The diagnostic accuracy of clinical examination in hand lacerations

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Hand lacerations; Diagnosis; Clinical examination; Accuracy

Abstract
Introduction: Hand injuries account for a significant proportion of emergency department attendance. We investigated the diagnostic accuracy of clinical examination in patients with simple hand lacerations undergoing surgical exploration at our unit. Methods: One hundred and sixty-five consecutive patients were identified as undergoing exploration of the hand. Case notes of these patients were reviewed. The clinical findings, made by emergency department doctors (ED) and hand surgeons (HS), were compared with the operative findings. Results: A total of 101 patients were included following exclusion criteria. Both ED and HS correctly identified 68.2% of flexor tendon injuries. Overall, the ED diagnosed accurately significantly fewer extensor tendon injuries (ED 65.6% vs HS 75.0%, p < 0.001). Similarly, HS diagnosed nerve injuries more accurately than ED (ED 54.5% vs HS 78.8%, p < 0.005). Discussion: Clinical examination forms an important part of the patient assessment, provides the surgeon with an idea of which structures are potentially injured, and its value should never be underestimated. Formal exploration, however, should be undertaken since both ED and HS missed about 30% injuries.

Introduction
Hand injuries account for a significant proportion of emergency department attendances. Studies have reported the frequency of hand injuries to vary from about 6.6% to 21% of the total number of injuries presenting to A&E.1,2 The accurate diagnosis and subsequent management of such injuries is important in order to avoid morbidity, loss of function and consequent sick leave.3 These injuries when misdiagnosed are a common cause of litigation. We investigated the clinical diagnosis of patients with simple hand lacerations undergoing surgical exploration at our unit. The diagnosis of damaged structures, as made by the emergency department officers and hand surgery junior doctors, were compared with the intra-operative findings.

Methods
All hand trauma patients undergoing surgery were identified from theatre records over a year period, commencing August 2003. A total of 1143 hand procedures were undertaken during the study period at our regional hand unit.
One hundred and sixty-five consecutive patients were identified as undergoing exploration of the hand. Case notes of these patients were reviewed. Inclusion criteria included patients with simple hand lacerations from a sharp object. Exclusion criteria used were patients with crush injuries, amputations, fractures, bites, or incomplete notes.

Information was collected from the case notes regarding patient demographics and mechanism of injury. The notes of the emergency department doctors and admitting on-call hand surgery Senior House Officers were analysed for their diagnoses of damaged structures. These structures were noted and grouped according to the type of structure and zone of injury. These results were then compared to the intra-operative findings. Partial lacerations of tendons and nerves were included in the study if more than 50% of the structure was damaged.

The clinical and intra-operative findings were then compared statistically using McNemar’s test for paired proportions. Statistical analysis was also performed to assess if the zone of injury had any significance in the correct diagnosis of damaged structures.

**Results**

One hundred and one patients were included in this study. Following review of the 165 case notes, 64 patients were excluded by the criteria explained above.

At the time of operation, 22 flexor digitorum profundus and superficialis (FDP and FDS, respectively) tendon lacerations were repaired. Fig. 1 illustrates the number of tendons correctly identified by zone of injury, by the emergency doctors (ED) and hand surgeons (HS). It also highlights the number of missed and over-diagnosed injuries. Both ED and HS correctly identified 68.2% of flexor tendon injuries. Over-diagnosis of 8 and 9 flexor tendon (FDP and FDS) injuries was made by ED and HS, respectively. Both ED and HS missed 32.8% of flexor tendon injuries. Analysis of the results according to the zones of injury, described by an international committee, illustrates the majority of flexor injuries missed by ED were in zone V. No differences between the two groups were noted with respect to extensor tendon injuries and zones (Fig. 2).

Overall, the ED diagnosed accurately significantly fewer extensor tendon injuries (ED 65.6% vs HS 75.0%, p < 0.001). Similarly, HS diagnosed nerve injuries more accurately than ED (ED 54.5% vs HS 78.8%, p < 0.005). HS, however, were more likely to over-diagnose nerve injuries (HS 13 vs ED 9) (Fig. 3). Arterial injuries were not commonly seen in this series, with overall results being similar for both ED and HS.

**Discussion**

Reports have shown that there is a significant incidence of under-diagnosis when emergency department staff clinically assess lacerations of the hand. McNicholl et al. reported that subclinical injuries occurred in nearly half of all lacerations of the hand and forearm where the wound extends below the subcutaneous tissue. They also reported that 64% of subclinical tendon injuries required repair. According to our series, although hand surgery juniors perform better when diagnosing hand structure damage, a number of injuries still remain undiagnosed or misdiagnosed until formal exploration was performed in theatres.

Partial tendon lacerations are often difficult to diagnose clinically as there is often residual function. Distinguishing between FDP and FDS lacerations can be difficult for the junior doctor without previous hand trauma experience. Extensor tendon and nerve injuries were more frequently missed by the ED. Flexor tendons, however, were correctly diagnosed in 68% of patients in both ED and HS. Both groups had similar over-diagnosis rates. The difference between two groups in diagnosis of zone V flexor tendon injuries may
reflect better understanding of the anatomy of this zone in the HS group.

Observer error can result in a high rate of missed diagnoses. The hand surgeon’s diagnosis is biased, as they are already aware of possible damaged structures when the patient is referred. Patient anxiety, pain, alcohol intoxication as well as willingness to co-operate have a significant effect on the accuracy of the diagnosis. The retrospective nature of this study can also further bias results.

Vascular injuries may be missed if Allen’s test is not performed when assessing circulation because of good back flow through the palmar arches.

This study highlights the importance and clinical relevance of basic knowledge of hand anatomy and clinical examination. This may be represented by hand surgeons more accurately diagnosing lacerations, due their experience. However, the hand surgeon is often already aware of the emergency doctor’s diagnosis. Gibson et al. have shown that errors in diagnosis were not well correlated with the level of experience.6

We believe that this study reveals the need for most hand lacerations to be referred to hand surgeons and subsequently undergo a formal exploration in theatre. Clinical examination forms an important part of the patient assessment, provides the surgeon with an idea of which structures are potentially injured, and its value should never be underestimated. A study also highlighted the need for formal exploration of small laceration

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**Figure 2** Extensor tendon injury by zone of injury.4

**Figure 3** Nerve injuries by zone of injury.4
injuries as they have the potential to conceal a deep injury.\textsuperscript{7}

Formal exploration, however, should be undertaken since about 30\% injuries were missed by both ED and HS.

References


