

IBJI at Morton Grove Introduces DXA Scans with Trabecular Bone Score (TBS)

The IBJI Arthritis and Osteoporosis Specialists are pleased to announce the introduction of a new diagnostic tool that is becoming the standard of care in the diagnosis of osteoporosis and assessment of fracture risk, called the Trabecular Bone Score (TBS).

This higher standard in diagnostic imaging will now be incorporated into our standard DXA report exam to all eligible patients. TBS is now being offered exclusively at IBJI's Morton Grove location.

What is Trabecular Bone Score (TBS)?

Trabecular Bone Score is a software application that can reprocess DXA images of the lumbar spine (low back) using a texture analysis algorithm. (Figure 1).

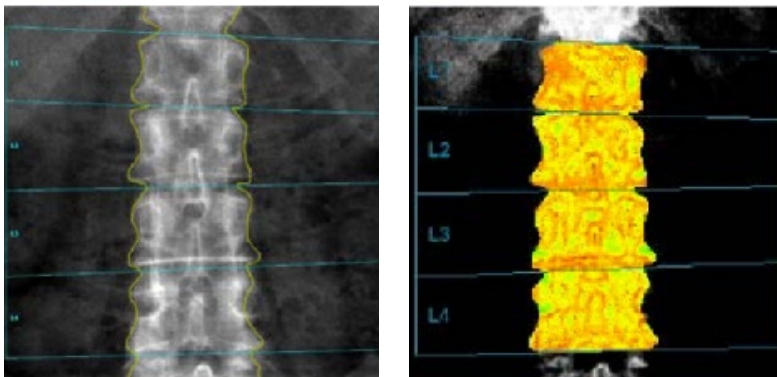


Figure 1. DXA image of the spine (left) TBS reprocessed image (right)

TBS values are associated with the status of trabecular microarchitecture and therefore can improve estimates of future fracture risk over bone density and T-scores of the spine alone. This additional data has been shown to provide information that is independent of the bone density measurements at the spine. It can be used to refine 10-year estimates of major fracture and hip fracture risk, in the FRAX® algorithm currently included in our DXA reports. (Figure 2).

The FRAX®10-year probability of fracture:		
Type of Fracture	Risk	Risk adjusted for TBS*
Major Osteoporotic	22%	26%
Hip	7.5%	8.9%

*validated only for Caucasian and Asian women and men³. Refer to local guidelines before using these values

Figure 2. Example of FRAX risk for major and hip fractures before and after adjusting for TBS results.

Until now, we were only determining risk based on DXA measurements of the femur neck. TBS provides additional information on fracture risk for patients, adding to what the DXA scan currently measures. This additional information improves our ability to decide the best course of treatment for a given patient. Higher TBS correlates with better bone architecture and lower TBS with worse bone architecture.

What Are Some Advantages and Limitations Of TBS?

Advantages:

- TBS is a predictor of fracture risk independent of BMD and FRAX. Results are used to adjust FRAX to improve the accuracy of fracture risk.
- It provides additional information that helps in clinical decision-making; now there is a measure of quantity (BMD) and quality (TBS) of bone health which are the components of bone strength.
- The combination of TBS and BMD scores allows for refining the fracture risk analysis, particularly in osteopenic patients. It may be better at predicting fracture than either score alone.
- Is minimally affected by lumbar osteoarthritis, which can artificially increase BMD T-scores.¹
- TBS has been shown to have a correlation to fracture risk in patients with secondary osteoporosis (such as hyperparathyroidism, type II diabetes, and steroid use) not sufficiently captured by BMD.¹
- May be used in conjunction with BMD testing for monitoring anabolic therapy.³

Limitations:

- It can only be calculated in patients where the lumbar spine can be evaluated by DXA.
- Currently, TBS is limited to patients who have a BMI between 15 and 37 and must have at least 2 vertebral levels that can be accurately scanned by DXA. TBS is negatively correlated with increased soft tissue/BMI in the body. As soft tissue increases, TBS is underestimated. This may be due to a limitation of the algorithm.² Newer versions are being tested for improved accuracy.²
- TBS can only analyze scans acquired on the DXA machine it is installed on. Retrospective analysis of prior scans is not possible because the calibration process uses the unique image resolution and dynamic range of individual scanners, determined at the time of installation.
- Score may be falsely increased by bony outgrowths between the vertebra of the spine (syndesmophytes).¹
- May not be useful in assessing anti-resorptive therapy response as BMD changes more quickly than bone micro-architecture.^{1,3}
- Scoring may vary with different DXA machines.³
- TBS adjusted T-scores are currently only available for women.
- TBS adjusted FRAX scores are only available for patients with at least one hip suitable for measurement by DXA.

References:

1. Rajan R, Cherian, KE, Kapoor N, Paul, TV. Trabecular bone score—an emerging tool in the management of osteoporosis. *Indian Journal of Endocrinology and Metabolism*. 2020; 24:237-243.
 2. Shevroja E, Aubry-Rozier B, Hans G, et al. Clinical performance of the updated trabecular bone score (TBS) algorithm, which accounts for the soft tissue thickness: the OstoLaus study. *Journal of Bone and Mineral Research*. 2019; 34(12): 2229-2237.
 3. Krohn D, Schwartz EN, Chung YS, Lewiecki EM. Dual-energy x-ray absorptiometry monitoring with trabecular bone score: 2019 ISCD official position. International Society for Clinical Densitometry. *Journal of Clinical Densitometry: Assessment & Management of Musculoskeletal Health*. 2019; 22(4): 501-505.
 4. Hans D, Goertzen AL, Krieg MA, Leslie WD. Bone microarchitecture assessed by TBS predicts osteoporotic fractures independent of bone density: the Manitoba study. *Journal of Bone and Mineral Research*. 2011; 26(11): 2762-2769.
- * <https://www.sheffield.ac.uk/FRAX/> (Last accessed: 01-Oct, 2022)