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Comparing ACDF Outcomes by Cervical Spine Level: A Single Center Retrospective Study

Introduction: Anterior cervical discectomy and fusion (ACDF) is one of the most common procedures utilized for treatment of cervical radiculopathy and myelopathy. However, minimal data is available comparing C3-C4 level of involvement in comparison to other cervical levels. Given higher level of cord involvement and complex anatomy at this level of the cervical spine, the authors hypothesize that the ACDF patients with involvement of the C3-4 level have higher rates of postoperative dysphagia and greater hospital length of stay.

Materials/Methods: A retrospective chart review was conducted on all patients diagnosed with cervical myelopathy or radiculopathy due to degenerative disc disease and treated with an anterior cervical discectomy and fusion (ACDF) from January 2012 to September 2022 at a single academic center. Trauma patients, patients undergoing revision cervical approach or having undergone previous ACDF surgery, patients with ACDF involving C1-2, C2-3 or C7-T1 were excluded. Patients were delineated into those patients with C3-4 level inclusion within the ACDF construct versus those without C3-4 level involvement.

Patients' demographic and clinical characteristics and surgical outcomes including procedure time, length of hospital stay (hLOS), improvement in neurological symptoms, major and minor complications, and discharge disposition were collected from the patient's medical records. Major and minor complications were defined according to *Campbell et al*¹. Data were analyzed using SAS version 9.4. Baseline patients' characteristics and outcomes were compared between groups using the chi-square test for categorical variables and the Student's t-test for continuous normally distributed variables.

Results: Eight-hundred and sixty patients were included in the study (Table 1). Patients with C3-C4 involvement were older (58.4 vs. 53.6, $p < 0.0001$) and more likely to be African American (56.7% vs. 36%, $p < 0.0001$) and male (70.1% vs. 46.9%, $p < 0.0001$). In addition, both the C3-C4 inclusion group and the group without C3-C4 involvement had a high percentage of Medicaid (18.9% and 27.4%, respectively) and Medicare patients (43.6% and 32.4%, respectively). ACDF with C3-C4 involvement was associated with longer hLOS (3 days versus 1.5 days, $p < 0.0001$), a higher prevalence of at least one minor complications (29.6% vs. 18.8%, $p = 0.0004$), no change or a worsening of neurological symptoms following surgery (24.5% vs. 39.2%, $p = 0.0001$), and an increased need for in-patient or out-patient rehabilitation (16.5% versus 7.2%, $p < 0.0001$) compared to ACDFs without C3-C4 involvement. There was no significant difference in major complications, new neurological deficits, or rates of revision between the two groups (Table 2).

Conclusion: Patients with C3-4 involvement requiring surgery were more likely to be older, male, and African American and have Medicare insurance. Patients undergoing ACDF for C3-4 level, whether one level or multilevel involvement, were more likely to have longer lengths of stays, higher rates of complications, less improvement in neurologic symptoms, and an increased need for rehabilitation services.