Answer to the Letter to the Editor of Sebaaly AY, et al. concerning “correlation between the apex of lumbar lordosis and pelvic incidence in asymptomatic adult” by Pan C, et al. (Eur Spine J [2020]; 29(3): doi: 10.1007/s00586-019-06183-y)

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Dear Editor,

We thank the authors of the Letter to the Editor concerning our recent publication [1], and we appreciate their methodological and principal problems. Our responses to the comments are provided below.

Roussouly et al. [2, 3] described five disparate types of sagittal spine alignment on the basis of the orientation of the sacrum in an asymptomatic adult population. One of the goals of surgical correction for patients with adult spinal deformity (ASD) diseases is to restore their corresponding physiological spinal alignment, particularly lumbar alignment. However, under pathologic conditions, a preoperative spinal deformity can cause pelvic compensatory retroversion, resulting in a smaller sacral slope (SS) than the physiological SS. Obviously, it is irrational to design a lumbar sagittal alignment, including the apex of lumbar lordosis (LLA), simply relying on the preoperative SS. Many previous papers have demonstrated that the pelvic morphology can have a vital impact on lumbar sagittal alignment [1–3]. Therefore, pelvic incidence (PI) as a stable morphological parameter is able to predict the ideal sagittal profile of the lumbar spine, which can provide a reference during surgical correction. As the construction of physiological alignment, these positional parameters, such as SS and pelvic tilt, will spontaneously restore their normal values.

In this study, we found that there existed a linear correlation between the LLA and PI ($r_s = -0.595$), and

then, the simple regression was concurrently conducted, $LLA = -0.042 \times PI + 6.134$ ($R^2 = 0.306$). This formula illustrates that the LLA becomes located more cranially as the PI increases, which is in agreement with the essential contents of the seminal Roussouly classification. However, it is not correct to construct the location of the LLA only relying on PI during surgical correction. The location of the LLA is influenced by multiple factors, including age, pelvic morphology, thoracic kyphosis, and back muscles, which can be viewed as a reason for why a same PI could be associated with the diverse types of lumbar shapes. Therefore, we should take all relevant factors into account when designing an ideal lumbar alignment to decrease mechanical complications in the corrective plan.

We appreciate the letter above, and we hope our answer can help to comprehend the regulatory mechanisms of spinopelvic sagittal alignment and design a satisfactory preoperative plan.

References

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