

Relationship between clinically detected joint swelling and effusion diagnosed by ultrasonography in metatarsophalangeal and talocrural joints in patients with rheumatoid arthritis

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ABSTRACT

Objective. To assess the relationship between clinically detected swelling and effusion diagnosed by ultrasonography (US) in metatarsophalangeal (MTP) and talocrural (TC) joints in patients with rheumatoid arthritis (RA). **Methods.** Thirty consecutive patients with RA were studied. Altogether 288 MTP joints and 60 TC joints were evaluated. The clinical investigations were carried out by one doctor and the US investigations by another and they were blinded to each others' results.

Results. The clinical examination and US gave similar results in 194 MTP joints, whereas they differed in the remaining 94 MTP joints, and correspondingly the results were similar in 34 TC joints and differed in 26 TC joints. The kappa coefficient between these investigations was 0.165 in MTP joints and 0.043 in TC joints, showing very poor agreement.

Conclusion. These preliminary results showed poor agreement between the clinical assessment of swelling and effusion detected by US in MTP and TC joints. Thus US may considerably improve the diagnosis of synovitis in patients with RA.

Introduction

The metatarsophalangeal (MTP) joints are involved in up to 89% of patients with rheumatoid arthritis (RA) and are most often the first joints to be affected (1, 2). Each MTP joint is lined by a separate cavity. In cases of synovitis the synovial proliferation distends the joint capsule (3). The talocrural (TC) joints are less often affected in RA, approximately 9% of patients being involved (1). The TC joint is a synovium-lined hinge joint between the

trochlear surface of the talus and the distal ends of the tibia and fibula. The synovial cavity of the TC joint does not normally communicate with other joints, adjacent tendon sheaths or bursae (3).

Clinical examination for possible synovitis in MTP and TC joints is made by inspection and palpation. This is often difficult in obese patients and in the case of extra-articular swelling of the foot and the ankle. Ultrasonography (US) is a useful method for assessing abnormalities in rheumatological conditions, fluid-filled structures such as joint and tendon sheath effusions being readily detectable (4). The purpose of this study was to ascertain the relationship between clinically detected swelling and effusion diagnosed by US in MTP and TC joints in patients with RA.

Patients and methods

Thirty consecutive patients fulfilling the American Rheumatism Association 1987 revised criteria for RA entered the study (5). Exclusion criteria were any kind of surgery performed on the ankle or MTP joint areas. Table I shows some of the clinical characteristics of the patients. Twenty healthy persons without any symptoms in the feet or ankles formed a control group. They were all women and their mean age was 44 (range 26-56) years. Clinical assessments of the MTP and TC joints were carried out by inspection and palpation according to the methods presented in the *Eular Handbook of Clinical Assessment in Rheumatoid Arthritis* (6). The investigators were not blinded to the diagnoses. Swelling of the joints was evaluated on a scale from 0 (normal) to 1 (swelling).

The diagnosis of effusion in MTP and

Table I. Some clinical characteristics of the 30 patients with rheumatoid arthritis.

Mean age (years), (range)	62 (36-80)
Number of females	24
Mean duration of RA (years), (range)	14 (0.2-27)
Number of seropositives	27
Mean serum C-reactive protein (mg/l), (range)	21 (4-83)
Mean blood erythrocyte sedimentation rate (mm/hour), (range)	28 (2-86)
Mean blood haemoglobin (g/l), (range)	122 (84-157)

TC joints was based on the method described by Koski (7). This method has not been adequately validated. US of the MTP joints was carried out longitudinally from the dorsal side with toes in a neutral position. The anechogenic space between metatarsal bone and joint capsule was measured (Fig. 1). US of the TC joints was performed from the dorsal side with the ankle in plantar flexion. The space between the talus and the joint capsule was measured (Fig. 2). The US measurements were carried out using a Siemens Sonoline Prima apparatus with a 7.5 MHz transducer. The ultrasound machine did not have the Doppler facilities. X-rays were not taken since the purpose of the study was solely to examine the relationship between clinical investigation and US. Intra-observer reliability was not studied in the clinical assessment or in the US investigations. The study protocol was approved by the ethical committee of Satalinna Hospital.

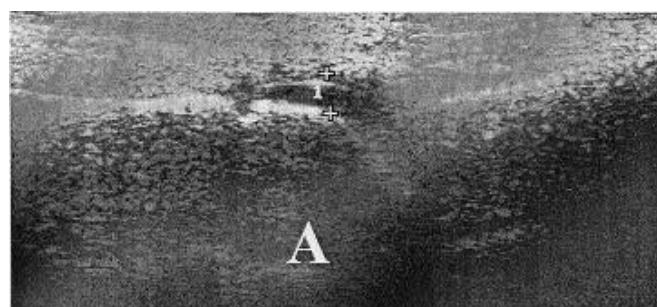
Altogether 288 MTP joints and 60 TC joints of RA patients and 200 MTP joints and 40 TC joints of controls were studied. Twelve MTP joints of the patients could not be evaluated by US due to the presence of the dorsal flexion of the corresponding toes. All clinical assessments were made by one doctor (RL) and the US investigations by another (MS), each being blinded to the other's results.

The level of agreement between the clinical and US investigations was evaluated by the Kappa coefficient (8). Kappa values range from -1 to +1, the value 1.0 representing perfect agreement.

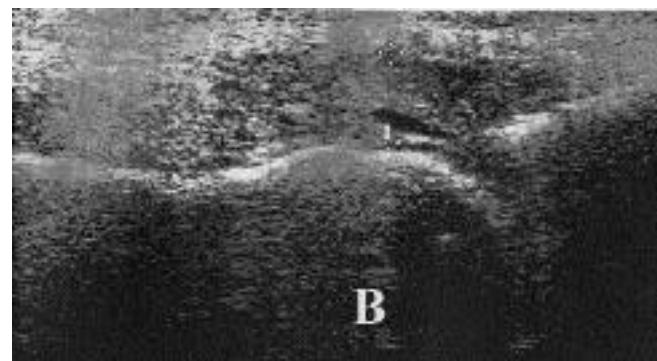
Results

The normal upper limit for MTP joints, 2.9 mm (mean + 2 SD), was evaluated according to the control group. If the anechogenic space was 2.9 mm or less it was regarded as normal, and if it was 3.0 mm or more it was regarded as effusion. Correspondingly, the normal upper limit for TC joints, 3.0 mm (mean + 2 SD), was taken from the control group. If it was 3.0 mm or less, it was regarded as normal and if it was 3.1 mm or more it was regarded as

Fig. 1. Ultrasound scans of the normal (A) and arthritic (B) metatarsophalangeal joint. In (A) the area between the asterixes measures 1.9 mm and is composed mainly of cartilage (the border can be seen as a curved white line) while in (B) the measurement is 5.1 mm. There are three layers: cartilage, joint fluid (black zone) and proliferative synovium.

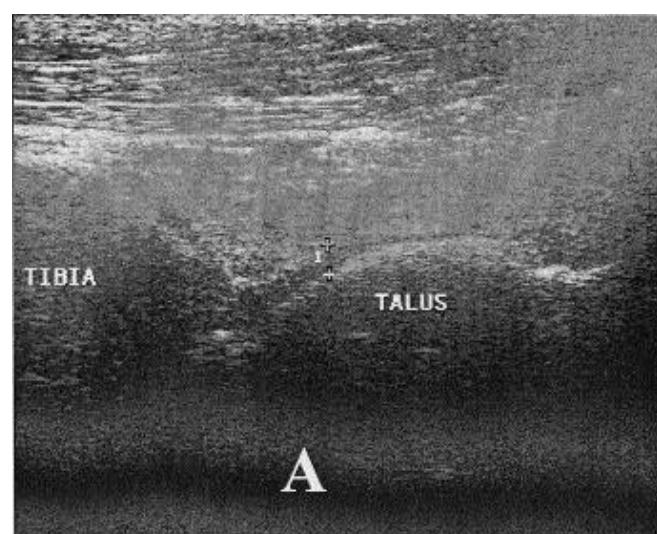


A

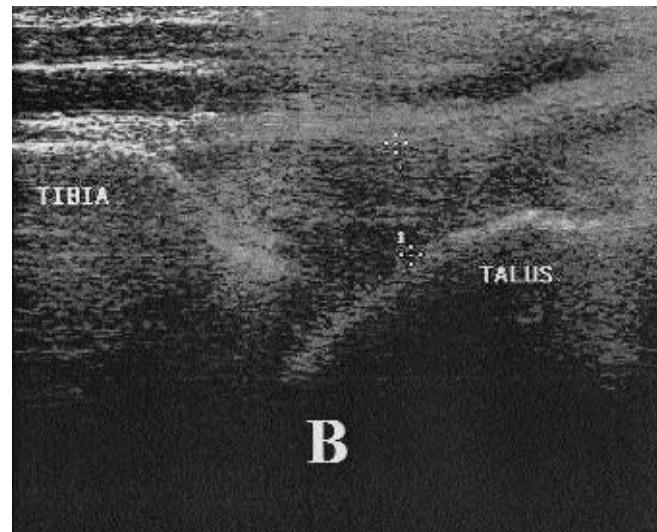


B

Fig. 2. Ultrasound scans of the normal (A) and arthritic (B) talocrural joint. In (A) the measurement between the asterixes is 1.7 mm and in (B) 6.4 mm. In (B) there is increased joint fluid with proliferation.



A



B

Table II. Results of clinical assessment and ultrasonography of 288 metatarsophalangeal and 60 talocrural joints of 30 patients with rheumatoid arthritis.

Metatarsophalangeal joints			
Clinical assessment	Ultrasonography		
	Normal	Effusion	Total
Normal	165	44	209
Swelling	50	29	79
Total	215	73	288

The kappa coefficient between the clinical assessment and ultrasonography was 0.160.

Talocrural joints			
Clinical assessment	Ultrasonography		
	Normal	Effusion	Total
Normal	28	7	35
Swelling	19	6	25
Total	47	13	60

The kappa coefficient between the clinical assessment and ultrasonography was 0.043.

effusion.

Table II shows the relationship between clinically detected swelling and effusion diagnosed by US in MTP and TC joints of RA patients. In 194 of the 288 MTP joints studied in RA patients the clinical assessment and US gave similar results, whereas they differed in the remaining 94 MTP joints. The kappa coefficient between these investigations was 0.160, showing poor agreement. Ten of the 200 MTP joints in the control group showed effusion, the anechoic space being more than 2.9 mm.

In 34 of the 60 TC joints of RA patients clinical assessment and US gave similar results, whereas they differed in the remaining 26 joints. The kappa coefficient between these investigations was 0.043, showing almost no agreement. Only 2 of the 40 TC joints studied in the healthy controls showed effusion. The anechoic space was 4.1 mm in one and 5.4 mm in the other TC joint. These findings occurred in different persons.

Discussion

There are few studies concerning the relationship between clinical findings and effusion as detected by US in RA. In knee joints the validity of clinical

detection of knee joint effusion has been shown to be good only when the joint effusion is substantial (9). Östergaard and colleagues have shown that detection of knee joint effusion by US is similar to MRI (10). We had no possibility to use MRI in this study. In a study comparing physical examination and US findings in painful shoulder, clinical assessment showed low accuracy in the diagnosis of periarticular shoulder lesions (11).

The ultrasound method used would appear to be fairly specific, since only 10 of the 200 MTP joints and 2 of the 40 TC joints of the 20 healthy controls showed effusion. In the original work by Koski there was also some overlap between the normal and synovitic values in MTP joints (7). The measurement between the joint capsule and the bone is obviously the sum of the cartilage, synovial proliferation and effusion. Color Doppler sonography might be of benefit in diagnosing active synovial proliferation and periarticular flow in early synovitis, but the method needs to be validated and at the moment no Doppler study has been reported concerning the joints in question. The poor agreement between the clinical and US investigations in detecting effusion in both MTP and TC joints

may have several causes. Fat in obese patients, multiple tenosynovitis around the ankle and swelling due to causes other than synovial effusion are very common in RA and in clinical examination may be interpreted as swelling in the TC and also in the MTP joints.

Accurate detection of effusion in MTP and TC joints is in many cases important in both the diagnosis and therapy of RA.

The results of this study indicate that swelling assessed by clinical examination is inadequate for the diagnosis of effusion and synovitis in patients with RA. US of both MTP and TC joints is a very fast method which can be applied in the consulting room in connection with clinical examination. So, the accuracy of the diagnosis of effusion and synovitis may be considerably improved by US in these patients.

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