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Why scaphoid fractures are missed. A review of 52 medical negligence cases

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ABSTRACT

Background: The "missed" scaphoid fracture is a common cause of litigation. This study investigates why a series of scaphoid fractures involved in medical negligence litigation were missed. It also assesses how many might have been detected if MRI had been used to assess all suspected scaphoid fractures with normal X-rays, as suggested by National Institute for Health and Care Excellence (NICE).
Methods: Medical reports on 52 medical negligence cases of missed scaphoid fractures were reviewed. Complete sets of hospital and GP records and X-rays had been reviewed in every case.
Results: The recorded mechanism of injury was consistent with a scaphoid fracture in 41 (79%) cases. There was no record of an examination for scaphoid tenderness in 37 (71%) cases. Scaphoid tenderness was assessed and not found in 10 of 15 cases. No X-rays were obtained in 13 (25%) cases, and a scaphoid fracture was only suspected, resulting in scaphoid series X-rays being performed, in only 3 (6%) cases. In only 5 (10%) cases was there a record of the patient being advised to return if the wrist remained painful.
Conclusions: Most of these scaphoid fractures were missed due to failure to consider the possibility of a scaphoid fracture and search for clinical signs of this injury. Some were missed due to failure to detect (or absence of) tenderness over the scaphoid bone. As a scaphoid fracture was never considered, or excluded by clinical examination, in 49 of the 52 cases, a policy of obtaining MRI for all suspected scaphoid fractures would only have detected three of 52 (6%) fractures. Improved awareness through better education is required to reduce the number of missed scaphoid fractures.

Introduction

Scaphoid fractures may not be visible on standard (postero-anterior and lateral) wrist X-rays or scaphoid series radiographs obtained shortly after injury[1,2]. As a result the diagnosis of a scaphoid fracture relies heavily on the clinical history of the injury and clinical findings. Untreated scaphoid fractures can lead to non-union and cause persistent wrist pain and loss of function in the short term, and clinically relevant wrist arthritis over a period of years[3].

Missing a scaphoid fracture is a common cause of litigation. It is estimated that between 1995 and 2010, claims relating to the mismanagement of scaphoid fractures cost the National Health Service in the United Kingdom £3.5 million [4]. Early magnetic resonance imaging (MRI) of suspected scaphoid fractures is reported as the most reliable method for detecting actual scaphoid fractures, and may be more cost effective than repeated clinical examinations and scaphoid series radiographs [5–8]. Recent National Institute for Health and Care Excellence (NICE) guidelines recommend consideration of an MRI scan as a first-line imaging modality in patients with suspected scaphoid fractures [9].

This study is a review of a series of missed scaphoid fractures that were involved in medical negligence litigation. It aims to determine the reasons why these fractures were missed, and ascertain whether MRI scanning all "suspected scaphoid fractures" would have detected these cases, and resulted in the provision of appropriate treatment.

Methods

Fifty-two medicolegal reports regarding the quality of care of acute scaphoid fractures which were not diagnosed at the initial presentation to a medical practitioner were reviewed. These reports concerned Breach of Duty, Causation and/or Condition and Prognosis. All were prepared by the senior author and were based on a comprehensive review of all the relevant hospital emergency department, outpatient clinic and in-patient records, all the general practitioner case notes, all the imaging of the injured wrist and the claimants' witness statements.

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Data was collected from these sources regarding patient (age and sex), mechanism of injury, time from injury to first presentation, fracture location and whether the scaphoid fracture had been an isolated injury. Also collected were the recorded details of the clinical history and examination findings at the first and subsequent hospital/GP attendances, the X-rays which were obtained, the diagnosis, treatment and follow-up provided and what advice was given in case the wrist remained painful. Details of the treatment provided after the scaphoid fracture was diagnosed were also recorded.

Mechanisms of injury considered consistent with a scaphoid fracture were a fall onto an outstretched hand and wrist hyperextension or punching injuries. The recorded presence or absence of tenderness in the anatomical snuff box (ASB) was used to determine whether the treating health professional had considered the possibility of a scaphoid fracture. It was assumed that the possibility of a scaphoid fracture had only been considered if there was a record of whether there was, or was not, tenderness in the anatomical snuff box (ASB). It was also assumed that if scaphoid series X-rays had not been requested, then the possibility of a scaphoid fracture had been discounted on the basis of the clinical history and examination, regardless of the presence or absence of ASB tenderness.

Results

The patients' ages ranged from 14 to 53 years with a median of 24. Forty-seven (90%) of these injuries occurred in men. The fracture involved the scaphoid waist in 36 (69%), the proximal pole in 13 (25%) and the distal pole in three (6%) cases. Forty three (83%) patients initially attended an Accident an Emergency (A&E) department while 9 (17%) attended other medical facilities such as primary care and sports club physiotherapists. The range (median) duration from injury to initial presentation was: 0–30 (1) days. The mechanism of injury was considered consistent with a scaphoid fracture in 41 (79%) and inconsistent in 9 (17%) cases (Table 1). Two (4%) patients had also sustained distal radius fracture and one (2%) had a fracture of the lesser tuberosity of the humerus. The remainder of the patients did not have any additional significant injuries that may have masked the scaphoid fracture.

The site of pain was not recorded in the notes in 15 (29%) patients. In 37 (71%) cases there was no record of an examination for tenderness in ASB. There was also no record of an assessment for tenderness over the scaphoid tubercle or performance of the thumb compression test in 41(79%) and 46(88%) cases respectively. A scaphoid fracture was considered and scaphoid tenderness was assessed by the treating health professional in just 15 (29%) of the 52 patients. Five of these 15 were recorded to have tenderness in the ASB, while no tenderness in the ASB was found in the other ten.

Table 1
Reported mechanisms of injury.

Mechanism of Injury	Number of cases
Consistent with Scaphoid Injury	
Hyperextension of wrist	19
Fall onto outstretched hand	19
Punching Injury	3
	41
Inconsistent with Scaphoid Injury	
Stamp on playing sport/assault	4
Unknown mechanism after sport/drinking	2
Hyperextension of thumb	1
Hyperflexion of wrist	1
Fall onto shoulder	1
Not recorded	2
	11

No wrist radiographs were obtained at the initial presentation in 13 (25%) of the 52 patients, and only standard anteroposterior (AP) and lateral views of the wrist were obtained in 29 (56%), and AP, lateral and one oblique views in 7 (13%). Only three (6%) patients had scaphoid series (at least 4 views) radiographs. Twenty-nine (56%) patients were provided with some form of wrist support. No follow up appointment was arranged for 37 (71%) patients, and it was only documented in seven (13%) cases that the patient had been advised to seek further advice if the wrist remained painful.

The range (median) duration from injury to the scaphoid fracture diagnosis was 4–250 (29) weeks. Following the scaphoid fracture diagnosis, 41 (79%) were treated operatively. Thirty five (67%) of these 41 had an open reduction, bone graft plus screw fixation and six (12%) had screw fixation only. Eleven (21%) patients were treated conservatively. The latter were managed by plaster cast (6 patients) and without treatment (5 patients). The scaphoid fracture was considered to have united following the post-diagnosis treatment in 17 of the 41 patients that had operative treatment. The fracture was considered united following post-diagnosis treatment in 4 of the 11 patients treated non-operatively. Thus the scaphoid fracture had united at the time of the medicolegal evaluation in 21 (40%) of the 52 patients.

Discussion

Scaphoid fractures are difficult to diagnose as clinical examination findings are often subtle and the fracture may not be visible on immediate "post-injury" "scaphoid series" radiographs [5]. The reported prevalence of true fractures amongst clinically suspected scaphoid fractures ranges from 12% to 57% [1,10,11]. This wide variation is probably related to the quality of the initial clinical assessment and interpretation of the scaphoid series radiographs, on which it is quite possible to miss a fracture or see a fracture which is not actually present [1]. Much research has focussed on the role of advanced imaging such as MRI in improving the physicians' ability to triage clinically suspected scaphoid fractures [3,7,12] but would only be of value if the clinical assessment results in the diagnosis of a "suspected scaphoid".

Clinical examination

There is no single clinical sign that is diagnostic of a scaphoid fracture[13]. Although tenderness in the ASB is considered the cardinal sign of a scaphoid fracture and has sensitivity, it lacks specificity as it is found in many patients with soft-tissue wrist injuries. In the present study failure to document whether this was assessed was taken to indicate that a scaphoid fracture was not clinically suspected. Freeland reported that isolated tenderness in the ASB and at the ST have sensitivity rates of 90% and 87% and specificity rates of 40% and 57% respectively [10]. A systematic review concluded that the most accurate physical examination findings to rule out a scaphoid fracture are the absence of ASB and ST tenderness or the absence of pain with the thumb compression test [1]. However, no physical examination findings significantly increased the probability of diagnosing a scaphoid fracture [1,13].

In this study, the clinical examination results for tenderness in ASB and ST and the thumb compression test were documented in only 29%, 21% and 12% of cases respectively. This reflects a significant level of inadequacy in the clinical evaluation or documentation of the majority of patients seeking compensation for a missed scaphoid fracture [3,7]. Freeland reported that 3 out of 30 (10%) patients with scaphoid fractures had ST tenderness with no ASB tenderness [10]. He also suggested that the combination of ASB

or ST tenderness would identify all scaphoid fractures [1]. However analysed, history and physical examination alone are inadequate to diagnose or rule out scaphoid fracture [1].

MRI and NICE

The current NICE guideline is to consider an MRI scan as a first-line imaging modality in patients with suspected scaphoid fractures following a thorough clinical history and examination [9]. Use of this guideline will detect all scaphoid fractures which are suspected on the basis of the clinical history and examination, but will not detect scaphoid fractures which are not suspected by the clinician. A scaphoid fracture was never considered in 37 of the 52 scaphoid fractures in this series and excluded on the basis of no tenderness in the ASB on clinical examination in a further ten cases. Furthermore, only three patients underwent scaphoid views which suggests that these were the only three cases in which the clinician truly suspected a scaphoid fracture. Thus the NICE guideline would have resulted in only three of the 52 missed fractures being referred for MRI and presumably diagnosed.

Litigation

In scaphoid mismanagement, a missed fracture is the commonest reason for litigation.

Ring et al. analysed 99 litigation cases related to scaphoid fractures during 1995–2012 and found that 77% of the settled claims were related to errors in diagnosis [14]. This included delayed, incorrect or missed diagnosis. The mean cost of each litigation claim was £52,400. Harrison et al. reviewed 85 closed medicolegal cases of scaphoid fractures and found the reasons for the litigation were: missed fracture 57%, failure to interpret radiographs 8%, fracture not immobilised 5%, patient discharged too early 11%, operation delayed 6% and inappropriate surgery in 4% [4]. The reason why these fractures were missed was not stated[4].

Causes of missed scaphoid fracture

In the present study the failure to suspect a fracture on the basis of the clinical assessment was the most common cause of the missed diagnosis. In most cases this was probably because the clinical signs of a scaphoid fracture were not sought, but in ten it was recorded that there was no ASB tenderness. It is usually assumed that the failure to detect ASB tenderness is due to poor examination technique, but not all scaphoid fractures may cause ASB tenderness [10]. One could hypothesise that the fractures of the proximal pole do not cause ASB tenderness as the fracture is covered by the radial styloid process and is found on the dorsoradial aspect of the wrist where tenderness is not always sought. However 9 of the 10 fractures with no ASB tenderness were of the waist, and thus would have been directly under the ASB and not protected by the radial styloid process.

Outcome

The outcome of missed scaphoid fractures is not accurately reported, but delay in treatment increases the risk of non-union which is reported to be as high as 40%–88% [15]. However Chen et al. treated 87% of their 30 patients with late-diagnosed scaphoid fractures, diagnosed between 2 weeks and 5 months, by open surgery and reported a union rate of 97% [16]. Grewal et al. treated 28 patients with fractures diagnosed between 6 weeks and 6 months with cast immobilisation for 11–14 weeks and reported a union rate of 82% [15]. The union rate in our series is considerably lower, which may be due to the fact that the decision to take legal action was made based on persistent wrist pain and problems following treatment.

Limitations

This series is a highly selected group of patients as it concerned those with missed scaphoid fractures who pursued a medical negligence claim. Thus our findings may not be relevant to patients with these injuries that did not make a legal claim. Its conclusions are reliant on what was documented in the notes, though all relevant notes and X-rays were available in every case. Equating examination of ASB with a scaphoid fracture being clinically suspected may be disputed, as some clinicians may have considered the diagnosis of a scaphoid fracture and examined for ASB tenderness, but not documented this assessment. Failure to record that the ASB was assessed for tenderness makes the defence of a medical negligence claim virtually impossible.

Conclusion

The majority of these 52 fractures were missed due to failure to consider the possibility of a scaphoid fracture and search for clinical signs of this injury. As a scaphoid fracture was never considered, or excluded by clinical examination in 49 cases, a policy of obtaining MRI for all suspected scaphoid fractures would only have detected 3 out of 52 (6%) fractures. Improved awareness of the need to consider the possibility of a scaphoid fracture in all acute wrist injuries is required. Mandatory assessment of every wrist injury for the clinical signs of an acute scaphoid fracture might reduce the number of missed injuries.

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