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REVIEW ARTICLE

Osteoporotic vertebral endplate and cortex fractures: A pictorial review☆

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Abstract Despite years' research, the radiographic criteria for osteoporotic vertebral fracture and its grading remain debated. The importance of identifying vertebral endplate/cortex fracture (ECF) is being recognised; however, evaluation of osteoporotic ECF requires training and experience. This article aims to serve as a teaching material for radiologists/physicians or researchers to evaluate osteoporotic ECF. Emphasis is particularly dedicated to identifying ECF that may not be associated with apparent vertebral body collapse. We suggest a combined approach based on standardised radiologic evaluation by experts and morphometry measurement is the most appropriate approach to detect and classify osteoporotic vertebral fractures. *The translational potential*: A good understanding of radiologic anatomy of vertebrae and fracture signs of endplate/cortex are essential for spine fragility fracture assessment.

Introduction

Osteoporosis is characterised by low bone mass and microarchitectural deterioration, which leads to bone fragility and consequent increase in fracture risk. Often bone loss becomes apparent only after a typical osteoporotic fracture has occurred. Vertebral fractures (VFs) are the most common osteoporotic fracture. A VF, after minor

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trauma, is a hallmark of osteoporosis. Thirty to fifty percent of women and 20—30% of men experience a VF at some points in their life (2). Prevalent VFs increase the risk of future vertebral and nonvertebral osteoporotic fracture independent of bone mineral density [1]. VFs may be associated with poor life quality, impaired bending and rising, difficulties in the activities of daily living, frailty, higher risk of institutionalisation and higher mortality (irrespective of those related to fractures) [2—7]. Appropriate management of osteoporosis can reduce future fracture risk, and therefore, it is important to identify and report VFs accurately and clearly, so that appropriate investigation and treatment can be instigated [8].

Despite years' research, the radiographic criteria for osteoporotic VF and its grading remain hotly debated [8—17]. The semiquantitative (SQ) criteria proposed by Genant et al. are commonly used for identifying VF [18]. According to this criteria, a "normal" vertebra, i.e., vertebra that does not meet the following defined vertebral deformity (VD), is defined as Grade 0; 20—25% reduction in

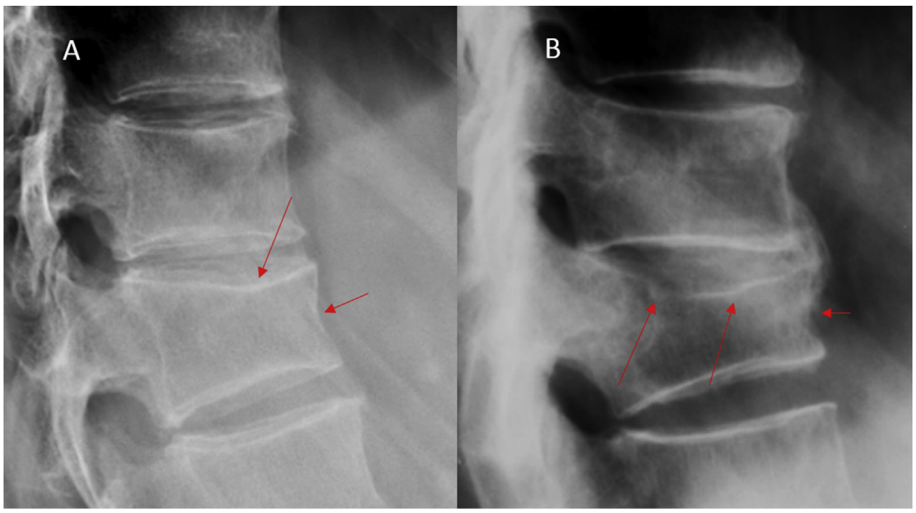

Figure 1 (A) T12 upper endplate fracture (long arrow) and anterior cortex mild buckling (short arrow), with SQ-VD Grade 2; (B) T12 vertebra Grade 3 SQ-VD (wedge fracture) with buckling of the anterior cortex (short arrow) and upper endplate fracture (long arrow). Note that there is no fracture for T12 lower endplate.
SQ-VD = semiquantitative vertebral deformity.

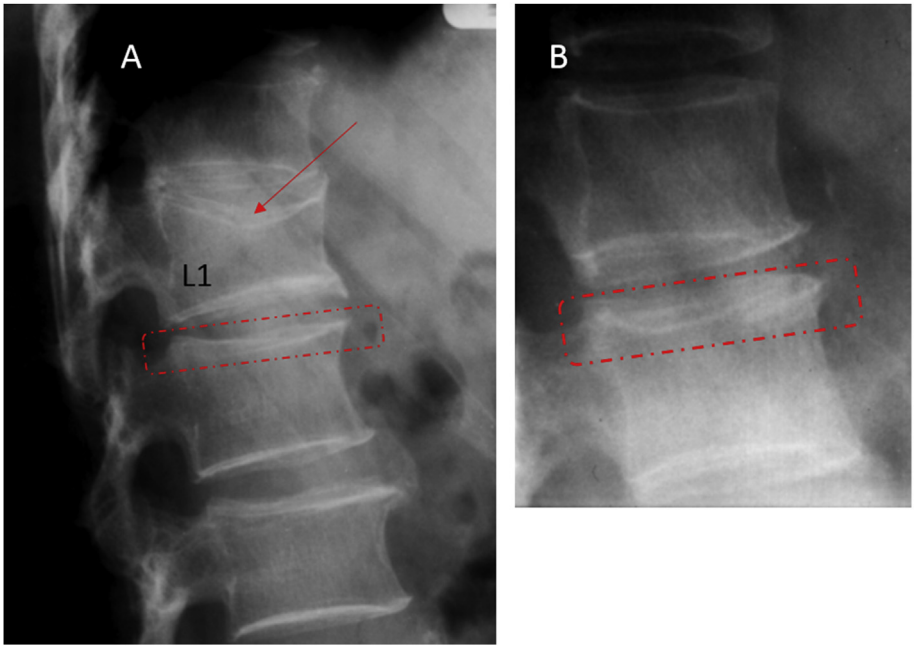

Figure 2 (A) L1 upper concave endplate fracture (long arrow) and Grade 2 SQ-VD. L2 upper endplate is normal (dotted square) which may be misdiagnosed as endplate fracture. This is due to the projection of endplate ring; note the parallel multilayered endplate lines and that there is no depression; (B) Radiograph from another subject demonstrates a similar appearance of upper endplate (without fracture).
SQ-VD = semiquantitative vertebral deformity.