



## Letter to the Editor

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# Reply to Commentary on “Impact of Nonlordotic Sagittal Alignment on Short-term Outcomes of Cervical Disc Replacement”

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To the editor,

We would like to thank you for the opportunity to respond to the letter to the editor. We would also like to thank the authors of this letter for their interest in our research and hope that the additional information provided here addresses their concerns and questions.

With regard to the first point of the difference between reducible and irreducible kyphosis, we agree that the underlying mechanisms for the two are different, and thus outcomes of surgery, cervical disc replacement or otherwise, may be different in these patient populations as well. This study included patients with passively reducible kyphosis and thus our findings are applicable to this subset of patients with nonlordotic alignment, as mentioned in the discussion section of our paper. In terms of patient-reported outcome measures (PROMs), we have included a comprehensive list of PROMs for cervical spine surgery,<sup>1</sup> covering disease-specific measures, pain scores and general health measures. Additionally, these PROMs were obtained preoperatively and at multiple postoperative timepoints, with the early follow-up timepoint including PROMs from 2 weeks up to 3 months after surgery, thus ensuring that PROMs and pain scores in the early postoperative were effectively captured and analyzed.

As a second point, the authors propound concerns with regard to incomparable baseline characteristics and potential confounders. We agree that having similar baseline characteristics is an important consideration when performing comparative analyses, and we made efforts to ensure that our groups were comparable. As seen in the results section of the manuscript and the tables, there were no statistically significant difference in any patient demographics or operative factors, except age, thus demonstrating that the cohorts in our study were comparable. Furthermore, the study by Yang et al.,<sup>2</sup> cited by the authors, demonstrates an association between adjacent segment (ASD) and occipito-cervical inclination (OCI), but shows no association between ASD and C2–7 Cobb angle, SVA or T1 slope. The current study did not analyze OCI but analyzed C2–7 Cobb angle, SVA and T1 slope, which are not associated with ASD. Additionally, as mentioned by the authors of this letter, numerous parameters, including occipital orientation, can impact cervical alignment. However, in the study by Zhu et al.,<sup>3</sup> cited by the others, although the correlation between the occipital orientation parameters and C2–7 lordosis was statistically significant, it was a weak



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correlation, with the correlation coefficients ranging from 0.23 to 0.30. Additionally, this study was performed in asymptomatic healthy individuals without any degenerative spinal pathology. Thus, it is not clear whether this association would be present in patients with spinal pathology and how it would affect outcomes following cervical spine surgery. Thus, we believe that our findings are valid and remain unchanged regardless of ASD or occipital orientation. Nevertheless, we agree that these are important topics that should be explored further in future studies. Traction treatment was not used for any patients prior to surgical intervention, and thus does not impact our findings.

Thirdly, as the authors rightly point out, numerous methods exist to characterize alignment of the cervical spine,<sup>4,5</sup> each with its limitations and advantages. We chose the Cobb angle method because it is an established, simple and reproducible method that can be performed quickly and easily in a clinical setting, without the need for sophisticated software or numerous measurements. Furthermore, it has been used in a number of published studies,<sup>6-9</sup> thus allowing for comparison of results across studies as well as pooling of results for meta-analyses. Additionally, although Hu et al.,<sup>10</sup> cited by the authors, do not use a particular angular measurement to determine spinal alignment, our methodology was based on the studies by Kim et al.<sup>11</sup> and Le Huec et al.,<sup>12</sup> which define lordosis and kyphosis based on the C2-7 Cobb angle being less than or greater than 0 degree. This method provides a simple way to classify patients and has been used in numerous studies in the literature.

We appreciate the interest the authors of this letter have shown in our work and thank them for their valuable comments and insightful feedback. We hope that the additional information provided here better explains our methodology and the rationale for it, and further supports the findings reported in our study.

## CONFLICT OF INTEREST

The authors have nothing to disclose.

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