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Letter to the Editor

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Bone density scanning, using dual energy X-ray absorptiometry (DXA), is minimally invasive to the patient and provides reproducible measures of bone mineral content (BMC) and the more commonly used measure of areal bone mineral density (BMD) in the diagnosis of osteoporosis. Several papers published in recent years by *Spinal Cord* describe the use of DXA scanning to measure post-injury immobilisation bone loss in patients with spinal cord injury (SCI). Together with its use for assessing patients with other neurological deficits, this suggests an increasing awareness of the importance of bone loss and fracture prevention in the rehabilitation of such patients.

The majority of these reports use BMD measurements at the lumbar spine and sub-regions of the proximal femur (femoral neck, etc), sites used by the World Health Organisation for defining postmenopausal osteoporosis.[1] However, the use of these sites for DXA assessment in SCI patients should be treated with care. At this relatively early stage in the application of DXA to disabled patients we would highlight two important practical considerations which, to our knowledge, appear to have been overlooked.

The first is that optimal patient positioning, often difficult in patients with poor mobility and postural control and especially at sites in the proximal femur, is essential. The DXA technologist can readily address such problems by addressing and implementing standardised protocols in order to optimise both the reproducible acquisition and assessment of bone density results in physically disabled subjects. To merely assume adequate positioning of patients in all of these studies may call into question the reliability of published data. Positioning of disabled patients to achieve 'clinically meaningful' analyses requires considerably more effort on behalf of the DXA technician than for physically able subjects who are scanned for osteoporosis *per se*. DXA scanning of SCI patients requires careful planning before patient transfer to the table. Contracture and spasticity are common, and can often influence the length of time a patient can maintain their position during a scan. Although newer generation 'fan beam' machines complete a whole body scan in a few minutes, older 'pencil beam' models can take significantly longer. Positioning of the lower limb is critical at sites such as the proximal femur for reproducible determination of sub-regional BMD. We have previously shown that variations in femoral ante-version of up to $\pm 20^{\circ}$ can cause changes of up to 4, 7 and 11% in area, BMC and BMD respectively for femoral neck DXA, due to foreshortening effects.[2]

Secondly, it is recognised that bone density at the lumbar spine in SCI is not necessarily decreased after long-term immobilisation, and in many patients does not follow the pattern of changes seen at the proximal femur.[3,4] Decisions regarding the appropriate skeletal sites to measure in disabled patients, therefore involve more complicated issues which are currently under investigation.

In conclusion we outline basic protocols which we have found to be of vital importance when scanning paralysed patients and particularly when making axial or whole body bone density measurements.

Before the scan:

- *Provide patients with information* detailing what the scan involves and suggesting what type of clothes to wear,
- *Make prior assessment of patient*, on the ward or from a brief questionnaire included with the patient referral letter, noting level of injury, neurology, time since injury, mobility, height and weight and any postural deformity,
- *Plan patient transfer* for safe movement to the scanning couch,
- *Allocate adequate time for scanning*.

At time of the scan:

- *Transfer patient* in accordance with the hospital's manual handling guidelines,
- *Position patient* on table in a natural, comfortable position, to reassure and relax them for reproducible scanning,
- *Place catheter* tubes, bags etc., in unobtrusive position,
- *Minimise scan time* since longer scan times are associated with movement errors, spasm etc.

After the scan

- *Make a critical visual assessment* of the quality of the scan before the patient leaves department. Assess patient positioning, fracture sites, callous formation, heterotopic bone, metal artefacts etc.,
- *Exclude metal artefacts* or the site/sites containing them from the analysis.

We trust that these recommendations will be of use to other investigators in appreciating the difficulties involved in scanning the less physically able patient. They are designed to avoid the production of clinically misleading data and the need for repeat scanning. We apologise if this correspondence appears to be stating the obvious, but often the unstated is unappreciated, or at worst ignored.

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