IMAGING CORNER

Seeing Through the Density: A Case of Misleading BMD Results on bone densitometry

Syeda Hadia Najam, Aamna Hassan
Department of Nuclear Medicine, Shaukat Khanum Memorial Trust, Lahore, Pakistan; [2]Third year Student, Rashid Latif Medical college, Lahore, Pakistan;
Correspondence: Aamna Hassan. e-mail: aamnah@skm.org.pk
ORCID ID. 0000-0003-0026-0729

Abstract

Bone mineral densitometry (BMD) using dual-energy X-ray absorptiometry (DXA) is widely recognized as the standard method for evaluating bone density. DXA produces attenuation maps that aid in measuring BMD. Non-relevant findings are commonly observed in DXA images, some of which may influence BMD measurements, while others have limited clinical significance. While opinions vary, the majority of studies suggest that vascular calcifications do not significantly affect BMD. We present a case of an 84-year-old female who presented for BMD evaluation emphasizing the need to consider different confounding factors in results interpretation.

Keywords: Bone Mineral Density (BMD) overestimation, Dual-energy X-ray Absorptiometry (DXA), vascular calcifications

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Discussion

An 84-year-old female presented for bone mineral density (BMD) evaluation, with complaints of decreased right leg

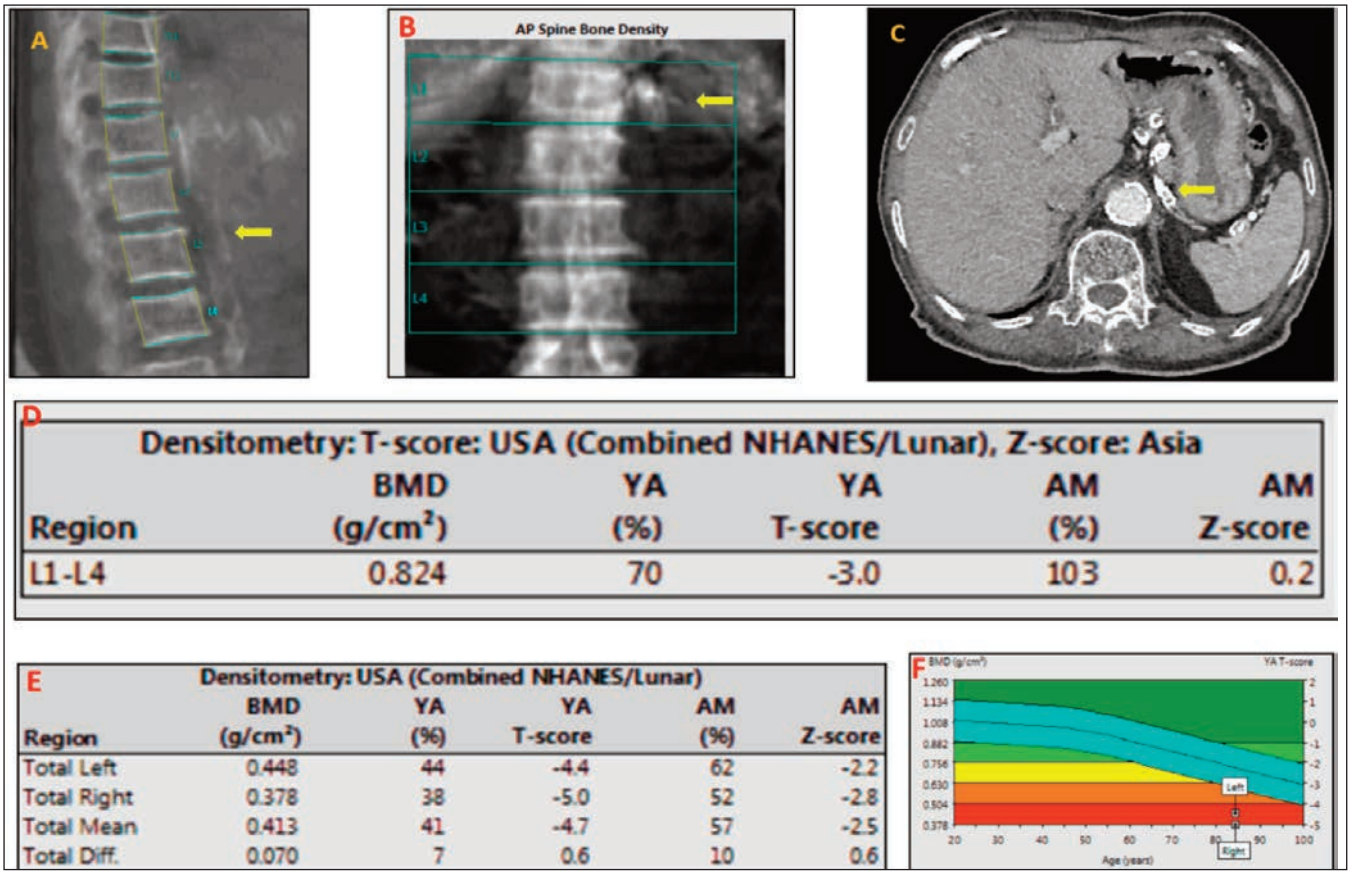

Figure: A) Lateral vertebral assessment on DXA showing calcifications of abdominal aorta (Yellow arrow), B) Anteroposterior spine image; radio-opaque density in the left paravertebral region (Yellow Arrow), C) Axial computed tomography images showing splenic vessels calcification (Yellow arrow), D, E) T-score values of lumbar vertebra and bilateral femoral bones. F) Graphical BMD representation in the bilateral femur.

movement and an inability to walk or stand for the past three months. Her medical history included diabetes, hypertension, and asthma, and she was taking calcium supplements. DXA scan was performed, revealing a lumbar spine BMD of 0.824 g/cm^2, with the left and right hip BMDs measurement of 0.448 g/cm^2 and 0.413 g/cm^2, respectively. These values were notably discordant, with a T-score of -3.0 in the lumbar spine, -4.4 in the left hip, and -4.7 in the right hip.

Lateral vertebral assessment demonstrated vascular calcifications of the abdominal aorta overlying the lumbar vertebrae (Figure A). Additionally, an anterior spine image revealed a radio-opacity in the left paravertebral region, which was subsequently correlated with CT imaging of the chest, abdomen, and pelvis. The opaque shadow was identified as calcifications in the splenic vessels (Figure B, C). CT images also showed diffuse calcifications in major vessels. Based on these findings, the BMD was interpreted as being in the osteoporotic range. However, there was a false elevation of BMD in the lumbar vertebrae.

DXA scanning, which uses dual-energy X-rays, can indicate bone mineral density through relative attenuation of X-ray beams.[1] Nevertheless, several factors may contribute to erroneous interpretations if they are within the measurement region of interest.[2] Notable causes of BMD overestimation include degenerative changes, vertebral compression fractures, and heterotopic ossifications. Conversely, decreased BMD may be associated with systemic diseases, osteolytic lesions, and other conditions.[3]

References

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