

Analysis of Risk Factors for Adjacent Segment Facet Joint Degeneration Following Lumbar Fusion: A 10-Year Retrospective Cohort Study

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Introduction

To identify 10-year risk factors for proximal adjacent segment (L3/4) facet joint degeneration (FJD) following L4-S1 lumbar fusion.

Materials and Methods

A retrospective analysis was conducted on 65 patients who underwent L4-S1 posterior fusion between 2012 and 2015 with a follow-up of ≥ 10 years. Based on the Weishaupt grading system, the L3/4 segment was categorized into a degeneration group ($n=40$) and a non-degeneration group ($n=25$). Spino-pelvic parameters [lumbar lordosis (LL), pelvic incidence (PI), pelvic tilt (PT), sacral slope (SS), and height of disc (HOD)], cranial facet joint angles, and multifidus FI% were compared. Multivariable logistic regression identified risk factors for FJD, while ODI and JOA scores assessed clinical outcomes.

Results

Baseline characteristics were balanced ($P>0.05$). At the 10-year mark, the degeneration group exhibited significantly higher PI ($58.28^\circ \pm 7.03^\circ$), PT ($19.72^\circ \pm 6.96^\circ$), and cranial facet angles ($59.68^\circ \pm 3.40^\circ$) compared to the non-degeneration group ($P<0.05$). Multivariable regression confirmed that high PI (OR=1.217, 95% CI: 1.042-1.422), facet joint sagittalization (OR=2.035, 95% CI: 1.206-3.434), and severe multifidus FI (OR=1.342, 95% CI: 1.232-1.531) were independent risk factors for long-term FJD. Clinical efficacy (ODI improvement and JOA scores) was significantly lower in the degeneration group ($P<0.05$).

Conclusion

Long-term FJD is primarily driven by high pelvic incidence, facet sagittalization, and paraspinal muscle atrophy. Optimizing sagittal alignment and perioperative muscle training are essential to mitigate adjacent segment degeneration.