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Hand trauma: A prospective observational study reporting diagnostic concordance in emergency hand trauma which supports centralised service improvements

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Summary *Background:* Hand injuries are common, contributing up to 30% of accident and emergency (A&E) attendances. The aim of this study was to prospectively analyse the pathological demographics of hand injuries in a level 1 trauma centre with a Hand Trauma Unit and direct A&E links, and compare clinical and intra-operative findings. The null hypothesis was that there would be no differences between clinical and intra-operative findings (100% diagnostic concordance). *Methods:* Data were prospectively collected for referrals during 2012. Referral diagnosis, additional pathologies found on clinical assessment and intra-operative findings were documented on a live database accessible from both the Hand Unit and associated operating theatres. Odds ratios were calculated using SAS.

Results: Injuries (1526) were identified in 1308 patients included in the study. Diagnostic concordance between Hand Unit clinical examination and intra-operative findings was $92.5\% \pm 2.85\%$ (mean \pm SEM); this was lower for flexor tendon injuries (56.3%) because a greater number of additional pathologies were found intra-operatively (2.25 ± 0.10). This 'trend' was noted across multiple referral pathologies including phalangeal fractures (1.28 ± 0.02 ; 82.9%), lacerations (1.33 ± 0.04 ; 79.1%), extensor tendon injuries (1.30 ± 0.05 ; 87.8%) and dislocations (1.18 ± 0.05 ; 87.8%). Odds ratio analysis indicated a relationship between primary referral diagnoses that were more or less likely to be associated with additional injuries ($p < 0.05$); referral diagnoses of flexor tendon injuries and lacerations were most likely to be associated with additional injuries.

Conclusions: As hand injuries are a common presentation to A&E departments, greater emphasis should be placed on training clinicians in the management of hand trauma. Our findings, coupled

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with the presented relevant literature reports, lead us to advocate that A&E departments should move towards a system wherein links to specialist hand trauma services are in place; we hereby present useful data for hospitals implementing such services.

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Introduction

Hand injuries are the most common presentation to accident and emergency departments (A&E), accounting for 10–30% of all attendances.^{1–4} Accurate assessment and treatment are vital as mismanagement may result in long-term disability, loss of work and/or income, livelihood, psychological issues and withdrawal from society in extreme cases.⁵ The effect of hand injuries is extensive; direct treatment costs including initial management, surgery, inpatient stay, sick leave and outpatient attendances have been reported to cost over £100 million per annum.^{6,7} Indirect costs in Europe, such as lost wages and company or industry costs, have been estimated to be six times that of the direct costs, with similar financial implications of upper limb injuries having been reported in America.^{8,9}

Significant hand trauma, in particular, should initially be managed according to Advanced Trauma Life Support (ATLS) principles. It is essential to obtain detailed medical, employment and social history and perform a thorough clinical examination considering the patient's age; handedness; employment; relevant hobbies; and most importantly, details of the mechanism of injury.¹⁰ Radiological investigations should include anterior-posterior and true lateral radiographs of affected parts often including neighbouring joints. If the wound is very small and does not appear to be associated with functional deficit or is located away from relevant deeper structures, skilful exploration of the zone of injury (with due consideration of iatrogenic injury) under local anaesthesia by using surgical magnification (loupes) might enable direct visualisation of deeper structures e.g. tendons and nerves and their integrity or lack of. If the injury is superficial or these structures are spared in the case of a deeper zone of injury, simple wound washout, debridement and wound closure in the A&E department may be appropriate, thus avoiding a need for an operation; admission; delays; and often, general anaesthesia and unnecessary starving.

Suspicion of deeper injury, however, warrants immediate tertiary referral to a hand surgery service. It is therefore imperative for healthcare professionals to have a thorough understanding of the spectrum of injuries commonly seen, and in particular, which of these injuries require a high index of suspicion and subsequent referral and which do not. Furthermore, these data would provide useful information for hospitals wishing to implement their own specialist tertiary referral hand surgery service.

Aim

The aim of this study was to prospectively analyse the pathological demographics of hand injuries in a level 1 trauma

centre with a specialist Hand Trauma Unit and direct A&E links and compare clinical and intra-operative findings (diagnostic concordance). Associated injuries found intra-operatively for each primary referral diagnosis were also compared. The null hypothesis was that there would be no differences between primary referral/Hand Trauma Unit clinical findings and intra-operative findings (100% diagnostic concordance). These data would provide useful insights for hospitals considering implementation of a specialist hand service.

Methods

Consecutive patients were prospectively collected using a standardised online referral form which included one or multiple discrete exploratory diagnoses based on the initial clinical examination performed by the A&E's referring clinician (Registrar or Consultant). All adults with non-life/limb threatening hand injuries referred by A&E departments in South-West London and Surrey (the St. George's Hospital catchment area over the course of 2012) were included in this study. Children, patients who failed to attend clinic and patients who did not require operations were excluded (Figure 1).

Specialist hand examination was performed either by a Registrar or a Consultant at the Hand Trauma Unit. The prospective data including primary referral and clinical assessment diagnoses were entered into a standardised database designed to facilitate time-specific data entry. Patients who underwent surgery were followed up, and correlation was ascertained between referral diagnosis and intra-operative findings (gold standard for diagnosis). No surgeons were 'blind' to the primary referral diagnosis. All intra-operative findings were recorded as discrete diagnoses. Odds ratios were calculated to ascertain the relationship between primary referral diagnoses that were more or less likely to be associated with additional injuries. The risk of further pathology was calculated as the percentage of patients with multiple undiagnosed pathologies being found intra-operatively for each primary referral diagnosis. This diagnostic study adheres to the STARD guidelines.¹¹ All statistics were calculated using SAS.¹²

Results

There were 1475 patients prospectively referred with acute non-life/limb threatening hand injuries (Figure 1). Of these, 1308 patients met the inclusion criteria, with 1526 primary referral diagnoses and 17 pathologies. The number of injuries found after specialist hand unit clinical assessment and surgical exploration are listed for each primary A&E referral diagnosis (Table 1). No indeterminate diagnoses were reported on primary referral or intra-

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