

Can DXA be used to predict fracture risk in people with diabetes?

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DXA Parameter (technique)	Does the technique differ between those with or without diabetes?		Is the technique associated with fracture risk in those with diabetes?		Does the technique account for excess fracture risk in those with diabetes?	
	T1D	T2D	T1D	T2D	T1D	T2D
BMD	Yes	Yes	Yes	Yes	Partially	No
Bone Geometry	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
TBS	Uncertain	Yes	Uncertain	Yes	Uncertain	Partially
VFA	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Body Composition	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
FRAX (no adjustments)	Yes	Yes	Uncertain	Yes	Partially	No

Adapted from Tables 2 & 3, G.I. Schacter, W.D. Leslie: DXA-based Measurements In Diabetes: Can They Predict Fracture Risk. Calcified Tissue Int. 2016

Table lists different DXA-based parameters (techniques) and whether they differ between those with and without diabetes, are associated with fracture risk in diabetes and whether they account for excess fracture risk in diabetes. Credit: © International Osteoporosis Foundation

Increased risk of fracture has been shown to be one of the complications

arising from longstanding diabetes. With the worldwide increase in Type 2 Diabetes (T2D), in part due to aging populations, there is also increasing concern about how to identify and manage patients with diabetes who are at high risk of osteoporotic fracture.

Osteoporosis is usually diagnosed from bone mineral density (BMD) measured by dual-energy X-ray absorptiometry (DXA). The authors reviewed data on skeletal parameters and techniques readily available from DXA scanning, and considered their utility in routine clinical practice for predicting fracture risk. DXA measures BMD as well these other applications and measurements: trabecular bone score (TBS), skeletal geometry and DXA-based finite-element analysis, vertebral fracture assessment (VFA), and body composition.

They also looked at fracture prediction tools, and specifically at the widely used Fracture Risk Assessment Tool (FRAX) which is incorporated into modern DXA scanners. FRAX underestimates fracture risk in individuals with T2D - with factors contributing to this underestimation including the higher BMD observed in T2D, the greater risk for falls, and alterations in material strength. Nevertheless, several methods have been proposed to improve the performance FRAX in T2D.

The review summarizes the evidence for the effect of various DXA-derived skeletal parameters in T1D and T2D. In regard to whether they can be used to account for the excess fracture risk, the review concludes:

- **In Type 1 Diabetes (T1D)**, BMD and FRAX (when secondary osteoporosis is included without BMD) only partially account for the excess risk of fracture in T1D. It is uncertain whether bone geometry, TBS, VFA or body composition account for excess fracture risk in T1D.
- **In Type 2 Diabetes (T2D)**, BMD and FRAX can be used to

stratify fracture risk, but do not account for the increased risk of fracture. However, several adjustments to the FRAX score can be made as proxies for T2D to inform the use of FRAX by primary care practitioners. Examples include the rheumatoid arthritis input (as a proxy for T2D), lumbar spine TBS (to adjust FRAX probability) or an altered hip T-score (lowered by 0.5 units). TBS is associated with increased fracture risk, and may partially account for excess risk of fracture. It remains uncertain whether bone geometry, VFA, or [body composition](#) differ between those with or without T2D, or whether they are associated with increased or excess fracture risk.

Lead author Professor William D. Leslie of the Department of Medicine, University of Manitoba, Canada stated:

"Diabetes is associated with increased fracture risk that is only partially reflected by the BMD reductions seen in T1D, and is underestimated in T2D where BMD is increased. While BMD from DXA still stratifies [fracture risk](#) in those with diabetes, additional measures that can be obtained from DXA help to identify high-risk patients. Incorporating this additional information into risk prediction models may help to avoid systematically underestimating the risk of osteoporosis-related fractures in people with [diabetes](#)."

More information: G. Isanne Schacter et al, DXA-Based Measurements in Diabetes: Can They Predict Fracture Risk?, *Calcified Tissue International* (2016). [DOI: 10.1007/s00223-016-0191-x](https://doi.org/10.1007/s00223-016-0191-x)

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