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J Rheumatol 2001;28;1338-1340

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# Sonography in the Study of Metatarsalgia

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**ABSTRACT.** *Objective.* To identify sonographically the changes of the forefoot in patients with metatarsalgia. *Methods.* Sonography of the foot was performed in 112 patients with metatarsalgia and in 50 healthy controls. Metatarsophalangeal (MTP) joints, intermetatarsal web spaces, flexor and extensor tendons, and plantar aponeurosis were examined. *Results.* Sonography showed intermetatarsophalangeal bursitis in 20.5% of cases, Morton's neuroma in 15.2%, and effusion of MTP joints in 11.7%. *Conclusion.* Sonography gives useful information about the possible alteration responsible for metatarsalgia. (J Rheumatol 2001;28:1338-40)

## Key Indexing Terms:

METATARSALGIA  
INTERMETATARSOPHALANGEAL BURSTITIS

SONOGRAPHY  
MORTON'S NEUROMA

Metatarsalgia may be caused by various factors with possible involvement of different anatomic structures. It is a relatively common condition and a frequent cause of alteration of both the gait and walking. Indeed, during walking weight is mainly borne by the forefoot and metatarsal heads are the fulcrum of a complex group of movements that involve the entire foot<sup>1</sup>.

Frequently metatarsalgia is due to Morton's neuromas, which are focal masses of perineural fibrosis involving the plantar digital nerves of the foot<sup>2</sup>. They are easily detected by ultrasound, which shows hypoechoic masses located in the intermetatarsal spaces<sup>2-4</sup>. In other cases pain is due to intermetatarsophalangeal bursitis<sup>5</sup>. Intermetatarsophalangeal bursae are physiologically present between the metatarsal heads<sup>6</sup>. In normal conditions no bursa formation is visible by ultrasound, the areas between distal metatarsal heads being echogenic<sup>7</sup>. In cases of bursitis, sonography shows large anechogenic areas between the distal heads of the metatarsal bones, bulging more than 1 mm under the metatarsal head level<sup>7</sup>.

In view of the high diagnostic capacities of sonography in the evaluation of soft tissues<sup>8,9</sup>, we used this technique in the study of patients with metatarsalgia.

## MATERIALS AND METHODS

Sonography of the foot was performed in 112 patients (81 female and 31 male) with monolateral metatarsalgia (Table 1). Their mean age was 58.9 years (range 29-78) and the mean duration of the symptoms was 3.3 months (range 1-9). In 14 cases the presence of Morton's neuroma was clinically suspected, in 9 the presence of tendinitis had been supposed; 13 patients had rheumatoid arthritis (RA), 7 psoriatic arthritis, 13 osteoarthritis

(OA); in one patient with polyarthritis the possibility of Morton's neuroma had been assumed. In 55 cases it was not possible to suppose any etiological hypothesis for metatarsalgia by means of clinical examination; for this reason they are indicated with the generic term "pain" in Table 1.

The diagnosis of RA had been made according to the latest American College of Rheumatology (formerly the American Rheumatism Association) criteria; psoriatic arthritis and OA had been diagnosed on the basis of the clinical, radiological, and serological characteristics of the disease<sup>10-12</sup>.

The feet of 50 healthy subjects (20 men, 30 women) were also examined. Their mean age was 52.5 years (range 32-60). In all cases dorso-plantar radiographs of the forefoot were made. Clinical examination confirmed the presence of pain in the metatarsal area.

Sonography was performed by 2 different operators using a 7.5 MHz linear transducer. Longitudinal and transverse scans of the metatarsal area were carried out on both the plantar and dorsal side of the foot. In all cases both feet were examined to compare the findings to contralateral structures. Investigations included the metatarsophalangeal (MTP) joints to identify effusion; the intermetatarsophalangeal bursae to detect bursitis; the intermetatarsal web spaces to find signs of Morton's neuromas; the long and short extensor tendons of the hallux and the toes, long and short flexor tendons of the hallux and the toes, and abductor tendons of the hallux and 5th toe for the identification of either inflammatory lesion or degenerative process of those structures. Moreover, the plantar aponeurosis was studied to reveal any signs of alterations within it.

Involvement of any of the intermetatarsophalangeal bursa was diagnosed when a sonolucent and large area appeared between the distal heads of the metatarsal bones (Figure 1), bulging more than 1 mm under the metatarsal head level<sup>7</sup>. Effusion of the MTP joints was considered to be present when an anechoic or hypoechoic area appeared within an articular cavity and simultaneously the capsule stood convex to the joint space<sup>13</sup>. Morton's neuroma was diagnosed when a hypoechoic intermetatarsal web space mass, located proximal to the metatarsal heads (Figure 2), was found<sup>2-4</sup>. Tendinitis of the tendons was considered to be present when either changes of their thickness were found or alterations of their fibrillar pattern were revealed; thinning or thickening were considered significant when the variation was at least 1/3 of the thickness of the normal contralateral tendon<sup>13</sup>. Plantar aponeurosis was considered to be altered when either changes of its thickness or abnormal echotexture was found<sup>14</sup>.

## RESULTS

Sonographic findings are reported in Table 1. In healthy subjects no significant changes of the structures examined were found. Sonography made it possible to identify

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Submitted July 21, 2000; revision accepted December 14, 2000.

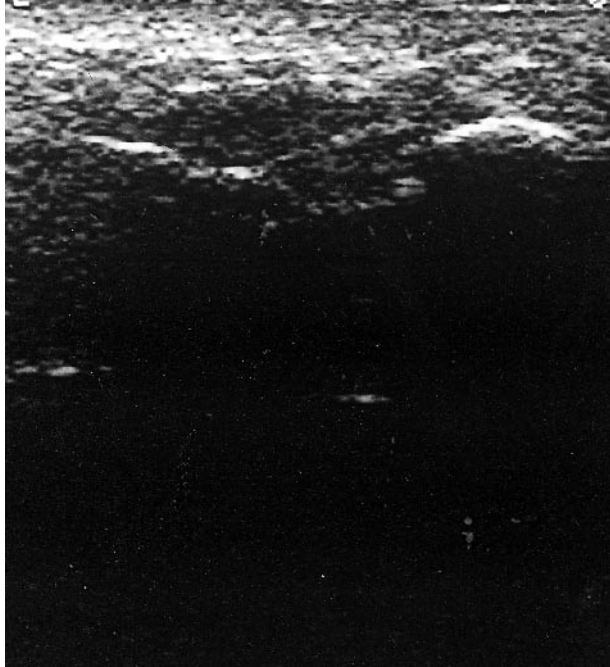


Figure 1. Sonographic evidence of intermetatarsophalangeal bursitis: effusion within the bursa is visible.

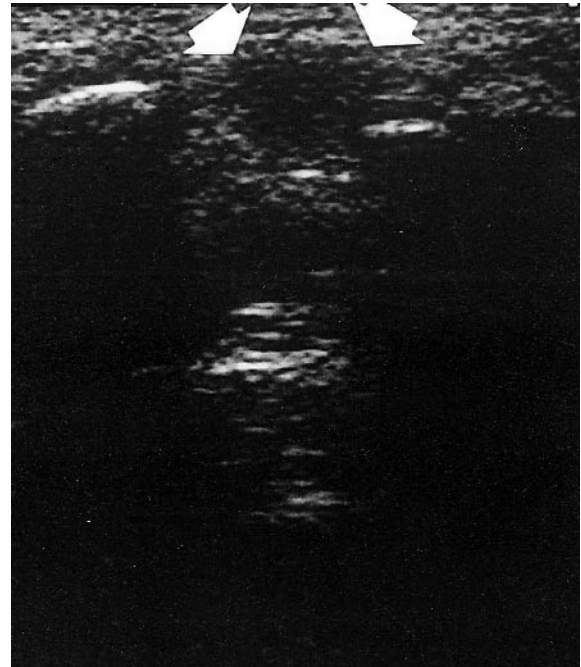


Figure 2. Sonographic visualization of Morton's neuroma (arrows): hypochoic intermetatarsal web space mass is visible.

Table 1. Survey and sonographic findings.

	n	Sonographic Findings		
		Morton's Neuroma, n (%)	Effusion, n (%)	Bursitis, n (%)
Suspected diagnosis				
Pain	55	6 (10.9)	5 (9.1)	12 (21.8)
Morton's neuroma	14	6 (42.8)	0	3 (21.4)
Rheumatoid arthritis	13	2 (15.4)	4 (30.7)	3 (23.1)
Psoriatic arthritis	7	0	1 (14.3)	1 (14.3)
Tendinitis	9	1 (11.1)	0	1 (11.1)
Osteoarthritis	13	2 (15.4)	2 (28.6)	3 (23.1)
Polyarthritis and Morton's neuroma	1	0	0	0
Total	112	17 (15.2)	12 (11.7)	23 (20.5)

Morton's neuroma in 6 (10.9%) of 55 cases with the generic clinical diagnosis of "pain," in 6 (42.8%) of 14 cases with clinical diagnostic suspicion of Morton's neuroma, in 2 (15.4%) of 13 patients with RA, in one (11.1%) of 9 subjects with clinically suspected diagnosis of tendinitis, and in 2 (15.4%) of 13 cases with OA of the MTP joints. In all, sonography showed the presence of Morton's neuroma in 17 patients (15.2%).

Effusion within MTP joints was found in 5 cases (9.1%) with clinical diagnosis of pain, in 4 patients (30.7%) with RA, in one subject (14.3%) with psoriatic arthritis, and in 2

cases (28.6%) with OA. It was present in a total of 12 patients (11.7%).

Intermetatarsophalangeal bursitis was found sonographically in one or more intermetatarsal web spaces of 12 subjects (21.8%) with clinical diagnosis of pain, in 3 (21.4%) with suspected Morton's neuroma, in 3 (23.1%) with RA, in one (11.1%) with clinically diagnosed tendinitis of the flexor tendons, and in 3 (23.1%) with OA. In all, sonography showed intermetatarsophalangeal bursitis in 23 patients (20.5%). No changes in the tendons or in plantar aponeurosis were found.

## DISCUSSION

In many cases of metatarsalgia Morton's neuroma is clinically suspected; in other cases the possibility of intermetatarsophalangeal bursitis is proposed; rarely is it possible to identify effusion using clinical examination<sup>2-5,7,15</sup>. In our study sonography revealed intermetatarsophalangeal bursitis in a relatively large percentage of cases (20.5%), although such a finding had not been suspected with clinical examination. In contrast, Morton's neuroma was revealed in a lower percentage of cases than that suspected clinically. The incidence of effusion of the MTP joints was quite high, and this finding appears particularly useful considering it is difficult to detect clinically.

Sonography is a useful diagnostic imaging method for the evaluation of soft tissue pathology. Our study shows that ultrasound can reveal the causes of pain in the metatarsal area, and it can be a valuable method in the evaluation of patients with metatarsalgia. Based on its low costs, wide availability of the instruments, and good tolerance by patients, it may be a useful baseline measure for pathology and may be of value in determining therapeutic options and monitoring of the response to treatment.

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