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## An isolated acute pisiform fracture: usefulness of magnetic resonance imaging

Received: 21 October 2003 / Accepted: 8 February 2004 / Published online: 5 March 2004  
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**Abstract** The incidence of pisiform fracture is very low, and generally it is associated with other carpal or distal radial injuries. We present the case of an acute isolated pisiform fracture suspected on plain films and diagnosed on magnetic resonance imaging (MRI). MRI revealed a fracture line within the pisiform bone and helped to exclude additional fractures and soft-tissue injuries. Immobilization in a short arm cast was applied for 4 weeks, and the patient had good clinical response.

**Keywords** Pisiform bone · Fractures · Magnetic resonance imaging

### Une fracture isolée de l'os pisiforme: utilité de l'imagerie IRM

**Résumé** La fréquence de la fracture de l'os pisiforme est très faible et est souvent associée à d'autres lésions du radius distal ou du carpe. Les auteurs présentent un cas de fracture isolée du pisiforme suspectée sur les radiographies standard et confirmée par IRM. L'IRM mit en évidence le trait de fracture dans l'os et permit d'exclure d'autres lésions traumatiques associées. Le traitement consista en une immobilisation plâtrée de quatre semaines avec un bon résultat clinique.

**Mots clés** Os pisiforme · Fractures · IRM

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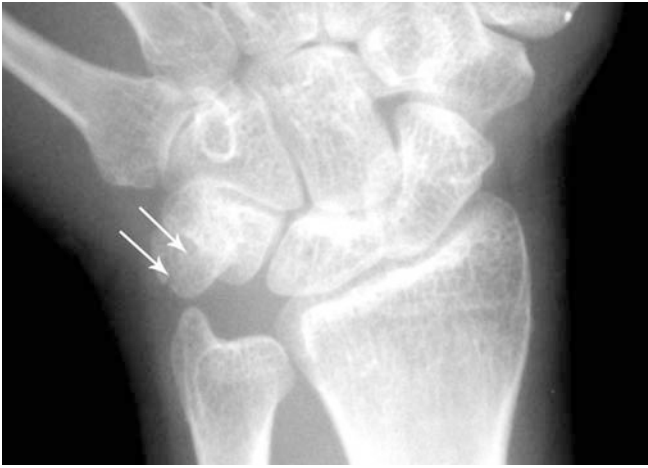
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### Introduction

Most fractured carpal bones are the scaphoid (70–80%) and the triquetrum (7–20%) followed in frequency by the trapezium (5%) [4]. Fracture of the pisiform is extremely rare and frequently associated with other carpal or distal radial injuries. The average incidence of pisiform fractures is 0.2% of all carpal fractures, and approximately half of them are isolated fractures [7]. Fracture of the pisiform may not be recognized on standard radiographs because of superimposition of adjacent bones, and diagnosis may require special radiographic views or other imaging techniques such as computed tomography or scintigraphy [2]. Magnetic resonance imaging (MRI) has a high clinical impact in the early diagnosis of acute wrist trauma. MRI allows not only better evaluation of osseous injury and soft tissue to detect occult carpal fractures, but also the avoidance of false-positive diagnoses and inadequate therapy [5]. We report the case of an isolated acute pisiform fracture suspected on plain films and diagnosed on MRI.

### Case report

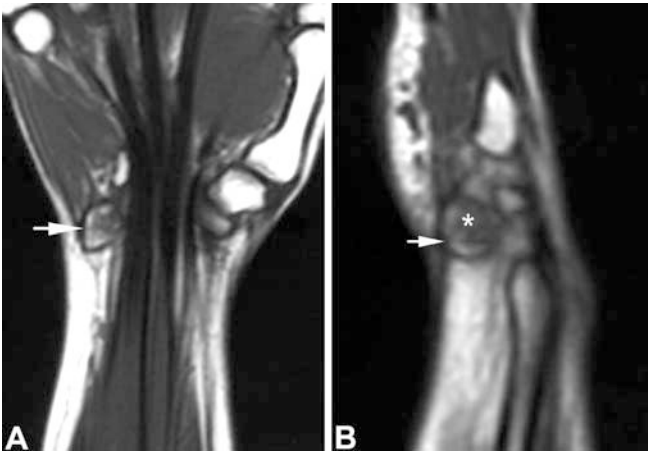
A 25-year-old right-handed female slipped in the shower and fell on her outstretched right hand. Physical examination revealed restricted active and passive range of motion of the wrist joint and tenderness and swelling in the hypothenar region. Posteroanterior (PA), lateral, pronated oblique, and scaphoid views were obtained for the radiographic examination of the wrist. Despite the fact that other radiographic views were normal, a suspected fracture line within the pisiform bone was seen on the scaphoid view (Fig. 1). MRI of the right wrist was performed. The imaging protocol included coronal, sagittal, and axial T1- and T2-weighted sequences. Coronal (Fig. 2A) and sagittal (Fig. 2B) T1-weighted images revealed a transverse fracture line and marrow edema within the pisiform bone with low signal intensity. Although the fracture line was not demonstrated on any axial MRIs because of transverse plane of fracture, T2-weighted images showed high signal intensity within the pisiform bone indicating marrow edema due to the fracture. We applied immobilization in a short arm cast for 4 weeks and then allowed controlled active physical exercises. Eight weeks



**Fig. 1** Scaphoid view of the right wrist. The suspected fracture line within the pisiform bone is seen (arrows)



**Fig. 3** After 4 months of immobilization in a short arm cast and 6 months follow-up period, plain film of the wrists shows only a small notch on the lateral surface of the pisiform bone



**Fig. 2** Coronal (A) and sagittal (B) T1-weighted magnetic resonance image (MRI) shows transverse fracture line (arrow) and low signal intensity indicating marrow edema (asterisk) within the pisiform bone

after, there was no limitation of wrist joint range of motion or palpable tenderness over the hypothenar region on physical examination. After 6 months follow-up period, there was no disability about the wrist joint, and radiographs were normal except for a small notch on the lateral surface of the pisiform bone (Fig. 3).

## Discussion

The pisiform is a small and round carpal bone situated in the palmar and ulnar aspect of the wrist. The transverse carpal ligament and the tendon of flexor carpi ulnaris insert into the pisiform. The flexor carpi ulnaris forms the pisohamate and pisometacarpal ligaments distally, and all of them stabilize the pisiform. Fractures of the pisiform are often due to direct trauma to the hypothenar region or avulsion fracture of the distal portion of the pisiform when the flexor carpi ulnaris resists forcible hyperextension of the wrist [2]. Another

mechanism described by Israeli [3] is repetitive trauma causing vascular disruption, microfractures, and then a complete fracture. In our case, fracture of the pisiform occurred because of direct trauma.

The signs and symptoms of a pisiform fracture may be comparatively minor when associated with other carpal or distal forearm fractures. In isolated fractures, immediate pain, swelling, and tenderness localized to the proximal hypothenar eminence occurs [7]. Our patient also had symptoms suggesting an isolated fracture.

Since radiographs are easily available and inexpensive, it is advisable to use these as the first step in detecting a possible pisiform fracture. If routine plain films (PA, lateral, pronated oblique) fail to demonstrate the fracture, special views such as carpal tunnel, scaphoid, or supinated oblique views are indicated [2]. In our case, the suspected fracture line was seen on only scaphoid view while posteroanterior, lateral, and pronated oblique films were normal.

There is far less literature on the pisiform fractures than other carpal fractures. Vasilas et al. [7] reviewed roentgenograms of 6,000 wrist and found 13 pisiform fractures. Only seven fractures were in isolated form. Fleege et al. [2] looked at ten pisiform fractures, and only four of them were isolated fractures. Although there is much in the literature about MRI of the scaphoid and other carpal fractures, there is no literature regarding MRI of pisiform fractures. In our case, MRI achieved detection of the fracture line within the pisiform bone, and it helped to exclude additional fractures and soft-tissue injuries.

Early diagnosis of a pisiform fracture is important, because missed diagnosis or delayed treatment may result in malunion or nonunion. This may manifest as chronic pain, grip weakness, or limitation of movement. Later sequelae are pisotriquetral chondromalacia, subluxation, and osteoarthritis if the articular surface is poorly aligned [6]. The treatment of chronic pisiform area pain by excision of the pisiform provides

complete relief in most cases [1, 6]. However, the experience with the acute treatment of a pisiform fracture is much more limited due to the rarity of the acutely diagnosed fracture. Immobilization in a cast for a period of 4–6 weeks is advised during the acute period [3, 4]. In our case, immobilization in a short arm cast for 4 weeks produced good clinical response. Early diagnosis and elimination of the additional injuries through MRI prevented unnecessary surgical treatment.

Radiologic evaluation of a clinically suspected fracture of the pisiform bone should begin with radiographs. MRI can be considered as a second-step imaging method in patients whose radiographs are negative or indistinct. If the referring physicians were uncertain about other associated sites of tenderness, then MRI may be helpful to exclude additional carpal fractures and soft-tissue injuries.

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