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Commentary

# A Commentary on "Impact of Paraspinal Muscle Degeneration on Surgical Outcomes and Radiographical Sagittal Alignment in Adult Spinal Deformity: A Multicenter Study"

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See the article "Impact of Paraspinal Muscle Degeneration on Surgical Outcomes and Radiographical Sagittal Alignment in Adult Spinal Deformity: A Multicenter Study" via https://doi.org/10.14245/ns.2449174.587.

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Adult spinal deformity (ASD) has been gathering much attention due to its morbidity and socioeconomic burden with the aging global population.[1] The prevalence of ASD with the Cobb angle > 10° is notably high in the elderly aged ≥ 60 years, accounting for up to 68%.[2] With aging and advances in surgical techniques and technology, ASD surgeries aiming to improve functionality and reduce pain by correcting abnormal spinal curvature have also increased.[3] However, mechanical failures, including proximal junctional kyphosis (PJK)/proximal junctional failure and distal junctional kyphosis (DJK)/distal junctional failure, are common complications, that often require additional surgeries and deteriorate the patients' postoperative course and quality of life. Many studies have identified risk factors for mechanical failures, which can be classified into patient, surgical, or radiological factors.[4] Patient factors include age, sex, presence of osteoporosis, and body mass index. Surgical factors include rod characteristics, the number of fused segments, the level of proximal and distal fusion, the degree of correction, and posterior soft tissue integrity. Radiological factors include positive sagittal vertical axis (SVA), mismatch between pelvic incidence and lumbar lordosis, thoracic kyphosis (TK) > 40°, and junctional angle > 10°. Moreover, recent studies have demonstrated sarcopenia[5,6] and frailty[7] as significant risk factors in ASD surgeries as well as other spine surgeries.[8,9] Given these systemic degenerative conditions are associated with paravertebral muscle (PVM) fat infiltration, it is fascinating to focus on the relationship between PVM degeneration and mechanical complications following ASD surgery.

The authors conducted a retrospective multicenter study of 454 patients who underwent ASD surgery between 2017 and 2020.[10] They demonstrated that fat infiltration in PVM was associated with greater SVA and smaller Hounsfield unit values of vertebrae before surgery, leading to more extensive correction with longer fusion surgery. After propensity score matching, patients with PVM fat infiltration showed a tendency toward a higher incidence of DJK, which is consistent with a higher incidence of mechanical failure as reported in prior studies.[5,6] Additionally, PVM fat infiltration showed a greater decrease in pelvic tilt postoperatively and a tendency toward a greater increase in TK postoperatively. These findings can help us better understand the pathogenesis of mechanical failure and mitigate postop-

erative complications. Compared to several studies regarding the effects of PVM degeneration on ASD surgery, the authors should be commended for their sample size and statistical methods. On the other hand, unlike previous reports demonstrating a higher incidence of PJK,[5,6] the authors demonstrated no difference in the incidence of PJK. The authors did not describe the kind of pelvic anchors and the level of the lowest instrumented vertebrae in detail, which should be associated with DJK. Therefore, future studies with longer follow-up durations, including these factors are warranted.

Prevention strategies for mechanical failures are primarily directed toward risk modification. This includes patient selection, treatment for osteoporosis, appropriate age-adjusted sagittal alignment, prophylactic verteoplasty, cement augmentation, and the use of hook or sublaminar tethers at the upper instrumented vertebra. Based on the authors' findings, implementing preoperative rehabilitation programs for PVM strengthening can help spine surgeons reduce mechanical complications, which is supported by a prior report.[11] Additionally, early postoperative core rehabilitation would provide beneficial effects on the postoperative course.

Although risk factors for mechanical failure are multifactorial and further investigation is warranted to establish robust treatment strategies for ASD, the authors provided valuable insights and more plausible evidence in ASD surgery.

- **Conflict of Interest:** The author has nothing to disclose.

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