



ORIGINAL REPORT

Analysis of the management of occult fractures of the scaphoid through early magnetic resonance imaging[☆]

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KEYWORDS

Scaphoid bone;
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Abstract

Introduction: We aimed to evaluate the usefulness of magnetic resonance imaging (MRI) in the diagnosis of occult fractures of the scaphoid and to determine the advantages and cost in comparison with the traditional follow-up protocol.

Materials and methods: The traditional approach at our center consisted of immobilization and periodic clinical and radiological follow-up (plain-film X-rays and computed tomography in the final phase of the process). The new protocol called for a limited MRI study consisting of coronal T1- and T2-weighted fat suppression sequences if the findings at plain-film X-rays continued to be negative at the first follow-up examination with the traumatologist (10 days after trauma). We evaluated the MRI findings, the time the patient was immobilized, the cost of each protocol, and the dose of radiation received.

Results: We included 33 cases of patients with clinically suspected fractures of the scaphoid and negative findings on plain-film X-rays. In 13 patients, the MRI findings were negative. In 12 patients, the MRI findings confirmed the diagnosis of a fracture of the scaphoid, which was associated with other pathology in 6 cases. In 8 patients, another pathological process was diagnosed. The cost of the new protocol was €131.06 per patient; the cost of the traditional protocol was €114.41 or €151.06 per patient, depending on the follow-up studies required. The new protocol reduced the dose of radiation by eliminating successive radiologic studies.

Conclusions: The new protocol improved the management of these patients, reducing the time of immobilization, improving joint rigidity, and reducing the time off work. The limited MRI study makes it possible to diagnose other radiologically occult lesions. The cost of the new protocol is similar to that of the traditional protocol and even lower in some cases. The new protocol results in a reduction in the dose of radiation.

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PALABRAS CLAVE

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Análisis del manejo de fracturas ocultas de escafoides mediante la realización precoz de resonancia magnética**Resumo**

Introducción: Nuestro objetivo es valorar la utilidad de la resonancia magnética (RM) en el diagnóstico de las fracturas ocultas de escafoides, mostrando las ventajas y el coste comparativo frente al protocolo de seguimiento tradicional.

Material y método: El protocolo de actuación tradicional en nuestro centro, consistía en inmovilización y revisiones clínico-radiológicas periódicas (radiología convencional y tomografía computarizada en la fase final del proceso). En el nuevo protocolo, si en el primer control del traumatólogo (10 días post- traumatismo) la radiología convencional seguía siendo negativa se realizaba un protocolo limitado de RM de muñeca (coronal T1 y T2-supresión grasa). Se valoraron los hallazgos visualizados en RM, tiempo de inmovilización del paciente, coste económico de ambos protocolos y dosis de radiación recibida.

Resultados: Se incluyeron 33 casos de pacientes con sospecha clínica de fractura de escafoides y radiología negativa. En 13 pacientes la RM fue negativa. En 12 se confirmó el diagnóstico de fractura de escafoides, 6 asociadas a otra patología. En 8 se diagnosticó otro proceso. El coste del nuevo protocolo fue de 131.06€ por paciente y de 114.41€ ó 151.06€ para el tradicional, según las revisiones necesarias. Se redujo la dosis de radiación al eliminar la realización de sucesivas exploraciones radiológicas.

Conclusiones: El nuevo protocolo mejora el manejo de estos pacientes, reduciendo el tiempo de inmovilización, mejorando la rigidez articular y disminuyendo el periodo de baja laboral. Permite el diagnóstico de otras lesiones radiológicamente ocultas. El coste es similar, e incluso inferior en algunos casos, y la irradiación es menor.

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Introduction

Occult fractures are especially common in the scaphoid. They are defined as clinically suspected fractures with negative radiographic findings.¹ Scaphoid fractures account for 5% of all bone fractures and usually occur in young men.² Nonetheless, there may not be radiographic evidence of fracture during the acute phase.³ In these cases, the traditional approach involves clinical and radiographic follow-up to confirm or rule out the presence of fracture,⁴ since the fracture becomes more visible after a few days due to bone resorption processes around the fracture.²

Magnetic resonance (MR) imaging has proven useful as an alternative for the diagnosis of occult fractures, with a sensitivity and specificity close to 100%.⁵ A follow-up protocol that includes early MR imaging has been introduced at our institution for patients with diagnosis of clinical fracture of the scaphoid. The aim of this study is to evaluate the impact that the implementation of this alternative protocol has had on our setting and to analyze the advantages, cost and radiation dose in comparison with the traditional follow-up protocol, which involves radiographs and computed tomography (CT).

Materials and methods

A total of 140 scaphoid fractures were diagnosed at our institution between August 2008 and September 2009 (137 closed and 3 open).

Thirty-three patients with clinically suspected scaphoid fracture and negative radiographic findings treated at the

emergency department of our hospital were followed up during the study period. The patients were 12 women and 21 men, with a mean age of 30.6 years (standard deviation: 15.53, range: 13–66, and median: 25.5 years).

In our center, patients with suspected scaphoid fracture were treated with immobilization and clinical follow-up in 10–15 days at the outpatient orthopedic clinic, where an additional clinical-radiological (plain radiograph) evaluation was carried out. At this point, with the traditional protocol, patients with positive clinical findings and negative radiographic findings were asked to return for follow-up, following the same procedure. If the set of radiographs was negative at this second orthopedic consultation, the patient was referred for a CT scan. We developed an alternative protocol that offers MR imaging of the wrist at the first orthopedic consultation (10–15 days after the trauma) if the findings at presentation to the emergency department persist. In patients with negative MR findings, the clinician in charge was verbally informed so the splint was removed and the patient began early mobilization. The 33 patients followed this protocol.

Fig. 1 shows the traditional and the alternative protocol, which involves early MR imaging.

Plain radiographs of the wrist included AP and lateral projections. The absence of fracture was confirmed prior to the MR study (at our institution, plain radiographs are not reported by radiologists). An exclusion criterion was the identification of a fracture on any of the projections. Fracture was defined as low signal on T1- and T2-weighted images, and trabecular fracture was defined as the presence of bone edema, low signal on T1- and high signal on T2-weighted images with ill-defined margins, without

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