

*Ministry of Defence*

## **Synopsis of Causation**

### **Sternal Fractures**

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## **Disclaimer**

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This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

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# 1. Definition

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- 1.1. Sternal fracture involves disruption to the cortex of the sternum due to a direct blow or a pathological process. It occurs in isolation or with other associated injuries.

## 2. Clinical Features

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- 2.1. Sternal fractures are diagnosed in 3.7% of victims of road traffic accidents who attend hospital.<sup>1</sup> Whilst these are among the less common fractures, the incidence has increased following the implementation of seat belt legislation. Sternal fractures may occur in association with cardiothoracic injuries, rib fractures, craniocerebral injuries, whiplash injuries and spinal injuries.
- 2.2. Road traffic accidents account for 83% of sternal fractures; 13% are due to falls; and 4% are attributed to other causes. Nearly 80% of injuries are due to recreational activities and the remainder due to accidents at work, usually associated with travel.<sup>2</sup>
- 2.3. Sternal fracture is more common in females and the elderly. It has an overall mortality of 0.7%.<sup>3</sup>
- 2.4. Isolated sternal fractures present with pain in the front of the chest. Localised pain can also occur on taking a deep breath and on coughing. Chest pain is the predominant symptom and sometimes can persist up to a few weeks.<sup>4</sup> However, if there is associated cardiopulmonary injury, patients may present with breathing difficulties and heart abnormalities. The incidence of myocardial contusion is 6-12%.<sup>5</sup>

### 3. Aetiology

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3.1. Sternal fractures may result from:

- Direct trauma, which requires considerable force and is usually associated with other injuries
- Violent flexion injury of the thoracic spine, with a thoracic spine wedge fracture

3.2. Road traffic accidents are the most common cause of sternal fractures, due to:

- Fall onto the steering wheel of the car
- The seat belt

3.3. Sternal fractures are common in restrained, front seat vehicle occupants involved in frontal collisions. The frequency of these fractures increases with age. The incidence for drivers is 4.1%, for front seat passengers 6.3%, and for rear seat passengers 0.8%.

## 4. Prognosis

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- 4.1. Prognosis is excellent for isolated sternal fractures. Most patients recover completely over a period of several weeks (average 10.4 weeks).<sup>4</sup> Chest pain is the predominant symptom during this period. More than two-thirds of the patients require pain-killers only.<sup>6</sup> The time it takes for patients with associated injuries to get better depends on the extent of injuries to the neighbouring structures.
- 4.2. Patients with isolated sternal fracture and no abnormality in ECG and cardiac enzymes during the early hours after injury, are expected to have a benign course, and can be discharged home from the emergency room within the first 24 hours.<sup>7</sup>
- 4.3. The outcome for patients with a sternal fracture and associated injuries is more difficult to state. This largely depends upon the extent of involvement of the visceral injuries. For example, 6% of patients with cardiac injury at the time of the initial event have potential cardiac sequelae. Hence the management of sternal fractures should be directed towards the treatment of the associated injuries.<sup>8</sup>
- 4.4. Nonunion of sternal fracture is very rare. Painful pseudoarthrosis or overlap of fragments may require surgical correction.
- 4.5. Rarely acute aortic rupture is associated with sternal fracture.

## 5. Summary

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- 5.1. Sternal fractures are uncommon injuries although there has been a slight increase in the incidence due to seat belt legislation. Sternal fractures are diagnosed in 3.7% of victims of road traffic accidents who attend hospital.
- 5.2. After exclusion of other concomitant injuries, isolated sternal fractures can be classified as harmless injuries analogous to isolated rib fractures, and can be treated ambulatorily. The prognosis is good and these patients usually make a full recovery. No complications have been noted for the isolated sternal fracture.<sup>9,10</sup>
- 5.3. Of patients with a sternal fracture, 6-12% develop myocardial contusion and may require ECG monitoring.
- 5.4. Management of sternal fractures should be directed towards the treatment of associated injuries.

## **6. Related Synopses**

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Neck Pain

Whiplash

Head Injury



## 7. Glossary

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cardiopulmonary	Pertaining to the heart and lungs.
cardiothoracic	Pertaining to the heart and chest cavity plus its contents.
concomitant	Occurring or existing concurrently.
cortex	Outer zone of an organ or bone, as distinguished from the internal substance.
craniocerebral	Pertaining to the skull and the brain.
ECG	Electrocardiogram; a record of the electrical activity of the heart as it beats.
myocardial contusion	Bruising of the heart.
pseudoarthrosis	False joint due to failure of union at a fracture site.
thoracic spine	The 12 bones (vertebrae) of the spine that are situated in the area of the chest.
visceral	Pertaining to organs within a cavity.
wedge fracture	A compression fracture of just the anterior part of a vertebra, leaving it wedge-shaped.

## 8. References

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1. Otremski I, Wilde BR, Marsh JL, McLardy Smith PD, Newman RJ. Fracture of the sternum in motor vehicle accidents and its association with mediastinal injury. *Injury* 1990 Mar;21(2):81-3.
2. von Garrel T, Ince A, Junge A, Schnabel M, Bahrs C. The sternal fracture: adiographic analysis of 200 fractures with special reference to concomitant injuries. *J Trauma* 2004 Oct;57(4):837-44.
3. Brookes JG, Dunn RJ, Rogers IR. Sternal fractures: a retrospective analysis of 272 cases. *J Trauma* 1993 Jul;35(1):46-54.
4. de Oliveira M, Hassan TB, Sebewufu R, Finlay D, Quinton DN. Long-term morbidity in patients suffering a sternal fracture following discharge from the A and E department. *Injury* 1998 Oct;29(8):609-12.
5. Wojcik JB, Morgan AS. Sternal fractures – the natural history. *Ann Emerg Med* 1988 Sep;17(9):912-4.
6. Roy-Shapira A, Levi I, Khoda J. Sternal fractures: a red flag or a red herring? *J Trauma* 1994 Jul;37(1):59-61.
7. Bar I, Friedman T, Rudis E, Shargal Y, Friedman M, Elami A. Isolated sternal fracture – a benign condition? *Isr Med Assoc J* 2003 Feb;5(2):105-6.
8. Chiu WC, D'Amelio LF, Hammond JS. Sternal fractures in blunt chest trauma: a practical algorithm for management. *Am J Emerg Med* 1997 May;15(3):252-5.
9. Jackson M, Walker WS. Isolated sternal fracture: a benign injury? *Injury* 1992;23(8):535-6.
10. Wright SW. Myth of the dangerous sternal fracture. *Ann Emerg Med* 1993 Oct;22(10):1589-92.