



Answer to the Letter to the Editor of Tugba Ozudogru Celik concerning “Association between posterior tibial slope and anatomic spinopelvic parameters: a retrospective cross-sectional study” by Caffard T, et al. (Eur Spine J. 2023; doi: 10.1007/s00586-023-07830-1)

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We appreciate the reviewers' interest in our work and their comments. The letter to the editor regarding our above-mentioned work was reviewed. The main purpose of our study was to analyze the association between fixed anatomic spinopelvic parameters and the posterior tibial slope (PTS), a key parameter in knee joint stability and biomechanics. Our retrospective analysis of 80 patients showed a significant positive correlation between pelvic incidence (PI) and PTS, a significant negative correlation between PI and sacral anatomic orientation, and a strong positive correlation between PI and sacral kyphosis [1].

The letter raises valid points about our methodology. Lumbar lordosis (LL) was not included in our study because LL is not a fixed anatomic parameter. Physiological spinal aging and pathological conditions lead to changes in LL [2]. On the other hand, PI is a key parameter that dictates the morphological characteristics of the pelvis and affects sagittal spinal alignment variables, including LL [2]. Additionally, knee flexion is well-described in the literature as a compensation mechanism in cases of sagittal malalignment [3]. However, the PTS is an anatomical parameter, independent from knee flexion [4]. The significant correlation

between PI and PTS leads us to the conclusion that each individual patient has a specific combination of interlinked, anatomically fixed, and parameters that defines their physiologic whole-body posture.

PI is a position-independent parameter and therefore could have been measured on a CT scan [5]. Lee and Liu compared PI obtained from lateral radiographs and standard CT scans in a study of 77 subjects [6]. They found that standard lateral radiograph does provide a high level of reliability, but CT scans do provide increased reliability [6]. However, our cohort included adult patients presenting with lumbar, thoracic, or cervical complaints in addition to knee pain at our university hospital's orthopedic department. We excluded patients with severe osteoarthritis that led to a significant anatomic modification of the knee, hips, or spine. In the majority of our study cohort, only a radiograph was performed, and no further imaging studies were available.

Rasterstereographic analysis could have been very interesting in the understanding of a patient's whole-body alignment. The PTS was measured on a lateral knee radiograph. A whole-body scan with illustration of the mechanical axis of the tibia could provide additional radiographic insights. However, this imaging modality was not available for this study cohort. Further studies could be performed with 3-dimensional analysis of the spinal posture, pelvic position, and knee anatomy.

We thank you for your time and interest in our work and for indicating these limitations of our study. We hope that we have addressed your points to the best of our ability.

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References

1. Caffard T, Awan Malik H, Lutz B et al (2023) Association between posterior tibial slope and anatomic spinopelvic parameters: a retrospective cross-sectional study. *Eur Spine J* 32:3616–3623. <https://doi.org/10.1007/s00586-023-07830-1>
2. Le Huec JC, Thompson W, Mohsinaly Y et al (2019) Sagittal balance of the spine. *Eur Spine J* 28:1889–1905. <https://doi.org/10.1007/s00586-019-06083-1>
3. Obeid I, Hauger O, Aunoble S et al (2011) Global analysis of sagittal spinal alignment in major deformities: correlation between lack of lumbar lordosis and flexion of the knee. *Eur Spine J* 20:681–685. <https://doi.org/10.1007/s00586-011-1936-x>
4. Giffin JR, Vogrin TM, Zantop T et al (2004) Effects of increasing tibial slope on the biomechanics of the knee. *Am J Sports Med* 32:376–382. <https://doi.org/10.1177/0363546503258880>
5. Vrtovec T, Janssen MMA, Likar B et al (2012) A review of methods for evaluating the quantitative parameters of sagittal pelvic alignment. *Spine J* 12:433–446. <https://doi.org/10.1016/j.spinee.2012.02.013>
6. Lee CM, Liu RW (2022) Comparison of pelvic incidence measurement using lateral x-ray, standard ct versus ct with 3d reconstruction. *Eur Spine J* 31:241–247. <https://doi.org/10.1007/s00586-021-07024-7>

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