Osteoporosis in patients with type 2 diabetes mellitus

Ali S. Jawad, *MSc, FRCP.*

Dual x-ray absorptiometry (DXA) scanning is considered the gold standard in measuring bone mineral density (BMD). However, clinical judgement should take precedence if the clinical findings contradict the results. Bone strength is not always reflected by DXA-derived BMD measurement causing discordance between BMD and fracture risk. Al Shomar et al[1] used DXA as the sole mean of assessment of osteoporosis in a cohort of patients with type 2 diabetes mellitus (T2D). The DXA-derived BMD is least relevant in assessing fracture risk in patients with T2D, as it tends to be increased, partly due to associated obesity. Patients with diabetes mellitus (DM) types 1 and 2, have an increase in risk for all-site fractures and for fractures at proximal femur, proximal humerus and ankle irrespective of BMD using a DXA scan.[2] In addition, there is an increased postoperative mortality of up to 57% in women and 28% in men.

The increase in fracture risk in T2D is due to increased bone fragility as a result of accumulation of advanced glycosylation end products, low bone turnover, metabolic effects of nephropathy on bone and inhibition of bone formation due to loss of urinary calcium caused by hyperglycaemia.[2,3] The use thiazolidinediones and SGLT2 inhibitors may also contribute to increased fracture risk but the use of metformin may be protective. Complications of DM such as visual impairment, cardiovascular disease, hypoglycaemia, neuropathy and postural hypotension may increase the risk of falling. The factors that may increase fracture risk in patients with T2D are summarized in Table 1.

Fracture Risk Assessment Tool (FRAX) and Garvan Fracture risk calculator have been shown to underestimate fracture risk in patients with T2D, but QFracture is a better tool for fracture risk prediction as it incorporates diabetes mellitus and falls as independent predictors. Because FRAX underestimates fracture risk in patients with T2D, several adjustments have been proposed to get a better prediction.[3] The recently introduced FRAXplus® has 2 adjustments for T2D; the first is to enter 'yes' in the rheumatoid arthritis input, if the individual has T2D and also the duration of the disease.

Table 1 - Factors that may increase fracture risk in patients with type 2 diabetes mellitus.

Increased bone fragility due to accumulation of advanced glycosylation end products
Low bone turnover with reduction in unmineralized bone
Inhibition of bone formation due to increased urine calcium loss caused by hyperglycaemia
Use of thiazolidinediones and Sodium-glucose co-transporter-2 inhibitors
Metabolic effects of nephropathy on bone
Bone loss in the foot due to peripheral sympathetic neuropathy (diabetic neuroarthropathy)
Increased risk of falling due to visual impairment, cardiovascular disease, hypoglycaemia, neuropathy and postural hypotension

Fractures are associated with significant morbidity and mortality, more so in patients with DM. Fracture risk assessment using FRAXplus® should be part of the regular assessment of patients with DM. Early introduction of treatments, such as bisphosphonates or denosumab, may lead to better bone health and prevent fracture. New technological methods of assessments of bone architecture are needed to improve fracture risk prediction.

References

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From the Royal London Hospital, Bancroft Road, London, United Kingdom.

Address correspondence and reprint request to: Prof. Ali S. Jawad, Consultant Rheumatologist, Royal London Hospital, Bancroft Road, London, United Kingdom. E-mail: Ali.Jawad@rcplondon.ac.uk
ORCID ID: orcid.org/0000-0002-0434-7488

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