Appropriate Use of CT Wrist for Assessment of Distal Radial Fracture - a Clinical Audit

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Learning objectives

1. There has been an increase in the number of inappropriate referrals for CT wrist scans for assessment of distal radial fractures. Even with the availability of good quality radiographs.
2. Clear guidelines should be in place for the assessment of wrist trauma in adults.
Background

Gosford District Hospital (GDH) is a major teaching hospital within the Central Coast Local Health District (CCLHD) receiving a sizable number of wrist trauma cases. There are currently no best practice guidelines available in Australia for the radiographic investigation of adult distal radial fractures. Routine initial assessment of wrist trauma including a minimum of three plain radiographic projections (posteroanterior, lateral, and 45° semipronated oblique) is sufficient for assessing most of these fractures. Computed tomography (CT) is usually reserved for evaluation of complex fractures that affect articular surface, assessing of fragments’ size and position [1].

Anecdotally, there has been an overuse of CT wrist scans that are not indicated. Inappropriate investigations undermines the quality of health provision as it breeds inefficiency, overloads diagnostic facilities and wastes valuable healthcare resources. It also causes unnecessary patient anxiety and discomfort and delay in management [2].

This audit aims to investigate the incidence of inappropriate referrals for CT wrists for distal radial fractures despite sufficient findings reported on radiographs.
Best Practice Guidelines:

There are currently no best practice guidelines available in Australia for the radiographic investigation of adult distal radial fractures. The American College of Radiology (ACR) has published a guideline aimed at evaluating the appropriateness of initial radiologic examinations for patient with acute hand and wrist trauma. Based on recommendations by ACR, CT wrist without contrast may be appropriate for suspected acute distal radius fracture should initial x-ray (XR) wrist be normal. It is also recommended for surgical planning where comminuted, intra-articular distal radial fracture is found on radiographs [1]. A CT wrist is not usually indicated in a patient with an obvious comminuted, intra-articular distal radial fracture on plain film.

Methods:

Retrospective review of CT wrists was performed in GDH from 31st January 2015 to 31st January 2016. Imaging database on the Citrix software was evaluated for CT wrists performed. Images that fit the inclusion and exclusion criteria were then selected and further evaluated for the appropriateness of CT scans based on plain film reports and reported clinical indications.

Inclusion Criteria:

- Patients >18 years old
- Radiographs with reported distal radial fracture.

Exclusion Criteria

- Clinical and/or radiograph findings positive or suspicious of carpal bone involvement and fractures.
- Clinical and/or radiograph findings positive or suspicious of distal radioulnar joint (DRUJ) subluxation.

A subgroup analysis was performed with data between 1st October 2015 and 31st December 2015. Total number of XR wrists performed was counted and the proportion of CT scans that was subsequently performed was calculated.

Results:
In 2015, a total of 126 CT Wrists were performed regardless of indications. Based on the Citrix database, this was a marked increase from 79 in 2011 (Figure 1). Thirty-nine cases were found to fit the inclusion and exclusion criteria.

The most common clinical history provided for the indications for XR wrists that revealed distal radial fractures are "post-fall" or "fall on outstretched hand (FOOSH)", making up 80% of the total indications (Figure 2). In terms of the reported indications for CT scans as follow up from the plain radiographs, the largest proportion was stated as assessment for severity (42%). Severity assessment frequently referred to the presence of comminution or intra-articular extension. 10% simply reported "orthopaedic request" as an indication (Figure 3).

In a subgroup analysis between October 2015 and December 2015, a total of 95 XR wrists were reported for distal radial fracture. Out of which 85 did not receive any further scans. The remaining 13 received further investigations with CT scans (Figure 4).

Discussion:

This audit has revealed that there has been a 37.3% increase in the total number of CT wrist scans in the last five years (79 in 2011 and 126 in 2015). Anecdotally, a sizable amount of these scans are performed excessively and not based on best practice. In the assessment of distal radial fractures, radiographic projections are usually sufficient in confirming the fracture as well as showing the extent and severity of the fracture, including comminuted fractures and intra-articular extension.

Based on our subgroup analysis, 86% of XR wrist cases that reported distal radial fracture did not receive further radiographic investigations. However, the remaining 14% went on to receive CT scans. The vast majority (42%) of the CT wrists performed reported to be indicated for assessment of fracture severity. However, many of these requests were preceded with plain radiographs that have already reported the presence of comminution and intra-articular extension. Based on expert opinion and ACR guidelines, these scans were not indicated. Performing the CT scans in these cases have limited added value.

In this single centre experience, there has been an increasing numbers of inappropriate CT wrists performed. The additional information provided on CT scans increases the decision for more invasive procedures performed on some patients. However, the evidence remains limited as to whether these treatment options have improved outcomes [3]. Inappropriate investigations undermines the quality of health provision as it breeds inefficiency, overloads diagnostic facilities and wastes valuable healthcare resources. It also causes unnecessary patient anxiety and discomfort [2]. Reasons for the excessive ordering of CT scans include a lack of standardised clinical guidelines in place, defensive
behaviour, lack of clinical experience and uncertainty. Junior Medical Officers are also often unaware about the increasing costs of these investigations [4]. This issue is exacerbated by the lack of presence and communication with senior staff, especially during after-hours. It is crucial that irrational referrals CT scans are not incorporated into "routine" clinical practice.
Fig. 1: Total number of CT wrists performed in GDH between 2010 and 2015 regardless of indications. *Citrix database was initiated in 2010. Full records were unavailable.
**Fig. 2:** Proportion of initially reported indications for XR wrist that received subsequent CT wrists

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![Reported Indication for CT Wrist (n=39)](image)

**Fig. 3:** Proportion of reported indications of CT wrists that received prior XR wrist reporting distal radial fracture.

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Fig. 4: Proportion of imaging modalities performed for reported distal radial fracture.

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Conclusion

Recommendations:

Clear protocols and guidelines should be drawn up for the assessment of wrist trauma for adults, especially in distal radial fractures. There should be education provided for junior doctors on the topic, especially in the emergency, orthopaedic and radiology departments. Education posters can be placed in the above-mentioned departments. A system can be developed to ensure adherence to guidelines through further audits and active enforcement.

Upon presentation of the findings from this audit, expert opinion recommended the following indications for referral of CT wrist scans at CCLHD:

1. Patient with distal radial fracture where there is suspected intra-articular extension but is not reported on plain film.

2. Patient with distal radial fracture with suspected carpal bone injury

3. Any other reasonable requests by the orthopaedic consultant.

Conclusion:

This audit suggests that over 40% of referrals for CT wrists for the management of distal radial fractures in GDH were inappropriate. One major issue is a lack of clear practice guidelines to follow. Follow up studies can include similar audits in separate sites, including other major teaching hospitals as well as district hospitals to compare experiences. Further studies can also be conducted to evaluate reasons for inappropriate investigations performed.
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References


