Original Articles

Diagnostic Accuracy of Physical Examination of the Knee in Rheumatoid Arthritis: Clinical and Ultrasonographic Study of Joint Effusion and Baker's Cyst

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Introduction: In patients with rheumatoid arthritis (RA), knee pain can be inflammatory, mechanical, or extraarticular. The physical examination (PE) doesn't always detect the presence of knee joint effusion or Baker's cyst (BC) in the knees of these patients.
Objective: To determine the diagnostic accuracy of PE in the diagnosis of effusion and BC in patients with RA evaluated with musculoskeletal ultrasound (MSUS), using this technique as the gold standard for comparison.
Material and method: Three different models of ultrasound machines with a 7.5 MHz linear probe were used (Toshiba Tosbee, Toshiba Capasee, and Siemens Sonoline). A rheumatologist evaluated the presence or absence of knee joint effusion or BC in patients. We registered age, gender, time of evolution of RA, rheumatoid factor, treatment, functional class of RA (FCRA), and previous clinical diagnosis to the MSUS study.
Results: Forty patients (80 knees) with RA were evaluated. Eighty percent were women, mean age 61.3 (15) years. Time since onset of RA was 9.5 (11.3) years, rheumatoid factor was positive in 80%, FCRA I (3 patients), FCRA II (27), FCRA III (8), FCRA IV (2). Fifty-five percent of the patients received methotrexate. Patients referred pain in 26 knees (32.5%). Joint effusion was reported by the clinician in 35 knees (43.7%) and corroborated by MSUS in 31 knees (38.75%), BC was reported by the clinician in 12 knees (15%) and corroborated by MSUS in 6 knees (7.5%). The sensitivity of the PE for detection of joint effusion was 0.63 and specificity of 0.87, for the detection of BC was 0.43 and 0.91, respectively.

Conclusions: The PE showed acceptable diagnostic accuracy for the clinician. The complementary use of the MSUS can change the therapeutic and diagnostic approach in patients with RA.

Key words: Musculoskeletal ultrasound. Rheumatoid arthritis. Knee. Physical examination.

Agudeza diagnóstica del examen físico de rodilla en la artritis reumatoide: estudio clínico y sonográfico del derrame articular y quiste de Baker

Introducción: En pacientes con artritis reumatoide (AR), el dolor en las rodillas puede ser inflamatorio, mecánico o extraarticular. La exploración física (EF) no siempre detecta el derrame articular o el quiste de Baker (QB) en las rodillas de estos pacientes.
Objetivo: Determinar la agudeza diagnóstica de la EF en el diagnóstico de derrame articular y QB en pacientes con AR evaluados con ultrasonografía osteomuscular (USME), la técnica de imagen de referencia.
Material y método: Se utilizaron 3 equipos de ultrasonido marca Toshiba Tosbee, Toshiba Capasee y Siemens Sonoline, con transductores lineares de 7,5 MHz para detectar derrame y QB en rodillas de pacientes con AR valorados previamente por clínica por un reumatólogo, quien dictaminó si los había. Se registraron edad, sexo, duración de la AR, factor reumatoide, tratamiento, clase funcional de AR (CFAR) y diagnóstico clínico previo al USME.
Resultados: Se evaluó a 40 pacientes (80 rodillas) con AR, el 80% eran mujeres, la edad promedio fue 61,3 ± 15 años y la duración de la enfermedad, 9,5 ± 11,3 años; el factor reumatoide fue positivo en el 80% de los casos; CFAR I (3 pacientes), CFAR II (27), CFAR III (8), CFAR IV (2); el 55% de los pacientes recibían metotrexato. Hubo dolor referido por el paciente en 26 rodillas (32,5%). Se comunicó derrame por USME

en 49 rodillas (61,2%) y QB en 14 (17,5%); derrame por EF en 35 rodillas (43,7%) y corroborado por USME en 31 rodillas (38,75%), QB por clínica en 12 rodillas (15%) y corroborado por USME en 6 rodillas (7,5%). La sensibilidad de la EF para la detección de derrame fue 0,63 y la especificidad, 0,87; para la detección de QB fueron 0,43 y 0,91, respectivamente.

Conclusiones: La EF mostró una agudeza diagnóstica aceptable para el clínico. El uso complementario de la USME en la EF de los pacientes con AR puede ser un factor decisivo en la conducta terapéutica y diagnóstica en pacientes con AR y afección de rodillas.

Introduction

The evolution of rheumatology as a specialty has brought it closer to the use of new technology with the objective of improving the attention of our patients in the daily clinical practice. As was the case in cardiology and gynecology/obstetrics, the use of ultrasound has transcended the frontier of "imaging" and has reached the hands of clinical rheumatologists.[1] In patients with rheumatoid arthritis (RA) joint pain can be inflammatory, mechanic, or it may emanate from extra-articular structures. It is known that the physical examination (PE) cannot always detect an effusion in patients with arthritis and occasionally it is necessary to fall back on complementary studies to confirm its presence, such as magnetic resonance imaging and ultrasound.[2]

In the case of the shoulder, the superiority of the sonographic examination against PE has been proven[3] and there are previous reports that give an advantage to ultrasound over PE in the case of knees of patients with RA and osteoarthritis.[4-6] Because of this, our objective was to evaluate in a comparative manner the PE against osteomuscular ultrasonography (OMUS) in the detection of an effusion and Baker's cyst in knees of patients with RA.

Method

The study was carried out in the outpatient clinics of the departments of rheumatology of 3 hospitals in Madrid, in consecutive patients with a diagnosis of RA (including both symptomatic and asymptomatic knees in the study) that agreed to participate, classified according to the criteria of the American College of Rheumatology.[7] Patients with previous surgery of the knees or those who had been injected (for aspiration and/or infiltration) in the 3 previous months were excluded. For the sonographic exploration of the knees (reference technique),

3 ultrasound equipments were employed: Toshiba Tosbee, Toshiba Capasee, and Siemens Sonoline, with a lineal transducer lineal of 7.5 MHz. The exploration was carried out by a rheumatologist trained in OMUS, comparatively and following a conventional order that is mentioned below: suprapatellar recess, infrapatellar region, medial compartment, lateral compartment, and popliteal space.[8] The position of the patient for the examination of the suprapatellar recess and the medial and lateral compartments was supine with the knee flexed at 30°; for the infrapatellar region, supine with the knee flexed at 45°. The popliteal space was explored with the patient in decubitus in a neutral position. A joint effusion was sonographically defined as an anechoic or hypoechoic image that could undergo pressure by the transducer and with a long axis of more than 4 mm. A Baker's cyst was defined as a hypoechoic or anechoic image localized in the gastrocnemius-semimembranous bursa, independent of its size. Before the sonographic exploration, 2 rheumatologists in each center, with ample experience, graded the presence of a joint effusion and Baker's cyst as absent or present in each patient. Data such as age, gender, time since onset of disease (RA), positivity to rheumatoid factor (RF), treatment received, functional class of RA, and previous diagnosis was collected. For the statistical analysis we calculated sensitivity, specificity as well as positive and negative predictive values for PE.

Results

Forty patients with RA were evaluated (80 knees). Eighty percent were women. Mean age was 61.3 (15) years and time since onset of disease was 9.5 (11.3) years. RF was found positive in 80% of patients. As for the functional class of RA, 3 were class I, 27 class II, 8 class III, and 2 class IV; 22 patients received methotrexate as disease-modifying drugs; 3, leflunomide; 2, azathyoprine; 1, methotrexate plus cloroquine; 1, cloroquine; 1, infliximab; 1, dapsone; 1, cyclophosphamide; 1, sulfasalazyne; 1, gold salts, and 6, only anti-inflammatory drugs plus prednisone, without disease modifying drugs. The patient was who referred the symptom of pain in 26 knees (32.5%). An effusion was detected OMUS in 49 knees (61.2%) and BC in 14 (17.5%). Through PE an effusion was found in 35 knees (43.7%), confirming the diagnosis through OMUS in 31, and BC in 12 knees (15%), confirming it through OMUS in 6 knees. Sensitivity for PE for the detection of effusion was 0.63; specificity was 0.87; positive predictive value was 0.89, and negative productive value 0.60. In the case for detecting BC were: sensitivity 0.43; specificity 0.91; positive predictive value 0.50, and negative predictive value 0.88.

Discussion

Since its introduction in rheumatology, OMUS has proven to be a highly useful diagnostic and therapeutic tool. It is

an innocuous method, fast, economical, and reproducible. OMUS permits highly precise visualization and interventions of anatomical structures that were previously less accessible.[9]

It has allowed for the evaluation of inflammatory activity in joints of patients with RA using high-energy Doppler, ad allows for a correlation to clinical findings, even in early stages, as well as a follow-up of the disease.[10] This technique has recently been complemented with the use of contrast substances or echo-enhancers.[11] In soft tissue rheumatism, a frequent cause for rheumatologic consultation, OMUS guided infiltrations have proven to have a higher efficacy than those traditionally applied blindly.[12] The evolution of this method has reached the point where guidelines and recommendations for its correct use and the application of uniform criteria for rheumatologists practicing this technique have been developed.[13]

The comparison between sonographic and clinical findings of knee effusion was first done by Hauzeur et al[5] in 1999, finding the presence of definite effusion with a sensitivity of 100% and a specificity of 78%. Our study confirms the findings of Kane et al,[6] though with a much larger population with RA (40 vs 22). In that study, PE and sonographic findings of 44 knees in 22 patients with RA are described. Sensitivity and specificity were 0.41 and 0.89 respectively, and 0.20 and 0.94 for suprapatellar bursitis and BC, respectively (Table). In the present study, the rheumatologist knew the patients symptoms (absence or presence of pain as well as its degree) before carrying out the PE, which could have led to the intentional search for a pathologic condition (effusion, BC), with this being reflected as a larger diagnostic sensitivity than the one reported by Kane et al. On the other hand, detection through OMUS of affection in asymptomatic RA knees emphasizes the value of this technique for the prevention of complications (ie, cyst rupture).

PE is, at the present moment, the most widely employed tool for the detection of joint effusion and soft-tissue alterations, apart from it being an inherent and inescapable form in which the clinician approaches rheumatic patients on a daily basis; but, as it is demonstrated in our study up to 37% of knee effusions and 57% of BC are not detected through PE carried out by experienced rheumatologists. Exploration through OMUS complements and improves the evaluation of patients with RA, leading to a change in the perception that the rheumatologist has of the state of the patient with the therapeutic implications that this carries with it.

Comparative Studies of Sensitivity, Specificity, Positive, and Negative Predicitive Values Between the Study by Kane et al[6] and the Current One

	Kane et al[6]	Current Study
Joint effusion		
Sensitivity	0.41	0.63
Specificity	0.89	0.87
Baker's cyst		
Sensitivity	0.20	0.43
Specificity	0.94	0.91
Joint effusion		
Positive predictive value	0.70	0.89
Negative predictive value	0.71	0.60
Baker's cyst		
Positive predictive value	0.50	0.50
Negative predictive value	0.79	0.88

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