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Review article

Relevant aspects of imaging in the diagnosis and management of gout☆

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ABSTRACT

Gout is an inflammatory arthritis characterized by the deposition of monosodium urate crystals in the synovial membrane, articular cartilage and periarticular tissues leading to inflammation. Men are more commonly affected, mainly after the 5th decade of life. Its incidence has been growing with the population aging.

In the majority of the cases, the diagnosis is made by clinical criteria and synovial fluid analysis, in search for monosodium urate crystals. Nonetheless, gout may sometimes have atypical presentations, complicating the diagnosis. In these situations, imaging methods have a fundamental role, aiding in the diagnostic confirmation or excluding other possible differential diagnosis.

Conventional radiographs are still the most commonly used method in gout patients' evaluation; nevertheless, this is not a sensitive method, since it detect only late alterations.

In the last years, there have been several advances in imaging methods for gout patients. Ultrasound has shown a great accuracy in the diagnosis of gout, identifying monosodium urate deposits in the synovial membrane and articular cartilage, in detecting and characterizing tophi and in identifying tophaceous tendinopathy and enthesopathy. Ultrasound has also been able to show crystal deposition in patients with articular pain in the absence of a classical gout crisis.

Computed tomography is an excellent method for detecting bone erosions, being useful in spine involvement. Dual-energy CT is a new method able to provide information about the chemical composition of tissues, with high accuracy in the identification of monosodium urate deposits, even in the early stages of the disease and in cases of difficult characterization.

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Magnetic resonance imaging is useful in the evaluation of deep tissues not accessible by ultrasound.

Besides the diagnosis, with the emergence of new drugs that aim to reduce tophaceous burden, imaging methods have become useful tools in monitoring the treatment of patients with gout.

Aspectos relevantes do diagnóstico e seguimento por imagem na gota

Palavras-chave:
Gota
Ultrassonografia
Ressonância magnética
Tomografia computadorizada de dupla energia

RESUMO

A gota é uma artrite caracterizada pela deposição de cristais de monourato sódico na membrana sinovial, na cartilagem articular e nos tecidos periarticulares que leva a um processo inflamatório.

Na maioria dos casos o diagnóstico é estabelecido por critérios clínicos e pela análise do líquido sinovial, em busca dos cristais de MSU. Porém, a gota pode se manifestar de maneiras atípicas e dificultar o diagnóstico. Nessas situações, os exames de imagem têm papel fundamental, auxiliam na confirmação diagnóstica ou ainda excluem outros diagnósticos diferenciais.

A radiografia convencional ainda é o método mais usado no acompanhamento desses pacientes, porém é um exame pouco sensível, por detectar somente alterações tardias.

Nos últimos anos, surgiram avanços nos métodos de imagem em relação à gota. O ultrassom se mostra um exame de grande acurácia no diagnóstico de gota, identifica depósitos de MSU na cartilagem articular e nos tecidos periarticulares e detecta e caracteriza tofos, tendinopatias e entesopatias por tofos.

A tomografia computadorizada é um ótimo exame para a detecção de erosões ósseas e avaliação do acometimento na coluna. A tomografia computadorizada de dupla-energia, um método novo, fornece informações sobre a composição química dos tecidos, permite a identificação dos depósitos de MSU com elevada acurácia.

A ressonância magnética pode ser útil na avalição dos tecidos profundos, não acessíveis ao ultrassom.

Além do diagnóstico, com o surgimento de drogas que visam reduzir a carga tofácea, os exames de imagem se tornam uma ferramenta útil no acompanhamento do tratamento dos pacientes com gota.

Introduction

Gout is an inflammatory arthritis, characterized by periods of hyperuricemia and deposition of mono sodium urate (MSU) in the articular cartilage, subchondral bone, synovium, capsule, periarticular tissues and in lower temperature areas such as the superficial tissues of the extremities, leading to an inflammatory reaction.[1,2] Genetic and dietary factors have been implicated in increasing the level of MSU.[2]

Gout occurs in approximately 0.2–0.35 per 100 inhabitants in the general population. The incidence is higher at the end of the third/beginning of the fourth decade of life, predominantly in males and in about 5% of women, usually after menopause.[2,3]

Usually, the diagnosis is established by clinical and laboratory workup, and the reference method is the analysis of synovial fluid; however, this is an invasive technique. Thus, the therapy can be started based on the diagnostic criteria of the American College of Rheumatology (ACR).[4]

The importance of an accurate diagnosis and treatment of gout should not be underestimated, because these patients will depend on the therapy throughout their lives, in order to diminish those morbidities associated with hyperuricemia. Due to the multiple differential diagnoses, and also considering the atypical presentations of gout, imaging studies may be useful in various stages of this disease.[5]

In the last decade, we have witnessed important advances in imaging techniques, assisting in the noninvasive diagnosis and follow-up of patients being treated for gout. To the best of our knowledge, no recent review of the imaging aspects for gout was published in Brazilian literature. To the best of our knowledge, there has not been any recently published review of imaging aspects for gout in Brazilian literature. This review aims to summarize recent advances in the literature related to imaging studies, disclosing the relevant aspects to physicians of all specialties with respect to the diagnosis and follow-up of gout patients by imaging methods, in view of the increase and the high prevalence of this disease.

Methods

A search of major databases (Medline, Lilacs, Cochrane Library and PubMed) was conducted with the use of the terms "gout," "arthritis," "tophaceous gout" and "urate". Our search was limited to original articles published in the last 5 years, but review articles and case reports of significant clinical relevance were included in the survey.

More than 700 articles and abstracts published on the proposed topic in this review were identified in the search. The selection was based on clinical importance; articles that showed no relationship with diagnostic imaging were excluded. At the end, 39 articles remained.

Discussion

Four distinct clinical phases are recognized: asymptomatic hyperuricaemia, acute monophasic gout, recurrent acute attacks with intercritical periods and chronic gout which is often tophaceous[1,2] (a sequence of such events is not mandatory and asymptomatic patients do not receive a diagnosis of gout). In each of these phases, it is possible to use imaging studies.

The typical clinical picture of cases of acute gouty arthritis includes a painful acute monoarthritis of the first metatarsal or knee, with local inflammation and swelling, in association with elevated levels of uric acid.

Hyperuricemia is one of the clinical criteria for a diagnosis of gout, but although this is the predominant risk factor for this disease, elevated serum uric acid levels not always result in deposition of crystals.[6] Serum urate levels >6.8 mg/dl can lead to precipitation and deposition of urate crystals in the joints and soft tissues, but acute gout crisis can occur even in patients with normal serum urate levels; in these cases the clinical diagnosis is more difficult, and the doctor can get help through imaging methods. Imaging studies can also be used in atypical presentations, for example, in cases involving unusual age groups or locations, with prolonged and less intense symptoms at the time of presentation.[5,6]

The intercritical period is that following an acute episode of a painful gout crisis, in which the patient remains asymptomatic. Advances in imaging techniques showed that, in patients in the intercritical period, it is possible to detect tophaceous deposits in up to 50% of joints that have already been affected by acute episodes.[5] It has also been shown that asymptomatic patients had tophaceous deposits in the spinal column, detected by computed tomography (CT).[7]

Knowing that in many cases patients, even when asymptomatic, may have already tophaceous deposits not detected clinically, it is worth questioning whether it is important to evaluate early joint, bone and tendon damage – or even the tophaceous load – through imaging exams during the intercritical phase. At this stage, the imaging evaluation, as far as our knowledge goes, is not yet a recommended practice in the literature.

A few years must elapse so that the tophus becomes clinically evident after the first attack; rarely these formations are identified during this first episode.[1] Chronic tophaceous gout is characterized clinically by the presence of tophi, which are formed secondarily to the accumulation of uric acid, protein matrix, inflammatory cells and foreign body giant cells in the tendons, ligaments, cartilages, bursae, subcutaneous cellular tissue and in periarticular regions.[5] The tophi are more common on the extensor surfaces of the hands, elbows, feet, knees, auricular appendages and the tip of the nose.

Although generally chronic tophaceous gout has a straightforward clinical diagnosis, in some cases the diagnosis can be challenging, when the problem is associated with unusual symptoms or with an atypical disease. Atypical clinical manifestations are seen more frequently in certain segments of the population, including the elderly, patients who have undergone organ transplants, and cancer patients.[6]

The tophi nodules can also not be typical, and the physician should take into account some differential diagnosis as ganglion, cysts, bursitis, hematoma, amyloidosis, thrombophlebitis, sarcoidosis, psoriatic arthritis, pyrophosphate deposit arthritis, neoplasms, tenosynovitis, rheumatoid nodules, osteoarthritis and infection.[8,9]

At this stage, the imaging studies may be valid for the assessment of disease severity, the extent of MSU deposition, and the presence of chronic inflammation. Moreover, images may constitute a useful tool for monitoring the response to a reduction of uric acid therapy.[10]

Monitoring and response to treatment

Several methods have been developed and evaluated by the Outcomes Measures in Rheumatology (OMERACT) in order to quantify tophi in patients with chronic tophaceous gout, from the simplest methods, for instance, by physical examination, to more sophisticated means with the use of imaging tests. In patients with a chronic tophaceous gout, quantification of tophi and documentation of regression with treatment are important measures of monitoring, in order to prevent joint destruction. Patients with elevated levels of uric acid do not necessarily exhibit higher masses of tophi, compared with patients with low levels of uric acid.[11,12]

Among the methods using physical examination, the main ones are number of tophi counting, physical measurement with a measuring tape, the use of a specific instrument called Vernier caliper, and digital photography.[13]

Ultrasound is a good tool for the evaluation of response to treatment, thanks to its availability and also because it has good sensitivity. The use of computed tomography and magnetic resonance imaging, although less available techniques, results in some advantages, such as data storage possibility for later reading and visualization of intra-articular tophi, in the absence of subcutaneous tophi.[14–16]

Dual-energy CT (DECT) is emerging as a good tool because with its use the physician can demonstrate MSU deposits even in asymptomatic patients. Although the ability of this technique in terms of quantifying tophi is a potentially useful feature to evaluate small changes in tophus load and although the technique plays a role in monitoring the response to treatment, its cost and the radiation exposure (albeit low) mean that the main role of DECT in monitoring treatment is limited to clinical trials of new therapeutic agents, with little use in clinical practice.[16]

Image methods

The imaging methods used for the evaluation of gout are plain radiography (X-ray), ultrasound (US), DECT, CT and magnetic resonance imaging (MRI).

Plain radiography

Bloch et al.[2] classified the radiological findings in early, intermediate and late changes. Radiographic changes are more frequent in the feet, especially in the first metatarsophalangeal joint.[2,10] In the initial presentation of gout, there is no specific radiographic signs – only an increased soft tissue volume and density. With X-rays, one cannot assess early changes of the soft tissues such as effusion, initial erosion, synovial hypertrophy, hypervascularization, or small tophi. On the other hand, with MRI – which shows these changes – is not always that the physician can establish an accurate differentiation between gout and some of its differential diagnosis.

X-ray is a fast method, and generally it is used in the first investigation of gout. X-ray has low sensitivity for diagnosis, and there may be a gap from 6 to 12 years for the finding of radiological evidence.[2] In 2008, Rettenbacher et al. found a sensitivity of 31–55% and a specificity of 93% for X-ray in the diagnosis of gout.[17] In cases of chronic tophaceous gout, radiographic signs include visualizing tophi as soft tissue or intraosseous masses, whether or not containing calcifications; and the presence of a non-demineralizing arthropathy accompanied by erosions presenting margins which may be sclerotic or protruding. The Martel's sign (Fig. 1) consists in the presence of a protruding, salient bone edge separated from a tophus and leaning on it.[18,19] In X-ray, generally the joint space is preserved until the disease is advanced.[10]

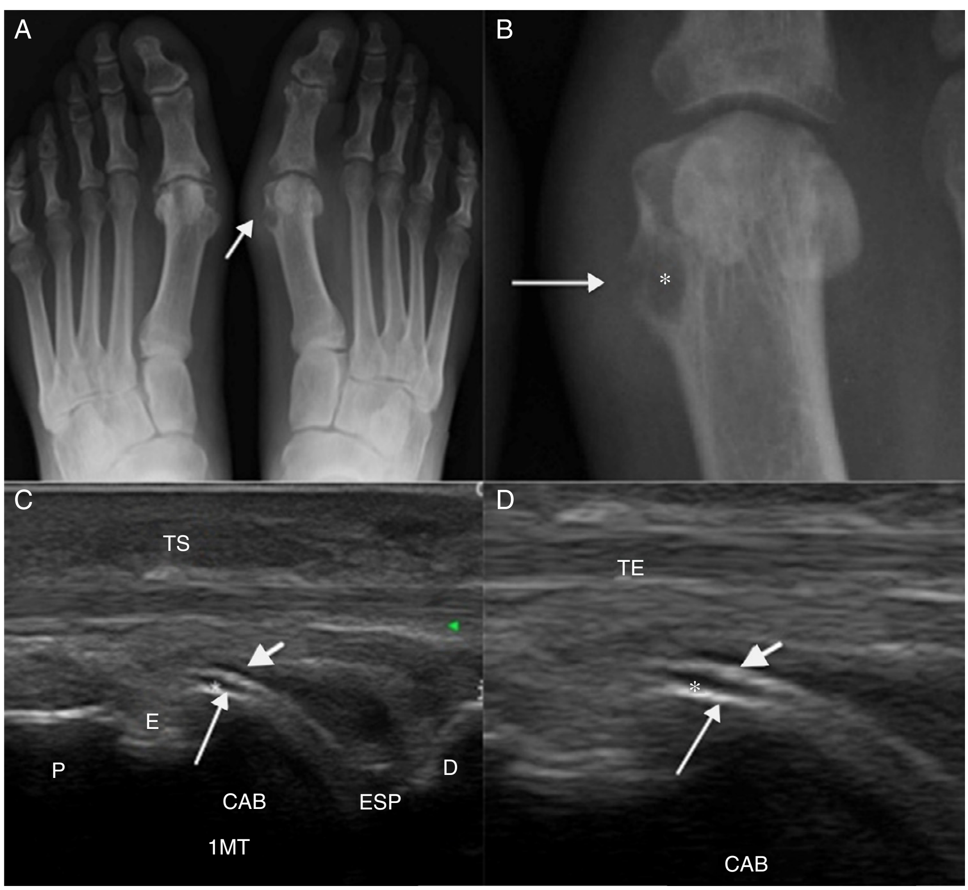

Fig. 1 – (A) Anteroposterior radiography of feet of a patient with gout showing increased volume and density of soft tissues adjacent to the first metatarsophalangeal (MTP) joint (arrow). One can also observe bone erosion in distal metaphysis of the first metatarsal. (B) Detail of the previous image showing the head of the first left metatarsal, evidencing bone erosion marked with an asterisk (*) with raised edges, and Martel's sign (arrow). (C) Ultrasound image with longitudinal section of the foot at the level of the first MTP joint, showing the cortical bone of the head of first metatarsal (large arrow), the MTP joint space of the hallux, the cartilage of the head of the first metatarsal (*) and a thin hyperechoic layer overlying the coating cartilage (small arrow), characterizing the double contour sign. (D) Detail of the previous image showing the bone surface (arrow) of the head of the first metatarsal, articular cartilage (*) and the thin hyperechoic layer (small arrow), characterizing the double contour sign. P, proximal; D, distal; TS, subcutaneous tissue; ESP, phalangeal space of hallux; TE, extensor hallucis tendon.

According to Bloch,[16] X-ray is a method with little use in the evaluation of treatment, primarily by its low sensitivity in detecting the disease in its early stages, but also, because it is based on the presence of late findings, such as increases in soft tissue, cortical erosions, and lytic injuries.

Ultrasound

The high resolution of US allows us to identify the various forms of presentation of gout and its relationship with the different tissues, helping in an early and noninvasive diagnosis, therapeutic decision and management of treatment. In addition, US is a very useful method of assessing the extent and measurement of lesions and in the involvement of adjacent structures, with low interobserver variability; besides, US fulfill the necessary characteristics for the evaluation of therapeutic response. As for histopathologic confirmation of gout, US is also useful in guiding punctures or biopsies.[19,20]

US detects early changes in the soft tissues in cases of gout and can be used especially when the clinical, laboratory and radiographic studies are negative or inconclusive. There are several other advantages with the use of this technology: it is noninvasive, easy to repeat the exam, ability to differentiate between solid versus cystic lesions, low cost, patient contact, absence of ionizing radiation, the possibility of acquisition of multiplanar and high-resolution images, dynamic assessment of the joint and tendons, and effective guidance in invasive procedures.[9,19,21] Some studies comparing the sensitivity and specificity of US versus X-ray showed that US is more sensitive and earlier that X-ray, because the sonographic changes are present at earlier stages, in comparison to typical X-ray signals.[17,19,22]

Sonographic aspects which are characteristic for the diagnosis of gout are the "double contour signal" (Fig. 1), which is characterized by an irregular linear hyperechoic layer on the superficial margin of the anechoic hyaline cartilage and parallel to the bone cortex, without a posterior acoustic shade. In a Thiele's 2007 study,[19] this signal was observed in 92% of patients with biopsy-confirmed gout, and none of the controls.

But patients with asymptomatic hyperuricemia may show the sign of the double contour, observed in the study of Pineda et al. in 25% of the metacarpophalangeal joints.[20] Moreover, with the reduction of uric acid levels, this signal tends to disappear in up to 7 months.[22]

In 2008, Rettenbacher et al.[17] found sensitivity and specificity of respectively 80% and 75% for the bright hyperechoic foci in synovial tissue (microtophi) and 79% and 95% for hyperechoic areas for the diagnosis of gout. Considering the presence of either of the two findings, ultrasound had a sensitivity of 96% and specificity of 73%. The specificity is not higher because punctate hyperechoic foci, which may represent microtophi, can also be observed in cases of osteoarthritis, rheumatoid arthritis and chondrocalcinosis.[23]

When the bright hyperechoic foci are seen in combination with the double contour signal, the specificity reaches 100%, but with a considerable reduction of sensitivity.[24]

In cases where the doctor depends on an imaging study, the knowledge of the sonographic features of tophus is important so that one can differentiate between tophaceous nodules and nodules from other etiologies (Fig. 2). US uses criteria that help to differentiate between nodules caused by cancer and inflammatory and infectious processes. In 2003, Nalbant,[10] comparing tophi nodules and rheumatoid nodules, showed that 80% of tophi were heterogeneous and of these, 75% were hyperechoic; furthermore, this author observed only 15% of heterogeneity and hyperechogenicity in rheumatoid nodules. The rheumatoid nodule is more homogeneous and can present a well-defined, hypoechoic central area due to the occurrence of necrosis. Since rheumatoid nodules rarely calcify, this feature also helps to differentiate these formations from tophi, which can calcify.

The presence of calcifications with posterior acoustic shadowing and irregularities of the cortical bone underlying to nodules also favor a diagnosis of tophi. There is no correlation between disease duration and the presence of calcifications in tophi. The tophi are hyperechoic in 96.3% and hypoechoic in 3.7% of cases.[12] The hyperechogenicity noted in tophi represents deposits of urate or calcifications. Small hyperechoic particles, or bright foci, measure less than 1 mm in size and represent synovial microtophi.[17] An agglomerate of microtophi form hyperechoic the tophus; therefore, hyperechogenicity and heterogeneity are strong indicators of a tophus.

The hypoechoic halo in tophus periphery is a hypoechoic band observed partially or completely around the tophus and

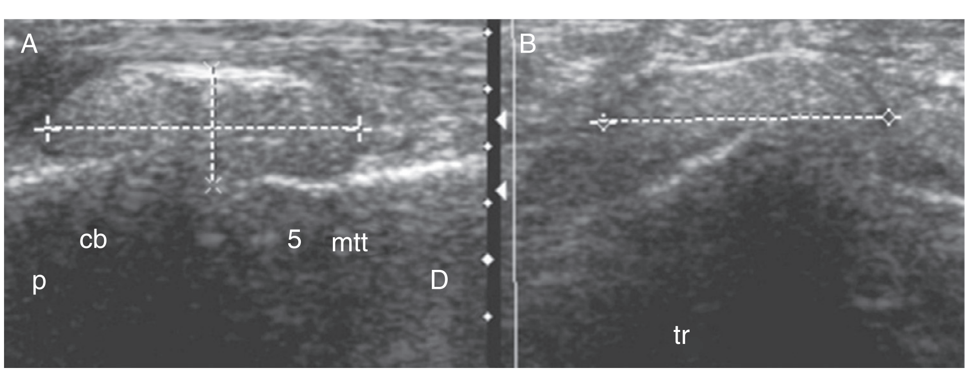

Fig. 2 – Fifth metatarsophalangeal. (A and B) Sonographic image. Longitudinal (A) and cross (B) sections of an amorphous, hyperechoic, nodule located in the soft tissues adjacent to the metatarsocuboid joint. The structures deep to the node are undefined by the attenuation of the acoustic beam. P, proximal; D, distal.

may correspond to inflammation, fibrosis or edema. This halo is observed in large parts of tophi and can be a marker for tophaceous nodule.[12]

The sonographic features of tophi in relation to the tendons may help to explain the clinical pictures showing movement restrictions of patients with chronic tophaceous gout; furthermore, their knowledge can avoid invasive procedures, such as biopsies. A five-type classification of the relationship between tophi and the tendon in patients with chronic tophaceous gout was proposed,[25] based on their location: tendon surrounded by tophi, no relationship between tophus and tendon, tophi in the tendon insertion site (enthesopathy), extrinsic compression, and tophi within the tendon.

Enthesopathy secondary to tophi is a recent finding in the literature; and although it has been described in only 7% of cases of chronic tophaceous gout, this possibility should be considered in the differential diagnosis, depending on the clinical context. The differential diagnosis of enthesopathy is broad and includes calcium pyrophosphate deposition disease, degenerative disease, acromegaly, hyperparathyroidism, hypoparathyroidism, and rheumatoid arthritis, among others. The intratendinous tophus tends to evolve to the rupture of the tendon[26] and an early sonographic diagnosis may assist the physician in establishing an effective treatment while avoiding damage that, if not treated medically, may evolve into the need for surgical treatment. Inside the tendon, the tophi may have microdeposits demonstrated by bright, ovoid and hyperechoic spots. Chronic intratendinous tophi can be evidenced as hyperechoic bands, occasionally accompanied by a posterior acoustic shadow.[27]

US allows the visualization of the changes in the inflammatory process of gout. The evaluation of gout by color Doppler US demonstrates increased flow in the acute phase of the podagra crisis, which normalizes partially in 7 days. Generally, color shows no flow when the patient is out of the gout crisis,[10] but in the author's practice it has been observed that painful periarticular areas in patients with a known diagnosis of gout can exhibit hyperechoic tophi and flow with Doppler, even without the classic signs of crisis, which explains the atypical clinical pictures of gouty arthralgia. However, these findings depend on further studies to justify their use (Fig. 3).

Bone erosions are defined as cortical discontinuities observed in two perpendicular planes. This is a late finding and has low sensitivity in diagnosing tophaceous gout; however, these erosions are slightly better detected by US versus X-ray (24% versus 20% of cases).[17]

The dimensions of the gouty tophus assume importance in assessing the response to treatment; therefore, in order to acquire practical utility, the method used for this purpose must show a good reproducibility. Perez-Ruiz et al. showed that US is able to detect all periarticular tophi identified by MRI.[10,28] After the publication of these studies, OMERACT has considered US as a possibly useful method in measuring gouty tophi; but new clinical trials must be conducted for validation of this method.

Computed tomography (CT)

CT allows the visualization of tophi in both the subcutaneous tissue and in intra-articular areas. This method also helps to identify bone erosion, being more sensitive than X-ray and MRI for this purpose. A systematic analysis showed that CT detects the presence of intraosseous tophi in 81% of joints presenting

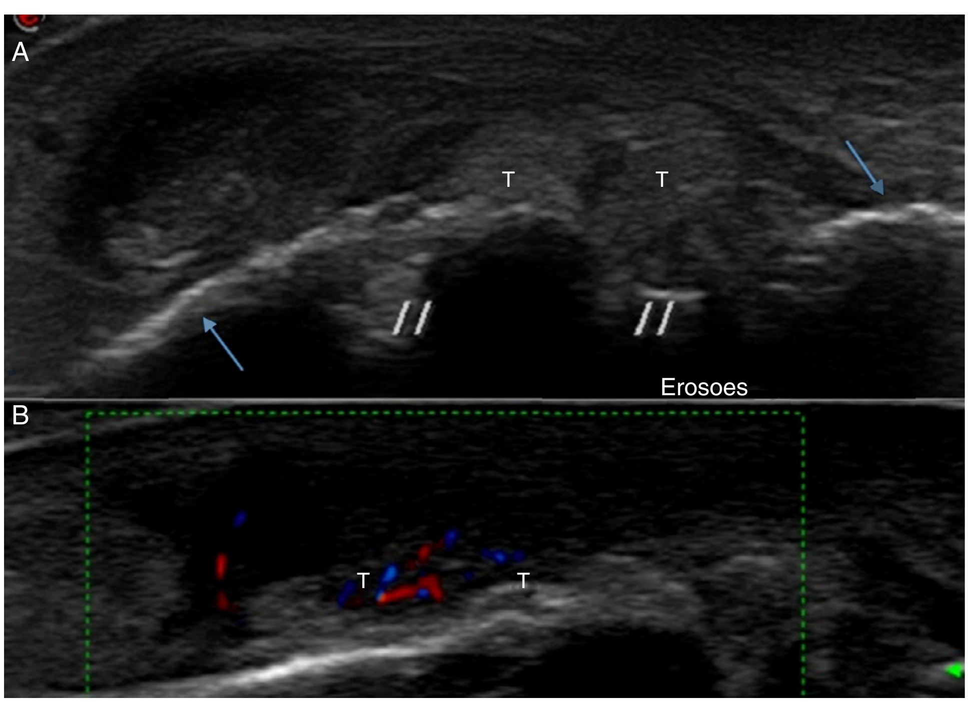

Fig. 3 – (A) sonographic image in the longitudinal plane in the first metacarpal. Patient with pain without evidence of a gouty crisis. One can observe the presence of bone erosions (//) and tophi (T) adjacent to the erosions. (B) The color Doppler shows increased vascularity in tophi. Cortical bone (arrows).

erosion and in 100% of cases when the erosion is greater than 7.5 mm.[29]

CT can also reveal MSU deposits inside tophi, thanks to its attenuation close to 160 UH, compared to calcium deposits, which have higher attenuation, around 450 UH.[30] Thus, CT can assist in the differentiation with respect to other types of soft tissue nodules. CT can be used as a complementary imaging method in the evaluation of damage to deeper structures, when methods that do not use ionizing radiation could not confirm its presence. In cases of involvement of deep structures such as the spine, possibly CT can complement an MRI study, by demonstrating masses of tophi with compression of nerve structures.

While it may be useful, CT is not recommended as a method of choice in the evaluation of gout on surface structures due to the ionizing radiation exposure.

Dual-energy computed tomography (DECT)

DECT is a method that provides information about the chemical composition of tissues and allows their differentiation. Through this technique, it is possible to distinguish MSU crystals from gout, bone or dystrophic calcification.[6] In some studies examining the deposition of articular and periarticular crystals using DECT, high sensitivity and specificity were observed. Variations on the data obtained could be due to the different joints evaluated, protocols used and different stages of this disease.[30–34]

In the early stages of the disease when the MSU deposits are microscopic and with an intra-articular location, not being macroscopic tophi, DECT may not be able to detect them, since this technique has a size threshold, usually of 2 mm – the technique is not able to distinguish deposits with dimensions below this limit.[35] In addition to the limitations related to the size of deposits, DECT is susceptible to some artifacts, mainly related to metallic devices, calluses, nails and thickened skin areas such as that in the heel.

Most studies did not explore the diagnostic accuracy of DECT in the first presentation of gouty arthritis. Based on limited published data, in the first episode of gouty arthritis, the diagnostic sensitivity is low, around 50%.[36] In a study of 21 patients comparing the diagnostic accuracy of US versus DECT in cases with suspected gout, the authors observed similar sensitivity in these two methods, with false-negative results in DECT accurately detected with US.[16]

DECT may be used to assess gout, regardless of serum uric acid levels, and can confirm the disease in patients with normal serum uric acid levels, or exclude it in patients with hyperuricemia. The general burden or uric acid deposition volume may be calculated on individual lesions, joints, or in the entirely digitalized area. A possible disadvantage of DECT could be the patient's exposure to ionizing radiation, but the dose is less than the natural annual dose received and much lower than the potentially malignancy-inducing values.[22] Due to the cost and to the radiation exposure (albeit low), its main role, monitoring the treatment, is limited to clinical trials of new therapeutic agents, more than in clinical practice.[16]

Magnetic resonance

MRI is not routinely used to evaluate tophaceous gout. This technique can be used to recognize the cause of motion limitations, motor or painful disorders secondary to changes in deep structures or that are coated with bone; in such event, the access through US is not suitable (Fig. 4).

MRI is also useful for assessing the differential diagnosis of soft tissue masses on the extremities.[31] In MRI studies, usually the tophus presents itself as a juxta-articular mass of soft tissue, causing periarticular erosions and synovial thickening. Using this technique, the appearance of tophi is variable. In T2-weighted sequence, there is a variation of a low-to-high signal, with a homogeneous or non-homogeneous pattern, depending on the degree of hydration and calcification. The most common appearance in a T2-weighted sequence is a low-to-intermediate, heterogeneous signal. In a T1-weighted sequence, its appearance is more consistent, generally exhibiting a low-to intermediate signal. The enhancement pattern is also variable. Another feature is the enhancement surrounding the tophus; probably this is related to the adjacent granulation tissue (Fig. 5).[37]

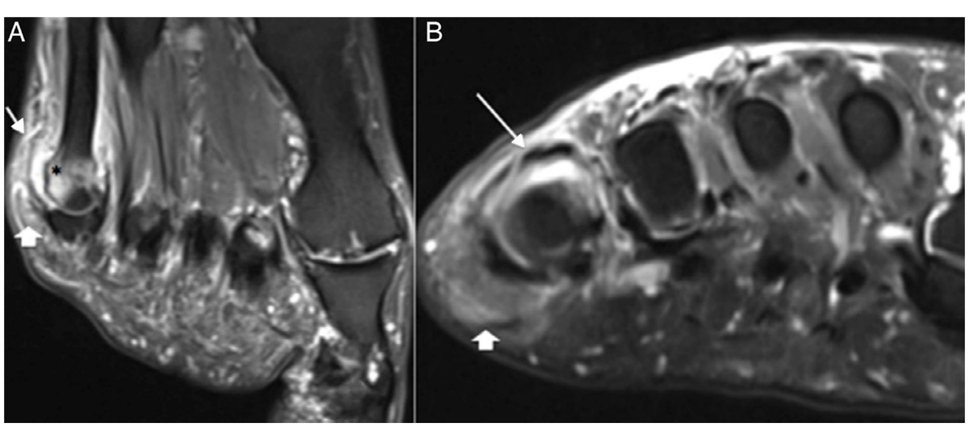

Fig. 4 – MRI images of the foot on the long (A) and short (B) axis, showing joint effusion (arrow) in the fifth metatarsophalangeal joint, in association with a pattern of medullary bone edema in the head and distal metaphysis of the fifth metatarsal (*), as well as a densification of the adjacent fat planes (arrowhead).

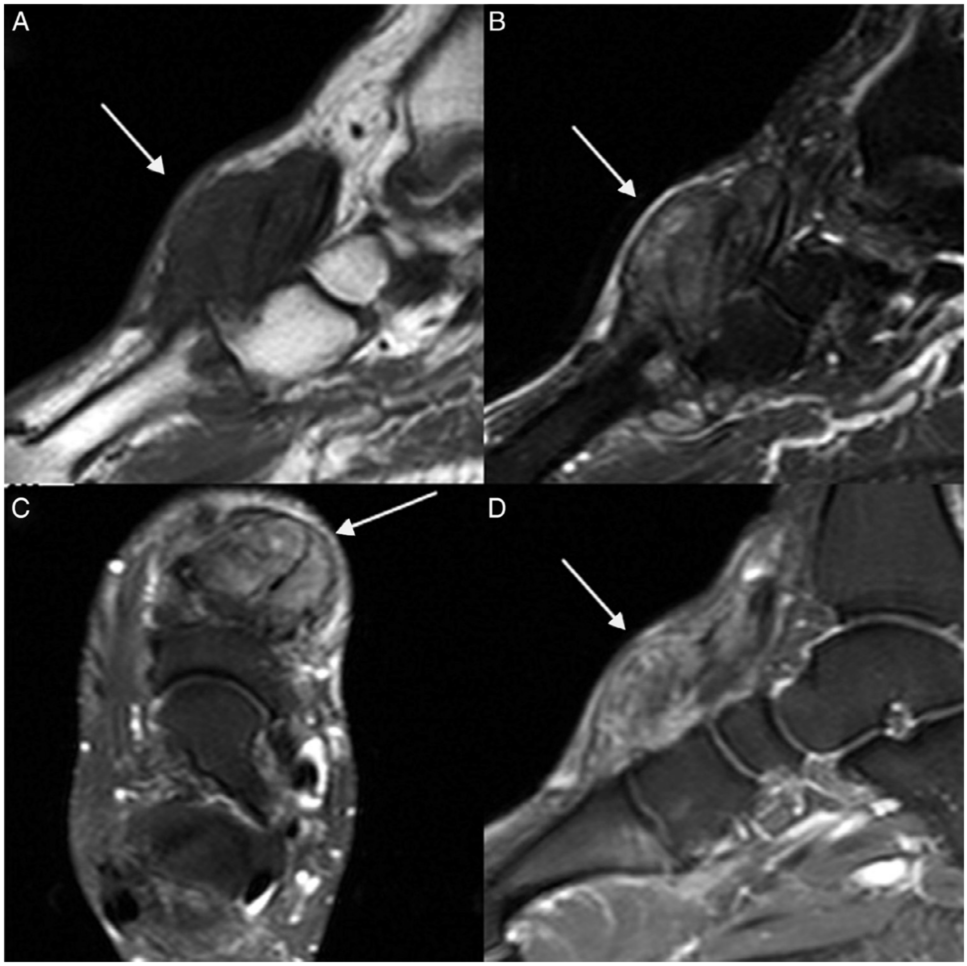

Fig. 5 – Sagittal MRI images: T1-weighted (A), T2-weighted (B), axial T2-weighted (C) and sagittal after contrast (D) images of the foot showing heterogeneous material with isosignal on T1, heterogeneous hyperintense signal on T2, with heterogeneous enhancement after IV injection of paramagnetic contrast in the dorsal aspect of the foot (arrows).

MRI also provides information on the morphology of tophi, which can range from small nodular masses deposited in poorly defined anatomical planes, even with a permeative aspect.[38]

Perez-Ruiz et al. evaluated the measurement of tophi in a comparison between US and MRI, including the change in tophus size and its association with serum concentrations of urate in the course of 12 months. In this study, the diameters evaluated in MRI were larger than those obtained with the use of US, and this may be related to better MRI imaging for the soft tissue component of the tophus, which can contain regions of inflammation and hypervascularity.[10]

Recent studies have shown that MRI can detect early articular erosions that are not radiographically apparent.[39] Faced with an acute gouty arthritis, it is common the occurrence of periarticular edema, synovitis, and joint effusion, as well as the presence of a high signal in bone marrow and periarticular soft tissues; but these changes can be seen in any inflammatory arthropathy, thus being unspecific findings. MRI is not a relevant technique to help in the establishment of the initial diagnosis of gout. For these reasons, MRI should not be routinely used for the diagnosis of gout in its early stages, both in cases of typical clinical presentation, as in atypical cases.

Conclusion

Imaging methods can be useful to aid in the diagnosis and monitoring of treatment of patients with gout and, in particular, the use of ultrasound, which is an available, noninvasive tool which provides good results. The potential of ultrasound diagnosis has increased the interest among physicians. This is a readily available, non-invasive tool that can be used for the investigation of this disease.

Conflicts of interest

The authors declare no conflicts of interest.

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