

Proximal Sublaminar Bands in Adult Spinal Deformity Surgery: A single centre study with 5-years follow up

Michael Newman (Exeter, Denmark), Olav Tøndevold (København, Denmark), Robert Svardal-Stelmer (København, Denmark), Benny Dahl (Copenhagen, Denmark), Martin Gehrchen (København, Denmark)

Introduction

Proximal junctional kyphosis (PJK) is a common complication in adult spinal deformity (ASD) surgery, with a reported incidence of 20-40%. Its aetiology is not fully understood, but is multifactorial. An important biomechanical contributor is the abrupt transition in the modulus of elasticity between the upper instrumented vertebrae (UIV) and the more cranial unfused spinal segment, creating a focused stress-riser predisposing to failure. Proximal sublaminar bands (PSB) have been proposed as a method to spread the modulus-mismatch over a larger area, creating a more gradual transition. However, supporting evidence is limited. This study reports the radiological and clinical outcomes of ASD patients treated with PSB at 5-years of follow-up.

Materials and Methods

This is a retrospective single-centre cohort study of patients that underwent ASD surgery (defined as >5 instrumented levels with pelvic fixation) with PSB between Jan 2019 and Nov 2020. Follow-up included radiographs and clinical examination. Any mechanical failure and reoperation was recorded, by way of a nationwide registry allowing the identification of patients readmitted anywhere within the Kingdom of Denmark (Faroe islands and Greenland) for any reason. PSB were used at surgeons' discretion and were passed under the UIV+1 lamina, and anchored via a cross-connector at UIV-1. PJK was defined utilising the Gattes criteria, comparing the increase in angulation between the UIV and UIV+2 sagittal Cobb angle in the immediate postoperative period with that of the 2-year and 5-year radiographs. Greater than 10 degrees was determined to be PJK. Primary outcomes include radiological PJK rate and rate of proximal junctional failure (PJF) requiring revision. Secondary outcomes include all-cause revision rate, cause of revision, mortality and the sagittal proximal junctional angle (PJA).

Results

A total of 29 patients were included (20F:9M; mean age 66.7 years, SD 12.0; mean BMI 27.7 kg/m²). 21 patients (72%) had had previous spine surgery. There were 8 de novo ASD surgeries (28%). Mean postoperative PJA was 10.8 degrees (SD 5.5). At 2-year follow-up, mean PJA was 17.1 degrees (SD 9.0). Radiological PJK was identified in 10/29 patients (34%): 3/8 primary (38%) and 7/21 revision (33%). Five patients (17%) underwent surgical revision: 3 (10%) for PJF (mean time to revision 19.7 months), 1 for screw cut-out, and 1 for rod breakage. In the 10 patients with 5-year radiographs, mean PJA was 19.1 degrees (SD 7.8). Five patients (17%) died during follow-up, all from unrelated causes.

Conclusion

In this study of 29 ASD patients treated with PSB, the 2-year radiological PJK rate of 34% is consistent with the wider spinal literature, suggesting that the technique does not substantially reduce radiological PJK rates. However, the PJF rate (10%) and all-cause revision rate (17%) compares favourably to the published literature, suggesting that the sublaminar bands may be contributing to a lower rate of PJF requiring revision. These results support further investigation in prospective, adequately powered studies.