VBQ Score Predicts Subsequent Osteoporotic Vertebral Fractures After OVF: A Retrospective Study

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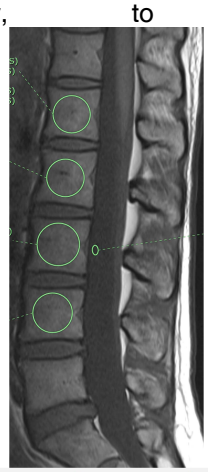
INTRODUCTION: Early occurrence of subsequent osteoporotic vertebral fractures (OVFs) following an initial OVF is not uncommon, but their risk factors remain under-investigated. This study aimed to identify predictors of subsequent OVFs in patients initially treated conservatively.

METHODS: We retrospectively reviewed 180 patients with fresh OVFs treated conservatively between January 2021 and September 2023. After excluding those with inadequate follow-up (<6 months), missing data, or surgical conversion, 101 patients (29 males; mean age: 80.7 years) were included. Patients were categorized based on whether they experienced a new OVF within 6 months. Clinical backgrounds, osteoporosis status, existing vertebral fractures, hospitalization, brace type, trunk muscle parameters, and nutritional status were evaluated. Quantitative measures included DXA-derived BMD, CT Hounsfield Unit (HU), MRI-based vertebral bone quality (VBQ) score, Psoas muscle index and density, and Prognostic Nutritional Index (PNI). Comparative analyses and multivariate logistic regression were performed to identify independent risk factors.

RESULTS: Within 6 months, 25 patients (24.8%) developed subsequent OVFs (mean onset: 3.7 months). Compared to those without subsequent fractures, affected patients had significantly lower HU values (45.5 ± 31.7 vs. 65.5 ± 32.8, $p<0.05$) and higher VBQ scores (3.3 ± 0.5 vs. 2.9 ± 0.4, $p<0.01$). No significant differences were found in age, sex, BMI, number of prior fractures, BMD, osteoporosis treatment, hospitalization status, brace type, psoas muscle measures, or nutritional indices. Multivariate analysis revealed the VBQ score as an independent risk factor (odds ratio: 6.04; 95% CI: 1.63–22.4; $p<0.01$). ROC analysis determined the optimal VBQ score cutoff to be 3.10 (sensitivity: 0.75, specificity: 0.72, AUC: 0.76).

DISCUSSION AND CONCLUSION: A high VBQ score is an independent predictor of subsequent OVFs within 6 months after an initial fracture. Clinicians should be vigilant in managing patients with elevated VBQ scores, even if treated conservatively, to prevent early subsequent vertebral fractures.



VBQ score = $SI_{L1\text{-}L4}$ / SI_{CSF}

$SI_{L1\text{-}L4}$: Median signal intensity of vertebral bodies (L1–L4)
SI_{CSF} : Signal intensity of CSF at L3 level