CORR Insights®: Are There Age- and Sex-related Differences in Spinal Sagittal Alignment and Balance Among Taiwanese Asymptomatic Adults?

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Where Are We Now?

Improved instrumentation and surgical techniques have become more powerful in terms of correcting coronal-plane deformities in patients with scoliosis and degenerative disorders. But coronal-plane correction alone sometimes is insufficient, and it is possible that residual uncorrected deformities in the sagittal plane contribute residual pain and persistent gait difficulties. For those reasons, clinicians and researchers have increasingly focused attention on achieving sagittal balance [1, 2, 5-8]. Although there are a number of ways to quantify sagittal balance [9, 12-14], we still do not know how large a sagittal-plane problem needs to be before it warrants correction. In addition, although research suggests there are age-related and ethnic differences in spinal alignment [4, 10, 11] the degree to which these are clinically important also is unknown.

Generally, patients with sagittal balance and alignment issues substantial enough to warrant intervention are 60 years of age or older, which makes it important for us to understand and recognize the differences between normal effects of aging and disease development.

In the current study, Yeh and colleagues [15] examine normal age- and sex-related differences in whole-spine sagittal alignment and balance in Taiwanese adults without spinal disorders, and in so doing, provide us with baseline data to help understand normal variation in these parameters. They present their data in a way that can be used to compare this ethnic group to other populations, which can help us determine whether ethnic differences in these variables need to be considered when planning spinal reconstructions.

Pelvic incidence is found to be constant across age groups, which makes sense because it is a measurement of the pelvic shape, and shouldn’t change over a lifetime. Other measurements change with age, such as increased cervical lordosis and decreased lumbar lordosis, and are slightly different between males and females.

Methodologically, the data were appropriately collected from a population of individuals without known spinal pathology. A one-time radiograph in a volunteer, who will not likely need multiple exams, is a reasonable decision for a normal volunteer subject to make.

Where Do We Need To Go?

It is important to distinguish between pathological problems of sagittal balance from those of normal aging. Which variations from normal need to be corrected to get the best treatment outcomes? What should be the target correction for an individual patient in order to restore total alignment, eliminate...
pain and restore normal gait for this person. Will the answer vary according to ethnicity and/or age?

To further investigate these parameters, low-dose, three-dimensional, whole-body radiographs may make the radiation risk lower and facilitate recruitment in future studies [3]. Unfortunately, the equipment required to take whole-body radiographs is expensive and not widely available. As that changes—and, over time, I hope it will—studies based on these images can provide valuable information such as simultaneous coronal plane and sagittal plane measurements in asymptomatic people and in patients before and after treatment intervention. Additionally, force plate data can also be incorporated, which will further relate the weight-bearing gravity force line with the sagittal parameters [3].

The ideal study will eventually examine a large group of people, including those with different conditions of the spine and lower extremities. Hip arthritis, knee arthritis and other conditions cause compensatory changes in the spine. Primary spinal conditions alter the spine alignment directly or due to pain. Sagittal alignment changes due to these conditions can be identified and characterized. Finally, studies that evaluate sagittal balance before and after spine surgery (and perhaps following nonsurgical approaches) can help us to distinguish the contribution of this important parameter to residual pain and gait dysfunction after treatment.

How Do We Get There?

To answer the questions posed above, we need multinational studies that can measure these parameters and make proper comparisons. The current study adds the Taiwanese piece of the discussion to the puzzle. Perhaps some of these variables of ethnicity or sex or age are not important for planning, but as of now, we just don’t know.

Data on the variability of sagittal alignment by age, sex and ethnicity is still not ready to apply to individual patients, but understanding the variability of asymptomatic people who are similar in age and demographic parameters can help identify promising directions for treatment. This data can be combined with other studies to give a good approximation of normal sagittal parameters, which is one of the areas we need to consider when realigning the spine. Age, sex, and ethnic group are all potentially part of the equation, and this study gets us closer to that answer, particularly with one population of patients.

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