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## A systematic review of ultrasonography in osteoarthritis

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### CRD summary

This review examined the evidence on ultrasound examinations for assessment of osteoarthritis and found that more work was required to develop standardised definitions of pathology and demonstrate validity of ultrasound. Despite a number of limitations in the review process, this conclusion reflected the heterogeneity and poor quality of the data presented and is likely to be accurate.

### Authors' objectives

To review the usefulness of ultrasonography as an assessment tool in osteoarthritis.

### Searching

PubMed was searched to June 2008 for English-language articles and search terms were reported. Experts in the field were contacted and bibliographies of recent review articles were searched to identify additional studies.

### Study selection

Articles that reported original research on use of B-mode ultrasonography in assessment of a joint and that were conducted in a cohort of patients diagnosed with osteoarthritis were eligible for inclusion. Studies of ultrasonography used for injection guidance and that did not report any validity data or results of ultrasonography were excluded, as were studies that used ultrasonography to measure only rotational angles.

Joints assessed by included studies were knee, hip, hand, foot, shoulder, cervical spine and sacroiliac joint; most of the included studies were of knee joints. Most studies used greyscale ultrasonography. Ten of the 47 included studies used colour and/or power Doppler ultrasound techniques. One study assessed use of a contrast agent.

The authors stated neither how studies were selected for the review nor how many reviewers performed the selection.

### Assessment of study quality

The authors did not state that they assessed study validity.

### Data extraction

Data were extracted on aspects of study methodology, ultrasonographic findings in participants with osteoarthritis, the relationship between ultrasonography findings and symptoms of osteoarthritis and/or the results of other examinations, and changes in ultrasonography-detected pathology in response to intervention.

Data were extracted using a review-specific spreadsheet. The authors did not state how many reviewers performed data extraction.

### Methods of synthesis

Studies were summarised in a narrative synthesis and tables grouped by target pathology: cartilage, tendon and ligament, cortical and synovial.

### Results of the review

Forty seven studies were included in the review. Thirteen studies addressed cartilage pathologies; 10 studies addressed tendon and ligament pathologies; nine studies addressed cortical pathologies; and 26 studies addressed synovial pathologies. The number of participants in included studies ranged from two to 600; most studies had fewer than 50 patients. Definition of osteoarthritis varied and was unspecified in approximately half of the studies; where a definition was reported, American College of Rheumatology criteria were often used. Most studies described ultrasound technique and joint position during image acquisition; these varied between studies of the same joint area. A wide variety of pathologies were examined and definitions of the imaging appearance of the pathology imaged were only provided in

approximately half of the studies, with no standard definition across studies.

Twenty seven studies assessed construct validity of ultrasonography (compared ultrasound with other examination techniques) and nine studies addressed criterion validity (compared ultrasound with the reference standard of either direct macroscopic or microscopic visualisation of the pathology (for example, by arthroscopy), examination during surgery or histopathological examination).

**Cartilage:** Comparisons were limited to cartilage thickness. Two studies found reasonable correlation between ultrasonography-detected cartilage thickness and histological cartilage thickness. One study demonstrated reasonable correlation between ultrasonography-detected cartilage thickness and magnetic resonance imaging.

**Tendon and ligament:** Ultrasound changes were usually compared with clinical examination. Results varied. There was poor correlation between ultrasound and clinical diagnosis of anserine tenosynovitis (one study), but good correlation between ultrasound and clinical and radiographic changes of enthesitis at the shoulder and foot (two studies).

**Cortical:** Ultrasound was found to be more sensitive for detection of osteophytosis in the small joints of the hand than radiography (one study), but less sensitive to erosions (one study).

**Synovial:** Ultrasound was comparable to magnetic resonance imaging for detection of effusion, synovial hypertrophy and popliteal cysts. Ultrasound was more sensitive and specific than clinical examination in detecting effusion and synovial hypertrophy at the knee joint.

Overall, no consistent relationship between clinical symptoms and ultrasound-detected pathology was identified, although symptomatic joints tended to have more abnormalities on ultrasound than controls/healthy joints.

Eight studies assessed the ability of ultrasound to detect changes in joint pathology over time. The trend was towards a reduction in pathology with time after therapy.

### **Authors' conclusions**

The authors concluded that more work was required to develop standardised definitions of pathology and to demonstrate the validity of ultrasound examination in assessment of osteoarthritis.

### **CRD commentary**

The review examined the evidence on use of ultrasound examinations for assessment of osteoarthritis. Broad inclusion criteria were defined, but the limitation of the search to one bibliographic database and published English-language articles may have resulted in omission of relevant information and left the review open to language and publication biases. Details of the review process were poorly reported and so it was not possible to assess the potential for error and bias. Although some aspects of study design were extracted and discussed, no formal assessment of methodological quality for included studies was reported. Given the heterogeneity and poor quality of the available data, use of a narrative synthesis was appropriate. However, reporting of the results of included studies was limited, with very little numerical data; it was unclear whether this reflected a lack of data in the primary studies or poor reporting of the review. Despite the limitations of the review, the authors' conclusion that more work was required to develop standardised definitions of pathology and demonstrate the validity of ultrasound examination in assessment of osteoarthritis reflected the heterogeneity and poor quality of data presented and is likely to be accurate.

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