BILATERAL SCAPHOID FRACTURES IN AN ADULT FEMALE: A CASE REPORT

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ABSTRACT

In terms of size the scaphoid is the largest of the proximal carpal bones. It functions to directly transfer load between the hand and distal radius as occurs when falling onto an outstretched hand. We present an adult female patient who presented to our unit after falling two meters onto her outstretched hands and complained of bilateral wrist pain. Our investigations revealed bilateral scaphoid fractures which were treated with internal fixation using bilateral cannulated scaphoid compression screws. At 8 weeks post injury she had a full range of motion in both wrists and was able to return to work. At 6 months post-surgery follow-up X-rays of her wrists showed that fracture union had been achieved.

Key words: Bilateral scaphoid fractures, Cannulated scaphoid compression screws

INTRODUCTION

In terms of size, the scaphoid is the largest of the proximal carpal bones. It functions to directly transfer load between the hand and distal radius as occurs when falling onto an outstretched hand (1). The pathophysiological mechanism of injury involves wrist hyperextension beyond 95 degrees (2). When this occurs, the scaphoid body becomes fixed between the dorsal lip of the radius and the capitate bone and the distal scaphoid pole finds itself comparatively void of this bony constriction. The scaphoid waist hence becomes the focus of an immense differential stress force and as such is the most common site of scaphoid fractures (3,4). While a unilateral scaphoid fracture is a common presentation, bilateral scaphoid fractures are rarely reported in the literature. We present an adult female patient who presented to our unit after falling off a two meter high scaffolding onto her outstretched hands and complained of bilateral wrist pain. Investigations revealed bilateral scaphoid fractures for which she was treated operatively with internal fixation using bilateral cannulated scaphoid compression screws. Post-operatively her wrists were immobilized in scaphoid plaster of Paris casts. At 6 weeks post-surgery this was removed. At 8 weeks post injury she had a full range of motion in both wrists and was able to return to work. At 6 months post-surgery follow-up X-rays of her wrists showed that fracture union had been achieved.

CASE REPORT

We present an adult female patient who, while working as a laborer at a construction site, fell off a two meter high scaffolding onto her outstretched hands. She reported experiencing immediate extreme pain in both of her wrists which subsequently became swollen with decreased range of motion in all anatomical planes. She had no relevant medical history. Clinical examination of both wrists revealed tenderness in both anatomical snuffboxes and a reduced range of motion bilaterally. The neuro-vascular examination of both wrists was normal, however manual muscle testing power was impossible to be tested due to pain. X-rays of both her wrists were performed, and they revealed bilateral scaphoid fractures through the anatomical waist of each scaphoid bone classified by the Herbert classification system as Type 2B (Figures 1-2).

Figure 1

Pre-operative postero-anterior X-ray left wrist: showing scaphoid fracture through the anatomical waist of the left scaphoid bone (arrow)

Figure 2

Pre-operative postero-anterior X-ray right wrist: showing scaphoid fracture through the anatomical waist of the right scaphoid bone (red arrow)

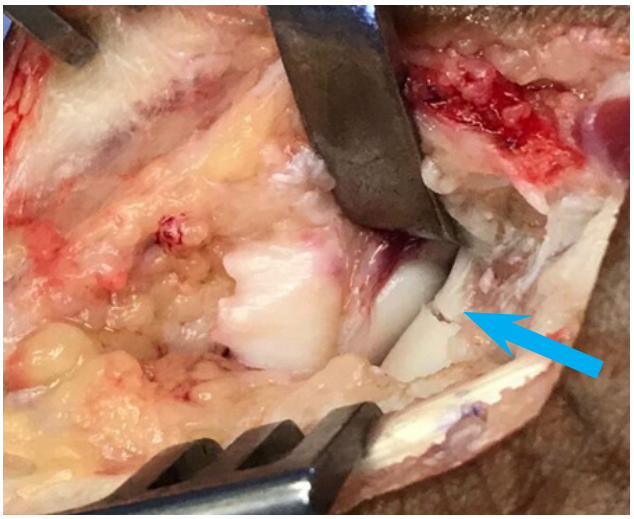
She was taken to the operating room for open reduction and internal fixation of the scaphoid bone of each wrist. She was placed supine with both wrists kept in a supinated hyperextended position utilizing a roll pad. A tourniquet was placed around each arm but these were inflated only whilst performing each operative procedure. The surgical approach used was a palmar skin incision that began at the distal flexion wrist crease continuing four centimeters proximally over the tendon of flexor carpi radialis. After the skin incision was complete and haemostasis ensured, the tendon sheath of the flexor carpi radius was split and retracted to the ulnar side. The deep fascia of the wrist joint was incised and retracted radially. The scaphoid and distal radius were hence clearly exposed as was each scaphoid fracture respectively (Figure 3-4).

Figure 3

Intra-operative photograph of left wrist: showing complete fracture through anatomical waist of scaphoid bone (blue arrow)

Figure 4

Intra-operative photograph of right wrist: showing complete fracture through anatomical waist of right scaphoid bone (blue arrow)



Once exposed a cannulated compression screw was inserted from distal to proximal into each scaphoid bone with intra-operative fluoroscopic confirmation. Thereafter, the wounds were closed in layers and a scaphoid plaster of Paris cast was applied for 6 weeks for post-operative immobilization. Immediate post-operative X-rays confirmed the scaphoid compression screws to be in place and that a reduction had been achieved. At 6 weeks postoperatively the plaster of Paris cast was removed and the patient commenced her physiotherapy. On the 8th post-operative week, she had a full range of motion in both wrists and returned to work (Figure 5-7).

Figure 5

Post-operative photograph at 8 weeks: shows full wrist extension bilaterally

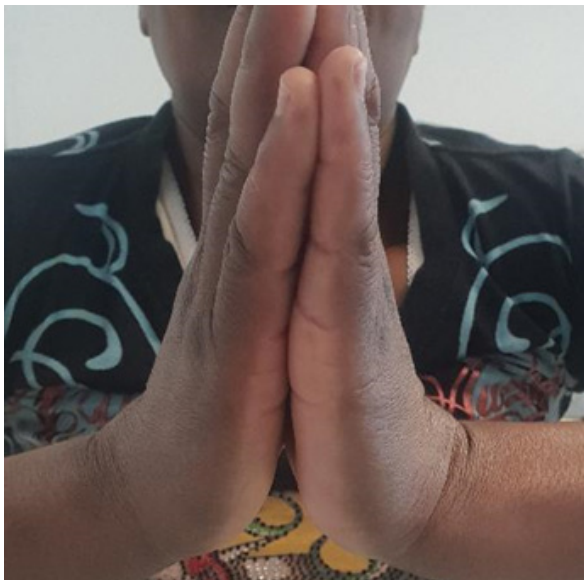


Figure 6
Post-operative photograph at 8 weeks: shows full wrist flexion bilaterally

Figure 7
Post-operative photograph at 8 weeks: shows preserved wrist eversion bilaterally

At her six month follow-up orthopaedic out-patient appointment she had a full range of motion in both wrists and X-rays confirmed that fracture union had been achieved (Figures 8-9).

Figure 8
Post-operative postero-anterior X-ray left wrist at six month follow-up: demonstrates fracture union has occurred

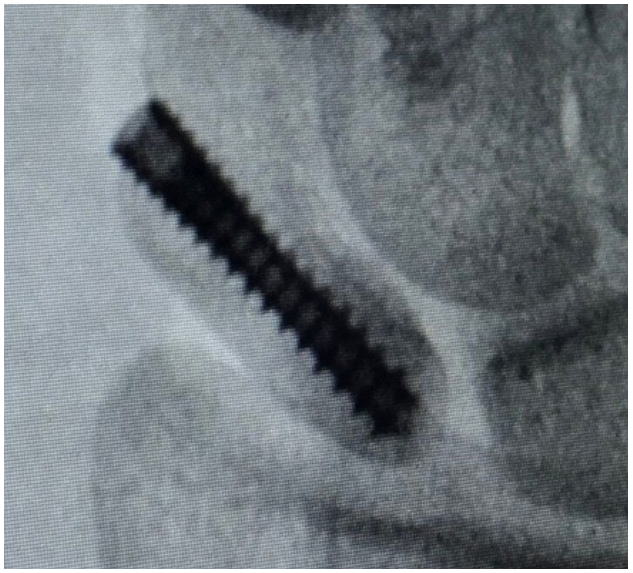
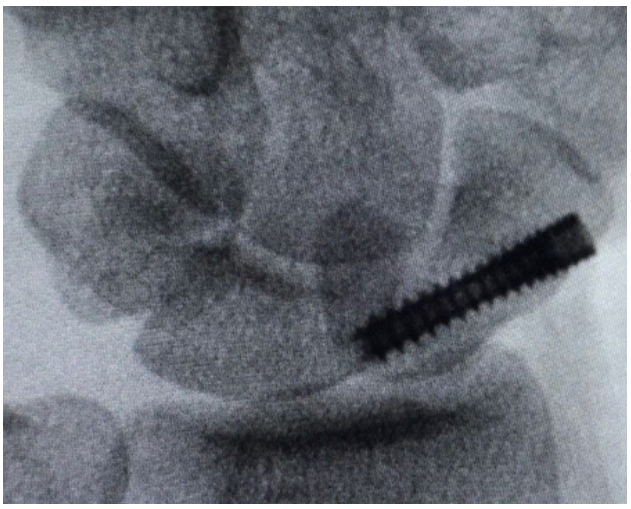


Figure 9
Post-operative postero-anterior X-ray right wrist at six month follow-up: demonstrates fracture union has occurred



DISCUSSION

While unilateral scaphoid fracture comprises 2.4% of wrist fractures, the exact incidence of simultaneously occurring bilateral scaphoid fractures is currently unknown (5). Examining the demographics of bilateral simultaneously occurring scaphoid fractures, what is reported in the literature is that this fracture pattern has a high prevalence in manual workers (6).

Understanding the blood supply of the scaphoid bone provides the conceptual link between a specific fracture pattern and its propensity for healing. Approximately 80% of the blood supply to the scaphoid is derived from dorsal branches of the radial artery which enter distally and flow in a retrograde manner towards the proximal pole. Hence, the more proximal the fracture is the higher the rate of avascular necrosis of the proximal scaphoid as demand outweighs supply.

In terms of diagnosis, classical pain during palpation in the anatomical snuffbox is characteristic. While relatively non-specific and insensitive, it is important that this clinical sign is elicited with the wrist held in ulnar deviation to provide to the attending clinician the maximally available surface area of the scaphoid bone within the anatomical snuffbox. Reasons for the poor specificity of anatomical snuffbox tenderness is that pressure over the dorsal sensory branch of the radial nerve which courses superficially across this region may provide a false positive that a scaphoid fracture is present, even when it is not. Two other important tests regarded as more specific in the diagnosis of scaphoid fractures are tenderness of the scaphoid tubercle and the scaphoid compression test (7,8).

In terms of investigating a wrist suspected of harboring a scaphoid fracture, a "scaphoid X-rays series" is commonly performed in order to minimize the incidence of false negatives. Here, between four and five different views are necessary which include the postero-anterior; postero-anterior with wrist extension and ulnar deviation; 45-degree pronation postero-anterior; 45-degree pronation postero-anterior with ulnar deviation; and a lateral view. Even by performing this comprehensive series up to 25% of scaphoid fractures will be missed on early radiographs. In such cases, clinical suspicion should direct the attending clinician to treat the wrist as though it does indeed harbor a scaphoid fracture even if the preliminary imaging is normal. There is furthermore substantial evidence in the literature that classical follow-up imaging at 2 weeks after the traumatic event traditionally prescribed to increase the sensitivity in diagnosis, has a poor sensitivity (9).

Considering further investigations in the context of a strong clinical suspicion scaphoid ultra-sound, radio-isotope bone scans, computed tomographic scans and lastly MRI scans have all been evaluated in the diagnosis of a suspected scaphoid fracture. With regards to ultrasound, critics label this investigation as too user-dependent to have any real practical value. Radio-isotope bone scans are described as problematic due to their excellent sensitivity outweighing their specificity leading to overdiagnosis. While computed tomographic scans provide exquisite detail, their usefulness is especially relevant in the context of assessing bony detail across the fracture site in patients who present late. MRI has proven itself as the most accurate second-line imaging modality, not only in excluding a fracture being present but furthermore adds valuable information regarding surrounding ligamentous structures. As such MRI has the highest sensitivity as well as the highest specificity in the diagnosis of a suspected scaphoid fracture (9). A recommended algorithm of investigation hence begins with a "scaphoid X-rays series" which if negative should be repeated at 10 days after the traumatic event. If the second "scaphoid X-rays series" is also negative despite ongoing strong clinical suspicion, an MRI of the scaphoid is recommended (10). Performing an MRI of the scaphoid is however a practice limited by the availability of local resources and as such simply treating the patient with plaster of Paris immobilization is a cheaper more commonly employed alternative.

The management of scaphoid fractures is fraught with controversy. The Mayo classification attempts to predict the non-union rate by dividing the scaphoid into thirds with distal 1/3rd fractures further subdivided into distal articular and distal tubercular subtypes. Using this classification, union rates put forward were 100% for distal 1/3rd fractures, 80% in scaphoid waist fractures, and 64% in fractures of the proximal 1/3rd. This directly impacts on management as proximal or middle 1/3rd fractures, due to their increased tendency towards non-union, are candidates for earlier operative intervention (11). The Herbert classification divides scaphoid fractures into Type A-stable acute fractures; Type B-unstable acute fractures; Type C-delayed union and Type D-established non-union, with further sub-divisions based on fracture orientation and in Type D based on the type of non-union namely fibrous or pseudoarthrosis. Again this directly dictates management as Type B fractures are candidates for earlier operative intervention due to their inherent instability (12).

Regarding displacement, it is recognized in the literature that greater displacement lends itself to greater instability and an increased rate of non-union. Displacement greater than 1mm is regarded as significant and this is commonly measured by the lateral scaphoid fracture angle with significance given to an angle greater than 35 degrees. What is further appreciated is that plain X-rays notoriously under-evaluate displacement and this is only accurately quantified on computed tomographic or MRI scan (11).

Scaphoid fractures with an increased propensity towards non-union are regarded as best managed operatively and significant fracture factors include location, stability, orientation, displacement and comminution. Patient factors lending themselves towards increased non-union and thereby operative intervention include smoking and delayed diagnosis (10). The relative risk of smoking is often under-appreciated and one study reports a 3.7 times non-union rate in smokers compared to a similar fracture in a non-smoker (13).

Understanding which factors are significantly associated with non-union must, however, be substantiated by the outcome and on this subject, several studies have demonstrated no difference in the fracture union rates comparing an operative versus a conservative approach. In these studies, it was, in fact, the operative group that furthermore demonstrated the higher incidence of osteoarthritis of the scaphotrapezial joint and a reduced range of wrist motion (6, 14).

In conclusion, despite scaphoid fractures forming the bread and butter of orthopaedics, and despite unilateral scaphoid fractures being relatively commonplace, the management of these is complex and fraught with controversy. By comparison, bilateral simultaneously occurring scaphoid fractures are rarely reported in the literature and in terms of their management no clear guidelines currently exist. We advocate surgical management in these patients due to the practical considerations of a conservative approach whereby prolonged bilateral scaphoid plaster casting would negatively impact on the patient's daily life. In our patient, an operative approach was undertaken bilaterally and we report a functional outcome being achieved relatively faster than would have possibly been achieved with a non-surgical approach by minimizing the risk of non-union.

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Declaration of interest

None of the authors has any financial or personal relationships with other people, or organizations, that could inappropriately influence (bias) their work, all within 3 years of the beginning the work submitted**.**

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