

# Spontaneous sternal fractures in four patients with chronic airflow obstruction taking corticosteroids

K Hameed, G E Packe, J S Legge, J A R Friend

## Abstract

**Four patients with chronic airflow obstruction developed spontaneous sternal fractures. All had received repeated courses of high dose corticosteroids and three were receiving long term treatment with low dose corticosteroids. It is important to consider sternal fracture in the differential diagnosis when patients with chronic airflow obstruction present with chest pain.**

(Thorax 1993;48:1183-1184)

Four patients are described with chronic airflow obstruction who presented with spontaneous sternal fractures.

## Case reports

### CASE 1

A 65 year old man, an ex-smoker with severe chronic bronchitis, presented with a one day history of sharp central chest pain aggravated by breathing and coughing. For two days he had complained of increased dyspnoea and a cough productive of yellow sputum. For the past five years he had received 5-10 mg prednisolone daily, regular bronchodilators, inhaled beclomethasone dipropionate 1500 µg daily, and frequent courses of high dose systemic corticosteroids.

On examination he was dyspnoeic at rest, cyanosed, and tender over the mid sternum with obvious crepitus. There were bilateral wheezes on auscultation of the chest. The peak expiratory flow rate was 70 l/minute. Measurement of arterial blood gas levels revealed hypoxaemia and hypercapnia. The chest radiograph showed hyperinflation with multiple healing rib fractures bilaterally. Sternal radiographs revealed a non-united fracture of the sternal body.

Despite increased bronchodilator treatment and antibiotics his condition worsened and he later died on the ward.

### CASE 2

A 78 year old woman was admitted with a three week history of intermittent sharp central pain, aggravated by inspiration. She was an ex-smoker and had chronic airflow

obstruction. There was no history of preceding trauma. She was receiving long term treatment with inhaled budesonide 800 µg daily and bronchodilators, with frequent courses of high dose prednisolone.

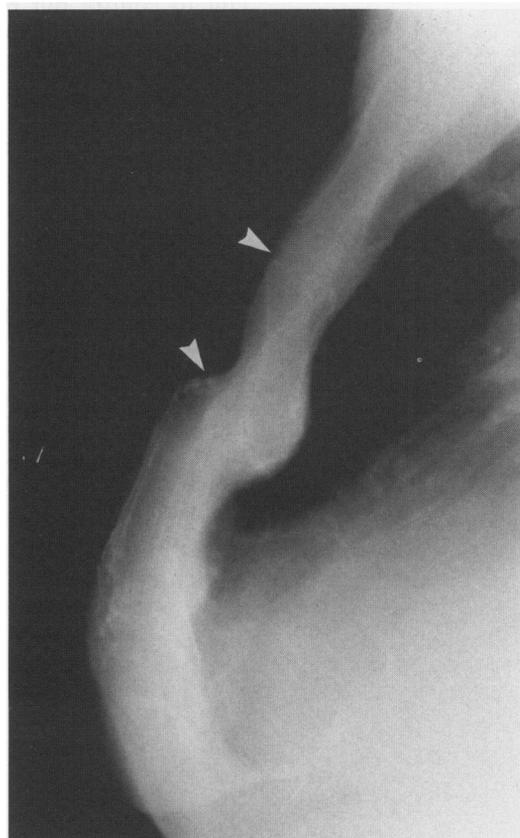
There was considerable tenderness over the lower sternum, which was protuberant, and a significant dorsal kyphosis. Auscultation of the chest revealed occasional wheezes and basal crackles. The chest radiograph showed changes of hyperinflation. A skeletal survey revealed generalised osteopenia with collapse of several thoracic vertebrae and a fracture through the body of the sternum with overriding of the fragments (fig).

Her pain settled with simple analgesics and she was able to return home. At follow up there was no recurrence of her symptoms, but the sternal deformity was still present.

### CASE 3

A woman aged 79 years, an ex-smoker with chronic bronchitis, was admitted with a 48 hour history of worsening breathlessness, wheeze, unproductive cough and pleuritic anterior chest pain. At the age of 45 she had undergone hysterectomy and bilateral oophorectomy. She had been maintained on prednisolone, 5 mg daily, for two years and long term inhaled corticosteroids.

On examination there was a bulge over the mid sternum which was tender. There was no crepitus. Her thoracic spine was kyphotic,



Lateral radiograph of the sternum of case 2 showing sternal angle (top arrowhead) and fracture of the mid sternum with overlapping of the sternal fragments and callus formation (lower arrowhead).

Department of  
Thoracic Medicine,  
City Hospital,  
Aberdeen  
K Hameed  
G E Packe  
J S Legge  
J A R Friend

Reprint requests to:  
Dr G E Packe, Ward 32,  
Aberdeen Royal Infirmary,  
Foresterhill, Aberdeen  
AB9 2ZB

Received 4 September 1992  
Returned to authors  
9 November 1992  
Revised version received  
23 November 1992  
Accepted 4 December 1992

there was hyperinflation of the chest, and auscultation showed diffuse bilateral wheezes. The chest radiograph showed evidence of chronic lung disease. A fracture of the manubrium with overriding of the fragments was evident. Radiographs of the spine showed advanced osteoporosis with collapse of many vertebral bodies. Lumbar spine bone density measured by photon absorptiometry was severely reduced at 0.51 g/cm<sup>3</sup>.

Her pain subsided with simple analgesics and she was discharged from hospital. Over the subsequent year the pain did not recur although the deformity of the sternum persisted.

#### CASE 4

A 55 year old woman, a smoker with long-standing asthma, was admitted with a five day history of breathlessness and sudden onset of sharp central chest pain. She had been taking continuous oral prednisolone, 5–10 mg daily, for many years and had frequently required booster courses. She also took inhaled beclomethasone dipropionate, 1500 µg daily.

She was distressed by breathlessness and there was a tender hard swelling without crepitus over the mid sternum. She was also tender over the lower ribs and thoracic spine. Her chest radiograph showed patchy inflammatory changes in the left lower zone. A fracture of the mid sternal body with overriding of the fragments, plus multiple rib fractures and collapse of multiple vertebral bodies, were found. Lumbar spine bone density was very low at 0.39 g/cm<sup>3</sup>. Her pain proved difficult to control but eventually abated after a course of subcutaneous calcitonin and the use of transcutaneous electrical nerve stimulation.

At follow up she continued to be troubled by chest pain but this was adequately relieved by paracetamol. The sternal deformity persisted.

#### Discussion

Traumatic sternal fractures are common, usually the result of major injury in road traffic accidents.<sup>1</sup> Tumour metastases are probably the commonest cause of spontaneous sternal fracture.<sup>2</sup> In elderly subjects there is an increased incidence of sternal fractures caused by minor trauma.<sup>3</sup> Two factors which contribute to this are increasing bone loss with age, and loss of elasticity associated with ossification of the costal cartilages.<sup>4</sup>

Excessive bone loss results in osteoporosis with the risk of vertebral compression fractures. This, in turn, can lead to progressive thoracic kyphosis and a deforming stress to the sternum, which is also thought to add to the risk of sternal fractures.<sup>4 5</sup> Three of our patients had severe thoracic kyphosis: as with rib fractures in such patients, coughing may also have caused the fracture.

All of the patients except case 2 were receiving continuous oral prednisolone. This treatment will have caused accelerated bone loss, particularly of trabecular bone from the axial skeleton.<sup>6</sup> All the patients had severely limited mobility secondary to their chronic lung disease. This is also likely to have resulted in increased bone loss.<sup>7</sup>

The two common symptoms in patients who develop spontaneous fractures are chest pain and dyspnoea.<sup>3</sup> The pain may mimic that of a myocardial infarction<sup>8</sup> or a pulmonary embolism.<sup>9</sup> The dyspnoea, induced by paradoxical movement of the upper fragment, can worsen respiratory distress in patients with chronic airflow obstruction and aggravate the respiratory failure.

Symptoms and signs in patients with sternal fractures may mislead; a lateral radiograph of the sternum is the only reliable way to diagnose accurately the fracture.<sup>10</sup> This investigation should be considered in any patient with chronic obstructive lung disease who presents with unexplained central chest pain.

- 1 Wojcik JB. Sternal fractures—the natural history. *Ann Emerg Med* 1988;17:912–4.
- 2 Urovitz EPM, Fornasier VL, Czitrom AA. Sternal metastases and associated pathological fractures. *Thorax* 1977;32:444–8.
- 3 Breederveld RS, Patka P, Van Mourik JC. Fractures of the sternum. *Neth J Surg* 1988;40:133–5.
- 4 Sapherson DA, Mitchell SCM. Atraumatic sternal fractures secondary to osteoporosis. *Clin Radiol* 1990;42:250–1.
- 5 Cooper KL. Insufficiency fractures of the sternum; a consequence of thoracic kyphosis? *Radiology* 1988;167:471–2.
- 6 Reid DM. Corticosteroid-induced osteoporosis. In: Smith R, ed. *Osteoporosis*. London: Royal College of Physicians of London, 1990:99–117.
- 7 Issekutz B Jr, Blizzard JJ, Birkhald NC, Rodahl K. Effect of prolonged bed rest on urinary calcium output. *J Appl Physiol* 1966;21:1013–20.
- 8 Rutledge DI. Spontaneous fracture of the sternum simulating myocardial infarction. *Postgrad Med J* 1962;32:502–4.
- 9 Vassalo L. Spontaneous fracture of the sternum simulating pulmonary embolism. *Br J Clin Pract* 1969;23:388–9.
- 10 Buckman R. The significance of stable patients with sternal fractures. *Surg Gynecol Obstet* 1987;164:261–5.