

# Ultrasound Characterization of Gouty Dactylitis

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## ABSTRACT

**Introduction:** Dactylitis is a manifestation of gout that can occur on debut or throughout the course of the disease, although it is usually considered a sign of chronicity or a hallmark of long-term disease. The etiological prevalence based on imaging studies is unknown. The aim of present study is to determine the prevalence of different ultrasonographic features of dactylitis of the hands in patients with gout. **Methods:** A cross-sectional study was conducted based on a registry of ultrasound images of patients with gout and clinical dactylitis either in debut or throughout evolution. **Results:** We included images of 66 patients diagnosed with gout and with dactylitis of at least one finger at the time of the ultrasound evaluation. The mean age of the patients was 59.2 standard deviation 4.3 years. 62 patients were male. Of the total number of patients, 60 had tenosynovitis of the flexor tendinous apparatus (90.9%). Four of these patients also presented tenosynovitis of the tendinous extensor apparatus. No patient presented only extensor tenosynovitis. Enthesopathy was identified in 6 patients (9.1%), in no case did enthesopathy occur with power Doppler (PD) signal. Synovitis was identified in 43 patients (65.1%). Of these, in 13 patients a Grade I was registered and in 26 a PD signal was demonstrated. Tophi were identified in 16 patients (24.2%). **Conclusions:** This is, as far as we know, the first iconographic prevalence study of gouty dactylitis based on ultrasound. According to our results, tenosynovitis of the flexors is the most frequent finding in gouty dactylitis while enthesopathy is rather rare. Our results demonstrate a main etiological difference of the gouty dactylitis and those seen in spondyloarthritis.

**Key words:** Dactylitis, gout, prevalence, ultrasonography

## INTRODUCTION

Dactylitis is a well-known hallmark of spondyloarthritis, but also can be found in other autoimmune or infectious diseases.<sup>[1]</sup> Furthermore, dactylitis is a manifestation of gout that can occur on debut or throughout the disease.<sup>[2,3]</sup> From the clinical perspective, dactylitis is defined as the swollen of a finger with or without associated pain but with a corresponding limitation on its arc of movement.<sup>[1]</sup> Although it is usually considered a sign of chronicity or a hallmark of long-term disease, gouty dactylitis can be assessed as part of the physical examination of patients with their first flare.<sup>[1,2]</sup> Classically, the synovitis or tenosynovitis mediated by the deposit of microcrystals and the presence of tophus has been interpreted as the cause of gouty dactylitis.<sup>[4]</sup> There are, however, no etiological study based on imaging analysis. The prevalence of gouty dactylitis features, from the point of view of the ultrasound imaging is still unknown.

Recently, some studies have shown the evidence of persistent ultrasonography findings in patients with a serum uric acid level below the therapeutic target.<sup>[5-7]</sup> One of them is the deposit of urate crystals into tendons or the superficial layers of the joint cartilage.<sup>[5]</sup> Dactylitis, could also be the result of the same findings and not necessarily secondary to the presence of tophus. The present study, aims to determine the prevalence of different ultrasonographic features of dactylitis of the hands in patients with gout.

## METHODS

A cross-sectional study was conducted based on a registry of ultrasound images of patients with gout and clinical dactylitis either in debut or throughout evolution.

### Source of registries

In 2013, we started a rheumatology clinic dedicated to assessing patients on self-demand into the urgency

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and emergency department of our hospital.<sup>[8]</sup> Our clinic protocolized the use of ultrasonography in almost all patients assessed. Every image was recorded into a database related to the corresponding clinical case using an identification code. To gather registries for the purposes of the present study, we accessed that database and the corresponding demographic, epidemiologic and clinical information from the electronic registries. The selection of patients followed strictly clinical criteria-based on the corresponding medical reports.

### Selection of registries

We included registries of patients recently diagnosed with gout or known gouty patients, with dactylitis and an available ultrasound study. We only include, then, registries of patients who accomplished the EULAR evidence-based recommendations for diagnosis of gout.<sup>[9]</sup> The term dactylitis was actively searched in our registries. We included only those registries which dactylitis was not included as the pain focus. Hence, by the means of present study, every dactylitis analyzed was not “active.” We only included dactylitis of a finger because ultrasound study of a dactylitic toe was difficult due to geometrical limitations of our probe. Finally, revised the entire ultrasound image database to locate those dactylitis studies including a grey scale longitudinal flexor and extensor study of the metacarpophalangeal and proximal interphalangeal joint and a power Doppler (PD) study as well.

### Image features

All images included from the database were obtained using an ultrasonography equipment (LOGIQe, General Electrics) with a 13–16 MHz linear transducer. All images were obtained by the same operator over 3 years. Given that no comparisons were planned, no masking of the clinical situation of the patients was made to the eyes of the interpreter when the images were collected for the purposes of present study. The interpretation of findings was dichotomous in the determination of synovitis, tenosynovitis, and enthesopathy according to EULAR definition criteria.<sup>[10]</sup> The identification of tophi was made according to the definition of Fernandes *et al.*<sup>[4]</sup> The overlapping of findings was counted independently at the moment of establishing the prevalence.

### Exposition of results

Prevalence of different ultrasonographic findings was expressed in terms of proportion from the total of registries (patients). Time from onset of disease in years (diagnosis of gout), blood uric acid level in mg/dL, time since the last flare in months and number of flares per year were variables expressed using average and standard deviation (SD). Presence of renal impairment was expressed in terms of proportion.

### Ethical considerations

The authors of the present study did not enroll patients or performed any special study on the basis of clinical practice.

All the data gathered to achieve our objectives belonged to a database that was built under the permission of the Ethical Scientific Committee of our institution. Furthermore, every patient was informed, when the ultrasound was performed, that the images could be used for scientific purposes and all of them consented to it. Finally, to access to the clinical and demographical information of the patients which images were analyzed, we obtained permission from our local ethical scientific committee.

## RESULTS

We included images of 66 patients diagnosed with gout and with dactylitis of at least one finger at the time of the ultrasound evaluation. The mean age of the patients was 59.2 SD 4.3 years. 62 patients were male. Of the total number of patients, 60 had tenosynovitis of the flexor tendinous apparatus (90.9%). Four of these patients also presented tenosynovitis of the tendinous extensor apparatus. No patient presented only extensor tenosynovitis. Enthesopathy was identified in 6 patients (9.1%), in no case enthesopathy did occur simultaneously with PD signal. Joint synovitis was identified in 43 patients (65.1%). Of these, in 13 patients a Grade I was registered, and in 26 a PD signal was demonstrated. Tophi were identified in 16 patients (24.2%). Soft tissue enlargement was observed in 28 patients. Table 1 summarizes the independent results of findings of dactylitis ultrasound studies.

Patients with joint synovitis and a positive PD signal had an average of 7.4 SD 2.1 years since diagnosis while those with synovitis without PD signal had 5.9 SD 2.9 ( $P < 0.001$ ). Patients which ultrasound studies demonstrated the presence of PD signal also showed a shorter time from the last flare (4.4 SD 1.9 vs. 7.1 SD 2.8 months) and higher levels of blood uric acid (8.7 SD 2.5 vs. 7.4 SD 1.9 mg/dL). In both comparisons, the differences were statistically significant ( $P < 0.001$  and  $< 0.05$ , respectively). Table 2 summarizes the relationship of main ultrasound findings and clinical characteristics of our patients.

Of the 60 patients with tenosynovitis, 10 of them had an average blood uric acid level in the past year under 6 mg/dL, 12 had a level between 6 and 7 mg/dL and the rest had a level above 7 mg/dL. Of the 27 patients with joint synovitis, the distribution of average blood uric acid level was 5, 10, and 12, respectively.

## CONCLUSIONS

The present study is, as far as, we know, the first iconographic study of gouty dactylitis based on ultrasound. According to our results, tenosynovitis of the flexors is the most frequent finding in gouty dactylitis while enthesopathy is rather rare. This is, maybe, the most relevant distinction from the

**Table 1: Prevalence of all ultrasound findings in fingers with dactylitis**

Ultrasound finding	Number of observations	Proportion (%)
Soft tissue enlargement	28	42.4
Joint PD		
Mild	19	28.8
Moderate	7	10.6
Flexor tenosynovitis	60	90.9
Flexor and extensor tenosynovitis	4	6.1
Enthesopathy	6	9.1
Synovial effusion	13	19.6
Mild moderate	8	12.1
Severe	6	9.1

PD: Power doppler

**Table 2: Ultrasonographic main findings and correlation with clinical features**

Clinical feature	Tenosynovitis		Enthesopathy (6)	Synovitis		Tophus (16)
	Flexor (60)	Extensor (4)		PD (-) (34)	PD (+) (26)	
Time from diagnosis (years±SD)	6.7±2.3	6.9±0.8	7.1±1.8	5.9±2.9	7.4±2.1	10.2±3.4
Annual average of blood uric acid (mg/dL±SD)	7.3±0.9	6.7±0.9	7.0±2.3	7.4±1.9	8.7±2.5	9.9±1.1
Time since last flare (months±SD)	6.0±3.1	3.2±0.8	6.5±3.1	7.1±2.8	4.4±1.9	5.0±3.1
Number of flares per year±SD	2.2±1.0	2.5±0.5	1.9±0.7	1.6±1.0	2.9±1.1	3.3±2.5
Renal impairment (%)	12.5	25	16.6	23.5	26.9	37.5

PD: Power doppler, SD: Standard deviation

dactylitis observed in patients with psoriatic arthritis or other spondyloarthritis.<sup>[11]</sup> The presence of significant synovitis is the second most frequent finding while tophi as conditioning agent of synovitis were the least frequent finding. This finding suggests that tophus is not the major cause of gouty dactylitis and also supports the fact that dactylitis is not a chronic hallmark of the disease such as tophus.<sup>[4]</sup>

Although, we have observed that higher levels of blood uric acid are present in patients with PD signal, it is even more relevant to underline the fact that tenosynovitis and joint effusion was present in patients with levels of uric acid below the theoretical target. This observation could be confusing and can be interpreted from two different points of view: First, we can assume that, as some studies have suggested, the therapeutic goal in gout is still not enough to prevent musculoskeletal damage.<sup>[6]</sup> Second, we can assume that what we found are subclinical and not relevant findings that do not affect the clinical course of the disease. This last hypothesis should be supported by further prospective studies in gouty dactylitis that, as far as, we know, do not exist.

We understand that the knowledge of the echographic characteristics of gouty dactylitis can serve as a clinical guide when making therapeutic decisions in cases where this clinical sign lasts despite the control of other manifestations.

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