GRAPPA 2011: Proceedings from the Ultrasound Imaging Module

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ABSTRACT. In a plenary session at the 2011 meeting of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA) the use of sonography for evaluating enthesitis and dactylitis in psoriasis and psoriatic arthritis (PsA) was reviewed, and initial proposals were presented to develop ultrasound joint indices to assess enthesitis and dactylitis in PsA. Sonography can depict ultrastructural morphopathological features of an enthesis and its adjoining tissue structures, as well as increased vascularity; candidate entheses were proposed for an initial sonographic PsA enthesitis index. Ultrasound also can readily demonstrate soft tissue changes, synovitis, erosions, and osteoproliferation in dactylitis, and these features were proposed for an initial sonographic dactylitis index. A perspective was also presented on a wider proposed index including the skin, nail, joint, and enthesis. (J Rheumatol 2012;39:2211–13; doi:10.3899/jrheum.120826)

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PSORIATIC ARTHRITIS SONOGRAPHY DOPPLER ENTHESITIS DACTYLITIS

At the 2011 annual meeting of the Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA), an imaging module was chaired by Mikkel Østergaard (Glostrup, Denmark) and Gurjit S. Kaeley (Jacksonville, FL, USA). At the previous GRAPPA meeting in 2010, a comprehensive review was presented on the current use of sonography in psoriatic arthritis (PsA)[1]. In 2011, the imaging module focused on developing sonography as a measure to assess enthesitis and dactylitis in PsA. Summarized below are presentations regarding developing sonography as a validated tool in evaluating enthesitis and dactylitis as well as a preliminary composite scoring system in PsA.

Which Peripheral Entheses Should Be Sonographically Examined in Psoriasis and PsA?

Enthesitis is a well recognized feature of PsA. Its clinical detection relies on palpation of entheses[2]. Sonography is more sensitive than clinical examination in detecting enthesitis and reveals detailed morphological information[3,4]. Maria Antonietta D'Agostino (Paris, France) presented an overview of the definitions of enthesitis as well as the utility of ultrasound in evaluating features of enthesitis.

Traditionally, an enthesis has been defined as the junction of bone and ligament or tendon. Sonography can detect extraosseous structural changes and inspect vascularization of the tissue. The ultrasound working group of Outcome Measures in Rheumatology (OMERACT) published a sonographic definition of enthesopathy, which included alterations at the enthesis proper manifested by cortical changes as well as proximal ligamentous and tendinous alterations[5]. In view of the abnormalities of tissues adjoining the enthesis (e.g., bursae, fat pads, tendons) and magnetic resonance imaging (MRI) evidence of enthesitis abutting joints in spondyloarthropathies, an alternative view of a synovial enthesis organ has been advanced by Benjamin and McGonagle[6]. Thus, when considering which structures to study, the enthesis proper, tendon or ligament, bursa, and cortical bone may be studied with B mode sonography. Elementary changes that may be detected include tendon thickening, hypoechogenicity, calcification, underlying bone cortical erosions, and bursal distension[1,7,8].

The blood supply to the structures may be evaluated by using power Doppler. However, neovascularization can be observed in degenerative tendinopathy in the tendon proximal to the enthesis. The aforementioned structural changes may also be seen in noninflammatory tendinopathy. The specificity of Doppler examination may be improved by the examination of the proper enthesis, i.e., the cortical bone insertion of the ligament or tendon. D'Agostino, *et al* first

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reported the specificity of the presence of power Doppler signal at the entheseal junction to bone in patients with spondyloarthropathy[9], and power Doppler at the entheses may assist in confirming the diagnosis of early spondyloarthropathy[10].

GRAPPA members discussed avoiding pitfalls in the Doppler examination. Since superficial structures are being studied, the sensitivity of the power Doppler signal can depend on the quality of machine used, machine settings, and probe pressure. The sonographer needs to elicit slow vascular flow and to be able to distinguish it from artifacts such as flash artifacts. The sensitivity of the Doppler signal may be compromised if the limb posture results in a tense tendon[11]. In addition, sonographers must be aware of the normal vascular signal from nutrient vessels.

When choosing which entheses to study, a balance should be struck between feasibility and reliability. For example, the clinical evaluation of enthesitis using the Mander Index has been described as too time-consuming, and a distillation of fewer entheses has been proposed. As summarized by Gladman, *et al*, the newer indices include the Achilles enthesis but do not agree on which other entheses to study[2]. Similarly, ultrasound composite measures all include the Achilles tendon but vary on what other entheseal sites to study[1]. Sites such as the costosternal junctions, spinous insertion at L5, and the pubis enthesis may not be reliable or feasible.

GRAPPA members agreed that sonography not only is more sensitive than clinical examination in detecting enthesitis, but also can demonstrate various abnormalities at the entheses of patients with PsA[12]. It has the additional advantage of detection of neovascularity at the enthesis proper and surrounding structures.

Defining Sonographic Elements of Dactylitis

Dactylitis is a common characteristic clinical feature of PsA and is defined as uniform diffuse swelling of the soft tissues of a digit such that actual joint swelling can no longer be independently recognized[13]. Dr. Kaeley and Ignazio Olivieri (Potenza and Matera, Italy) presented the current state of ultrasound imaging of dactylitis. Initially, dactylitis was believed to be predominantly due to flexor tendon tenosynovitis at the hand or foot[14,15,16]. In 1998, McGonagle, *et al* proposed an alternative hypothesis that dactylitis may be a manifestation of enthesitis. They proposed that the numerous ligamentous and capsular attachments to bone may be regarded as "functional entheses,"[17] and cited the fact that patients with rheumatoid arthritis have flexor tendon tenosynovitis, yet do not sustain dactylitis. Further, the presence of periostitis and extrasynovial new bone formation may be explained by this model. Subsequent MRI studies of dactylitic fingers demonstrated diffuse digital edema with or without flexor tendon tenosynovitis[18,19,20]. In an ultrasound study, Fournie, *et al* demonstrated analogous changes of soft tissue thickening as well as new bone formation in the capsule and juxtaarticular periosteal spaces; they also reported the presence of synovitis and profundus flexor tendon insertional changes[21]. Although MRI has the advantage of detecting intraosseous changes, it is not as sensitive as sonography at detecting osteoproliferation or subtle new bone formation.

In designing imaging measures for dactylitis, consideration should be given to evaluating the various ultrastructural changes. Thus, the measures should include not only quantitative measures of soft tissue thickening, flexor tendon thickening and tenosynovitis, and extensor tendon thickening[22], but also assessment of joint pathology, osseous changes, and intra- and extraarticular erosions.

Preliminary Evaluation of a Composite Scoring System in PsA

Psoriasis is a heterogeneous condition with multiple integumentary and musculoskeletal manifestations. Inflammation may affect contiguous structures such as the nail bed, enthesis, and adjoining joint[23]. Walter Grassi (Ancona, Italy) presented a perspective on the use of sonography in evaluating multiple targets in PsA. A preliminary sonographic scoring system to evaluate joint, tendon, enthesis, nail bed, and psoriatic plaque has been proposed by Gutierrez, *et al*[24,25]. The power Doppler signal can be evaluated at each of these sites and summed as a composite score. The utility of ultrasound to screen for early PsA in the dermatology clinic would be useful, but will require training and development of a screening protocol.

Ultrasound machine technology is rapidly advancing, with the result that power Doppler is becoming very sensitive. Dr. Grassi discussed the presence of Doppler signal in normal joints using advanced equipment and noted the importance of interpreting Doppler signal in conjunction with B mode findings.

Sonography can demonstrate dermal and epidermal skin thickening, subepidermal hypoechogenicity of the psoriatic plaque, and increased vascularity of the plaque[26,27]. Similarly, morphological nail changes as well as an increase in power Doppler in the nail matrix and nail bed may be observed in patients with PsA. Thus, a patient with PsA can be evaluated in a multidimensional manner with sonography and followed longitudinally in response to therapy[25]. Future refinements in ultrasound technologies such as 3D and 4D scanning may improve the ease and reliability of assessing various sites with ultrasound.

GRAPPA Ultrasound Project

At the 2010 GRAPPA meeting, members identified a need to develop a reliable sonographic index to examine features of PsA. At the 2011 meeting, Dr. Kaeley presented an outline of a pilot sonographic project with an initial focus on enthesitis and dactylitis.

Developing a Sonographic PsA Entheseal Index

Based on feasibility and access, sites chosen for the enthesitis index included the Achilles tendon, plantar fascia, patellar and quadriceps knee entheses, greater trochanter enthesis, lateral deltoid origin, and the medial and lateral epicondyle and triceps insertion at the elbow. Exploratory areas proposed included the medial and lateral compartments of the ankle — specifically to detect presence or absence of tenosynovitis and peroneus brevis enthesis. Although the OMERACT ultrasound task force achieved consensus on entheses elements to be studied, GRAPPA proposes to study additional elements, such as tendon morphological changes. The areas to be examined by Doppler signal include the enthesis insertion, the adjoining bursa and tendon, and the peritendon area of tendon or ligament close to enthesis, all of which will be evaluated and reported separately from the traditional definition of enthesitis.

Developing a Sonographic PsA Dactylitis Index

With regard to which dactylitis features to examine sonographically, the initial proposal is to include soft tissue, joint, and extraarticular osseous changes. Soft tissue thickening and tenosynovitis may be measured quantitatively using the method of Olivieri, *et al*[22], and the other features may be scored dichotomously.

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