A Vertical Shear Proximal Scaphoid Fracture – an Unusual Pattern of Injury

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Introduction

Scaphoid fractures are common, accounting for up to 80 % of carpal bone fractures. They have a propensity towards non-union, with up to 10 % of undisplaced and 90 % of displaced scaphoid fractures failing to unite with conservative management [1]. Moreover the scaphoids unusual anatomy makes diagnosis of fractures and fracture planes difficult. Its natural twist at the waist and overlap of other carpal bones means that four views, rather than the conventional two views, are required on radiographs to characterise fracture patterns [2].

We describe a case that highlights an unusual pattern of injury in the scaphoid and how initial radiographs can be misleading in the management of fractures of the proximal scaphoid.

Case Report

We present the case of a 38 year old, right hand dominant, man who had initially sustained a scaphoid fracture when a door was slammed onto the dorsum of his right hand. A radiograph revealed a transverse stable fracture configuration despite being a proximal injury (Fig. 1a) and he was managed conservatively for 12 weeks. He continued to have tenderness in his wrist and was referred to our hand clinic as no clinical or

radiological evidence of fracture union existed. We confirmed non-union using a Computed Tomography (CT) scan, which interestingly revealed an unusual vertical shear pattern of injury (Fig. 1b). He was managed with open reduction and internal fixation through a dorsal approach, using an 18 mm Herbert screw augmented with distal radius bone graft. A dorsal approach allowed us to insert the screw from the proximal pole and direct it perpendicular to the fracture line, thus allowing both compression and stability. The patient made an uneventful recovery and was discharged from our care at 9 months follow up with bony union and a return to normal function (Fig 2).

Discussion and Conclusion

Although the scaphoid is the second most commonly fractured bone of the upper extremity, its unusual boat like shape and its natural twist at the waist makes diagnosis of fractures and definition of fracture planes difficult on plain film views [2]. Many anatomical and clinical classifications of scaphoid fractures exist, with the Russe classification commonly used [3]. It describes in decreasing order of frequency, waist, distal pole, proximal pole and tubercle fractures of the scaphoid, and further classifies patterns into horizontal oblique, transverse and vertical oblique (although these descriptions apply more towards waist fractures). The vertical oblique fracture line is thought to be the most unstable as it results in greater shear forces across a fracture line, although in the waist they account for less than 5 % of described patterns. Proximal pole fractures account for 5 % and are unstable fractures according to the Herbert classification [3, 4].

Vertical fracture lines are rare, comprising 4 % of scaphoid fractures in an epidemiological study [4]. A study delineating fracture lines using transparent 3D methyl methacrylate models superimposed over radiographs looked at 91 acute

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Fig. 1 Scaphoid radiographs in the acute setting showing a transverse appearing proximal scaphoid fracture (**a**) and Coronal CT and 3D Reconstruction CT of the right wrist revealing the true vertical shear fracture pattern (white arrow) (**b**)

fractures and did not describe a vertical oblique fracture pattern. They demonstrated that in proximal scaphoid fractures the proximal extent of the scaphocapitate facet had a bearing on the direction the fracture line took, with a more distally placed facet in a well-developed proximal half of the scaphoid resulting in more vertically appearing fracture lines, although a true vertical shear fracture line was not reported [2].

Classification and determination of scaphoid fracture patterns off plain radiographs is difficult, and at least four views are required. From a clinical standpoint the acute management of scaphoid fractures centres around the plain radiograph and

clinical suspicion, with 85 % or more fractures involving the waist uniting with conservative management. CT scans and three dimensional reconstructions are widely used in to confirm and characterise non unions, and guide operative management. Grewal et al. showed that CT could be used to identify factors that increase the odds of non-union in scaphoid fracture, and the time to union. Identification of fractures that are less likely to unite allows for a lower threshold for operative intervention. They found fractures with displacement and presence of a humpback deformity were at a significantly greater risk of non-union as they impacted directly on

Fig. 2 Scaphoid radiographs showing Herbert screws in situ and fracture union

the stability of the fracture, whereas comminution, sclerosis and cystic change on the fracture line were more likely to contribute to delayed-union. Moreover proximal fractures took an additional 46 days towards union in their study compared to other locations [5]. Davis showed that interpretation of plain radiographic features of displacement and comminution are poor predictors of union. He puts forward the case for CT/MRI as more sensitive modes of assessing displacement, and proposes operative intervention in cases of >2mm displacement whilst those with <2mm displacement needing approximately 8–12 weeks plaster immobilisation [6].

In our experience, not all scaphoid fractures are straightforward and we use CT and 3D reconstruction routinely in scaphoid non-union to anticipate potential pitfalls when operating. In this particular case, not only were we able to appreciate an unusual pattern of injury, but also allowed for planning the dorsal approach as the best means by which to achieve definitive screw fixation of an unstable injury.

We report an unusual vertical shear fracture pattern of the proximal scaphoid, which we have not come across at our tertiary referral centre before. Vertical oblique fractures can mislead treating surgeons as transverse variants on radiographs, and this unstable configuration was not evident initially in our case either. We propose CT Scans in the acute setting when there is doubt regarding the degree of displacement and in proximal scaphoid fractures. These can be

unstable injuries with a high risk of non-union and plain films can mislead with regard to displacement, deformity and fracture line, and if discovered early can be treated operatively in order to obtain the best possible outcome for the patient.

Conflict of Interest None.

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