

Is Decreased Bone Mineral Density Associated with Severe Interbody Subsidence following Elective ACDF?

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INTRODUCTION:

While several patient and technique-related risk factors for subsidence have been proposed, the relationship between low bone mineral density (BMD) and interbody subsidence remains unproven. The primary purpose of this study was to utilize computed tomography to characterize subsidence of cage interbodies in ACDF and determine the influence of BMD on pseudarthrosis. The secondary aim of this study was to evaluate whether preoperative Hounsfield Unit (HU) measurements are predictive of increased risk of severe subsidence in the cervical spine.

METHODS: We performed a retrospective review of patients undergoing 1 to 3 level ACDF and anterior plating at a single institution between the years 2011-2020. To be included in this study, patients were required to have a preoperative CT scan, preoperative DEXA scan, and a CT scan performed at least 6 months postoperatively. Graft subsidence was assessed on CT scan performed at least 6 months postoperatively and classified as mild if ≤ 2 mm, moderate if 2-4mm, and severe if ≥ 4 mm. Demographic and surgical variables were compared between groups based upon degree of subsidence. Logistic regression analysis was performed to assess the correlation between HU and BMD. Receiver operating characteristic (ROC) curve analysis was performed to determine optimal BMD cutoffs to prevent severe subsidence.

RESULTS: We identified 52 patients (97 levels) for inclusion. Comparison of subsidence based on bone mineral density demonstrated significantly increased superior (1.95 vs 1.08mm, $p=0.002$), inferior (2.51 vs 1.50mm, $p=0.001$), and cumulative (4.46 vs 2.58mm, $p<0.0001$) subsidence. Multivariate analysis demonstrated low BMD and active smoking to be risk factors for >2 mm of subsidence, while low BMD was the only independent predictor of increased risk of severe subsidence. Logistic regression analysis revealed that mean vertebral body HU correlates strongly with BMD Hip and Spine. ROC analysis demonstrated that vertebral body HU >271 is the optimal cutoff to prevent severe subsidence.

DISCUSSION AND CONCLUSION: Low bone mineral density is an independent predictor of increased risk of moderate and severe subsidence. Cervical HU correlates strongly with BMD Hip and Spine assessed on DEXA scan, and a cutoff of 271 may be predictive of an increased risk of severe subsidence.