The ''fish-vertebra'' sign

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This is a case report about a radiological sign appearing in the spinal *x* ray of a 58-year-old patient with sickle cell disease (SCD), who presented at the emergency department with lumbar pain. The ''fish-vertebra'' sign appears as biconcave lumbar vertebrae with bone softening in lateral and posterior–anterior radiographs of the spine as an exaggeration of the normal concavity of the superior and inferior surfaces of one or more vertebral bodies (fig 1).[1] The above vertebral changes, characteristic of SCD, are the result of ischaemia (due to microinfarctions) of the central portion of the vertebral growth plate, with a consequent disturbance of vertebral growth.[2 3]

The fish-vertebra sign is a smooth deformity of the vertebral bodies, with a characteristic biconcave body occurring as a result of squared-off depression of the vertebral end-plates and compression by adjacent intervertebral discs.[3] SCD is a systemic hereditary disorder most commonly found in African Americans, in which fetal haemoglobin is replaced by abnormal sickle cell haemoglobin. It manifests in the second half of the first year of life. Two forms are recognised: homozygotic, HbSS (sickle cell anaemia), and heterozygotic, HbSA (sickle cell trait) or HbSC (less severe form). Vaso-occlusive phenomena and haemolysis are the clinical hallmarks of the disease, resulting in several painful episodes (sickle cell crises) and a variety of striking organ system complications that can lead to lifelong disabilities or death.[4] The radiological appearance of SCD depends on the severity and chronicity of the disease. Radiographic findings due to marrow hyperplasia include osteoporosis, ''hair-on-end'' appearance at the skull, ''fish vertebra'' and pathological fractures. Bone infarction causes avascular necrosis of long bones (mainly hip), epiphysial deformity and biconcave vertebrae. Infection-related radiographic findings include septic arthritis and periostitis.[5] Diagnostic radiology is not specific for vaso-occlusive crises (VOC), and the differentiation between VOC and osteomyelitis can be a challenge. Nevertheless, VOC is much more frequent than osteomyelitis, responding rapidly to aggressive pain management, and presented in another healthy child with little or no fever.[6] However, symptoms and clinical features may be identical.[7] Radiographs may show bone infarcts but also signs of infection in a vascularly compromised bone.[8] Although bone scans are not helpful in differentiating bone infarction from osteomyelitis, magnetic resonance imaging can be more specific.[9] Differential diagnosis of the above radiological findings include thalassemia, Legg–Calvé–Perthes and Gaucher disease (table 1). However, radiological findings in thoracolumbar spine are characteristic for SCD.

Advances in medical treatment have led to a prolongation of life expectancy in patients with sickle cell haemoglobinopathies. Median age at death for patients with SCD is 42 years for men and 48 years for women.[10] Treatment of pain and hydration remain the main interventions in the management of sickle cell crises. Hydroxyurea has been shown to prevent VOC by increasing the amount of fetal haemoglobin. Allogeneic stem-cell transplantation is the only curative treatment.[11]

In conclusion, the fish-vertebra sign is part of the spectrum of SCD and is distinguished by the biconcavity and the bone softening of the vertebral bodies. It is mostly characteristic in SCD and can be helpful in the differential diagnosis of other conditions with similar radiological findings.

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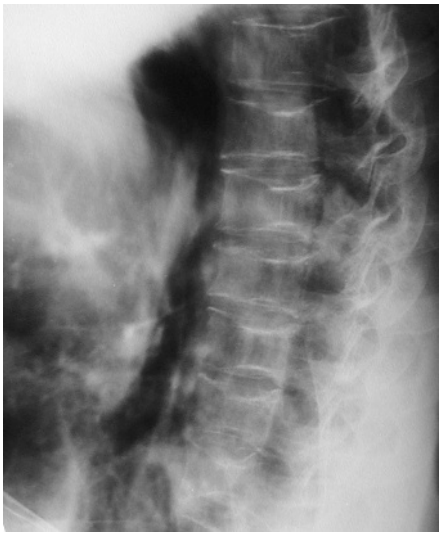

Figure 1 Thoracolumbar *x* ray (lateral view) of a 58-year-old man with sickle-cell disease (SCD), showing the characteristic ''fish-vertebra'' sign. Survival of this range is uncommon for a patient with SCD, as death in men usually occurs before the age of 48 years.

Table 1 Differential diagnosis of radiological findings in sickle cell disease

Thalassemia	Expanded bone marrow space
	Avascular necrosis of long bones
Legg–Calvé–Perthes	Rare in African Americans
	Idiopathic avascular necrosis of long bones
Gaucher disease	Bone marrow expansion
	Periostitis
	Avascular necrosis of long bones

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IMAGES IN EMERGENCY MEDICINE

Bilateral fractured clavicles with multiple rib fractures

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A 45-year-old previously fit and healthy, female physiotherapist was walking her dog in fields. Cows in the field were frightened by her dog, resulting in her being trampled and crushed. She presented with severe pain in the chest along with pain in both shoulders. On examination she was severely short of breath. The only injury outside the chest was a minor scalp laceration. Radiographs of her chest revealed fractures of all 24 of her ribs and clavicles (fig 1) along with bilateral haemopneumothorax.

The patient was intubated and ventilated, and bilateral intercostal chest drains were inserted. Computed tomographic (CT) scan of her chest showed that she had fractured all 24 ribs and both clavicles. CT scan of the abdomen was within normal limits. She was admitted to the intensive therapy unit for ventilation. It became progressively difficult to ventilate the patient. Orthopaedic opinion was sought because it was felt that death was imminent. The patient underwent plate osteosynthesis of both clavicles using AO 3.5 mm reconstruction plates. Immediately after fixation of the clavicles ventilation became easier. Her chest drains were removed after 7 days. She was ventilated for 24 days. She mobilised rapidly once she was off ventilation, and was discharged home 4 weeks after her injury. At the time of discharge she had almost full range of movements in both shoulders and fractures of clavicles were uniting. At long term review, 5 years post-injury, she has returned to normal work and leisure activities. Her clavicle plates remain in situ.

Thoracic injury is a major cause of morbidity and mortality. In a study by Benjamin *et al* [1] there was a statistically significant increase in mortality rate with each successive rib fracture. They also noted that patients with more rib fractures had a corresponding increase in mortality and pulmonary morbidity. Isolated bilateral clavicle fractures healed uneventfully with non-operative treatment in a case report by Sutherland *et al*.[2] In a study by Schwarz *et al*[3] indications for ORIF (osteosynthesis of irreducible fracture) were an open fracture, ipsilateral fractures of the arm or ribs, bilateral clavicle fractures and fractures that were irreducible by conservative means. The bilateral clavicle fractures in our case were internally fixed to provide stability to shoulder girdles which assisted her respiration. Fixation is also likely to have reduced analgesic requirements. Bilateral fractured clavicles with all, or almost all, 24 ribs fractured have not been reported in the English literature. There are similar cases in the world literature. In all cases the patients died. Apart from being rare, this case also reinforces the importance of a multidisciplinary approach in dealing with such serious injuries. In our opinion significant rib fractures, associated with clavicle fractures, should be considered for internal fixation. This is even more important when the injury is bilateral. The case is the first, to our knowledge, of a patient surviving this injury of fracture of all 24 ribs and bilateral clavicle fractures.

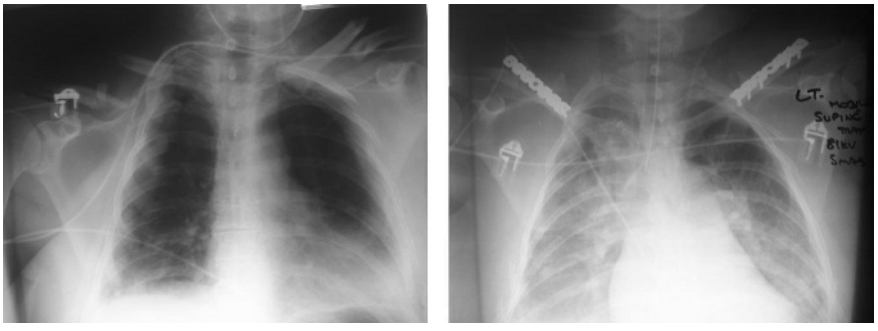

Figure 1 Radiographs showing fractures of all 24 ribs and the clavicles, along with bilateral haemopneumothorax.

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