged sitting	82	(96.5)
Pain related sleep disturbance	50	(58.8)
A history of excessive walking or running	29	(34.1)
History of falls or repetitive trauma	17	(20.0)
Limping on walking	17	(20.0)
Use of NSAIDs to ease the pain	63	(74.1)
Leg length discrepancy	0	(0.0)

* Note: Each patient may have more than one presentation

Clinical examination results

Six clinical examinations/tests had been used to diagnose trochanteric bursitis, and the validity of these tests were tested by comparing the results with the ultra-sonographic findings as presented in Table 3a and 3b. All the patients tested positive to 'Pain on resisted hip abduction' but only 74 out of 85 were true positive (87.1%).

'Tenderness to deep palpation of the greater trochanter of the hip' gave 100% sensitivity, 81.8% specificity. It had a 97.4 % positive predictive value and a 100% negative predictive value. There was 97.6 % total agreement. There was no significant difference between its results and the ultra-sonographic findings (p = 0.500).

Regarding the other four tests: FABER test had low sensitivity 35.1% but high specificity 90.9%. Single leg stance test (SLS) gave 63.5% sensitivity, 54.5% specificity. FADER test gave sensitivity 23%, specificity 72.7%. ADD test gave sensitivity 36.5%, specificity 72.7%. They

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had relatively low sensitivity and moderate specificity, and there were significant differences between their findings and those of the ultrasonography ($p < 0.001$).

Table (3a): Clinical tests results compared to ultrasound findings to diagnose trochanteric bursitis

		Ultrasound finding			
Tests		**Positive**	**Negative**	**Total**	**P (McNemar)**
Abduction*	Positive	74	11	85	NA
	Negative	0	0	0	
Tenderness**	Positive	74	2	76	0.500
	Negative	0	9	9	
Stance***	Positive	47	5	52	<0.001
	Negative	27	6	33	
Faber test	Positive	26	1	27	<0.001
	Negative	48	10	58	
Fader test	Positive	17	3	20	<0.001
	Negative	57	8	65	
ADD test	Positive	27	3	30	<0.001
	Negative	47	8	55	

*Pain on resisted hip abduction. *Tenderness to deep palpation of the lateral aspect of the hip. ***Single leg stance test

Table (3b): Validity of the clinical tests compared to the ultrasound findings to diagnose trochanteric bursitis

	Sensitivity %	**Specificity %**	**PV^+ %**	**PV^- %**	**Total agreement %**
Abduction	100.0	NA	87.1	NA	87.0
Tenderness	100.0	81.8	97.4	100.0	97.6
Stance	63.5	54.5	90.4	18.2	62.4
FABER	35.1	90.9	96.3	17.2	42.4
FADER	23.0	72.7	85.0	12.3	29.4
ADD	36.5	72.7	90.0	14.5	41.2

US Findings

For the analysis, a total of 85 patients and 87 greater trochanter ultrasound tests (two of whom got bilateral US evaluation) were carried out. The final diagnosis obtained from ultrasound examination showed that 58 patients (68.2%) had trochanteric bursitis alone which described as (a well-defined thick fluid collection in the greater trochanter area with different measures related to the muscular tendon);16 patients (18.8%) had trochanteric bursitis in addition to hip osteoarthritis; 5 patients (5.9%) had gluteal tendinopathy which prescribed as (heterogeneous tendon that has swollen and lost its usual fibrillary pattern, either with or without calcifications overlaid.) and in 6 patients (7.1%), no abnormality was detected.

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Table (4): Ultrasound findings

	No.	(%)
Trochanteric bursitis	58	(68.2)
Trochanteric bursitis and OA	16	(18.8)
Gluteal tendinopathy	5	(5.9)
No abnormality detected	6	(7.1)
Total	85	(100.0)

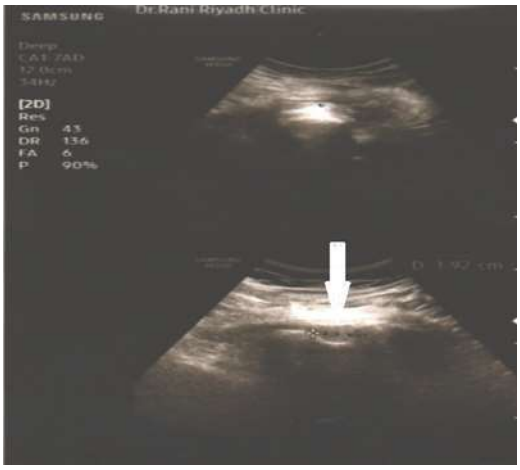

Figure (1): Ultrasound of a 55 years old woman with left sided hip pain, showing a small well-defined thick fluid collection in the region of greater trochanter of the left femur, measures (19*8mm), related to the muscular tendon, no mass lesion seen; features of trochanteric bursitis

Discussion

Global studies regarding the clinical and ultrasound evaluation of trochanteric bursitis are rare, and the available studies did not report any significant association between ultrasound and clinical findings. Our study assessed the diagnostic usefulness of six clinical hip tests for identifying trochanteric bursitis in patients complaining of lateral hip pain, in order to know which of the tests has the most significant diagnostic value. An ultrasound examination was done to compare its findings with the clinical examination results and to define other associated pathologies, as previous studies proved that trochanteric bursitis rarely occurs alone. The clinical examinations selected for this investigation were those that have been deemed.

The majority of the demographic and clinical characteristics of our study's participants matched those observed in a previously published series of GTPS [3,12-17]. The current study data revealed significant female preponderance, mean age between 50 and 70 years, extended symptom duration and rarity of bilateral involvement. Different studies worldwide reported different sensitivities, specificities of the diagnostic clinical tests and different ultrasonographic findings.

According to the present study, among all tests described previously, tenderness to deep palpation was reported to be the most sensitive and the most accurate test to diagnose trochanteric bursitis. This is in line with a previous prospective cross-sectional study by Woodley *et al.*[18], in which a

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clinical examination and magnetic resonance imaging were performed in 40 patients with unilateral lateral hip pain (LHP) to determine which diagnostic tests were good indicators of gluteal tendinopathy or partial tears, bursitis, or arthritic changes. The physician clearly considered palpation in and around the greater trochanter to be the most provocative clinical exam.

Our study was in contrast with the most recent article; Grimaldi *et al*.[9]; 65 patients presenting with lateral hip pain, evaluated the usefulness of seven clinical tests which included (palpation, resisted hip abduction, tests of FABER, ADD, ADD with resistance, FADER, FADER with resistance to diagnose MRI-confirmed gluteal tendinopathy or bursopathy. They discovered that the most useful combination for diagnosis is probably the combination of the most sensitive test; palpation, and the most specific tests (SLS, FADER-R, ADD-R). The key distinction between our study and their study, is that they added resistance to (FADER and ADD), which raised both tests sensitivity, specificity diagnostic accuracy; thus improving their diagnostic value.

Another study by Ganderton *et al*[10] compared the outcomes of ten clinical tests' accuracy in diagnosing GTPS in 46 women (28 symptomatic, 18 asymptomatic) with MRI findings. The study revealed that the tests with the highest diagnostic accuracy for GTPS were the FABER test, palpation, resisted hip abduction, and the resisted external derotation test. The difference from our study may be related to the small sample size and the use of clinical tests thought to cause excessive compression on the gluteus medius and minimus tendons.

In other studies, in contrast to palpation, other tests showed low to moderate diagnostic accuracy rates. In a study by lequesne *et al*.[12], they evaluated the diagnostic accuracy of (SLS and resisted external derotation test) to diagnose gluteal tendinopathy, as well as bursitis in patients presented with lateral hip pain. Both tests revealed a very high diagnostic accuracy rate which disagree with our results. This discrepancy could be explained by; first, the patients had long-term refractory GTPS (13 months); this protracted period suggests extensive lesions that can cause irritation when the tendon is actively stretched. Second, the postural settings they suggested in these 2 tests were the most advantageous for tendon stretching.

Ultrasound is a well-established method for identifying hip abductor tendon anomalies, such as tendinosis and tears in both patients with and without hip replacements. It is also a invaluable method to show excessive bursal fluid [15,19-22].

Due to its tolerability, accessibility, excellent cost-benefit ratio, and extremely precise resolution of fibrillary alignment and vasculature, diagnostic ultrasound has an increased usage and appears appropriate as a first-line imaging tool that provides dynamic and reliable evaluation of the most frequently presented pathologies (bursitis and tendon pathology: tendinosis, partial- and full-thickness tendon tears) in comparison with MRI, and can also be used therapeutically to guide injections [23].

Trochanteric Bursitis had the most heterogeneous US definitions in many studies. In the present study ultrasound definition of trochanteric bursitis was well-

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defined an echoic or hypoechoic thick fluid collection > 2mm in the region of greater trochanter of the femur related to the muscular tendon). These results are in line with many previous studies in which they used ultrasonography as the proper diagnostic or therapeutic imaging modality.

In a study by Ruta *et al*.[11], they examined the prevalence of several abnormal US findings in 96 individuals with GTPS and identified bursitis as fluid distention of the trochanteric bursa as a well-circumscribed anechoic collection (>2 mm) situated at the lateral aspect of the greater trochanteric bursa deep to the gluteus maximus.

In another study, Hilligsøe *et al* [23], characterized bursitis as a collection of anechoic fluid where the trochanteric bursa should be. This study compared the different ultrasound abnormalities that were described in the previous researches by different authors and they all were different from our results. It included studies by (McEvoy *et al.*, Bolton *et al*.), who reported the presence of bursitis in the subgluteus medius or minimus bursa. And (Ramirez et al) defined bursitis as well defined, localized anechoic or hypo-echoic area at the site of the anatomic bursa which was compressible by the transducer.

In the current study, an associated pathologies in addition to bursitis was found during ultrasound examination, named joint osteoarthritis in 16 (18.8%) patients. This is nearly compatible with a study done in 1985 by Schapira *et al*.[24]; they assessed patients with trochanteric bursitis diagnosed by clinical criteria only. They found associated hip osteoarthritis in 16 patients out of 72 patients diagnosed as having trochanteric bursitis.

But incompatible with a study by, *long et al*.[19] whom they have analyzed 877 patients with greater trochanteric pain. They discovered that 8.6% of the patients also had bursitis and gluteal tendinopathy. The differences between the studies can be attributed to the large number of patients they enrolled in the study and the fact that their study's goal was to demonstrate that bursitis was not the most frequently observed abnormality in patients with GTPS features and that bursitis found in association with gluteal tendinopathy.

In the present study, normal US findings were present in only 6 patients (7.1%) out of 85 patients despite their positive clinical features and clinical examinations. The normal presentation of their ultrasound could be related to different pathologies which we didn’t look for in our study. These pathologies can be mistaken for trochanteric bursitis like Femoroacetabular impingement, other lesions that comprise GTPS, Osteitis pubis, iliopsoas tendinopathy/bursitis or pelvic pathology which may present as referred lateral hip pain.

Conclusions

Tenderness to deep palpation of the greater trochanter, combined with ultrasound imaging modality, is likely to have the best diagnostic value for evaluation of trochanteric bursitis in patients complaining of lateral hip pain around the greater trochanter region.

Limitations

1.The sample size is relatively small, making it hard to generalize the results. Although trochanteric bursitis is an infrequent disease, a larger number of participating patients would be recommended for further studies.

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2.It is a cross sectional study and it lacks control group. physical examination in asymptomatic patients was not performed.

3.We didn't add resisted muscle contraction to the clinical tests which has an important role in increasing sensitivity and specificity of the clinical tests which must added in future studies.

4.The descriptions of the greater trochanteric pain syndrome and US approaches lacked sufficient methodological quality. This may provide an explanation for the inconsistent prevalence of US findings. Future GTPS studies will be more reliable if definitions are standardized.

Recommendations

For patients with increased trochanteric pain, a precise diagnosis is crucial. A comprehensive history must be taken from the patient, including information on any trauma, the mechanism of damage, the kind and duration of pain, aggravating and mitigating factors, and previous surgical procedures. For the differential diagnosis of greater trochanteric pain, a physical examination and an imaging technique are required; ultrasonography has been proven to be a crucial tool for the syndrome of greater trochanteric pain. To confirm the pathology causing GTPS and rule out alternative diagnoses, US examination of the lateral hip is extremely important [23].

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Conflict of interest: Nil

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التقييم السريري والموجات فوق الصوتية لمرضى التهاب الجراب المدوري

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الملخص

خلفية الدراسة: التهاب الجراب المدورى هو التهاب يصيب الجراب المدور الأكبر وهو مصدر متكرر لآلام الورك الجانبية.

اهداف الدراسة: لتقييم القيمة التشخيصية لستة اختبارات سريرية يمكن استخدامها لتشخيص التهاب الجراب المدورى واستخدام الموجات فوق الصوتية كطريقة تصوير لتأكيد التشخيص.

المرضى والطرائق: تضمنت هذه الدراسة المقطعية ٨٥ مريضًا متتاليًا كانوا يعانون من ألم الورك الجانبي في منطقة المدور الأكبر لمدة ٦ أسابيع على الأقل مع واحدة على الأقل من السمات التالية: الألم أثناء الاستلقاء على الجانب المصاب ؛ ألم أثناء صعود السلالم أو عند الجلوس. تم إجراء ستة اختبارات سريرية تستحث الضغط على منطقة المدور الكبرى لتقييم قيمتها لتشخيص التهاب الجراب المدور ثم تم استخدام الموجات فوق الصوتية لتأكيد التشخيص.

النتائج: تم تسجيل ما مجموعه ٨٥ مشاركًا في الدراسة. كانت الرقة للمس العميق هي الأكثر دقة في التنبؤ بالتشخيص بحساسية ١٠٠٪ ونوعية ٨١,٨٪. لم تكن هناك فروق ذات دلالة إحصائية بين نتائجه ونتائج التصوير فوق الصوتي (ع = ٠,٥٠٠). بالنسبة (P <0.001) للاختبارات الأخرى ، كانت هناك فروق ذات دلالة إحصائية بين نتائجها ونتائج الموجات فوق الصوتية.

الاستنتاجات: من المرجح أن يكون الاختبار السريري الأكثر حساسية (الرقة عند الجس العميق للمدور الأكبر) جنبًا إلى جنب مع طريقة التصوير بالموجات فوق الصوتية ، أفضل قيمة تشخيصية لتقييم التهاب الجراب المدور في المرضى الذين يشكون من آلام الورك الجانبية حول منطقة المدور الأكبر.

الكلمات المفتاحية: التهاب الجراب المدوري ، التقييم ، الاختبارات السريرية ، الموجات فوق الصوتية

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