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Response to Letter to the Editor on "Hybrid Anterior Cervical Discectomy and Fusion and Cervical Disc Arthroplasty: An Analysis of Short-Term Complications, Reoperations, and Readmissions"

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We appreciate the insightful comments made by our colleagues with regards to the article, "Hybrid Anterior Cervical Discectomy and Fusion and Cervical Disc Arthroplasty: An Analysis of Short-Term Complications, Reoperations, and Readmissions."[1]

Thank you for taking the time to critically assess our manuscript, as well as the opportunity to respond to your comments. This current study utilized a large, national registry to compare the short-term (30-day) morbidity, hospital length of stay (LOS), and operative duration in patients undergoing hybrid surgery (HS) of the cervical spine in comparison to a two-level ACDF cohort. We found a similar morbidity profile between HS and ACDF cohorts (e.g., total complication rate, wound complications, etc.) and operative duration; however, patients undergoing HS had a shorter LOS (decrease of 0.5 days) compared to those undergoing an ACDF. As noted, this current study establishes the short-term safety profile of HS. This is in concordance with your prior prospective study on 20 patients undergoing HS that also established the efficacy, reliability, and safety of HS.[2]

In your study, no difference in LOS was identified between the ACDF and HS cohorts (2 days for both cohorts).[2] In contrast, this current study identified a difference in LOS between the HS cohort (mean 1.2 days) and ACDF cohort (mean 2.1 days; $P < .001$). A number of prior studies have sought to assess independent predictors of LOS after cervical spine surgery.[3,4] Gruskay et al., in a retrospective study of 2164 patients undergoing elective ACDF between 2005 and 2010, found that preoperative dependent functional status, anemia, advanced age (defined as ≥65 years old), history of diabetes mellitus, and prolonged operative duration as predictors of a prolonged LOS.[3] Other authors have also identified female gender and the development of post-operative complications (e.g., cardiac, pulmonary, and urinary) as factors affecting LOS.[5] Potential reasons for the discrepancy in LOS between this current study and your study are likely multifactorial but may be attributable to statistical power, your sample has a higher proportion of women (+2.5%), and the medical complexity of patients in your sample (e.g., rate of diabetes mellitus in each cohort) is not reported which makes it difficult to fully compare samples and explain this discordance in LOS. In our sample, patients undergoing HS were younger, more likely to be male, had fewer comorbidities (e.g., HTN, DM), and a lower American Society of Anesthesiologists classification—all factors that may have contributed to their shorter LOS.

Another interesting difference is that your study identified a shorter operative duration for the ACDF cohort (95 minutes) relative to the HS cohort (140 minutes).[2] There are a number of potential reasons why a HS procedure may require a longer operative duration. For instance, it is technically more complex than a multi-level ACDF and requires an increased number of surgical and implant trays which may reduce surgical efficiency. In spite of this, our current study did not find differences in operative duration between ACDF (mean 149 minutes) and HS (mean 145 minutes, $P = .758$). Our study leveraged a large national (United States–based) registry to

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generate one of the largest samples of HS patients reported (390 patients). It also draws from a wide range of participating institutions from smaller community affiliates to large academic centers, and from a large number of diverse participating surgeons. As a result, these types of "big data" registry studies may benefit from increased external validity. However, they may lack in granularity of data and may be missing relevant or interesting variables, including but not limited to: the cervical levels operated on, pre- and post-operative radiographic parameters, implants utilized, and functional outcomes. In contrast, your paper helps to answer questions that cannot be well reported on by these types of registry studies, including patient satisfaction, functional outcomes (SF-36, JOA, NDI), establishing that post-operative cervical ROM is higher in HS patients compared to ACDF, and identifying that HS patients may benefit from earlier return to work compared to ACDF patients. Furthermore, your continued work on this topic has shown that HS has durable effects on improving pain levels and health-related quality of life metrics up to 5 years after the index procedure.[6]

Ultimately, these types of questions regarding the safety, efficacy, optimal implant design/configuration to most accurately re-create cervical biomechanics, etc. will have to be answered through prospective, randomized control trials. Unfortunately, there is a dearth of high-quality clinical trials performed thus far in the United States;[7] however, work from your group as well as our other clinician/scientist colleagues in spine surgery will undoubtedly lead the way toward safely improving and optimizing patient outcomes.

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