

Original Research Article

Detecting suspected scaphoid fractures? the role of different imaging modalities within a district general hospital during the pandemic

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ABSTRACT

Background: This study evaluates the effectiveness of magnetic resonance imaging (MRI) versus computerised tomography (CT) scans for persistent wrist pain at the thumb base following injury in adults and children during covid. This was part of a pathway introduced as access to MRI scan was limited.

Methods: Patients were identified as having possible scaphoid fractures within the emergency department but had no fracture identified on initial imaging over a 3-month period. These were triaged to a scaphoid pathway during the covid pandemic from a virtual clinic. Patients were reviewed clinically and radiographically within the hand clinic using further imaging with CT or MRI scan.

Results: During the study time 45 patients with scaphoid fractures were detected on initial radiography in ED and 187 with suspected scaphoid fractures were selected for further review. Ninety (48%) were referred to the hand clinic where 2 (1%) scaphoid fractures were diagnosed on a second radiograph and ninety-seven (52%) were to be seen in an upper limb clinic where 2 (1%) further fractures were detected. 92% of scaphoid fractures were identified on radiography either in ED or orthopaedic clinic. Of the remaining 178 with two negative radiographs further imaging was requested in 45 cases (25%). Pathology was found in 17 (58%) MRI scans and in 7 (39%) CT scans.

Conclusions: Imaging needs to be timely to enable effective treatment. Obtaining MRI scans while diagnostically superior is not always achievable especially in times of resource depletion. Back up pathways using alternative imaging can be effective.

Keywords: Scaphoid fracture, Wrist injury, Wrist pain

INTRODUCTION

Fractures of the scaphoid are seen in 29 per 100,000 people affecting males following falls from a standing height but with greater risk in high-energy injuries.¹ Failure to detect these fractures leads to significant loss of function from arthritis often years after the index injury requiring salvage surgery.² Suspicion should begin after a history of a fall onto an outstretched hand (FOOSH) with palmar impact to the ground.³ Clinical examination typically with pain in anatomical snuffbox, scaphoid tubercle tenderness and

pain on thumb telescoping or compression improving the sensitivity when detecting these injuries.³⁻⁵

Clinically the absence of snuffbox tenderness has the most accuracy in excluding a fracture.^{6,7}

Radiographic assessment is similarly unreliable with significant false-negative rates reported in up to 30% of cases.⁸ Serial radiographic examination improves detection to 96% of cases leaving 4% undiagnosed.⁹ Risking the litigation with each case costing up to

€206,789 (over £180,000 in 2023).^{10,11} Radiographs are no longer considered the ‘gold standard’ in imaging to diagnose scaphoid fractures with MRI scan taking over as it is more sensitive being recommended by the national institute for health and care excellence (NICE) as the first-line investigation of patients with suspicion of a fractured scaphoid bone.¹²⁻¹⁴ The timely access to MRI scanning facilities remains an obstacle across the country with only 13% of centres being able to provide MRI direct from ED in compliance with NICE guidelines.¹⁵

CT scan has been used pragmatically by others in diagnosing scaphoid fractures effectively with a sensitivity of 81% and can often be arranged quickly and reported in a timely fashion.¹⁶ During the COVID pandemic as part of a mechanism to support the ED department a pathway to detect fractures using CT scan was trialled when resources for MRI were no longer available and compared to standard care of an MRI at some point. The aim of this study is to evaluate the effectiveness of alternative pathways when imaging resources are constrained.

METHODS

This retrospective service development at Queens hospital Burton in the United Kingdom (UK) involved a review of patients with suspected scaphoid fracture. Inclusion criteria were all patients assessed by the A and E department to have a suspected scaphoid bone fracture from November 2021 to September 2021. Patients with confirmed fracture in ED, children with open growth plates and patients with arthritis were excluded from the study. Ethical approval was not needed as this was part of a service development.

Patients identified in ED as having scaphoid fractures and suspected scaphoid fractures had prior to the covid pandemic been reviewed in a fracture clinic and if a scaphoid injury was identified or suspected the patients care was transferred to the hand team. During the covid pandemic the pathway was altered to ensure resources were utilised effectively due to the lack of availability of timely MRI scan and hand clinic slots within the institutions template.

In the new pathway all patients over a 3-month period were identified 312 patients between the 17th January 2020 until 17th April 2020 received an initial radiograph in ED and FUTURO splinting of the hand, and a referral to the local ‘scaphoid pathway’ via the virtual clinic-the pathway is shown in Figure 1. The diagnosis of scaphoid fracture was confirmed in 45 patients receiving initial treatment with plaster successfully in 37 patients with the remaining 8 requiring surgery because of delayed union evident on CT scan. In the remaining 267 patients those with end stage arthritis 62 were excluded as intervention for any potential fracture would not have altered the functional outcome for the patient acutely. Also 18 children with open growth plates were treated as potential growth plate injuries on a separate paediatric radial fracture pathway successfully.

This left 187 patients in adults with a possible suspected fracture requiring review on a 'scaphoid pathway'. Ninety patients were offered appointments in the hand clinic to receive further clinical examination, a radiograph and urgent CT scan and ninety-seven were triaged to standard care in an upper limb clinic of clinical examination, a radiograph and delayed MRI scan. The outcomes in these two groups were compared retrospectively with a minimum of two years follow up by reviewing the imaging results and notes for further interventions.

The patient's diagnosis believed to have caused the pain was identified and included acute injuries to soft tissues structures such as the triangular fibrocartilagenous complex (TFCC), extensor carpi ulnaris (ECU), or other fractures to carpal bones or radius and disease such as synovitis, arthritis or ganglia that could cause pain. Outcome measures considered were the need for surgery, return to function and the need for hand therapy.

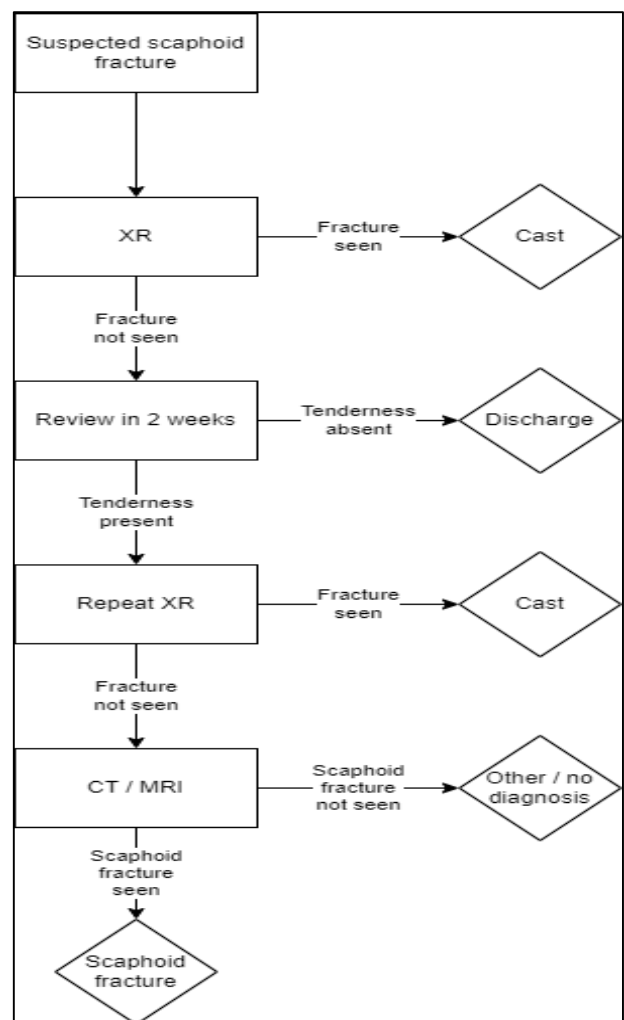


Figure 1: The local scaphoid pathway.

RESULTS

The 187 patients that remained with suspected scaphoid fractures had an average age of 32 (18 -57) with 99 males

and 88 females sent appointments in the two clinics Table 1 for more information about the demographics. The patient demographics remained similar in both clinic groups (hand clinic: average age 29 (18-55) years; 39 females; 51 males and upper limb clinic: average age 31 (18 -57) years: 49 females; 48 males). Only 148 patients attended clinic with the demographic ratios being unaffected. The 39 patients that did not attend were contacted by our triage nurses and all commented that the pain had resolved, the splints had been removed and functions and activities had returned to normal for them. None reattended in the following 2 years for wrist pain.

In total 80 patients attended the hand clinic at an average of 2.3 weeks (1-4) and 78 were seen in an upper limb clinic at an average of 3.6 weeks (1-8). In this group of patients reattending clinic 89 (56%) of patients still had tenderness requiring further investigation (42 hand clinic and 47 upper limb clinic). The remaining 44% did not reattend during the subsequent study period.

A diagnosis of scaphoid fracture was made on a second x-ray in 4 patients (2 in each group) making a total of 49 (16%) fractures detected on x-rays and serial examination out of 312 patients with a suspected fracture. Alternative diagnoses were made in a total of 15 (5%) cases in clinic with ulna collateral ligament injury was made in 10 patients (6 in hand clinic; 4 upper limb clinic); 3 inflammatory arthritis (upper limb clinic with elevated urate) and Bennetts fracture in 2 cases (hand clinic). Also, at this stage 108 (35%) patients had improved of the original 312 patients and did not reattend and 62 (20%) were deemed to have arthritis or a growth plate injury so were inappropriately signposted as a suspected scaphoid fracture. So, there were 32 patients selected for further imaging from hand clinic and 40 from the upper limb clinic a total of 72 (23%) cases. However only 29 people went on to have MRI scans from the upper limb clinic reported within 6.7 (3-18) weeks and 18 people had CT scans within 3.5 (2-18) days of the hand clinic, 3 had both CT and MRI after an initial negative CT scan in hand clinic with persistent pain at 8.3 weeks. A further 22 people were booked to have a scan but did not attend the appointment. It was possible to contact 12 who said the wrist symptoms had resolved whilst waiting for the scan.

A scaphoid fracture was only picked up in 2 MRI scans and 2 CT scans with all fractures having minimal displacement. This means that 92% of patients with scaphoid fractures were identified by the initial two x-rays with 84% of the fractures being identified on the first x-ray. Males made up 48% of patients with suspected scaphoid fractures, but a much higher proportion of males (73%) had a confirmed fracture. MRI scan (Table 2) was able to identify an additional 17 causes for pain with musculoskeletal disease including arthritis or ganglia being the commonest finding in over half of the MRI scan results. CT scans (Table 3) identified 7 additional causes for pain with the commonest finding being other forms of carpal or metacarpal fractures. The majority of MRI and

CT scans had a normal result at the 41% and 61% respectively.

The treatment plan after the scans (Table 4) did not change significantly with 53% of patients continuing conservative measures weaning out of the splint or being referred to hand therapy. Additionally, 17% of patients were discharged after MRI/CT scan without any further treatment. Only 15% of patients continued in the cast or were changed to a different splint.

Table 1: Patient demographics.

Age (In years)	Male	Female
18-19	12	11
20-39	43	25
40-59	32	29
60+	12	23

Table 2: Diagnosis after MRI scan.

Diagnosis after MRI scan	N
Scaphoid fracture	2
Carpal/ metacarpal fracture	4
Ligament injury	2
MSK disease (details)	9
Normal	12

Table 3: Diagnosis after CT scan.

Diagnosis after CT scan	N
Scaphoid fracture	2
Carpal/ metacarpal fracture	3
Ligament injury	0
MSK disease	2
Normal	11

Table 4: Management after CT/ MRI.

Management plan after CT/MRI scan	N
Wean out of splint	16
Referred to hand therapy	9
Discharged	8
Did not attend follow up after scan	2
Continued in cast	4
Changed to different splint	3
Other	5

DISCUSSION

Patients without fractures excluded themselves from attending clinic in 39 (12.5%) of presentations, by clinicians in clinic in 108 (35%) cases and on imaging through scans in 23 (7%). Suggesting over half the time that clinic appointments are not required from ED. The pathway with virtual clinic also managed to successfully exclude those with alternative disease in 20% of cases initially. Clinical examination excluded 5% because of a lack of tenderness around the anatomical snuffbox,

scaphoid tubercle and on telescoping which are sensitive but not always specific tests, sometimes the specificity is quoted as being as low as 14%.^{6,17} Many alternate diagnoses can be excluded clinically with experience such as De Quervain's tenosynovitis, arthritis, or ligament injury. Similar patterns of tenderness were evident on clinical examination in scaphoid fractures taking longer than 2 weeks to resolve also showing a male preponderance, believed to relate to activity especially sports.^{1,17,18} Radiographs were able to pick up most of the fractures (84%) with 8% being picked up by the second x-ray at 2 weeks. This means that 92% of fractures in this study were picked up by radiographs, like other studies showing the sensitivity of initial x-rays is 50% and as high as 94%.^{1,17,19} In those seen in clinic where the diagnosis of fracture was still suspected 4% of fractures were diagnosed on scan. In those who had CT scan a higher percentage of normal scans occurring in 10 (61%) patients. However, while MRI scans diagnosed a higher proportion of causes of pain it took a longer time to arrange them during the pandemic. Other pragmatic studies using CT scan where MRI has been unavailable have shown that CT can be sensitive but did not show how MRI helps explain the patients pain more accurately.²⁰ Both scan modalities can be useful when radiographs are unavailable since the risk of delay in arranging the MRI scan is that patients may choose not to attend, and the diagnosis can be missed. Surgery was not required in those diagnosed on scan.

The need for further enhanced imaging with the use of CT scans or MRI scans in the management of suspected scaphoid fractures does require attention as a number do not attend the appointment (18%) almost the same as those diagnosed with a fracture of significance. Although the scan did not change the treatment plan and may therefore only be required for medicolegal purposes. So is appropriate clinical examination and radiographs more cost effective.²¹⁻²³ Moreover, radiation exposure from CT scans can lead to increased risk of cancer in the future.²⁴ On the other hand, knowing the diagnosis may help patients manage these alternate conditions causing pain for the patient. Acutely 12% of patients were identified as having an alternative fracture such as a trapezium fracture which settles over 3-6 months of conservative treatment.²⁵

It might be that patients should have a second clinical review when coming out of splint at 6-8 weeks either in clinic/with hand therapy. Then only those patients with high risk or clinical suspicion could go on to have MRI/CT scan. More research is needed on pragmatic pathways where imaging options are limited with higher sample size.

CONCLUSIONS

In conclusion this study has shown that scaphoid fractures are diagnosed mainly on the initial X-ray. Clinical examination remains key at 2 weeks and may need repeating further as very few fractures are diagnosed on MRI or CT scan needing treatment. Pragmatic pathways

need embedding and reviewing in order to ensure efficacy in a timely fashion.

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