Ultrasound (US) Findings in Patients with Knee Pain: Sensitivity and Specificity for the Diagnosis of Knee Osteoarthritis and Development of an US Prediction Score

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Background/Purpose: The diagnosis of knee osteoarthritis (OA) is based mainly on clinical examination and radiological features. The objectives were to evaluate the sensitivity and specificity of different ultrasound (US) findings and to develop an US score for the diagnosis of knee OA.

Methods: Consecutive patients complaining of knee pain with and without previous diagnosis of knee OA (ACR criteria) and no other known rheumatologic condition were included. US examinations were performed by an experienced rheumatologist, blinded to clinical data, using a My Lab 70 machine (Esaote) provided with a multi-frequency linear transducer (4-13 MHz).The following US abnormal findings were investigated (presence/absence): joint effusion (increased hypoechoic or anechoic intraarticular material, within synovial recesses greater than 4 mm), osteophytes (cortical protrusions at the joint margin), menisci protrusion (a distance between the peripheral border of the meniscus and the outline of the tibial plateau greater than 2 mm), degenerative femoral hyaline cartilage involvement (loss of sharpness of the cartilage margins and/or loss of homogeneity of the cartilage layer and/or focal or extended cartilage thinning) and Baker's cyst (abnormal hypo-anechoic, displaceable and compressible material within the gastrocnemius-semimembranosus, with a transverse diameter greater than 4 mm). We developed a US score using logistic regression analysis (OA as dependant variable) with US features included in the model. Weighting of each of these variables was obtained using the regression OR

Results: 75 knees were examined in 52 patients without knee OA (mean age 59.5 ± 16 years, 34 female/18 male) and 127 knees were examined in 87 patients with knee OA (mean age 72.6 ± 8.3 years, 70 female/17 male).

Table 1. Diagnostic characteristics of different US abnormal findings for the diagnosis of knee OA.

	Sensitivity %, (95% CI)	Specificity %, (95% CI)	PPV %	NPV %
Joint effusion	89.8 (83-94)	32 (22-44)	69	64.8
Osteophytes	85.8 (78-91)	77.3 (66-86)	86.5	76.3
Menisci protrusion	48 (39-57)	93.3 (85-98)	92.4	51.4
Degenerative femoral hyaline cartilage involvement	92.9 (87-97)	84 (74-91)	90.7	87.5
Baker's cyst	16.5 (10-24)	82.7 (72-90)	61.7	36.9

Table 2. US score.

Variables		OR	Points
Joint effusion	If present	1	1
Degenerative femoral hialine cartilage involvement	If present	44	4
Osteophytes	If present	5.8	3
Menisci protrusion	If present	1.5	2
Maximum Total score			10

Knees with OA had significantly higher scores than knees without OA (mean (SD): 8.1 (2.3) vs 2.1 (2.7); p<0.001, respectively. The area under the Receiver operative curve (ROC) was 0.93 (95% CI: 0.89-0.97). A value ≥ than 5 had a sensitivity of 92 % and specificity of 81 % for the diagnosis of knee OA (LR + 4.9).

Conclusion: The identification of both osteophytes and degenerative femoral hyaline cartilage involvement by US showed the best diagnostic performance among all the US features investigated for the diagnosis of knee OA. A combined US score showed very good discriminative value for the diagnosis of knee OA in our population. A prospective cohort study would be needed to confirm these results.