

Fractures of the scaphoid:

Why they matter and how should they be treated

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1. Introduction

The scaphoid is a small bone in the wrist that bridges the proximal and distal carpal row. It is the commonest (90%) carpal bone to be fractured¹ accounting for 2-7% of all fractures.² It occurs in young active individuals (mean age 29 years 3), mainly men, when they fall on to the palm of the hand or when the palm is stuck forcefully.

Most fractures (64%) affect the waist of the scaphoid but 5% affect the proximal pole of the scaphoid (Figure 1).

Once the scaphoid is broken the two parts can move away from their anatomical position and the fracture is “displaced”. This is seen as a step, a gap, angulation or rotation and occurs in 10-29% of scaphoid fractures.⁴ A CT scan in the true longitudinal axis of the scaphoid shows the shape of the bone and displacement at the fracture better than do plain radiographs. (Figure 2)

2. Epidemiology

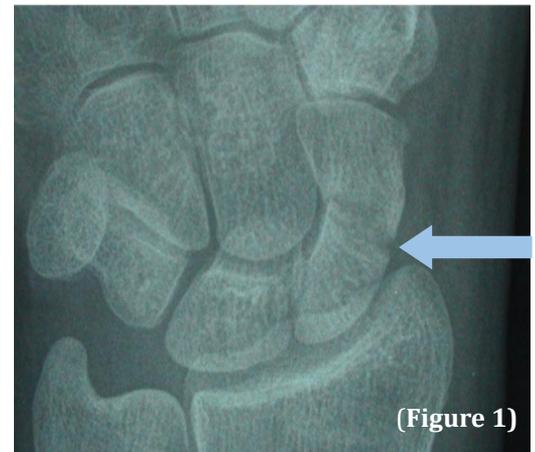
In the UK 12.4 in 100 000 of the population each year have a scaphoid fracture and the incidence is higher (18.6/100,000) in the lowest socioeconomic strata. The injury occurs more often in the summer (rate in June - 17/ 100 000) and is lowest in the winter (December 7.6/100 000).⁵

3. Consequence

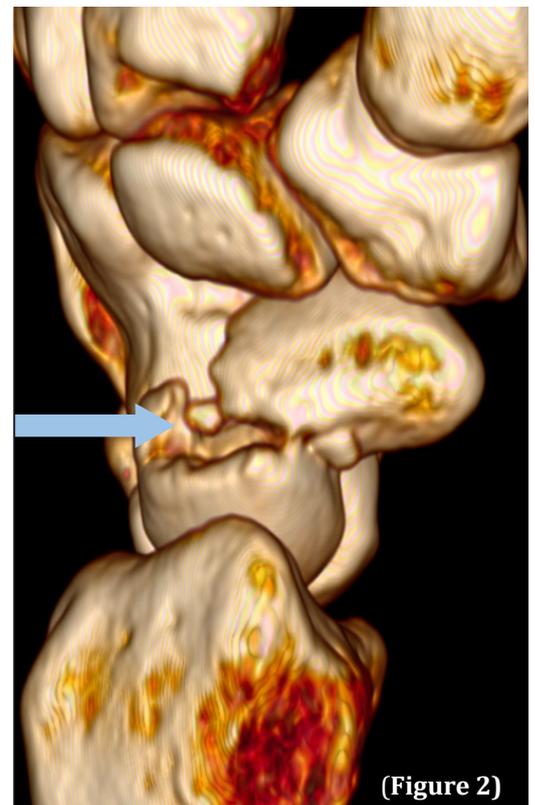
The main concern of initial treatment is that the fracture will not unite.⁶ This can happen in around 10-12% of scaphoid waist fractures treated in a cast alone⁷ and causes immediate persistent pain and stiffness.⁸ Fractures “displaced” ≥ 1 mm have a higher risk of non-union and malunion.⁸ Mild malunion is well tolerated, but the long-term impact of a displaced fracture that healed in malalignment has not been established. When the fracture is very proximal the retrograde blood circulation⁹ is disrupted and may explain the higher failure of union in proximal fractures.¹⁰

A fracture of the scaphoid changes the way the proximal carpal bones work; the distal scaphoid fragment bending under load and the resulting abnormal loading. This persists if the fracture remains ununited.¹¹ This leads to wrist arthritis which proceed in a particular pattern¹²⁻¹⁴ named the “Scaphoid Non-union Advanced Collapse” or SNAC causing degenerative arthritis¹⁵ first between the distal part of the scaphoid and the distal radius, and then progressively involving the midcarpal joint as the carpus collapses into the dorsal intercalated segment instability (DISI) pattern¹⁶ where the lunate tilts dorsally changing the loading between the capitate and the proximal carpal row.

Although the association^{17,18}, patterns and probable cause has been



(Figure 1)



(Figure 2)



observed by many there is much variation in the reported proportions from 24%¹⁹ to 60%¹², relationship to fracture attributes such as location¹⁷, and duration to onset of degenerative change. Much of the previous literature has been based on radiographs^{12-14,17,18} and not CT scans.²⁰ Literature suggests that most non-unions will develop osteoarthritis within 5 years.

4. The SWIFFT study (Scaphoid Waist Internal Fixation for Fractures Trial)

The treatment of an acute scaphoid fracture is to immobilise the wrist with a broken scaphoid in a plaster cast. (Figure 3)

The alternative is to fix the broken scaphoid with a headless screw. The rate of Immediate surgical fixation of this fracture has increased but the evidence to support this is poor. (Figure 4)

Displaced fractures can be treated in a plaster cast, accepting the risk of malunion and non-union. Surgically the displacement can be reduced, checked radiologically, arthroscopically or visually, and stabilised with headless screws or wires.

We have recently completed a UK wide NIHR study²¹ to investigate whether of surgical fixation was superior to cast immobilization and early fixation only of those that fail to unite for $\leq 2\text{mm}$ displaced scaphoid waist fractures in adults.

This study was commissioned by our National Institute for Health Research (NIHR) and the published this year in the Lancet²² and the full report published by the NIHR²³- both are openly available. The findings have been also reported and presented extensively nationally and internationally (USA, UK, Europe, India, Australia).

This study randomized 439 adult patients who presented to orthopaedic departments of 31 hospitals in England and Wales with a clear, bicortical scaphoid waist fracture on radiographs. Patients randomised to surgery had early fixation of the fracture with a headless compression screws (surgery group, n=219) and those randomised to cast had initial below-elbow cast immobilization for 6 to 10 weeks followed by urgent fixation of confirmed non-union (cast immobilization group, n=220).

We assessed their pain and function using the Patient Rated Wrist Evaluation but also assessed complications, return to work and failure of the fracture to unite.

We had data from 408(93%) participants for the primary analyses and found no difference at one year in pain or function, and non-union rate was low in both groups (surgery group (4, 2%) cast immobilization (9, 4%). Participants in the surgery group were more likely to experience a complication with a consequence (14%). Time off work was similar of around a fortnight in both groups. (Figure 4)

Based on this study Adult patients with $\leq 2\text{mm}$ displaced scaphoid waist fracture should have initial cast immobilization and suspected non-unions immediately confirmed and urgently fixed. Early fixation could be restricted for very displaced fractures to reduce exposure to surgical risks.

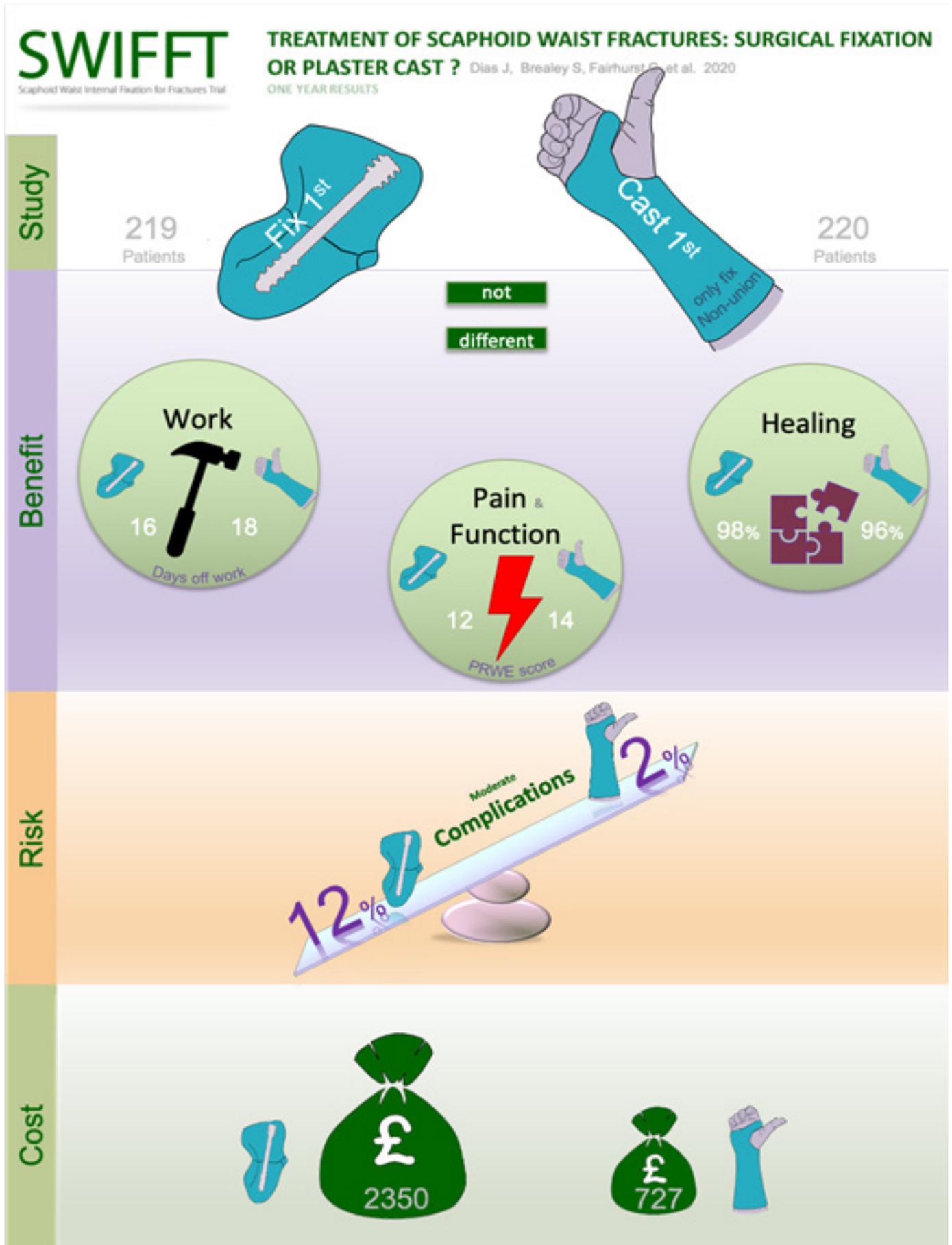
5. Costs

Patients completed a questionnaire about their general Quality of Life (QoL) that asked about their mobility, self-care, usual activities, pain/discomfort and anxiety/depression. The QoL score is a value between 0 to 1, where a higher score indicates better health. Over the year, patients in the surgery group and plaster group had a QoL score of 0.832 and 0.814, respectively. The cost of surgery to the NHS was £2,350 and cost of plaster cast treatment was £727. The significant extra cost of surgery for the tiny benefit in general QoL was not good value for money to the NHS.

We are currently reviewing these patients at five years investigating the consequences of arthritis and screw penetration and will report our findings in a couple of years.

6. Conclusion

This is one of the few fractures where the consequence of non-union is known, causes arthritis in young people which is completely avoidable in almost all instances. However, with simple management in a cast the vast majority heal without the need for surgery. This, and other studies have shown that our systems, internationally, adopt surgical interventions with less scrutiny than new drugs.



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Joe Dias is Professor in Hand and Orthopaedic Surgery and Head of Academic Team of Musculoskeletal Surgery (AToMS) at the University Hospitals of Leicester. He is a Consultant Hand and Orthopaedic Surgeon for the University Hospitals of Leicester. He is currently Chair of the University Hospitals of Leicester NHS Trust Clinical Senate.

Joe Dias graduated from Bombay University in 1981 and obtaining accreditation in the UK 1987. He trained on the Leicester training programme under Paul Greig where he obtained his MD.

He has a special interest in epidemiology in hand and wrist disorders, Dupuytren's contracture, the outcome of interventions in upper limb and hand trauma and interventions in wrist disorders. His research has focused on clinically-based investigations of effectiveness of interventions for hand and upper limb disorders. He has a special interest in education.

He has published over 180 scientific articles, over 20 other publications and over 30 chapters in books most on hand surgery and epidemiology. He has 24 publications on scaphoid fractures. He has authored multiple national reports and NICE accredited clinical pathways. Professor Dias has received many substantial grants including from the Health Technology Assessment which is a part of the UK NIHR looking at scaphoid fractures (SWIFFT-published in Lancet,2020) and Dupuytren's contracture (DISC).

He has been editor and then Editor-in-Chief of the Journal of Hand Surgery (Europe edition) and has been on the Editorial Board for the Journal of Bone and Joint Surgery, British edition. Professor Dias was President of the British Society for Surgery of the Hand (BSSH) in 2008 and was President of the British Orthopaedic Association in 2012.