MISSED INJURIES IN ORTHOPAEDIC EMERGENCY ROOMS
WHAT IS TO BLAME?

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Aim - Definition

The aim of this paper is to identify the types of injuries commonly missed in A & E departments, to establish an awareness of the diagnostic pitfalls that lead to errors in patient management, and to make recommendations for measures to avoid the occurrence of missed injuries.

One definition that seems to have been adopted by most authors for missed injuries is: "a diagnosis made after the patient has left the Accident & Emergency (A&E) Department (whether admitted or discharged) and which should have been made while the patient was in the department" (Guly, 1984). This most commonly results from a clinical or radiological error causing delay in the appropriate treatment for the patient.

Material-Method

Between January 2000 and December 2006 approximately 50400 patients were examined in the orthopaedic Emergency Room (ER) of our hospital (mean number of 7200 patients per year and 150 patients every day of duty). 934 cases of wrong or no diagnoses were recorded (1.85 %). Several parameters were analysed such as: radiographic and clinical evaluation, number of examined patients, duration of continuous work and experience of the physicians. The retrospective analysis was conducted by consulting the meticulous medical records of the clinic. Statistical analysis was evaluated with SPSS.

Comparison of the initial diagnoses to the diagnoses at the day of release was performed and recorded for the patients that were admitted in the clinic. For those patients that were examined in the ER and were discharged under instructions, a missed injury was feasible to be recorded only if they had returned for re-examination. It is likely though that many missed injuries were never detected by us, as a number of these patients may have attended another hospital or their general practitioner. So the real percentage of missed injuries shall be higher than the 1.85% calculated.

For every missed injury recorded (most common injuries shown on **Table 1**), several variables were calculated **(Table 2)**. These variables concerned the situation in the ER department that day of duty in terms of big or small number of patients admitted and high or little experience of the doctors involved. The duration of work of the medical stuff was also taken into account since the recorded time of examination of a wrong diagnosed case was correlated to how close or not that time was to the previous shift change. The role of insufficient radiographic control was assessed by retrospective analysis of the x-rays taken in any misdiagnosed case. The role of insufficient clinical evaluation was estimated by the differences found on the clinical notes of the Emergency Room case book and the correspondent records of the clinic or the outpatients' department.

Results

The most common missed injuries are shown in **Table 1**.

Type of injury	No of patients
1. Carpal & Hand fractures (Scaphoid)	107
2. Knee ligament tears	101
3. Radial Head Fractures	95
4. Ankle fractures	79
5. Hip fractures	72
6. Achilles tendon ruptures	56
7. Cervical Spine fractures	46
8. Posterior shoulder dislocations	26
9. Minor injuries in multiply injured patients	248/5540
10.Other injuries	104
Total	**934**

Table 1

The main causes for the missed injuries are described in **Table 2**, statistically assessed with SPSS

Main cause for missed injury	Pearson coefficient (r)	p	95% C.I.
Insufficient radiological evaluation	0.86	<0.05	(3.4-7.6)
Insufficient clinical evaluation	0.77	<0.05	(1.8-4.3)
Big volume of patients in ER	0.69	>0.05	(0.65-1.46)
Duration of continuous work	0.65	>0.05	(0.94-1.87)
Lack of experience	0.78	<0.05	(1.85-7.49)

Table 2

As seen in **Table 2** insufficient clinical and radiographic evaluation as well as lack of experience have been found to be statistically correlated with the wrong diagnoses whereas big volume of patients and long duration of continuous work did not seem to be statistically significant reasons.

Discussion

Several factors leading doctors to wrong diagnosis were spotted. Most injuries were missed on X-rays of the correct anatomical region, either because of bad quality radiographs **(Fig. 1-2)** or by wrong radiological interpretation **(Fig. 3-4)**. Other cases were missed because of no radiographic control of the anatomical region due to clinical underestimation of the patient's state, mainly because of the presence of injuries at other sites. This explains the big volume of not diagnosed minor injuries in multi traumatized patients with more obvious lesions. It was also clear that in many cases doctors missed injuries by failing to request X-rays a joint above and joint below the site of limb injury. In other cases the correct anatomical site was examined by a wrong or inadequate view **(Fig. 5-6)**.

Apart from the insufficient radiographic control, inadequate clinical examination was found to be another important factor for missing injuries. This was found to be straight correlated to the lack of experience of several ER doctors. Most of the wrong clinical diagnosis concerning tendon, muscle or nerve injuries were held by very young resident doctors especially in their first semester in the ER department. The big number of miss- or undiagnosed knee ligament tears, as well as Achilles tendon ruptures is indicative of this observation.

Another major reason for missing injuries was difficulties in history taking. In several cases patients' complaints of pain were ignored. This could happen because of the unreliable hysterical state of some patients but in most cases had to do with the inability to elicit an accurate history due to the patients' poor general state or depression in conscious level.

Missed injuries in multiply injured patients is another whole category. The rates in the literature vary from 1.4% (Robertson et al, 1996) to 12% (Chan, 1980). Our study included 5.540 multiple injury patients in whom 248 missing injuries (most usually of minor character) were recorded (4.4%). The usual involvement of more than one speciality which results in the lack of coordinative control along with the unstable state of the patients' health which may impose the need for urgent surgical intervention before the completion of the proper control, explain up to a point the situation. Moreover the tendency to underestimate secondary symptoms against the more obvious and more dangerous lesions is a common reason for the high incidence of undiagnosed injures in multi-traumatized patients **(Fig. 7)**. Fortunately all of these patients end up hospitalised, thus secondary clinical and radiographic controls usually reveal the remaining hidden diagnosis. In our series the majority of missed injuries in multiple trauma patients concerned the limbs (65%) and the thorax (35%). Fractures accounted from more than 75% of all missed injuries. Missed head injuries were not recorded as they were not of orthopaedic interest.

Fig. 1 Inadequate C-spine X-ray

Fig. 2 C-spine X-ray showing a C5-C6 dislocation

Fig. 3 Lateral elbow X-ray in an occult radial head fracture

Fig. 4 Oblique elbow X-ray showing an obvious radial head fracture

Fig. 5 Occult scaphoid fracture in AP wrist X-ray view

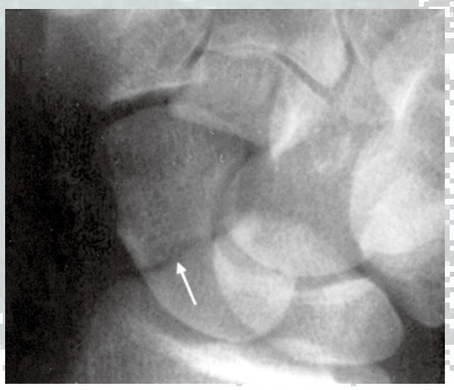

Fig. 6 Obvious scaphoid fracture in a scaphoid X-ray view

As Lee & Bleetman (Trauma 2004) state, a proportion of missed injuries will lead to legal action and compensation claims. Time lost in dealing with complaints, litigation, bad publicity and compensation leads to an increase in workload and costs for A&E clinical and managerial staff. Repeat attendances by patients with missed injuries result in additional and often unnecessary work. The increase in patient attendances may have a direct effect on patient waiting times.

Conclusion

A review of the literature identified that the rate of missed injury ranges from 0.4 to 65% (Lee. 2004). Orthopaedic emergencies usually are high risk cases in which the majority of patients are examined and treated by young doctors with poor clinical and radiological experience. Emergency rooms' stuff should be provided with a high level of experience, good access to radiology and an awareness of diagnostic pitfalls. In patients with multiple injuries, re-examination at regular intervals is advocated. Any symptomatic area should be X-rayed, with good quality views of the joint above and below. Radiological signs other than fractures must be identified (fat pad signs, joint effusions). Negative initial plain X-rays shall not be considered as evidence for the absence of a fracture. Clinical history and examination remain high priorities. Discharged patients shall be followed-up by senior stuff.

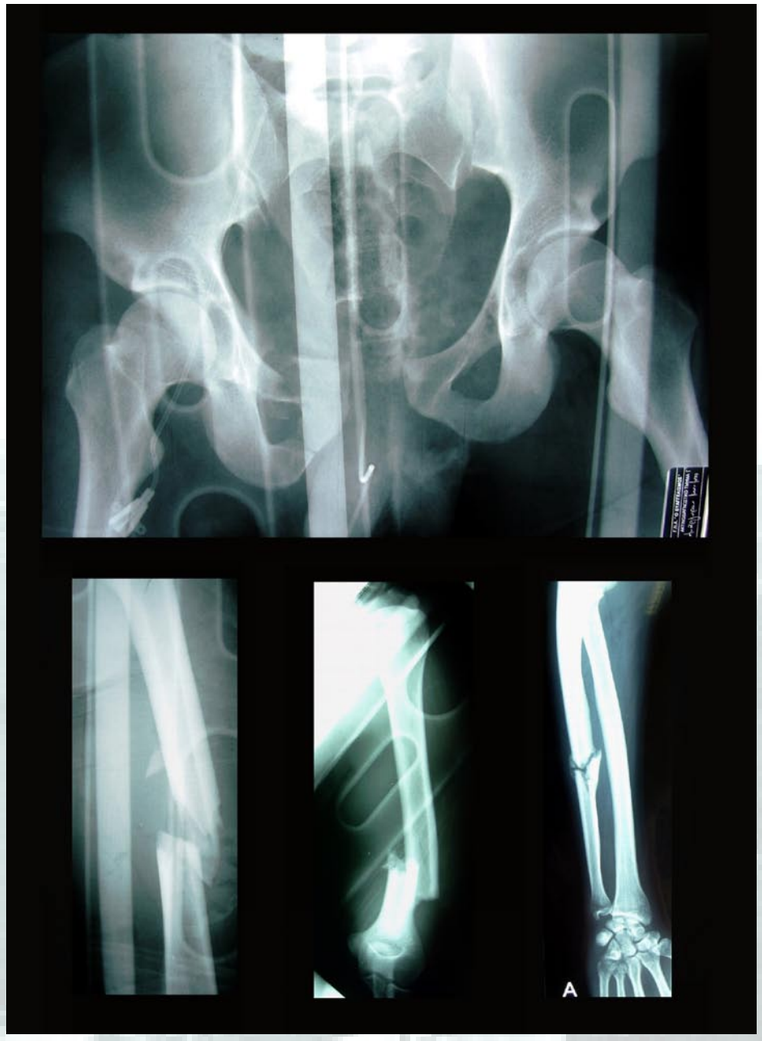

Fig. 7 Undiagnosed ulna fracture in a polytrauma patient

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