

Iatrogenic Flatback Syndrome

Iatrogenic flatback syndrome is a spinal disorder that often develops as a complication from spinal surgery, particularly after procedures like a lumbar fusion, where segments of the spine are surgically connected to stabilize it. This condition occurs when there is a loss of the natural lumbar lordosis, the inward curve of the lower back, leading to a flat or kyphotic curve.

Causes

The main cause of iatrogenic flatback syndrome is surgical alteration of the spine's natural alignment. It can result from:

- The use of non-lordotic or straight spinal instrumentation during surgery.
- Fusion of the spine in a straight or slightly kyphotic angle.
- Degradation or settling of surgical constructs over time.

Symptoms

Symptoms of iatrogenic flatback syndrome include:

- Chronic back pain that worsens over time.
- Difficulty standing straight or maintaining a normal posture without bending the knees or hips.
- Fatigue in the back muscles due to prolonged effort to maintain an upright posture.
- Possible neurological deficits if the spinal cord or nerves are affected.

Diagnosis

Diagnosis is generally based on the patient's history, especially a history of spinal surgery, along with clinical symptoms. Imaging studies such as X-rays, CT scans, or MRIs are used to assess the spinal alignment and the integrity of previous surgical sites.

Treatment

Treatment options vary based on the severity of the symptoms and the degree of the deformity:

- **Conservative treatment** includes physical therapy to strengthen the back and abdominal muscles, pain management, and sometimes bracing to support the spine.
- **Surgical correction** might be considered for severe cases to restore the spine's natural curvature and relieve symptoms. This can involve complex procedures that adjust the alignment and redistribute forces along the spine.

Managing iatrogenic flatback syndrome requires a comprehensive approach, often involving multiple specialties to ensure optimal outcomes and improve the patient's quality of life.

Retrospective cohort studies

ASD patients without prior spine surgery (PRIMARY) and with prior short (SHORT) and long (LONG) fusions were included. SHORT patients were stratified into modes of failure: implant, junctional, malalignment, and neurologic. Baseline demographics, spinopelvic alignment, offset from alignment targets, and patient-reported outcome measures (PROMs) were compared across PRIMARY and SHORT cohorts. Segmental lordosis analyses, assessing under-, match, or over-correction to segmental and global lordosis targets, were performed by SRS-Schwab coronal curve type and construct length.

Results: Among 785 patients, 430 (55%) were PRIMARY and 355 (45%) were revisions. Revision procedures included 181 (23%) LONG and 174 (22%) SHORT corrections. SHORT modes of failure included 27% implant, 40% junctional, 73% malalignment, and/or 28% neurologic. SHORT patients were older, frailer, and had worse baseline deformity (PT, PI-LL, SVA) and PROMs (NRS, ODI, VR-12, SRS-22) compared to primary patients ($p < 0.001$). Segmental lordosis analysis identified 93%, 88%, and 62% undercorrected patients at LL, L1-L4, and L4-S1, respectively. SHORT patients more often underwent 3-column osteotomies (30% vs. 12%, $p < 0.001$) and had higher ISSG Surgical Invasiveness Score (87.8 vs. 78.3, $p = 0.006$).

Conclusions: Nearly half of adult spinal deformity surgeries were revision fusions. Revision short fusions were associated with sagittal malalignment, often due to undercorrection of segmental lordosis goals, and frequently required more invasive procedures. Further initiatives to optimize alignment in lumbar fusions are needed to avoid costly and invasive deformity corrections.

Level of evidence: IV: Diagnostic: individual cross-sectional studies with consistently applied reference standard and blinding ¹⁾

The article titled *“Defining modern iatrogenic flatback syndrome: examination of segmental lordosis in short lumbar fusion patients undergoing thoracolumbar deformity correction”* (published in *Eur Spine J* on October 23, 2024) offers an ambitious attempt to tackle the complex issue of iatrogenic flatback syndrome in patients undergoing lumbar spinal fusion. However, despite its good intentions, the study is riddled with methodological issues, superficial analyses, and a lack of meaningful clinical application. Here’s a critical breakdown of the paper’s flaws:

1. Lack of Innovation in the Research Question

At its core, the paper attempts to address a well-documented problem—iatrogenic flatback syndrome following spinal fusion surgery—yet it adds little to the existing body of knowledge. The study rehashes what is already known about the undercorrection of segmental lordosis and its link to sagittal malalignment. This is not a novel insight, and the research feels more like a restatement of common spinal surgery complications than a true investigation into new approaches or preventive measures. The lack of innovation makes the study feel redundant in the context of existing literature, where these issues have been explored at length.

2. Poorly Defined Study Population

One of the most significant weaknesses of the paper is the lack of clarity in the definition and stratification of the patient cohorts. While the authors distinguish between *PRIMARY* patients (those without prior surgery) and *SHORT* and *LONG* revision patients, the criteria for these classifications

are vague at best. The *SHORT* and *LONG* categorizations appear arbitrary, and there is no clear explanation of how the authors determined when a fusion counts as *short* or *long*. Without a clear, standardized approach to defining these categories, the comparisons made between groups are dubious and prone to selection bias.

3. Inconsistent Use of Metrics

The study employs several metrics to assess patient outcomes, including baseline deformity parameters (PT, PI-LL, SVA) and patient-reported outcome measures (PROMs), but the application of these metrics is inconsistent and superficial. The authors cite significant differences between the *PRIMARY* and *SHORT* revision groups, but they fail to provide meaningful clinical interpretation of these differences. For example, while they report worse PROM scores in revision patients, there is little to no discussion on what this means in the broader context of patient care or how these findings should influence surgical decision-making. The absence of clinical relevance makes the results feel disconnected from real-world application.

4. Over-reliance on Statistical Significance

The paper places heavy emphasis on statistical significance without adequately discussing the practical implications of these findings. P-values are scattered throughout the results section (e.g., $p < 0.001$ for baseline deformity and PROMs), but the authors make no effort to translate these statistical results into actionable insights for clinicians. The heavy focus on statistical metrics gives the impression that the authors are more concerned with proving significance than with providing a nuanced understanding of how these findings might improve surgical outcomes or guide future research.

5. Underwhelming Segmental Lordosis Analysis

The segmental lordosis analysis—the supposed cornerstone of this study—leaves much to be desired. The authors report that 93%, 88%, and 62% of patients were undercorrected at various lumbar levels (LL, L1-L4, L4-S1), but these numbers are simply presented without any deeper examination. There is no discussion of the reasons behind such a high rate of undercorrection, nor is there any meaningful exploration of how surgeons might address these issues in practice. The paper simply points out the problem but fails to offer any practical solutions or recommendations for improvement. Moreover, the failure to discuss over-correction or optimal correction strategies further weakens the analysis, leaving it half-baked and incomplete.

6. Weak Conclusions and Lack of Practical Recommendations

The study's conclusions are disappointingly weak, given the complexity of the topic. The authors acknowledge that *SHORT* revision surgeries are associated with sagittal malalignment and that undercorrection of segmental lordosis is a major contributing factor, but their recommendations to optimize alignment in lumbar fusions are vague and non-specific. There is no clear takeaway for surgeons, and no concrete proposals for how future research or clinical practice could address the identified shortcomings. This lack of actionable insight renders the study ineffective as a guide for improving outcomes in spinal fusion surgery.

7. Low Level of Evidence

Finally, the paper is classified as Level IV evidence, which already limits its impact. Cross-sectional studies with diagnostic aims and no randomized control inherently provide weak evidence in the field of surgical research. While the authors recognize this limitation, they fail to justify why their study should be considered a meaningful contribution despite its low level of evidence. The use of a large

sample size (785 patients) does little to offset the inherent weaknesses in study design, and the findings must therefore be interpreted with significant caution.

Conclusion: A Flawed Attempt at Addressing an Important Issue

In conclusion, while the study aims to contribute to the understanding of iatrogenic flatback syndrome in revision lumbar fusion patients, it falls short in several key areas. Its lack of innovative thinking, poor methodology, superficial analyses, and weak conclusions all contribute to a final product that is underwhelming and adds little value to the field. The paper serves more as a reminder of the complexities of spinal surgery than as a blueprint for improving patient outcomes. Future studies should focus on providing clearer, more actionable recommendations and addressing the root causes of surgical failures with greater rigor.

This paper may raise awareness of some recurrent problems in spinal surgery, but its lack of practical insights or innovation severely limits its overall contribution to the field.

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