



Adjusting FRAX® on TBS for identification of subjects at high risk of fractures

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Introduction

Osteoporosis is a skeletal disorder characterized by *both low bone density & micro architectural deterioration*, prevention of osteoporotic fracture ,need pay attention to the both surrogates of bone strength.

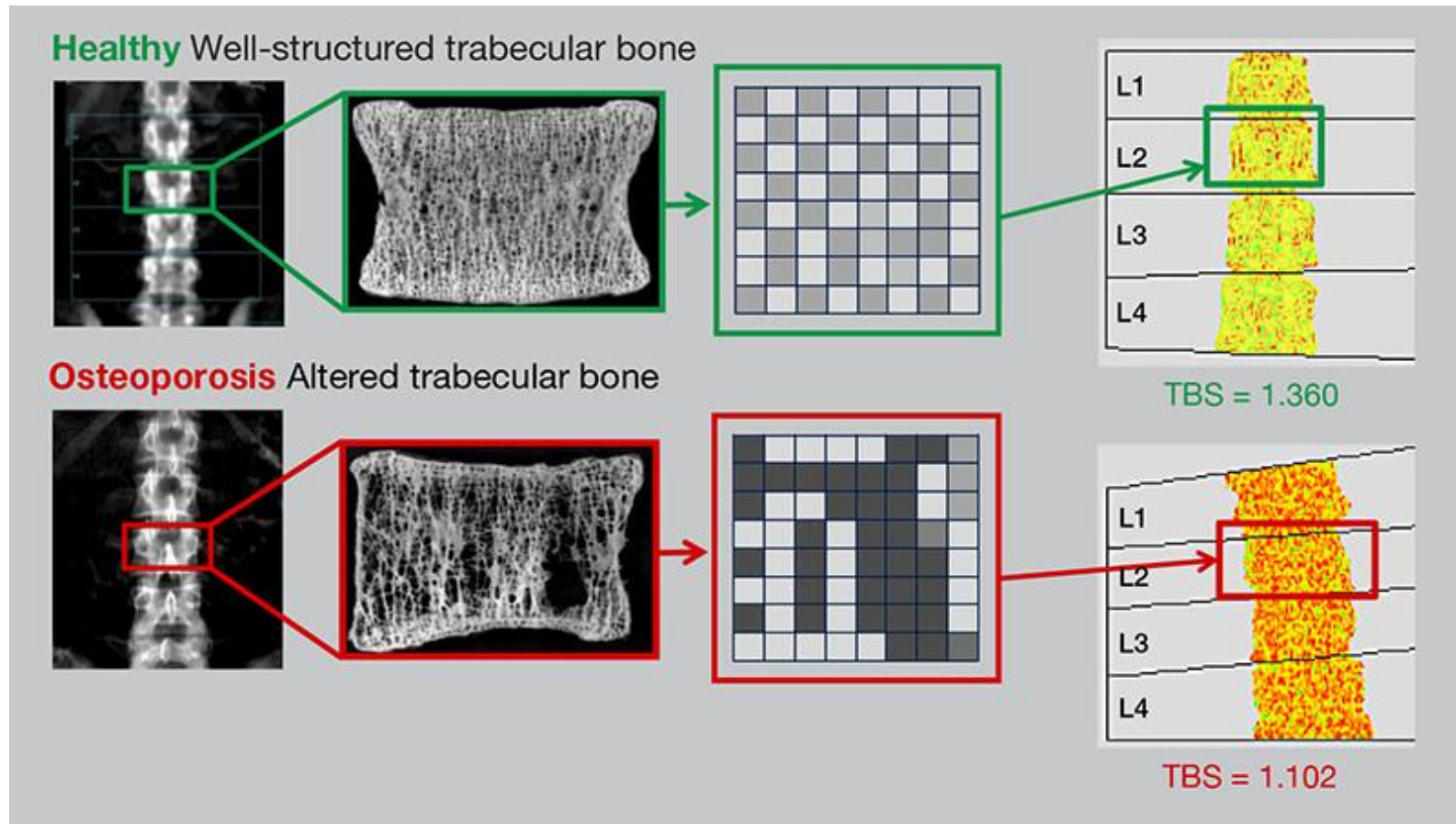
Introduction

- Until recently, aBMD was the only method used in assessment of osteoporosis and fracture risk.
- Attention: more than half of the fragility fractures occurred in people with aBMD above the diagnostic threshold of osteoporosis.
- TBS has recently been shown to independently predict fracture risk, to complement standard aBMD imaging.

Introduction

- TBS uses standard DXA spine images to measure texture in-homogeneity that is, how well-structured or poorly structured the trabecular bone appears when assessed as individual voxels and local variations in gray level distribution .
- TBS utilizes a software program installed on a standard DXA computer .
- TBS does not require additional scan time or radiation exposure.

Determination of trabecular bone score



FRAX-TBS

- Considering bone micro-architecture in combination with aBMD and other risk factors, TBS adjusted FRAX provides its users a 10-year percentage of the risk of hip fracture (HF) and major osteoporotic fracture (MOF).

Aim

- We assessed the bone microarchitecture of postmenopausal Iranian women using TBS.
- We aimed to compare their FRAX-TBS with the usual aBMD based FRAX in order to find if adding TBS could affect the fracture risk assessment in our population.

Methods:

- The total of 358 postmenopausal Iranian women (mean age 61.3 ± 9.5 years) tested for aBMD and TBS in shafa orthopedic hospital, 184 osteopenic women were identified.
- Thoracolumbar X-ray done in all participants revealed twenty-one vertebral fractures.
- For the osteopenic group, FRAX and TBS adjusted FRAX were calculated and compared.

Exclusion criteria

- Bisphosphonates or any osteoporosis drugs consumption within the past two years.
- History of Cushing's syndrome.
- Malabsorption syndrome
- Liver failure
- Creatinine clearance <30 mL/min
- Any chronic disorders of mineral metabolism
- Women with type 2 DM.

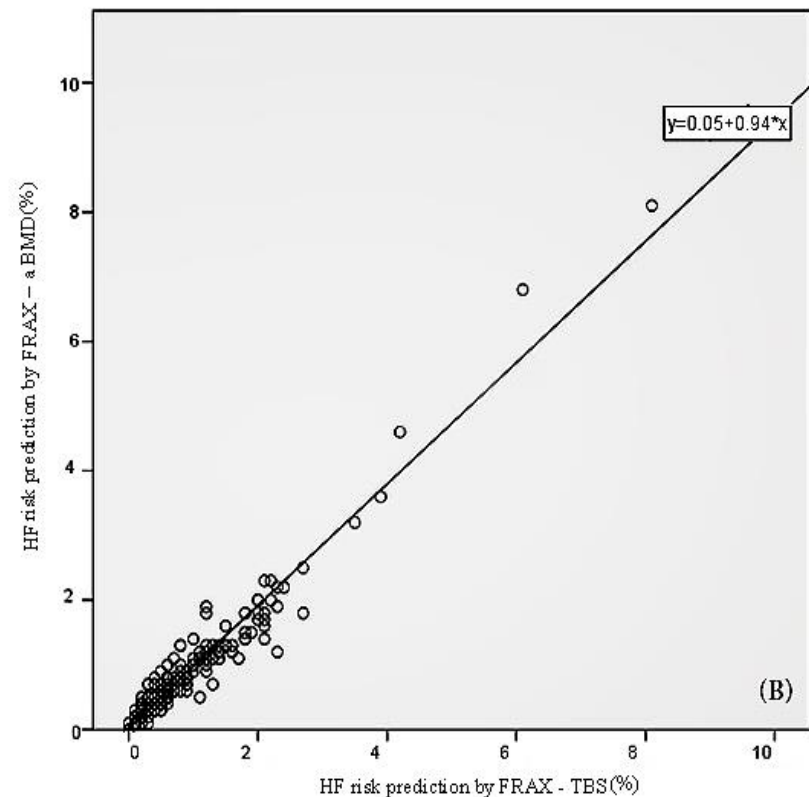
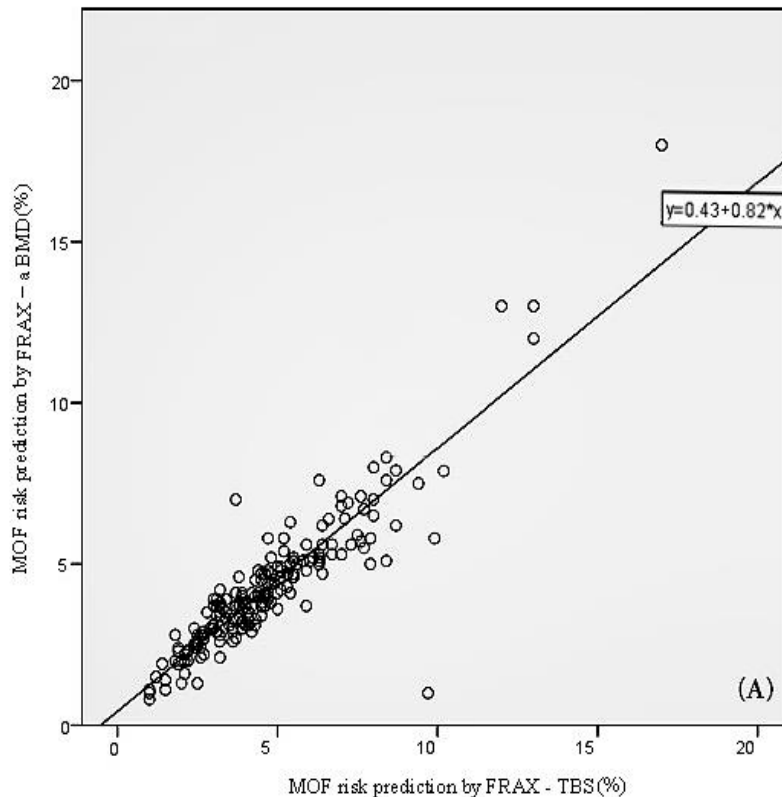
Demographic and densitometric characteristics of the patients

Variable	Mean±SD
Age (year)	61.3±9.5
Menopausal age (year)	48.8±4.1
Height (cm)	155.3±6.6
Weight (kg)	69±11.6
BMI (kg/m ²)	28.5±4.5
L1–L4 T score	-1.51±1.21
Femoral neck T score	-1.48±0.98
L1–L4 TBS	1.31±0.11
FRAX-BMD, MOF	4.3±2.1
FRAX-BMD, HF	0.8±0.96
FRAX-TBS, MOF	4.7±2.4
FRAX-TBS, HF	0.9±0.99

Results

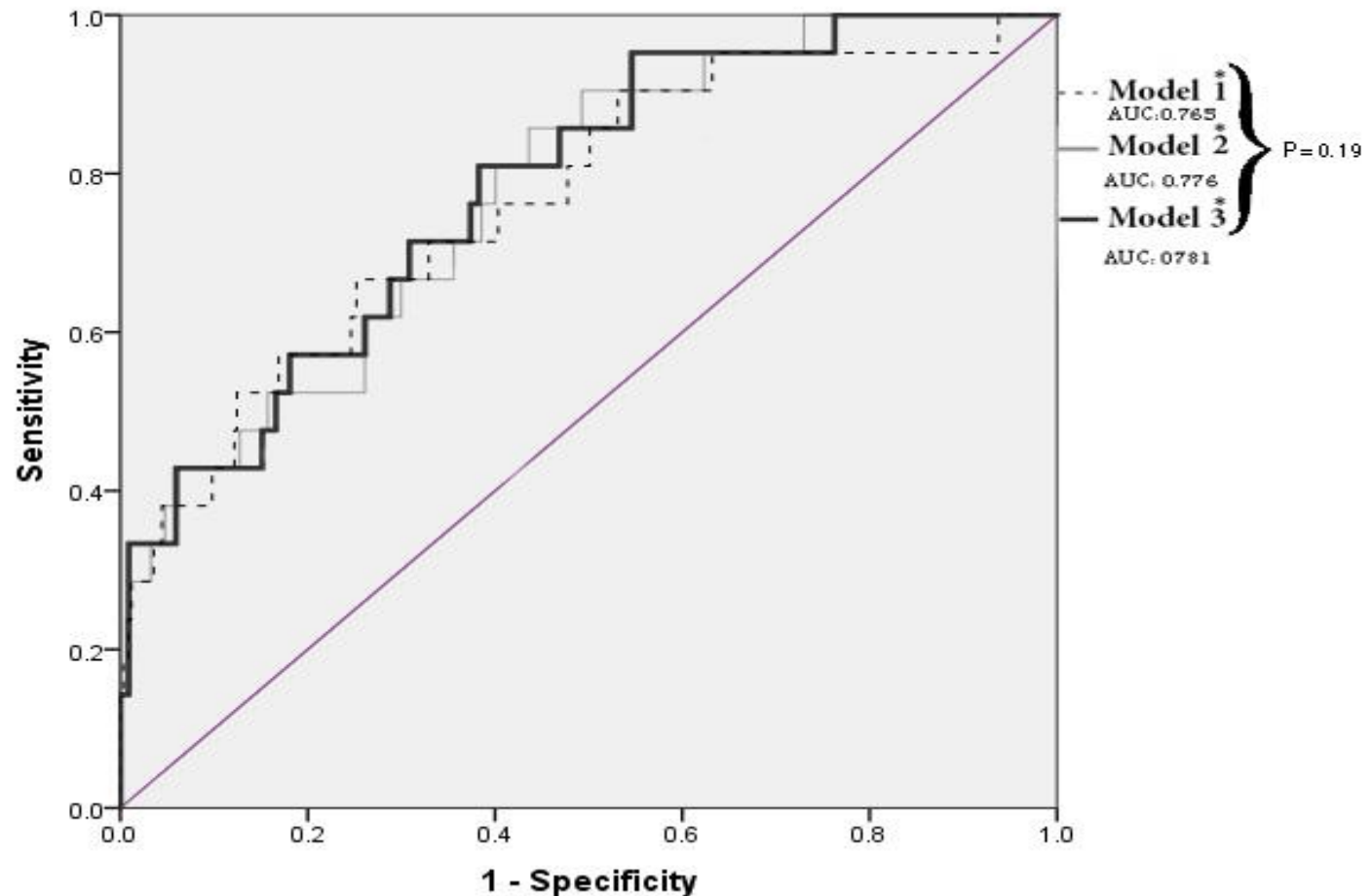
- Mean TBS of the patients was $1.31 (\pm 0.11)$.
- A significant correlation was found between TBS and spine aBMD ($r = 0.50$, $p < 0.001$) and TBS and femoral neck aBMD ($r = 0.37$, $p < 0.0001$).

Correlation between FRAX-BMD and FRAX- TBS



A strong positive correlation was observed between aBMD adjusted FRAX and FRAX-TBS in predicting the risk of major osteoporotic fracture ($r=0.90$, $p<0.0001$), and hip fracture ($r=0.97$, $p<0.0001$).

ROC analysis, the predictive value of the three different models using aBMD, TBS, and combination of aBMD and TBS were similar for fracture prediction.



Trend for better fracture prediction using combination model was found, the difference was not significant

Effect of TBS on treatment strategy

- According to the aBMD - FRAX, no osteopenic woman of our cohort had MOF risk >20%.
- Considering the HF risk, 5 (2.7%) osteopenic postmenopausal women showed HF risk of more than 3 %.
- After the adjustment of the FRAX with TBS, still no case of our cohort showed MOF risk of higher than 20%, while the same 5 (2.7) cases demonstrated a HF risk of more than 3% (P=1.00).

Effect of TBS on BMD pitfalls

- Lumbar osteoarthritis: BMD has error in elder people who may frequently suffer from spine OA. Using TBS may theoretically correct this pitfall.
- During our study we noticed that two of our patients presented with **normal BMD** but **fully degraded TBS**.
- When we reviewed their profiles, severe osteophytes were evident in their spines X-rays, which could explain their false positive normal BMD.

Conclusion

Adding TBS data to aBMD or FRAX in osteopenic patients neither improved aBMD predictive value for vertebral fracture nor changed the decision on treatment based on FRAX.

Limitations of the study

- The number of fractures was rather low in our study. It might be due to different factors: our patients' younger age comparing other studies, outpatient setting for recruitment, and lack of established fracture liaison service.
- The mean BMD-FRAX in our patients was low and it seems that TBS mainly effect on borderline BMD-FRAX