Instant vertebral assessment/lateral vertebral assessment

An integral and essential part of osteoporosis assessment

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Prevalent vertebral fractures and bone mineral density (BMD) are key criteria in assessing fracture risk. The World Health Organization (WHO) diagnostic criteria define 'severe osteoporosis' as low bone mass in the presence of one or more fragility fractures.

Vertebral fractures are frequently clinically silent. Performing routine lateral X-ray of the dorsal and lumbar spine at the point of care is often practically difficult. Hence vertebral fracture status is often unknown at the time of patient evaluation.

A significant number of women and men over the age of 50 have prevalent vertebral fractures, and the presence of such fractures puts them at substantially greater risk for future fractures. It is obvious that an assessment of the dorsal and lumbar spine is essential in order to improve patient evaluation. Indeed in most circumstances the assessment of a patient for osteoporosis and fracture risk is incomplete without an assessment of the dorsal and lumbar spine for prevalent fractures.

The increased availability of effective clinical tools for the assessment of vertebral fractures allows better patient evaluation, and enhances the doctor's ability to target effective treatment to those who will most benefit. Vertebral fracture data are now clear. An existing fracture increases the risk for subsequent fractures by 3 to 5 times, *independent* of BMD.[1-7]

Patients with a prevalent fracture and low BMD are 25 times more likely to suffer a fracture than those with normal BMD and no fractures.[1] A patient with multiple vertebral fractures and low BMD has a 75-fold increase for subsequent fractures. The presence of a vertebral fracture also increases the risk for subsequent hip fractures.[6]

A sound knowledge of vertebral morphometry and an ability to define whether a vertebral fracture is present or not is an essential component of risk assessment and profoundly influences clinical decision making. Vertebral fractures often go clinically undetected. Back pain is often minor or absent, and when present it is often attributed to other causes. Vertebral fractures in association with osteoporosis often occur after little or no trauma. Up to 50% of vertebral fractures are not diagnosed.[2] Conventional methods of radiology require the use of lateral X-ray of the dorsal and lumbar spine,

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often done at a different site and requiring increased expense and increased radiation exposure.

Greenspan *et al*.[8] followed up 482 postmenopausal women screened routinely with BMD measurement and spine instant vertebral assessment (IVA). Vertebral fractures were seen in 18.3% of asymptomatic women. of clinically osteoporotic patients, 11 - 18.7% would have been classified as normal by BMD criteria alone.

Steiger *et al*.[9] studied 172 patients aged 50 years and older (average 68.2 ± 9.8 years). Of these 22% had a normal BMD, 48% were osteopenic, 30% had osteoporosis and 27% had vertebral fractures. Both vertebral fractures and low bone mineral density increased markedly with age. By age 60 - 69 years, 20% of women had vertebral fractures, and 30% had osteoporosis according to BMD criteria. More than 40% of women over the age of 70 years had vertebral fractures. Low BMD correlated with fracture status. However, of the 120 females with normal or osteopenic BMD, 21% had vertebral fractures.

The availability of a rapid low-dose, safe, point-of-care method for the assessment of vertebral fractures (IVA/lateral vertebral assessment (LVA)), and BMD using advanced state-of-the-art dual X-ray absorptiometry (DXA) scanners provides a practical means for integrated assessment of DXA and vertebral fracture status. The combined evaluation of vertebral fracture status and BMD should be the new standard for patient evaluation, particularly in older patients in whom vertebral fractures are common.

Disadvantages of routine X-ray

1. They are only requested when a fracture is suspected on clinical criteria, and well over 50% of spine fractures are clinically silent.

2. They may require referral to a different facility. This wastes time and also involves the additional cost of a second consultation to evaluate the X-ray and advise on treatment.

3. There is excess radiation exposure (± 100 times that of a BMD measurement).

4. Separate films for dorsal and lumbar spine are required.

5. X-rays do not easily allow for computer-assisted evaluation of vertebral height.

6. X-rays do not allow instantaneous comparison with previous records.

Fortunately newer DXA systems that incorporate IVA (Hologic scanners) or LVA (Lunar scanners) overcome all these disadvantages. The technique uses a DXA system on a digital X-ray imaging device, but with the advantages of parallel beam geometry.

Advantages of IVA or LVA

1. Evaluation for spine fractures can be done without referral for X-ray. This can be done simutaneously with the DXA.
2. There is much less radiation exposure.
3. A single image of upper dorsal and lower lumbar spine can be obtained.
4. Images are digital and can be stored on computer for display and analysis at any time for comparison.

Limitations of IVA/LVA

1. There is lower resolution than with standard X-ray.
2. The field of view is narrower and one may miss other abnormalities such as aneurysms and tumours.
3. The higher dorsal vertebrae are not clearly visualised, but 97% of vertebral bodies are analysable up to T7.
4. Patients with high body mass index have a poorer clarity.

Use of IVA or LVA shows an overall sensitivity of 68% when compared with reading of a spine X-ray by a radiologist.[10] Of the 32% missed, 12% were unanaly-sable on IVA, 20% were classified as normal on IVA, and the majority of missed fractures were graded as mild. IVA or LVA will therefore capture 4 out of 5 moderate or severe fractures.[10]

It is clear that lateral X-ray of the spine remains the gold standard for vertebral fracture detection. In a recent study up to 33% of vertebral fractures detected by a central reading facility were missed by local radiologists not tuned to searching for prevalent fractures.[11] Therefore, although there is a small potential for missing some fractures with IVA or LVA, such fractures will usually have been missed anyway (either because an X-ray would not have been done or because it might have been missed by the reporting radiologists). A vertebral fracture suspected of deformity on IVA or LVA will be confirmed in 90% of cases on follow-up by X-ray.[11]

Who should have IVA/LVA?

1. Patients with a low BMD.
2. Subjects with BMD-independent risk factors for the development of osteoporosis (e.g. family history, previous history of fracture, propensity to falls, high bone turnover, etc.).
3. Elderly patients.
4. Patients on chronic (> 6 months) glucocorticoid therapy.
5. Patients with clinically significant height loss.
6. IVA or a lateral X-ray assessment is an integral component of follow-up for osteoporosis. Several

methods exist for measuring treatment efficacy, including: (*i*) presence or absence of clinical fractures; (*ii*) measurement of height; (*iii*) comparative BMD; and (*iv*) turnover markers. Based on current National Osteoporosis Foundation of South Africa (NOFSA) guidelines, an incident fracture while on adequate therapy is an indication to review treatment.

Conclusion

NOFSA is of the opinion that assessment of the lateral spine either by lateral X-ray of the dorsal and lumbar spine or by IVA/LVA should be a routine part of fracture risk assessment in a substantial portion of patients, particularly older patients in whom vertebral fractures are common and in whom BMD, particularly at the spine, becomes increasingly inaccurate and difficult to evaluate.

To limit costs such assessments are best done at the point of service, reducing the need for referral for X-rays and increased cost due to a second appointment for review of X-rays.

Upgrading of DXA machines to offer IVA or LVA involves considerable cost. An appropriate payment for IVA or LVA would therefore be just. The long-term cost savings and long-term benefit to patients are obvious.

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