



Contents lists available at ScienceDirect

North American Spine Society Journal (NASSJ)

journal homepage: www.elsevier.com/locate/xnsj

Editorial

Sound principles to prevent and address spinal deformities



“Every spine surgeon is a deformity surgeon, who either corrects or creates deformity”. So the old adage goes...

It is almost impossible to overstate the importance of a patient's sagittal and coronal alignment for proper preoperative planning, even when considering relatively simple spine surgeries. A non-instrumented laminectomy at the apex of a coronal curve in a patient with pre-existing listhesis and a mild degree of sagittal imbalance reasonably compensated by some pelvic retroversion may ultimately compromise the fragile pre-existing spinal alignment to the point that, a few years down the road, a multilevel osteotomy with extensive instrumented fusion is required. Similarly, a minimally invasive fixation of a patient with pre-existing sagittal imbalance may transform a deformity which was previously amenable to correction through multilevel interbody fusion to a fixed deformity requiring an invasive 3-column osteotomy and thoracolumbopelvic fusion.

The scientific literature reflects this reality, with the past decade witnessing an exponential growth in the number of studies focusing on the influence of spinopelvic alignment parameters on patient-reported outcomes (PROMs) for a variety of thoracolumbar spine surgery procedures [1–3], cervical procedures [4], and interestingly, even for the postoperative outcomes of hip [5] and knee surgeries [6].

Similarly, there is a robust and ever-expanding body of scientific evidence demonstrating a strong correlation between adequate correction of deformity and sagittal balance and long-term PROMs after deformity surgery [7], as well as failure rates and the incidence of proximal junctional failure and proximal junctional kyphosis [8].

This special edition of NASSJ is a *tour-de-force* by multiple internationally recognized specialists in the field of spinal deformity surgery which was especially designed to provide the audience with the basic knowledge about the history and current state-of-art of spino-pelvic parameters. It also informs the reader about surgical strategies for addressing deformities of multiple sources (infectious, degenerative, iatrogenic, and others). Finally, it also contains some didactic articles on spinal development and spinal alignment from the early stages of development all the way to advanced age.

Some avid readers may end this educational journey with a refined understanding of advanced nuances in spinal deformity surgery, such how to properly consider the Roussouly classification during the surgical planning for a deformity surgery [9] or how to use the GAP score to better provide individualized information to a patient about the unique

risks of mechanical complications in their specific case [10]. However, we hope that every spine surgeon who has the opportunity to interact with the articles in this special edition will be left with a keen awareness of the utmost importance of sagittal balance in spine surgery, as well as a general understanding of how to incorporate basic spinopelvic measurements (such as segmental lordosis, pelvic incidence - lumbar lordosis/PI - LL mismatch, and sagittal vertical axis/SVA) to the daily clinical practice.

Finally, we extend our sincere gratitude to the multiple spinal deformity experts who took their valuable time to share their expertise with all of us in this special edition, and we sincerely hope that this educational effort may lead to concrete changes in the attitude of every spine surgeon toward spinal alignment so as to positively impact patient outcomes.

Declaration of Competing Interest

One or more of the authors declare financial or professional relationships on ICMJE-NASSJ disclosure forms.

Tobias A. Mattei, MD, FACS*

Division of Neurological Surgery, Department of Surgery, Saint Louis University School of Medicine, Saint Louis, MO, United States

Alan H. Daniels, MD

Division of Spine Surgery, Department of Orthopedic Surgery, Brown University, Providence, RI, United States

*Corresponding author: Division Neurological Surgery, Department of Surgery, Saint Louis University School of Medicine, 1402 S. Grand Blvd, St. Louis, MO 63104, United States.

E-mail address: tobias.mattei@health.slu.edu (T.A. Mattei)

References

- [1] Li R, Shao X, Li X, Liu Y, Jiang W. Comparison of clinical outcomes and spino-pelvic sagittal balance in degenerative lumbar spondylolisthesis: minimally invasive oblique lumbar interbody fusion (OLIF) versus transforaminal lumbar interbody fusion (TLIF). *Medicine (Baltimore)* 2021;100(3):e23783. doi:10.1097/MD.00000000000023783.

FDA device/drug status: Not applicable.

Author disclosures: **TAM:** Nothing to disclose. **AHD:** Royalties: Stryker (F), Spineart (F); Consulting: Medtronic (D), Multiple Law Firms (D); Research Support (Investigator Salary, Staff/Materials): Orthofix (D, Paid directly to institution/employer), Alphatec (F, Paid directly to institution/employer); Fellowship Support: Medtronic (F, Paid directly to institution/employer).

<https://doi.org/10.1016/j.xnsj.2024.100510>

Received 10 June 2024; Accepted 11 June 2024

Available online 18 June 2024

2666-5484/© 2024 The Author(s). Published by Elsevier Inc. on behalf of North American Spine Society. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

- [2] DiMaria S, Karamian BA, Lambrechts MJ, et al. How does spinopelvic alignment influence short-term clinical outcomes after lumbar fusion in patients with single-level degenerative spondylolisthesis? *J Craniovertebr Junction Spine* 2022;13(3):300–8.
- [3] Divi SN, Goyal DKC, Bowles DR, et al. How do spinopelvic parameters influence patient-reported outcome measurements after lumbar decompression? *Spine J* 2020;20:1610–17.
- [4] Passias PG, Pierce KE, Imbo B, et al. Cervical and spinopelvic parameters can predict patient reported outcomes following cervical deformity surgery. *J Craniovertebr Junction Spine* 2022;13:62–6.
- [5] Louette S, Wignall A, Pandit H. Spinopelvic relationship and its impact on total hip arthroplasty. *Arthroplast Today* 2022;17:87–93.
- [6] Okamoto Y, Wakama H, Okayoshi T, Matsuyama J, Otsuki S, Neo M. Spinopelvic mismatch is associated with patient-reported outcome measures after total knee arthroplasty at a mean follow-up of 15 years. *Knee* 2022;34:156–66.
- [7] Liu Y, Liu J, Luo D, Sun J, Lv F, Sheng B. Focusing on the amount of immediate changes in spinopelvic radiographic parameters to predict the amount of mid-term improvement of quality of life in adult degenerative scoliosis patients with surgery. *Arch Orthop Trauma Surg* 2023;143:3975–84.
- [8] Gomez JA, Kubat O, Tovar Castro MA, et al. Pediatric Spine Study Group (PSSG). The effect of spinopelvic parameters on the development of proximal junctional kyphosis in early onset: mean 4.5-year follow-up. *J Pediatr Orthop* 2020;40:261–6.
- [9] Li J, Zhang Y, Zhang Y, et al. Clinical application of the roussouly classification in the sagittal balance reconstruction of 101 adolescent idiopathic scoliosis patients. *Orthop Surg* 2023;15:141–51.
- [10] Yilgor C, Sogunmez N, Boissiere L, et al. European Spine Study Group (ESSG). Global Alignment and Proportion (GAP) Score: development and validation of a new method of analyzing spinopelvic alignment to predict mechanical complications after adult spinal deformity surgery. *J Bone Joint Surg Am* 2017;99:1661–72.