BESTEST®: a new diagnostic opportunity for bone structure evaluation in oncology

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Goals: The incidence of fractures in patients undergoing hormone treatment for breast cancer is highly increased [1]. Most fractures occur in patients whose T-score falls outside the osteoporosis ranges [2].
An innovative diagnostic method, BESTEST®, simulates by engineer-ing methods the structure elastic response to loads of a virtual biopsy of the patient obtained from radiograms in the proximal epiphysis of the hand. The results are summarized in the Bone Structure Index (BSI), BSI_T-score and BSI_Z-score, analogous in meaning, but not related to densitometry [3].
We assessed the bone alterations induced by oncological treatment by BESTEST® and DXA.
Methods: Oncological Population (*OP*): 100 Caucasian women, BESTEST® as follow-up during oncological treatment.
Control Population (*CP*): 200 women, BESTEST® in screening.
Femoral neck DXA T-score availability (*DXA*) and self-reported osteoporotic fractures (*Fr*) as in Table 1.

Table 1.
Statistics: mean (min, max).

	N	Age	BSI_T-score	BSI_Z-score	DXA_T-score
OP	100	62 (35, 88)	−1.7 (−3.4, −0.0)	−1.3 (−2.6, 0.6)	NA
OP-Fr subgroup	10	67 (56, 82)	−2.4 (−2.9, −1.3)	−1.8 (−2.6–0.1)	NA
OP (BSI+DXA) subgroup	60	62 (35, 88)	−1.8 (−3.4, −0.1)	−1.3 (−2.6, 0.6)	−1.6 (−3.2, 0.5)
CO (BSI+ DXA)	200	68 (60, 82)	−1.1 (−3.6, 2.9)	−0.6 (−3.0, 2.9)	−1.9 (−3.7, 1)
OP-Fr (BSI+DXA) subgroup	8	63 (32, 89)	−2.4 (−2.9, −1.3)	−1.8 (−2.6, −0.1)	−1.5 (−2.9, 0.1)

Results: The BSI T-score in *OP-Fr* is lower than in *OP* ($p < 0.0100$).
After correction for age, BSI Z-score in *OP-Fr* is lower than in *OP* ($p = 0.0300$).
The BESTEST® and DXA results are independent in *OP(BSI+DXA)* ($R^2 = 0.0917$)and in *CO(BSI+DXA)* ($R^2 = 0.0294$).

OP-Fr (BSI+DXA): BSI T-score is indicative of a compromised trabecular structure and lower than in *OP(BSI+DXA)* ($p = 0.038$). DXA T-score results span all possible outcomes and not statistically different from *OP(BSI+DXA)* ($p = 0.674$).

Conclusions: Statistical analyses show that BESTEST® can help assessing bone alterations due to oncological treatment, especially when associated with fractures.

Notwithstanding its limitations, this pilot study provides a background for further studies into the use of a new, rapid and safe technique for monitoring the effects of breast cancers therapies.

Conflict of Interest: FC is co-founder of M2TEST srl, the company that commercializes BESTEST®.

References

1 Coleman RE *et al. Lancet Oncol*, 2007, 8(2), 119–127
2 Schuit SCE *et al. Bone*, 2004, 34, 195–202
3 Cosmi FC. MCB, 2015, 12(2), 87–105