Osteoporosis Diagnosis

These patients are often found to have significant VB compression fractures on plain films after presenting with back pain following a seemingly minor fall. CT often shows an impressive appearing amount of bone retropulsed into the canal.

T-scores of the lumbar spine and femoral neck from Dual-energy X-ray absorptiometry (DXA) scans A T-score within 1 SD (+1 or -1) of the young adult mean indicates normal bone density. A T-score of 1 to 2.5 SD below the young adult mean (-1 to -2.5 SD) indicates low bone mass. A T-score of 2.5 SD or more below the young adult mean (more than -2.5 SD) indicates the presence of osteoporosis.

Clinical brain CT scans can assist in the detection of osteoporosis, and patients with an HU value < 610 as determined via brain CT may be considered for further evaluation for possible osteoporosis [1].

There is emerging evidence that radiomics analyses can improve the detection of skeletal fragility. In a cross-sectional study, Biamonte et al. evaluated radiomics features (RFs) on computed tomography (CT) images of the lumbar spine in subjects with or without fragility vertebral fractures (VFs).

Two-hundred-forty consecutive individuals (mean age 60.4 ± 15.4, 130 males) were evaluated by radiomics analyses on opportunistic lumbar spine CT. VFs were diagnosed in 58 subjects by morphometric approach on CT or XR-ray spine (D4-L4) images. DXA measurement of bone mineral density (BMD) was performed on 17 subjects with VFs.

Twenty RFs were used to develop the machine learning model reaching 0.839 and 0.789 of AUROC in the train and test datasets, respectively. After correction for age, VFs were significantly associated with RFs obtained from non-fractured vertebrae indicating altered trabecular microarchitecture, such as low-gray level zone emphasis (LGLZE) [odds ratio (OR) 1.675, 95% confidence interval (CI) 1.215-2.310], gray level non-uniformity (GLN) (OR 1.403, 95% CI 1.023-1.924) and neighboring gray-tone difference matrix (NGTDM) contrast (OR 0.692, 95% CI 0.493-0.971). Noteworthy, no significant differences in LGLZE ($p = 0.94$), GLN ($p = 0.40$) and NGDTM contrast ($p = 0.54$) were found between fractured subjects with BMD T score < - 2.5 SD and those in whom VFs developed in absence of densitometric diagnosis of osteoporosis.

Artificial intelligence-based analyses on spine CT images identified RFs associated with fragility VFs. Future studies are needed to test the predictive value of RFs on opportunistic CT scans in identifying subjects with primary and secondary osteoporosis at high risk of fracture [2].

[1]

Na MK, Won YD, Kim CH, Kim JM, Cheong JH, Ryu JI, Han MH. Opportunistic osteoporosis screening via the measurement of frontal skull Hounsfield units derived from brain computed tomography images. PLoS One. 2018 May 10;13(5):e0197336. doi: 10.1371/journal.pone.0197336. eCollection 2018. PubMed PMID: 29746570.

[2]

Biamonte E, Levi R, Carrone F, Vena W, Brunetti A, Battaglia M, Garoli F, Savini G, Riva M, Ortolina A, Tomei M, Angelotti G, Laino ME, Savevski V, Mollura M, Fornari M, Barbieri R, Lania AG, Grimaldi M, Politi LS, Mazziotti G. Artificial intelligence-based radiomics on computed tomography of lumbar spine in subjects with fragility vertebral fractures. J Endocrinol Invest. 2022 Jun 25. doi: 10.1007/s40618-022-01837-z. Epub ahead of print. PMID: 35751803.

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