Supplementary document -1

Now we invite readers to have a look at the literature and images again, revise the gradings for cases when, based on a second look, revision is desirable.

Tips for revision:

1], to diagnose a VD, as we noted, a lack of morphological consistency with the adjacent vertebrae is the key.

2], We advocate an approach based a combination of visual grading and measurement. Firstly, please give a grading based on visual grading, then use measurement to support your grading. Measurement very much depends on how the computer cursors are placed, sometimes it will give an unrealistic result. Try to read this article a few time < Semi-quantitative grading and extended semi-quantitative grading for osteoporotic vertebral deformity: a radiographic image database for education and calibration >, so to build up your ability so that you can visually grade a VD < *more-or-less* > correctly.

3], If an ECF (endplate and/or cortex fracture) is on a vertebra noted without height loss, pls mark as 'minimal grade/ECF'.

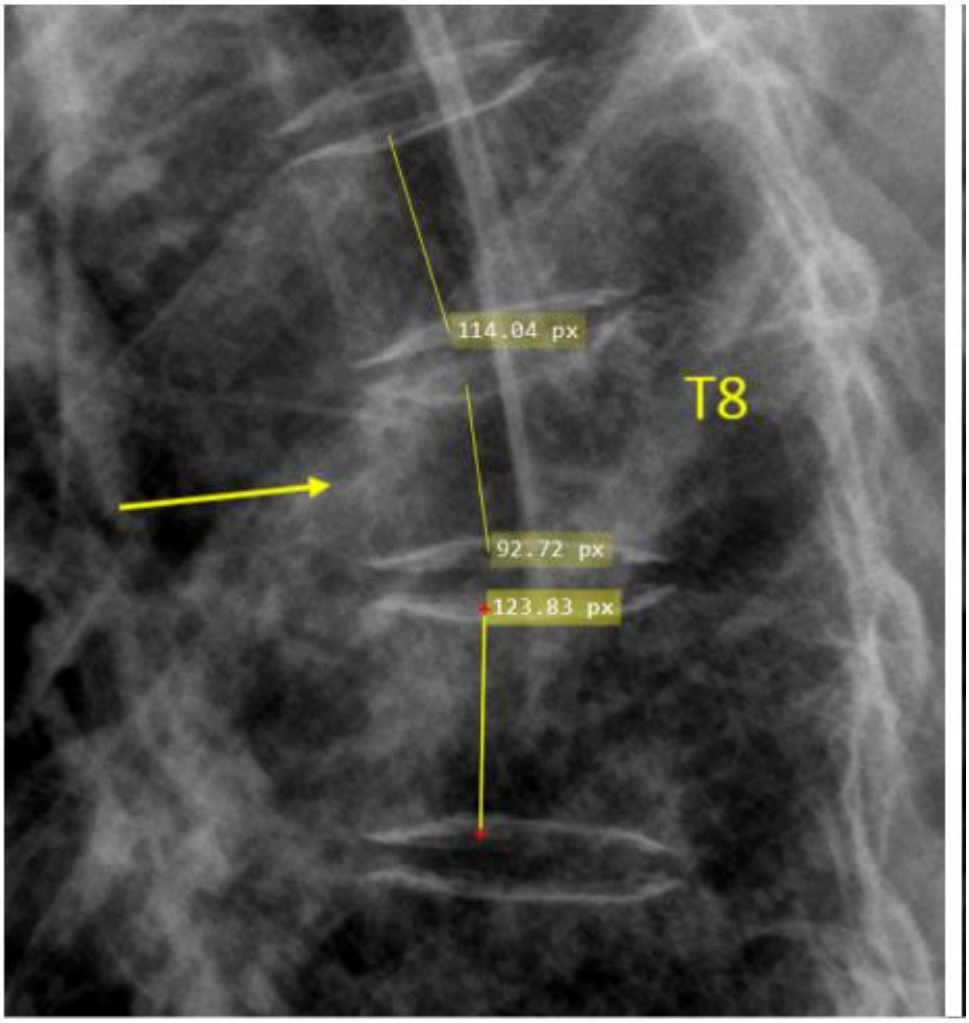
4], be careful when to measure vertebra' anterior height loss; pls note the following evidences:

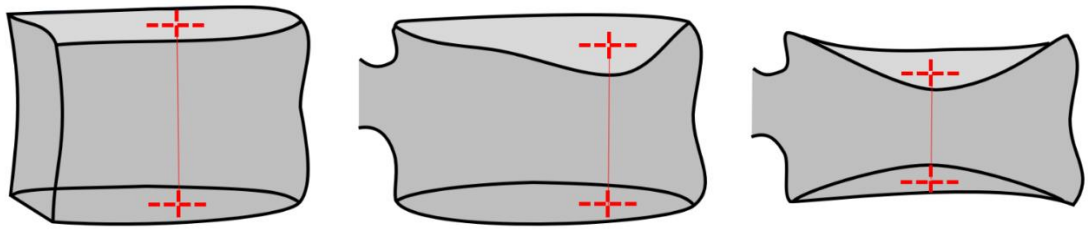
VD's shapes are commonly classified into 1) biconcave 2) wedged, 3) both biconcave and wedged, 4) crush. Whether wedged VD reflects OVF is a matter of dispute. Based on morphometrical evaluation for European Prospective Osteoporosis Study (EPOS) subjects, Lunt *et al.* [1] noted that VDs in which the mid-height loss only, or mid and anterior heights loss were both reduced, and crush deformities were associated with reduced BMD. However, VDs involving loss of anterior vertebral body height alone were poorly correlated with low BMD. With EPOS subjects, for a mean FU of 3.8 years, Lunt *et al.* [2] reported relative FU OVF risks differ according to the shape of the prevalent VD, ranging from 5.9 (95% CI; 4.1, 8.6) if the anterior and mid heights were reduced, 3.3 (2.3, 4.8) if the mid height was reduced, and 1.9 (1.0, 3.4) if the anterior height was reduced.

1. Lunt M, et al. (1997) Bone density variation and its effects on risk of vertebral deformity in men and women studied in thirteen European centers: the EVOS Study. *J Bone Miner Res.* 12:1883-94.

3. Lunt M et al, 2003) Characteristics of a Prevalent Vertebral Deformity Predict Subsequent Vertebral Fracture: Results From the European Prospective Osteoporosis Study (EPOS). *Bone*. 33:505-13.

Thus, generally we try to measure the middle height loss when it is reasonable.





On a lateral projection, the superior (or inferior) surface of the normal vertebra exhibits two lines; one line represents one side of the vertebral ring, and the second line represents the central endplate superimposed on the opposite vertebral ring. It is likely that the centre of the endplate within
the vertebral ring is the weakest area, this will be the primary site of osteoporotic deformity. Ideally, in concave osteoporotic fractures, the line representing the centre of endplate is measured upon. However, identification of the line representing the endplate is not always easy and reliable. To simplify the procedure and improve consistency, we use the initial description by Genant *et al.* (*J Bone Miner Res* 1993;8:1137–48.
see line drawing above)

5], be careful about large Schmorl's node, which may cause a pitfall for endplate depression.

6], for the measurement, sometimes it is necessary to make a radiological adjudgment where is the best place to place the cursors for the measurement.

7] try to read this article: Wáng YX, Deng M, He LC, Che-Nordin N, Santiago FR. Osteoporotic vertebral endplate and cortex fractures: A pictorial review. *J Orthop Translat*. 2018;15:35-49. (open access)