Ultrasound imaging for the rheumatologist

XXX. Sonographic assessment of the painful knee

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Competing interests: none declared.

ABSTRACT

The knee joint is a frequent focus of attention for rheumatologists when assessing patients presenting to a clinic and may represent underlying intra-articular inflammatory pathology or involvement of the surrounding soft tissues. This study describes the correlation between clinical and ultrasound findings in patients presenting with a variety of rheumatic disorders and knee pain. US imaging provides for a sensitive and detailed identification of different intra-articular and peri-articular pathology responsible for knee pain.

Introduction

The knee joint is a frequent focus of attention for rheumatologists when assessing patients presenting to a clinic and may represent underlying intra-articular inflammatory pathology or involvement of the surrounding soft tissues (1-12). It is now recognised that a rheumatologist may underestimate the extent of the findings solely by performing a clinical assessment (13-15). Ultrasound (US) examination is increasingly being incorporated into these clinical assessments and it is clear that this modality has the potential to illuminate a broader extent of the presenting pathology to the rheumatologist. The present study was aimed at investigating the value of US in the assessment of rheumatic patients presenting to clinic with knee pain.

Methods

The study was conducted according to the Declaration of Helsinki and local regulations, and informed consent was obtained from all patients.

Patients

Seventy patients with knee pain, attending the out-patient and the in-patient clinics of the Rheumatology Departments involved in this multicentre study were consecutively recruited in the study. Basic patient demographic and clinical data of the study population are reported in Table I.

Study design

All the patients underwent a complete clinical assessment by an expert rheumatologist who recorded the presence/absence of symptoms or signs indicative of knee joint inflammation, the presence/absence of knee joint effusion using the patella tap test and the presence/absence of tenderness elicited by compression at quadriceps insertion into the upper pole of the patella (2). Prior to beginning the study, sonographers reached a consensus on both the scanning technique to adopt and the pathological findings to detect. One sonographer for each centre performed the US examinations, blinded to the patients clinical and laboratory data.

US scanning technique

US examinations were carried out using a Logiq 9 (General Electrics Medical Systems, Milwaukee, WI) with a linear probe operating at 10 MHz for joints assessment and 14 MHz for tendons and enthesis evaluation, and a My Lab70 XVG (Esaote SpA, Genoa, Italy) equipped with a multifrequency linear probe (4-13 MHz). All US examinations of the knee were performed using a multi-planar technique following the indications provided by the EULAR guidelines for musculoskeletal US in rheumatology (16). For the assessment of knee joint cartilage, entheses and peri-articular bursae, the same scanning protocol used in previous studies was used (3-5).
US image interpretation
Sonographic findings indicative of knee pathology were documented and reported. For the detection of synovial fluid, synovial hypertrophy, and enthesopathy the US definitions described by the OMERACT special interest group (17) were adopted. Hyperechoic enhancement of the chondro-synovial margin and intra-cartilaginous hyperechoic spots were considered indicative of the presence of monosodium urate and pyrophosphate crystal deposits, respectively (8). The presence of osteophytes was defined by the detection of characteristic irregularities of the bone profile (10).

Results
A total of 137 knee joints were examined in 70 patients with at least one painful knee (in 3 patients only one knee was investigated). Table II shows the relationship between clinical and US findings indicative of knee inflammation.

The presence of at least one US sign indicative of enthesopathy was found in 71 entheses (52 quadriceps insertions into the upper pole of the patella, 11 patellar insertions into the anterior tibial tuberosity and 8 patellar insertions into the lower pole of the patella) of 61 knees in 35 patients, respectively affected by osteoarthritis (OA, n=15), psoriatic arthritis (PsA, n=6), rheumatoid arthritis (RA, n=7), gout (n=3), calcium pyrophosphate dihydrate disease (CPPD, n=2), seronegative spondyloarthropathies (SpA, n=1), and without a defined diagnosis (n=1). The most frequent finding was the presence of entheseophytes detected in 52 (85%) out of 61 knees of 29 patients. Power Doppler signal at entheseal level was found in only 3 knees (3 at patellar insertion into the anterior tibial tuberosity and 2 at quadriceps insertion into the upper pole of the patella) of 4 patients (2 PsA, 1 gout and 1 OA).

Meniscal calcification was found in a total of 14 knees in 8 patients (5 with CPPD disease, 2 with OA and one with RA). In 10 knees of 6 patients (3 with CPPD disease, one with OA, and two with RA) hyperechoic spots within the hyaline cartilage were detected. In four

<table>
<thead>
<tr>
<th>Clinical findings indicative of knee inflammatory involvement</th>
<th>US findings</th>
<th>Presence</th>
<th>Absence</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint effusion</td>
<td>Presence</td>
<td>27</td>
<td>34</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Absence</td>
<td>1</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Synovial hypertrophy</td>
<td>Presence</td>
<td>18</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Absence</td>
<td>10</td>
<td>24</td>
<td>34</td>
</tr>
<tr>
<td>Intrarticular power Doppler</td>
<td>Presence</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Absence</td>
<td>20</td>
<td>39</td>
<td>59</td>
</tr>
<tr>
<td>Popliteal cyst</td>
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<td>3</td>
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<td>15</td>
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<tr>
<td></td>
<td>Absence</td>
<td>25</td>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>Enthesopathy</td>
<td>Presence</td>
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</tr>
<tr>
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<td>Absence</td>
<td>15</td>
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<tr>
<td>Total</td>
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<td>28</td>
<td>42</td>
<td>70</td>
</tr>
</tbody>
</table>

Fig. 1. A. Rheumatoid arthritis. Knee joint effusion. Anterior longitudinal suprapatellar scan showing anechoic enlargement of the suprapatellar pouch. B. Psoriatic arthritis. Enthesopathy. Anterior longitudinal scan showing entheseophytes (arrowhead) at the distal patellar tendon insertion into the anterior tibial tuberosity. C. Osteoarthritis. Medial longitudinal scan showing osteophytes. D. Osteoarthritis. Posterior transverse scan showing a popliteal cyst. f: femur; qt: quadriceps tendon; p: patella; pt: patellar tendon; t: tibia.
patients, two with diagnosis of OA and two with RA. US revealed findings indicative of unknown CPPD disease. In two of these patients, one with OA and one with RA both hyaline cartilage and menisci were calcified bilaterally. Urate deposits were found only in 3 knees of 2 patients with gout. Osteophytes were found in 76 knees of 2 patients with SpA, 1 undifferentiated arthritis, and 2 with diagnosis not defined.

Discussion

To date, the role of US in the assessment of patients with knee pain has yet to be fully defined and validated internationally. Several investigators, including our own group, have described the expected US findings in different rheumatic conditions involving the knee (1-12). This observational multicentre study has demonstrated that US detected a higher number of inflamed knee joints than clinical assessment. There was poor correlation between the clinical impression of enthesopathy when compared to US confirmation. There are some lessons that we could learn from single cases that were examined. In one patient with diagnosis of knee OA, US revealed meniscal calcifications and subsequent identification of pyrophosphate crystals was made by microscope assessment of knee synovial fluid aspirated under sonographic guidance. In another patient with definite diagnosis of CPPD disease, the marked pain on the medial aspect of the knee was explained by US as the clinical manifestation of anserine bursitis. Conversely, US was not able to detect the presence of a meniscal tear in a patient who had such a diagnosis made by MRI performed one week before.

The important take-home messages from US assessment of knee pain are:

• perform an exhaustive search of both intra-articular and extra-articular structures when evaluating the knee
• US imaging provides for a sensitive and detailed identification of different intra- and peri-articular pathology responsible for knee pain.

It is inevitably the case that further observational and interventional studies will be required to enable US examination to become a conventional approach adopted by all rheumatologists when assessing patients with knee pain.

References


