Anterior Cervical Hybrid Constructs Reduce Upper Adjacent Segment Hypermobility Compared to Anterior Cervical Discectomy and Fusion

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INTRODUCTION: The mainstay surgical treatment for symptomatic cervical degenerative disc disease is anterior cervical discectomy and fusion (ACDF). Despite its effectiveness, one long-term consequence of fusion may be increased risk of adjacent segment degeneration resulting in the need for additional surgery. Cervical disc arthroplasty has been shown to preserve physiologic range of motion (ROM) and decrease the need for adjacent segment surgery. For patients with multilevel pathology requiring at least one level of fusion, combining anterior cervical fusion with arthroplasty may maintain better preserve physiologic ROM across the treated levels. This study primarily aims to compare postoperative adjacent segment motion between anterior cervical hybrid surgery (ACH) and ACDF. Secondarily, total global (C2-7) motion, construct motion, and alignment parameters will be compared between groups.

METHODS: In this retrospective cohort study at a multi-surgeon spine practice, 2- and 3-level ACH and ACDF cases were identified between 2013 and 2021. Patients with incomplete records, imaging, or less than 6 months of follow up were excluded. Demographic and radiographic data were obtained from medical and imaging records. Pre- and postoperative neutral lateral x-rays were analyzed for alignment parameters: C2-C7 global lordosis, cervical sagittal vertical axis (cSVA), and T1 slope (T1S). Motion detection in degrees was analyzed on flexion/extension views using Cobb angles to measure lordosis at: C2-C7 (global), the construct, and upper and lower adjacent segments. Differences between ACH and ACDF cohorts were determined using independent t-tests for continuous variables and Fisher's exact test for categorical variables.

RESULTS:

There were 50 patients in each cohort (2-level cases: 18 ACH, 20 ACDF) (3-level cases: 32 ACH, 30 ACDF). Hybrid patients were overall younger in age, (51 ACH, 59 ACDF, $p<0.001$) with lower CCI scores (0.8 ACH, 1.7 ACDF, $p<0.001$). Postoperatively, total ROM across the construct was significantly greater in the ACH cohort (16.25° ACH, 4.65° ACDF, $p<0.001$) as was total global ROM (38.03° ACH, 28.02°, $p<0.001$). The degrees of motion decreased at the level of the construct postoperatively was significantly less in the ACH cohort (-10.03° ACH, -18.07° ACDF, $p<0.001$). The degrees of motion at the upper adjacent segment postoperatively were significantly increased as compared to preoperatively in the ACDF cohort (-1.26° ACH, 1.59° ACDF, $p<0.005$).

DISCUSSION AND CONCLUSION:

In this study, 2- and 3-level ACH constructs partially preserved motion across the operative levels compared to ACDF constructs. As a result, postoperative total global ROM was better in the ACH cohort and postoperative upper adjacent segment hypermobility was seen only in the ACDF cohort. This supports consideration of combining fusion with arthroplasty in patients with multilevel cervical pathology that require at least 1 level of fusion.