Rugger jersey spine
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Section: Musculoskeletal system
Area of Interest: Spine
Procedure: Diagnostic procedure
Imaging Technique: CT
Imaging Technique: Conventional radiography
Special Focus: Metabolic disorders
Case Type: Clinical Cases
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Patient: 51 years, female

Clinical History:
A 51-year-old female patient with end-stage kidney disease (under dialysis) presented to our department with unspecific back pain.

Imaging Findings:
Frontal and lateral radiographs of the thoracic spine were performed and showed ill-defined sclerosis of the vertebral endplates at multiple contiguous levels, producing an alternating dense-lucent-dense appearance.

A previous abdominal CT of the patient was retrospectively reviewed in bone window and with coronal reformation and depicted the same findings, as well as some intravertebral disc herniations (Schmorl nodes).

Discussion:
In chronic renal insufficiency, reduced renal filtration causes phosphate retention and decreased calcitriol synthesis. This results in lowered serum calcium which in turn stimulates parathyroid hormone (PTH) secretion, thus causing secondary hyperparathyroidism. In order to elevate blood calcium levels, PTH increases bone resorption by stimulating osteoclast activity [2]. Osteoblasts respond by depositing osteoid that does not contain hydroxyapatite, which then accumulates along the inferior and superior end plates of vertebra [3, 4]. The aforementioned areas of osteoid appear opaque at radiography due to their increased volume compared to the normal bone, resulting in the appearance known as "rugger jersey spine" because of its resemblance to the horizontal stripes on jerseys worn by rugby players [1-5].

The rugger jersey spine appearance is virtually pathognomonic of hyperparathyroidism, particularly the secondary form related to chronic renal failure, where it is a feature of renal osteodystrophy [2, 5]. This sign can also be depicted at CT and MR imaging even though it has originally been described on a standard radiograph [1, 2]. Vertebral sclerosis may disappear after successful treatment of the underlying disease.

Despite being occasionally regarded as a cause of unspecific bone pain, most patients with rugger jersey spine
remain asymptomatic unless pathologic fracture occurs. Thus, other explanations for patient discomfort have to be excluded in symptomatic patients.

The two main differential diagnosis are osteopetrosis and Paget disease. In osteopetrosis there is a sharp demarcation between the peripheral bony sclerosis and the relative lucency of central vertebral bodies (in contrast with the indistinct margins in rugger jersey spine) producing the characteristic "sandwich vertebrae" appearance [1]. In Paget’s disease the characteristic bone expansion, trabecular thickening and increased opacity of the cortex on all sides of the vertebral body, results in the "picture frame vertebrae" appearance [4].

**Differential Diagnosis List:** Rugger jersey spine (secondary hyperparathyroidism), Osteopetrosis, Paget disease, Sclerotic metastasis

**Final Diagnosis:** Rugger jersey spine (secondary hyperparathyroidism)

**References:**


Description: Frontal radiograph of the thoracic spine shows ill-defined sclerosis of the vertebral endplates at multiple contiguous levels (alternating dense-lucent-dense appearance). Origin: Serviço de Imagem Médica, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal
Description: Lateral radiograph of the thoracic spine shows the alternating dense-lucent-dense appearance clearer than the antero-posterior incidence. Origin: Serviço de Imagem Médica, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal
Description: Abdominal CT in bone window and with sagittal reformation depicts the same findings seen in conventional radiography as well as some intravertebral disc herniations (Schmorl nodes).

Origin: Serviço de Imagem Médica, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal