

Imaging Evaluation of the Entheses

Ultrasonography, MRI, and Scoring of Evaluation

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KEYWORDS

• Ultrasonography • Enthesitis • Spondyloarthritis • MRI

KEY POINTS

- Power Doppler ultrasonography (PDUS) and MRI have changed the management of spondyloarthritis (SpA).
- MRI and PDUS are key imaging modalities for evaluating disease activity at enthesal level.
- Recent advancement in MRI, as whole body MRI, may have potential in early diagnosis and better understanding of SpA; further testing and validation are warranted.

INTRODUCTION

Over the last 40 years, the concept of spondylarthritis (SpA) has evolved thanks to the introduction of new drugs and an earlier detection of the disease, owing to the introduction of new imaging techniques such as MRI and ultrasound imaging (US; [Fig. 1](#)). The latter have permitted to visualize what is considered the landmark lesion: the enthesitis.^{1–3} Understanding of the imaging findings of enthesitis hinges on the knowledge of the relevant joint anatomy.^{3–7}

ENTHESIS, ENTHESOPATHY, AND ENTHESITIS

The term enthesitis refers to the anatomic interface, or bony attachment, of tendons, ligaments, fascia, muscles, and joint capsules. The involvement of the entheses in any pathologic process, whatever the origin (ie, metabolic, inflammatory, traumatic or degenerative), is usually defined as “enthesopathy,” whereas “enthesitis” defines

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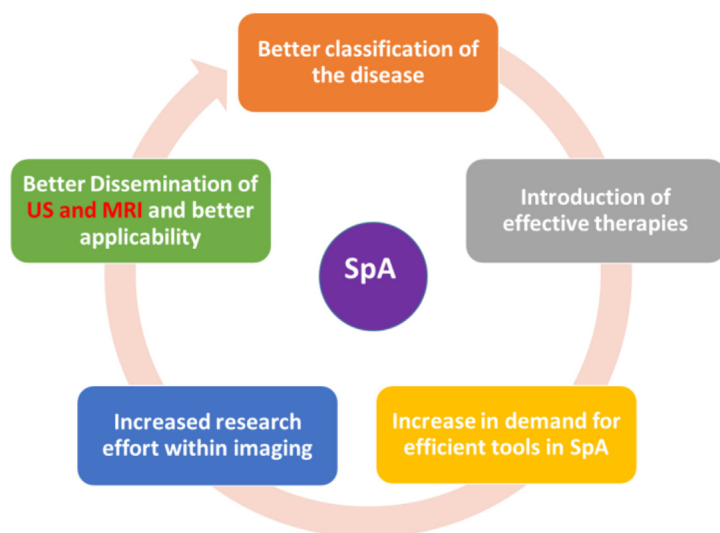


Fig. 1. Why imaging in spondyloarthritis?

the “inflammatory” involvement.⁸ In this context, Niepel and associates⁹ were the first to use the term “enthesitis” for describing the inflammatory symptoms commonly observed at the calcaneal insertion of the Achilles tendon in patients with ankylosing spondylitis. The pivotal role of enthesitis as common characteristic lesion of the SpA complex was suggested for the first time by John Ball.⁷ In his famous “Heberden Horation,” Ball pointed out that the persistent inflammation of the entheses (ie, “enthesitis”) is the distinctive pathologic feature of ankylosing spondylitis, whereas the characteristic feature of rheumatoid arthritis (RA) is the persistent inflammation of the synovial membrane (ie, “synovitis”).⁷ Recent knowledge regarding the function, anatomy, and physiology of the entheses in human and animal models led to improvements in our understanding of the enthesal pathology in the course of many rheumatic diseases, especially SpA.^{10,11}

ANATOMY, FUNCTION, AND HISTOPATHOLOGY OF ENTHESITIS

Although anatomic studies are difficult to perform, because the entheses represent areas where hard and soft tissues meet, 2 types of entheses are usually described: fibrous and fibrocartilaginous. In the fibrous entheses the collagen fibers of the tendons or ligaments attach directly to the bone, whereas in fibrocartilaginous entheses 4 transitional zones are observed^{4–6}: (1) collagen zone, directly derived from the tendon (or ligament, capsule, tendon, aponeurosis, or annulus) structure, (2) noncalcified fibrocartilaginous zone, (3) tidemark-calcified fibrocartilaginous zone, and (4) subchondral bone zone. The entheses are vascularized primarily by the vessels coming from the bone marrow, and partially by the vessels of the peritenon (eg, in the fibrocartilaginous entheses). Blood vessels are present predominantly at the junction between the uncalcified and calcified fibrocartilaginous zones.^{6,12,13} Few histopathologic studies have been performed on the entheses of ankylosing spondylitis patients, and most of them were performed on material obtained during joint replacement; some of them (especially in late 1960s) using biopsies from painful enthesal sites.⁷

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