Rod Options to Outcomes: Comparing Sagittal Correction in Pediatric Posterior Spinal Fusion by Rod Size and Material

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INTRODUCTION: Large diameter rods, such as 6.0 mm, are increasingly being used for surgical management of thoracic scoliosis. Our study aims to evaluate the impact of rod diameter and material on sagittal plane correction and reoperation. We hypothesize larger diameter rods would improve the sagittal plane alignment without increasing complications or progression of proximal junctional kyphosis (PJK).

METHODS: Data was reviewed from a multicenter registry of Lenke 1-4 AIS patients enrolled between 2010-2019 with minimum 2-year follow-up. Patients who underwent PSF with 5 common rod types (5.5 or 6.0 cobalt chrome, 5.5 stainless steel, 5.5 or 6.0 titanium rods) were evaluated. Other rod types/diameters were excluded from this study. RESULTS:

1348 patients treated by 29 surgeons at 13 centers met inclusion criteria. 42 had 5.5 titanium rods (3%), 651 patients had 5.5 cobalt chrome (48%), 586 had 5.5 stainless steel (43%), 46 had 6.0 titanium (3%), and 23 had 6.0 cobalt chrome (2%).

Preoperatively there was no difference in curve magnitude or flexibility. Patients that received stiffer rods were older and taller. At 2-years, the 5.5 stainless steel patients had the greatest major curve correction (62.5%) while 5.5 titanium patients had the lowest correction (54.2%) (whole cohort p<0.001).

At 2-year follow-up there was most improved T2-T12 kyphosis in the 6.0 titanium group (+6.5°), and least in the 5.5 titanium group (-3.2°) (p=0.014). T5-T12 changes were greatest in the 6.0 titanium group (+3.9°) and lowest in the 5.5 titanium group (-6.7°) (p<0.001). PJK increased most in the 5.5 titanium cohort (+4.0) and least in the 6.0 cobalt chrome cohort (+0.8) (p<0.001).

Complication rates were highest in the 5.5 stainless steel patients (12.6%) while rates of reoperations were highest in the 5.5 cobalt chrome cohort (N=9, 1.4%).

DISCUSSION AND CONCLUSION: In this retrospective review of patients undergoing PSF with rods of varying size and materials, there was evidence of better restoration of T5-T12 kyphosis with stiffer/larger rods without increased risk of PJK progression.

