What Factors Determine if a Patient Should Undergo a Staged Procedure for Adult Cervical Deformity Corrective Surgery

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INTRODUCTION:
When determining surgical approach, a surgeon may elect to choose a "staged" method, in which a patient has recovery time between surgeries as opposed to a single-day operation. Understanding how this may be beneficial to patients on choosing one method over another is unknown. The purpose of this study was to determine the patients who benefit from a staged approach in CD-corrective surgery.
METHODS: CD patients with BL and 2Y follow up were included if they had available operative decision data. Patients were stratified into two groups based on operative technique; same day combined approach and staged. Means comparison tests and multivariate analysis assessed differences between patient groups.
RESULTS:
Of 104 patients that met inclusion criteria (49% Female, 59.2±9.3 years, 29.0±7.7kg/m2, CCI .86±1.2, Levels Fused: 6.1±2.0, OpTime: 469.1±167.1 min, EBL: 783.1±639.8 mLs), 62 (51.9%) were same day procedures [Same] and 42 (48.1%) were Staged procedures [Staged]. When analyzing the cohort by those who were classified as frail and severely frail [F-SF], Staged patients reported significantly better neck pain at 2Y by NDI (31.8 vs. 43.3; p=0.012) and NRS Neck (4.0 vs. 5.8; p=0.004). Within this subset of patients, Staged saw significantly more improvement from BL to 2Y in NRS Neck (83.3% vs. 57.1%; p=0.010). Furthermore, only Staged patients were able to meet MCID in EQ5D if they were severely frail (37.5% vs. 0.0%; p=0.016). F-SF patients also fared better with neurological deficit improvements when staged. They were significantly more likely to no longer report hyperreflexia, paresthesia, and hand numbness (all $p<0.05$). When analyzing those in the cohort who had severe myelopathy (mJOA $\leq$14), staged patients were significantly more likely to no longer report any neurological deficit (25.0% vs. 4.0%; p=0.046) and more likely to improve radiographically in age-adjusted PT (20.0% vs. 0.0%; p=0.043) and one of Ames cervical criteria (16.0% vs. 0.0%; p=0.045). Additionally, severe myelopathy patients were less likely to experience dysphagia or pulmonary complications when undergoing a staged procedure (both $p<0.05$).
DISCUSSION AND CONCLUSION:
Staged procedures offer substantial benefit for frail patients undergoing operative correction of cervical deformity. Improvements are seen in clinical reported outcomes and neurological deficits. Also patients with severe myelopathy have greater radiographic improvement and less operative complications when undergoing a staged procedure.