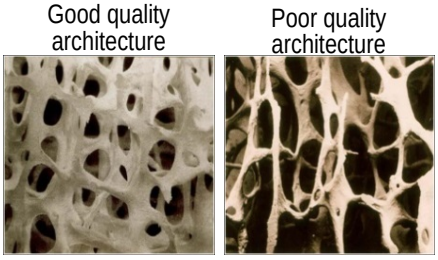
Trabecular Bone Score

Trabecular Bone Score or TBS provides information about bone structure that complements bone density measurement, and can be conveniently measured during a standard bone density test. We are pleased to announce that the Osteoporosis Program at University Health Network has recently installed innovative software to measure TBS in our clinic patients. Here we provide answers to FAQs about TBS.

How is TBS measured?

A low-dose x-ray is used to scan the hip and spine bones during a bone density test. As bone density is being measured, the TBS software examines the spine x-ray and calculates TBS. TBS is *not* calculated for the hip.

What information does TBS provide?



TBS provides information about the quality of bone architecture in the spine bones. The quality of bone architecture influences the strength of bones and their tendency to fracture. For some bones – particularly the spine bones – the influence of bone architecture on their strength and fracture tendency is particularly strong.

Think of bone architecture in terms of bridge architecture. The architecture of a bridge influences its strength and how well it can withstand wind forces, earthquakes and weight of the vehicles. If the bridge architecture deteriorated and ended up with thinner or broken rods and eventually gaps, the bridge could collapse even under small forces. Similarly, if bone architecture deteriorated, the bone could fracture even during a minor injury. Therefore, good TBS indicates good-quality bone architecture, while poor TBS indicates poor bone architecture with thinner or broken 'rods' and extensive gaps.

How does TBS complement bone density testing?

Standard bone density test measures how much bone mineral is present and how densely it is packed inside the spine (and hip) bones. Strong bones are packed densely with mineral, but when bones become porous and fragile, bone mineral is lost, such as with osteoporosis. . Bone density test, however, does not offer any information about the quality of bone architecture.

o people can have a bone with a similar density but different quality in architecture. For example, person A could have bone architecture that's uniform and good-quality, while person B could have extensively deteriorated sections in bone architecture. Person B would be more likely to break the bone, because the deteriorated sections in bone architecture often act as the 'weak link' that buckles down under forces.

Therefore, TBS complements bone density measurement by providing information about the quality of bone architecture in the spine bones. TBS does *not* replace bone density measurement, because bone density is the main determinant of bone strength in patients.

Trabecular Bone Score

How does TBS benefit patients?

Standard bone density measurement is used to calculate and classify a patient's risk for experiencing fracture(s), as high, moderate or low risk. TBS can then be used to refine the fracture risk. For example, two women could be identified as having moderate fracture risk based on their age and bone density measurements alone. If one woman has poor TBS, she would be ranked as having higher fracture risk than the other woman who has good TBS.

TBS is therefore especially important in a situation when a patient has moderate fracture risk and is approaching the high fracture risk category. If TBS is poor, the patient may decide to receive osteoporosis treatment, because his/her fracture risk may be higher than moderate. If TBS is good, the patient may rest more easily knowing that their fracture risk is likely less than what was estimated.

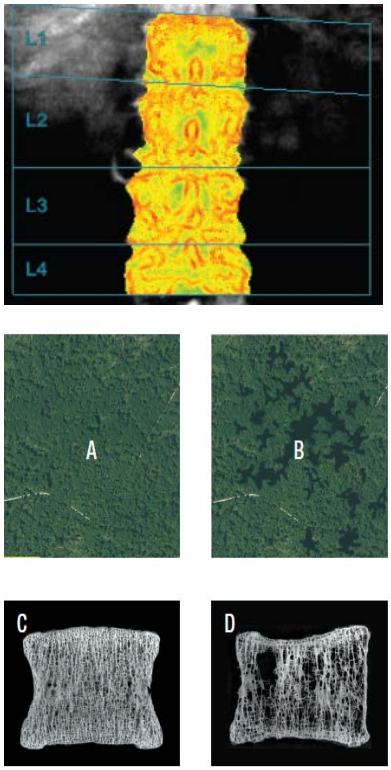
What is innovative about the TBS software?

TBS software is innovative because it obtains information about bone architecture at the same time as bone density is being measured – no additional scans are needed. TBS software uses the spine x-ray image from a standard bone density test, and calculates a single TBS score from the spine x-ray image.

The software is also innovative because of how it examines bone architecture. TBS measurement is based on the brightness of the x-ray image and how the brightness varies across the image. The brightness of the x-ray image is a reflection of architecture quality.

The clever principles behind TBS measurement could be compared to a satellite image of a forest. In the satellite image, one cannot *directly* see how many trees are in the forest, how thick they are and how widely they are spread out. But, based on the colours, the satellite image gives a good indication about where the forest is thick (green) and where it has open clearings (black).

Similarly, in the bone density x-ray image, the TBS software cannot *directly* see how many 'rods' make up the architecture, how thick are the 'rods', and how widely they are spread out. But, based on the brightness, the x-ray image gives a good indication about where the architecture has good-quality sections (bright) and where it has poor-quality sections (dark).



(A) Dense forest and (B) forest with open clearings. (C) good-quality spine bone architecture and (D) poor spine bone architecture.

References:

1. Advanced DXA Using TBS iNsight™. A New Bone Structure Assessment Technique Enhances Identification of Fracture Risk. MedimapsGroup.
2. TBS iNsightTM: A useful Tool to Poten tially Reconsider Patient Fracture Risk. MedimapsGroup.