



Answer to the Letter to the Editor of Changyu Pan et al. concerning “Global tilt: a single parameter incorporating spinal and pelvic sagittal parameters and least affected by patient positioning” by Obeid I et al. (Eur Spine J; [2016] 25:3644–3649)

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Received: 17 October 2018 / Accepted: 1 November 2018 / Published online: 13 November 2018
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Dear Editor,

The question raised in the Letter to the Editor concerning Global Tilt parameter [1] is very important to understand spinal balance, and we completely agree with the authors.

When we first described the Global Tilt parameter, the purpose was to gather in a single parameter spinal and pelvic malalignment. Indeed, the Global Tilt is the angle including geometrically the center of the femoral head, the center of the sacral endplate and the center of C7. If we consider pelvic incidence as fixed, the points femoral heads and sacral endplates are invariant. The only mobile point will be the position of C7 vertebral body related to the two previous points. C7 vertebral body can thus be modified by spinal curve changes or pelvic version.

If the spine is fused (arthrosis, previous fusion, ankylosing spondylitis, etc.), the absence of spinal mobility will induce Global Tilt variability only by pelvic tilt. On the other hand, with flexible spines, changes of C7 vertebral body position, and therefore Global Tilt, can be induced by pelvic tilt or spinal curve changes.

In the original paper, we did not emphasize on the absence of variability of Global Tilt but the fact that it was the least affected by patient position when compared to sagittal vertical axis and pelvic tilt. In an imbalanced patient, when he tries to compensate, usually spine alignment will go backward (decrease of SVA) as pelvis will retrovert (increase

of PT); this will result in a constant high Global Tilt in such case confirming the malalignment.

In the example presented by the authors, despite pelvic retroversion (or PT increase) the spine goes forward because of muscle fatigue, leading to malalignment and Global Tilt increase. GT can not remain constant if one of both parameters that composes it (PT or SVA) is changed without a change of the other in the opposite way. The authors are pointing out the difference between malalignment and imbalance [2]. If the deformity aggravates with muscle fatigue, it is understandable to notice a worsening of the static parameters we use to describe the X-rays; thus, this is mainly a dynamic issue that may be better studied with the use of three-dimensional gait analysis [3].

We appreciate the letter above, and we hope the answer will help to understand the difficulty we encounter in understanding dynamic conditions with static X-rays.

Compliance with ethical standards

Conflict of interest LB has received speaker honorarium from Spineart and consultancy from Medicea. IO has received consultancy honorarium from Medtronic and Depuy-Synthes, and royalties from Spineart, Clarence and Alphatec. IO and LB institution received grant from Depuy Synthes.

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