

DEXA management for the diagnosis of osteoporosis – a worldwide perspective

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Summary

The diagnosis of osteoporosis based on a T score has in the literature been slightly different in different countries, partly depending on the reference population used. This will be overcome in a WHO project on risk assessment that will calculate the absolute fracture risk based on risk factors including BMD. In the cohorts studies this seems to work worldwide.

KEY WORDS: bone mineral density, osteoporosis, fracture risk.

The definition of osteoporosis is a systematic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue, with a subsequent increase in bone fragility and susceptibility to fracture (Anonymous, 1993). This description is both concerning bone mineral density (BMD) and bone quality, but at present we can only measure BMD. Thus, the diagnosis of osteoporosis is based solely on a BMD measurement (WHO, 1994). It is also important to separate the operational diagnosis of osteoporosis based on the WHO T score (WHO, 1994) from intervention thresholds (Kanis et al., 2002a) since intervention thresholds should be based on the risk of fracture and the absolute 10 year fracture risk differs markedly at any given BMD depending mainly on age (Kanis et al., 2001).

Furthermore, the clinical significance of osteoporosis lies in the fractures (Johnell et al., 2004a) that arise with their attendant morbidity and mortality (Johnell et al., 2004b). Low bone mass is one of the most important component of the risk of fracture, but other skeletal abnormalities contribute to bone fragility as well as factors related to falls. Thus, ideally the assessment of fracture risk should encompass all these aspects of risk (Kanis et al., 2002b). Also for this reason there is a distinction to be made between the diagnosis of osteoporosis and the assessment of risk – a distinction between diagnostic and intervention thresholds (Kanis et al., 2002b).

Low BMD is widely recognized as one of the major risk factors for fractures (Marshall et al., 1996). Furthermore, BMD measurements at the hip predict hip fractures with a risk that is comparable to gradient of risk for cardiovascular disease pro-

vided by measurement of blood pressure (Marshall et al., 1996). Though several studies have been published on fracture risk and BMD we still have several gaps, is BMD working worldwide, is the threshold the same in men and women, is the predictive ability similar at different ages etc.?

To clarify whether BMD has a relationship to fracture and if it is similar worldwide we performed a study based on data from 12 perspective cohort studies that have hip BMD measured, in total almost 40,000 men and women (Johnell et al., 2005) including studies from Europe, North America, Asia and Australia. We calculated the predictive ability of the BMD measurement. There was no significant difference between the cohorts after adjustment for age – thus no heterogeneity. The 12 perspective cohorts – both men and women – were followed for 168,000 person years with almost 1,000 hip fractures and 2,600 osteoporotic fractures. The predictive ability was only marginally different between men and women and not statistically significant (Johnell et al., 2005). There was an effect of age in that the gradient of risk was not the same in all ages. For hip fracture the gradient of risk was highest at the lowest ages and low at the highest ages. The implication of these findings is that is better to use BMD in young ages than in old ages (Johnell et al., 2005). There was a small attenuation of the gradient of risk with time after assessment for hip fractures, but not significant. There was also a tendency that the gradient of risk per SD decrease in BMD for hip fractures decreased with increasingly better Z score, thus there was a non-significant better predictive ability of fractures in those with low BMD (Johnell et al., 2005).

In this study also ultrasound and peripheral measurements were tested (Johnell et al., 2005). The predictive ability for hip fractures was lower than for hip BMD but there was a significant predictive effect of both ultrasound and peripheral measurements.

In a separate calculation differences in prediction of hip fracture were studied (O. Johnell and J.A. Kanis, personal communication), whether lumbar spine BMD measurement had the same predictive ability as femoral neck BMD measurement and if the combination of femoral neck BMD and lumbar spine BMD could increase the predictive ability. The data show that for hip fracture BMD at the hip had a better predictive ability than the lumbar spine measurements and that combination of lumbar spine BMD and femoral neck BMD did not contribute to an increased predictive ability.

The problem with BMD is also that the absolute values differ between the types of scanner but an algorithm has been created to get a standardized BMD for the different scanners (Kanis et al., 2002b). This is necessary to make an easy calculation for the T score. As mentioned earlier, the diagnosis and the intervention threshold should be divided (Kanis et al., 2002b). Therefore focus on risk assessment for intervention threshold with BMD measurements and other risk factors should be done. The prevalence of osteoporosis is somewhat different in the published studies in that there are more osteoporotic patients in some countries, partly depending on the reference population, whether it is from the local area or from the manufacturer. Therefore we should shift focus from the diagnosis to risk assessment. From the studies quoted this seems to work worldwide (Johnell et al., 2005).

A WHO project on risk assessment is almost finished and a technical report will soon be published, where risk assessment is based on health economically determined cut offs with absolute fracture risk. There are several clinical risk factors that can be used in risk assessment but they have to be validated in multiple populations, adjusted for age, sex and type of fracture, readily assessable by primary care physicians, contribute to a risk that is amenable to the therapeutic manipulation intended, intuitive rather than counterintuitive to medical care (Kanis et al., 2002b). A cornerstone of the clinical risk factor is a BMD measurement but also other risk factors have to be added to BMD. The predictive ability of BMD + clinical risk factors is much better than clinical risk factors only. If there is a possibility to use BMD worldwide more patients at high risk will be identified by using a BMD measurement.

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