

Sternal fracture — a modern review

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INTRODUCTION

Sternal fractures have long been regarded as a potentially serious injury or at least a marker thereof. A retrospective review presented here challenges this premise and questions the current management.

Sternal injuries have been assessed since the 1860's when they were recorded to be both rare and associated with severe trauma (Guilt 1864). Over the next hundred years the incidence increased and a strong association with road traffic accidents (RTAs) became apparent (Helal, 1964). Indeed, by the early 1970's such was the preponderance of patients whose fracture was caused by a restraint that the injury was included in the 'Safety-belt syndrome' (Michelinakis, 1971).

From the mid-point of the century evidence demonstrated that patients ought to be admitted and closely observed — suggestions range from simple electrocardiogram to routine use of isotope scans and 2-D echocardiogram (Mayfield, 1984) — in order that cardiac contusion and other complications should not be missed. This represents the core of the policy currently followed in the United Kingdom.

The seat-belt law has recently been extended and hence a further increase in the frequency of this injury could reasonably be expected. A review of our cases was undertaken to see if these commonly held assumptions are true and whether a change in management is now required.

MATERIALS AND METHODS

A retrospective review of all patients admitted to this Unit between 1985–1991 was conducted. The policy during this time was to admit all patients who presented with a fractured sternum for observation having obtained radiographs of the chest and electrocardiograms (E.C.G.). The medical records of all patients and the X-rays

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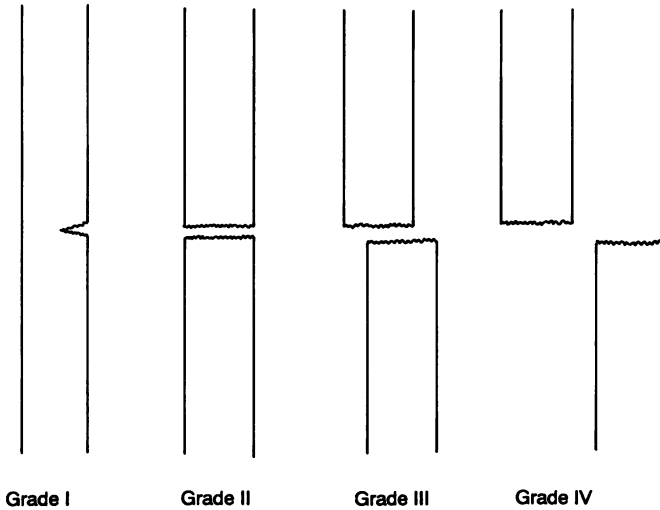


Fig. 1. Classification of sternal fractures.

of 80% were available for examination and the results are given below. No classification of sternal fractures has been described hence the following system has been introduced in this paper.

RESULTS

The review demonstrated a total of 103 patients were admitted with sternal fractures during the period 1985–1991 and that these were approximately equally divided between the sexes (male 49:female 54). The age range was 17–83 years of age, but no age group was significantly more prone to fracture. However, there was a trend towards a greater frequency with advancing years. The major cause of the injury, seen in 96 cases, was an involvement in RTAs and, in all cases, related to travelling in the front seats of a car wearing a seat-belt. The records did not reveal whether the passenger or the driver was more at risk but certainly the seat-belt rather than the steering wheel was the cause for the driver. Of the remaining seven patients, four were caused by falls at home, seen exclusively in the elderly, and three by direct violence to the chest either in sport or in a fight.

The length of hospital admission, a point we shall emphasize later, is given in Fig. 2 but it should be noted that 50% of patients were discharged in less than 24 h and 80% were discharged in under 48 h. There was no long-term sequelae in these patients found at routine follow-up. A variety of reasons, including social problems, adequate analgesia and an exacerbation of a pre-existing lung disease, extended the admission in the group whose stay ranged from 2 to 6 days. In the patients who were admitted for a week or more (6.2%), all had either been involved in

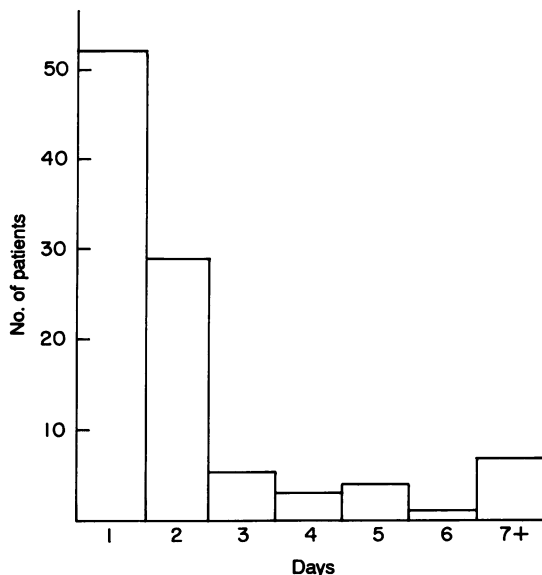


Fig. 2. Length of hospitalization.

multiple trauma and had problems of gas exchange secondary to lung contusion or there had been a severe exacerbation of an already prevalent lung disease.

The radiographs available were graded into the four categories already described and these were then correlated against the length of hospital admission and age. The results are illustrated in Table 1. (E.C.G.s) were recorded in all cases, of which only five had an abnormality, three had various forms of bundle branch block, one had severe ventricular hypertrophy in a known hypertensive man and one had raised ST segments. In the latter patient, cardiac enzymes were monitored but were within normal limits. Routine cardiac enzyme assay were not undertaken in this Unit. All the patients with abnormal E.C.G.s were followed by cardiologists after discharge and there were no sequelae. It should be noted that no patient had any clinical evidence of myocardial dysfunction in both normal and abnormal E.C.G. groups.

Table 1. Radiograph gradings correlated against length of hospital admission and age

Grade	Mean hospital stay (days)	Age of pt (years)	Range of age (years)
1	1.6	42.8	17-70
2	1.8	49.8	19-81
3	1.6	56.7	18-78
4	1.6	64.4	16-83

DISCUSSION

The series presented here represents one of the largest in the literature and, when compared to others, it has a similar age and sex rates (Buckanan *et al.*, 1987, Breederveld *et al.*, 1988). The majority of our patients resulted from road traffic accidents, followed by falls and thirdly from direct blows to the chest and this again is broadly in line with previously published reports (Maxwell, 1988). This cohort therefore appears typical of patients seen in current trauma practice.

The major finding, and the reason for suggesting a change of policy, is that over 50% of patients were discharged in less than 24 h and that 80% were discharged in under 48 h. All had minimal medical intervention during their admission and no-one had any long-term sequelae. We have also shown that the duration in hospital is not related to our grading of fractures and that this is not an important clinical sign. We feel, therefore, there is a good argument for not admitting an uncomplicated sternal fracture.

The literature demonstrates many associated injuries ranging from the infrequent innominate artery avulsion (Ben-Menachem, 1988) to the common pneumothorax, but this series did not have any complications in its patients. One of the most serious associations is cardiac contusion and it is the detection of this injury that has led to the current policy of admission and constant monitoring; a major drawback however is equating physiological parameters and the clinical picture. An E.C.G. rarely produces reliable diagnostic evidence in itself (Muwanga *et al.*, 1986), but any abnormality suggests that further investigation is mandatory. The use of cardiac enzyme assay is debatable and certainly results beyond 24 h post trauma may not be valid (Frazee *et al.*, 1986). The increasing use of 2-D echocardiogram has demonstrated evidence of dyskinesia especially in the right ventricle, as might be expected when one considers the anatomical relationship with the sternum. Any echocardiographic evidence of injury does not always relate to the clinical picture; indeed, if the patient remains well then the echocardiogram is non-predictive of outcome. Patients who require an anaesthetic within a month of injury have the same morbidity whether there is contusion demonstrable or not (Frazee *et al.*, 1986). In short, no matter how invasive or extensive the investigation, all results must be considered in the context of the clinical situation which further supports the assumption that a solitary sternal fracture may be benign.

The evidence from this series suggests in the group of patients with an isolated sternal fracture, who are clinically well, who have no abnormality in the E.C.G. and who have no underlying chest pathology, may not require hospital admission and in this group a fractured sternum is a benign injury.

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