

DXL Technology and Earlier Diagnosis of Osteoporosis

There is a clinical need for compact, reliable, cost-effective equipment for the diagnosis and monitoring of osteoporosis.

Joakim Arwidson explains how the use of DXL, a technology that measures bone mineral density (BMD) by combining laser scanning with dual-energy X-rays, may offer a solution.

A serious health problem on the rise

Osteoporosis affects an estimated 33% of women aged 60 to 70, and 66% of women aged 80 and older. Approximately 200 million women worldwide have osteoporosis, and the incidence of fractures as a result of the condition is likely to double over the next 50 years.

The condition is often referred to as a "silent epidemic" because it progresses without any outward sign, sometimes for decades. In France, Germany, Italy, the USA, the UK, Spain and Japan it is thought that less than half of women with osteoporosis are diagnosed. Postmenopausal women are at greatest risk, as are women with premature menopause. Genetic factors play an important role. People with a slight body build are more susceptible, as are those with eating disorders, such as anorexia. Smokers have a higher lifetime risk of hip fracture than non-smokers. Caucasians and Asians are most susceptible whereas Africans are less affected.

Prevention and treatment

In the absence of a known curative treatment for osteoporosis, prevention through a healthy lifestyle is of the essence. Currently, the best prevention for osteoporosis is to ensure the formation of strong bones, and this especially before age of 35. A healthy lifestyle includes a balanced diet rich in calcium and vitamin D, the pursuance of regular weight-bearing exercise, non-smoking habits, a limited alcohol intake, and the identification and treatment of persons at risk. Treatments include bisphosphonates, calcitonin, calcium, fluorides, HRT, ipriflavone, selective oestrogen receptor modulators (SERM), anabolic steroids, tibolone, vitamin D and vitamin D metabolites. Evidence for the effectiveness of these medications in reducing fracture risk varies considerably.

Early diagnosis for successful treatment

Diagnosis of osteoporosis often occurs following a fracture. Bone densitometry¹ can predict the risk of fracture, but is not frequently used in many countries, often because of a lack of health insurance or government reimbursement.

Measuring BMD

There is a variety of radiological and ultrasound technologies available for measuring BMD (SXA, SPA, DPA, QCT, RA, etc.) The "gold standard" of BMD measurement technologies, according to the American College of Obstetricians and Gynecologists², is dual-energy X-ray absorptiometry, called DXA or DEXA. It uses dual X-ray energies to measure bone mineral and lean soft tissue. However, according to recent studies³, even DXA can lead to incorrect measurements of up to 20-30%, since DEXA incorrectly assumes a constant relationship between lean soft tissue and adipose tissue.

The DXL measurement technology

Dual X-ray and Laser technology (DXL)⁴ represents a breakthrough in BMD scanning. It complements dual-energy X-ray technology with laser-based measurement of the thickness of scanned objects. Measurements are made in the heel, which consists of 95% trabecular bone. The rapid turn-over of the bone, coupled with the very high precision of the DXL method, enable reliable diagnosis even at the onset or very early stages of bone fragility. The bone mineral value can be determined with an accuracy of better than 98%.

The Royal College of Physicians⁵ concludes on the basis of several cost estimates that the use of bone densitometry for well-defined clinical indications seems to be justifiable in terms of cost utility.

Conclusion

In conclusion, it can be said that the best prevention for osteoporosis is to ensure the formation of strong bone tissue, especially before the age of 35. Bone densitometry measurement is a very good method for the early diagnosis of osteoporosis. DXL technology offers an earlier, more accurate and more reliable measurement com-

pared to other known methods.

However, more clinical research is required to compare methods, and determine the optimal clinical use for different patient groups.

References

¹ Marshall D. *et al.*, Meta-analysis of how well measures of bone mineral density predict occurrence of osteoporotic fractures. *BMJ*, 1996. 312: p. 1254-1259. <http://bmj.com/cgi/content/full/312/7041/1254>

²American College of Obstetricians and Gynecologists. <http://216.255.140.184/atoz/testprocedures/tpbone.html>

³ Bolotin HH *et al.*, Inaccuracies inherent in patient-specific dual-energy X-ray absorptiometry bone mineral density measurements: Comprehensive phantom-based evaluation. *Journal of Bone and Mineral Research*, February 2001. 16 (2): p. 417.

<http://www.jbmr-online.org/toc/toc01602.html>

⁴ Demetech

<http://www.demetech.se/sv/studies.htm>

⁵ Royal College of Physicians, Osteoporosis: Clinical guidelines for prevention and treatment. London: 1999. <http://hebw.uwcm.ac.uk/osteoporosis/chapter2.htm#2e>

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