

# Horseshoe Abscess of the Hand Due to Instrumentation Infection: A Case Report with Superb Microvascular Imaging and MRI Findings

Elif Cigdem karatayli, Esin Kurtulus Ozturk and Saffet Ozturk

*Department of Radiology, Ankara Etlik City Hospital, Ankara, Turkiye*

## ABSTRACT

Horseshoe abscess, aggressive pyogenic flexor tenosynovitis (PFT), is characterised by the spread of suppurative infection from the flexor tendon sheaths to the radial-ulnar bursa and can potentially cause limb-threatening complications. A horseshoe abscess is a rare and serious variant of PFT, but imaging has a crucial role in timely and accurate diagnosis and reducing the risk of morbidity. For early diagnosis and treatment, radiologists need to be familiar with the complex hand anatomy and its effects on patterns of disease progression. We report a case of horseshoe abscess in the hand following distal radius screw instrumentation evaluated using superb microvascular imaging (SMI) and magnetic resonance imaging (MRI). This report stands distinct in highlighting the need to radiologically evaluate horseshoe abscesses for accurate and prompt diagnosis.

**Key Words:** *Horseshoe abscess, Superb microvascular imaging, MRI, Infection, Hand.*

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## INTRODUCTION

Hand infections are common in people of all ages, especially in immunocompromised individuals and can lead to serious problems that can range from mild cellulitis to severe disabilities. Horseshoe abscess is a rare but serious and highly aggressive variant of pyogenic flexor tenosynovitis (PFT) that develops due to the spread of infection from the flexor tendon sheaths to the radial-ulnar bursa and Parona space.<sup>1</sup> Identifying imaging findings of horseshoe abscess allows accurate diagnosis and initiation of appropriate treatment. This is crucial in preventing significant morbidity and other complications.

Here, we present a case of horseshoe abscess in the hand after instrumentation using superb microvascular imaging (SMI) and magnetic resonance imaging (MRI).

## CASE REPORT

A 52-year, right-handed, male patient presented with complaints of swelling and severe pain in his right wrist along the palm for several months, and soon numbness began in his fingers. The patient underwent a surgery 5 months ago for a distal radius fracture and a screw was placed in the fracture area.

*Correspondence to: Dr. Esin Kurtulus Ozturk, Department of Radiology, Ankara Etlik City Hospital, Ankara, Turkiye  
E-mail: e.kurtulus@hotmail.com*

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On physical examination, there was a painful, massive swelling on the volar aspect of the wrist, extending to the palm of the right hand. Limited wrist flexion and numbness in the fingers were detected, and thumb, index and middle finger flexion strength were determined as 3/5 (Medical Research Council scale).

Laboratory studies were notable for a white blood cell (WBC) count  $12 \times 10^9/L$  with 56% ( $6.9 \times 10^9/L$ ) neutrophils. C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were slightly elevated (9 mg/L and 17 mm/h, respectively). The hand radiograph showed an intramedullary horizontal screw in the distal radius and soft tissue density extending from the wrist to the palmar region (Figure 1). Ultrasound (US) revealed a thick-walled, dense fluid collection measuring  $11 \times 5.2 \times 3.2$  cm, starting from the volar side of the right wrist and extending through the carpal tunnel to the palmar region. The deep-located collection surrounded the radial-ulnar bursa and flexor tendons extending into the Parona's space. Marked vascularity of the surrounding collection and flexor tendon sheath and lack of flow within the collection were detected using SMI (Figure 2). On MRI, peripheral enhancement was noted in the fluid collection and tendon sheaths extending along the carpal tunnel (Figure 3). The findings were consistent with horseshoe abscess. Percutaneous drainage of the fluid content yielded *Staphylococcus aureus*. The patient was started on antibiotic therapy and nonsteroidal analgesics for pain.

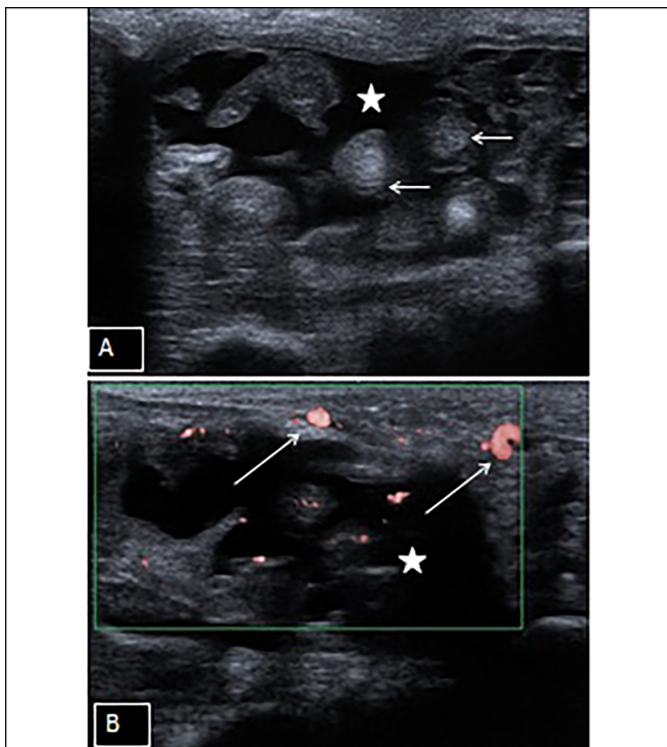
## DISCUSSION

PFT is an infection of the closed space of the flexor tendon sheath between the visceral layer on the flexor tendon and the

parietal layer that can result in horseshoe abscess.<sup>1</sup> The thumb and little finger extend into the radial and ulnar bursae, which communicate with the potential area at the wrist called the space of Parona. This deep potential space is located between the flexor digit profundus tendons and the pronator quadratus fascia in the volar distal forearm. Eighty-five percent of the population has this ligament anatomy, which can lead to PFT forming a horseshoe-shaped abscess.<sup>1,2</sup>



**Figure 1:** Lateral radiograph of the left hand shows soft tissue swelling from the volar aspect of the wrist to the Parona's space and a screw inserted horizontally into the distal radius.



**Figure 2:** Transverse B-mode ultrasound image (A) and superb microvascular imaging (SMI) image (B) demonstrate horseshoe abscess (asterisk) and the presence of slow flow signals (long arrows) in the surrounding inflammatory parenchymal tissue and tendon sheaths (short arrows).



**Figure 3:** Coronal T2-weighted image (A) and axial (B) and coronal (C) contrast-enhanced fat sat T1-weighted images show peripheral development of horseshoe abscess (asterisk) and diffuse inflammation and enhancement (arrows) around the flexor tendon sheaths.

PFT may exhibit symptoms described as Kanavel's 4 cardinal signs, including uniform, symmetrical finger swelling, semi-flexion position of the finger, hypersensitivity along the entire course of the flexor tendon sheath, and pain along the tendon sheath with passive finger extension.<sup>1,3,4</sup> It is also possible for PFT, which usually results from regional penetrating trauma, to spread directly from nearby soft tissue infection. *Staphylococcus aureus* and *streptococcal* species are the most commonly reported organisms in PFT.<sup>1,5</sup>

Hand radiographs are often used as a first-line imaging modality to detect any underlying fractures, foreign bodies, arthritic changes suggestive of osteomyelitis, or inflammatory or crystal-line arthropathy.<sup>1,6,7</sup> US is the most commonly used imaging modality to detect hand infections. SMI has recently emerged as a new imaging technique that may be useful in distinguishing abscess and soft tissue pathologies by imaging small vessels and low-velocity blood flow on Doppler US.<sup>8,9</sup>

MRI is valuable in confirming the presence of deep abscesses and assessing the extent of soft tissue infection. Abscess is accompanied by findings of tenosynovitis, including tendon sheath thickening and peritendinous subcutaneous enhancement.<sup>10,11</sup> PFT may even cause soft tissue necrosis, finger ischaemia and eventually amputation. Patients with diabetes mellitus, peripheral vascular disease, and renal failure are at greater risk of finger amputation.<sup>5</sup>

Conservative treatment of PFT included intravenous antibiotics, high arm elevation and splitting after wound culture.<sup>7</sup> If

there is no improvement within 12-24 hours or there is clinical deterioration, surgical intervention is needed. Closed flexor sheath catheter irrigation and open flexor sheath irrigation and debridement techniques are available. Early surgical treatment should be considered in immunocompromised patients or patients with diabetes.<sup>5,7</sup>

Hand infections still represent a diagnostic and management challenge for clinicians due to complex anatomy and physiopathology. Early diagnosis is crucial for timely and accurate management and reducing the risk of morbidity. While radiographs are often used as a first-line imaging modality, US with SMI and MRI can have a valuable role in the evaluation of a patient with a horseshoe abscess.

#### **PATIENT'S CONSENT:**

Written informed consent was obtained from the patient.

#### **COMPETING INTEREST:**

The authors declared no conflict of interest.

#### **AUTHORS' CONTRIBUTION:**

ECK: Manuscript writing and literature.

EKO: Conception, critical review, data collection, and interpretation.

SO: Design, supervision, and analysis.

All authors approved the final version of the manuscript to be published.

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