



ORIGINAL ARTICLE

Analysis of ulnar variance as a risk factor for developing scaphoid non-union[☆]



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KEYWORDS

Scaphoid;
Ulnar variance;
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Abstract

Objective: Ulnar variance may be a risk factor of developing scaphoid non-union.

Methods: A review was made of the posteroanterior wrist radiographs of 95 patients who were diagnosed of scaphoid fracture. All fractures with displacement less than 1 mm treated conservatively were included. The ulnar variance was measured in all patients.

Results: Ulnar variance was measured in standard posteroanterior wrist radiographs of 95 patients. Eighteen patients (19%) developed scaphoid nonunion, with a mean value of ulnar variance of $-1.34 (\pm 0.85)$ mm (CI -2.25 to 0.41). Seventy seven patients (81%) healed correctly, and the mean value of ulnar variance was $-0.04 (\pm 1.85)$ mm (CI -0.46 to 0.38). A significant difference was observed in the distribution of ulnar variance ($P < 0.05$). These results remained significant after adjusting for age, with an OR of 0.69 (CI 0.49 to 0.95).

The patients were categorized into two groups: ulnar variance less than -1 mm, and ulnar variance greater than -1 mm. It appears that patients with ulnar variance less than -1 mm had an OR 4.58 (CI 1.51 to 13.89) with $P < 0.007$.

Discussion: Desai et al. concluded that radiological features of acute scaphoid fractures cannot be used to predict the likelihood of fracture union. For this reason, the existence of other risk factors was analyzed.

According to the results of the present study, it can be concluded that patients with scaphoid fracture and ulnar variance less than -1 mm have a greater risk of developing scaphoid nonunion, OR 4.58 (CI 1.51 to 13.89) with $P < 0.007$.

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PALABRAS CLAVE

Escafoides;
 Varianza cubital;
 Seudoartrosis

Análisis de la varianza cubital como factor de riesgo para el desarrollo de seudoartrosis de escafoides carpiano

Resumen

Objetivo: Estudiar la varianza cubital como factor de riesgo en el desarrollo de seudoartrosis de escafoides.

Material y método: Analizamos retrospectivamente las radiografías posteroanterior de muñeca de 95 pacientes diagnosticados de fractura de escafoides. Incluimos todas las fracturas con un desplazamiento menor de 1 mm tratadas de forma conservadora. Realizamos la medición de la varianza cubital en todos los pacientes.

Resultados: Dieciocho pacientes (19%) desarrollaron seudoartrosis de escafoides, siendo el valor medio de la varianza cubital $-1.34 (\pm 1.85)$ mm (IC $-2.25-0.41$). Setenta y siete pacientes (81%) sanaron correctamente y su valor medio de varianza cubital fue $-0.04 (\pm 1.85)$ mm (IC $-0.46-0.38$). Se observaron diferencias significativas en la distribución de la varianza cubital ($P < 0.05$). Este resultado se mantuvo significativo ajustando por edad, con una OR de 0.69 (IC 0,49–0,95).

Categorizamos los pacientes en 2 grupos: varianza cubital menor de -1 mm y varianza cubital mayor de -1 mm. Los pacientes con varianza cubital menor de -1 mm presentaban una OR 4.58 (IC 1.51–1389) con $P < 0,007$.

Discusión: Desai et al. concluyeron que los hallazgos radiológicos en la fractura de escafoides no pueden predecir la probabilidad de unión de la fractura. Por esta razón, analizamos la existencia de otros factores de riesgo.

Según nuestros resultados, podemos concluir que los pacientes con fractura de escafoides y varianza cubital menor de -1 mm tienen mayor riesgo de desarrollo de seudoartrosis de escafoides, OR 4.48 (IC 1.51–1389).

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Introduction

Scaphoid fractures account for between 70% and 80% of fractures affecting carpal bones in young, active patients.^{1,2} According to several published series, between 85% and 90% of these fractures heal with correct conservative treatment.^{1,3–6} However, between 10% and 15% of patients develop scaphoid non-union which may result in arthrosis, pain and functional limitation over time.^{3,5,7}

In recent years different classifications of scaphoid fractures have been published. These classifications describe the location and configuration of the scaphoid fracture although, as noted by Compson et al., it is not easy to identify and locate the fracture plane.⁸ Furthermore, Desai et al.⁹ establish that none of them provide sufficient information regarding the consolidation rate, raising doubts about the reproducibility of these classifications.

This lack of reproducibility and the difficulty in interpreting radiological findings have led us to consider the importance of an alternative finding in simple radiology which could play a part in the detection of cases which could develop into a scaphoid non-union.

Negative ulnar variance appears to be connected to a greater frequency of scaphoid fracture due to an alteration of load distribution through the radius.¹⁰ However, despite biomechanical studies which show that the distribution of loads at radial-ulno-carpal level depend on ulnar variance, only 2 publications exist which study the relationship between this and the possibility of the development of scaphoid non-union, presenting major limitations when

establishing differences between the different treatment groups.^{11,12}

This objective of this study was therefore to evaluate the correlation of the ulnar variance with the risk of developing scaphoid non-union in scaphoid fractures and secondarily to assess the possible relationship with other radiological parameters.

Material and methods

We carried out a retrospective analysis of all patients diagnosed with non displaced or minimally displaced scaphoid fractures (interfragmentary diastasis of <1 mm) between 2002 and 2012, evaluating the initial radiological findings and comparing them with the development of the fracture either in consolidation or non-union.

Inclusion criteria included those patients diagnosed with a stable middle-third scaphoid fracture, i.e. with displacement less than 1 mm,^{13,14,20} treated conservatively with forearm plaster including the first finger, leaving the interphalangeal joint free,^{1,15} and with correct radiological follow-up until consolidation, non-union or delayed consolidation. In the latter case surgery was obligatory. Demographic analysis was performed on all patients and the radiological analysis of posteroanterior and lateral projections was performed at the time of fracture diagnosis, with particular attention being paid to the measurement of the ulnar variance as a possible prognostic factor^{16,17} (Fig. 1).

Patients were excluded if follow-up did not result in determining the consolidation or non-consolidation of the

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