Preoperative Canal Diameter, Foraminal Stenosis, or Cord-Lamina Angle Do Not Predict Postoperative C5 Palsy After Cervical Spine Surgery

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INTRODUCTION: Postoperative C5 palsy is a debilitating complication of spine surgery with unclear etiology. A prior study of 12 postoperative C5 palsies developed a three-variable predictive model with preoperative MRI measurements including anteroposterior canal diameter [APD], foraminal diameter [FD], and cord-lamina angle [CLA][1]. The receiver operating characteristic (ROC) area under curve (AUC) was 0.97, with a sensitivity of 0.91, and a specificity of 1.00. The objective of this study was to validate this three-variable model and its individual components in a larger patient cohort.

METHODS: We retrospectively identified both male and female patients who underwent anterior (ACDF) or posterior (PCDF) cervical discectomy and fusion involving the C4-5 level at a single institution (2010-2023). C5 palsy was defined as a new or worsened deltoid/biceps weakness on manual motor testing. Patients who developed a postoperative C5 palsy were propensity matched 1:3 to a control group based on age, procedure, levels fused, sex, BMI, and smoking status. Preoperative MRI measurements of APD, FD, and CLA were performed by two blinded reviewers. ROC curves, sensitivities and specificities were calculated to evaluate development of postoperative C5 palsy using APD, FD, CLA, and the three-variable predictive model previously published.

RESULTS: Forty-two patients (66.7% male) with C5 palsy were matched to 126 controls (68.3% male). There were no significant differences in preoperative APD (9.20 vs. 9.45 mm, p=0.426), minimum FD (1.82 vs. 1.90 mm, p=0.609), or maximum CLA (38.8 vs. 38.5 degrees, p=0.867) between the C5 palsy and control groups. APD had an AUC of 0.455, sensitivity of 0.912, and specificity of 0.148. Minimum-FD had an AUC of 0.501, sensitivity of 0.765, and specificity of 0.330. Maximum-CLA had an AUC of 0.513, sensitivity of 0.765, and specificity of 0.348. The three-variable predictive model had an AUC of 0.519, sensitivity of 0.676, and specificity of 0.452.

DISCUSSION: The preoperative MRI parameters of APD, FD, and CLA, as well as their collective three-variable model, were not predictive of postoperative C5 palsy in a larger validation cohort. The etiology of C5 palsy remains poorly understood, and reliable preoperative predictors have yet to be identified.

CLINICAL RELEVANCE: The previously proposed three-variable model demonstrated poor predictive utility for postoperative C5 palsy, and the model should be interpreted with caution until further investigation enhances clinical understanding of this pathology.

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