Vertebral fractures identified on lateral DXA images using deep neural networks predict incident fractures in older women

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Background: The interpretation of vertebral fracture assessment (VFA) is complex and requires competent readers who can interpret the VFA scans accurately. There is a need for more objective and automated methods for vertebral fracture (VF) identification.

Objective: The aim of this study was to examine if VFs identified on lateral DXA-images, using deep neural networks [1], predict incident fractures to a comparable degree of manually annotated VFAs.

Methods: 2,831 women from the SUPERB study were included in this study. VFs were diagnosed from DXA by VFA or by the novel deep learning method XVFA[1]. Due to image quality, manually annotation was possible for 30,589 vertebrae, while XVFA used all visible vertebrae (n=37,123). Incident fractures were x-ray verified. Cox regression models were used to assess the association between VFs and incident fractures.

Results: During 8 years of follow-up 683 and 1,310 women were identified as having any VF when analyzed manually or by XVFA, respectively. Women with any VF verified manually or by XVFA had 327 (47.9%) and 539 (41.1%) any fracture, respectively. Women with grade 3 VF, identified manually or by XVFA, had an increased risk of any fracture with HR 2.66 (95% CI; 2.14-3.31) and HR 1.95 (95% CI; 1.59-2.39), respectively, compared to women without VF. These associations remained in adjusted models in both methods (Table 1).

Conclusion: Both methods for identification of VFs, the novel XVFA and manually annotated VFAs, predicted incident fractures.

1. https://doi.org/10.48550/arXiv.2407.02926, 2024.