Overcorrection in Sagittal Alignment Effect on Optimal Outcomes in Adult Spinal Deformity Patients

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INTRODUCTION:
Age-adjusted sagittal spino-pelvic radiographic thresholds have been established and utilized by spine surgeons to assess postoperative success in adult spinal deformity (ASD) patients. But, recent studies have suggested that overcorrection can benefit some ASD patients without increasing the prevalence of proximal junctional kyphosis (PJK) or proximal junction failure (PJF). Our research wanted to investigate how overcorrection of age-adjusted radiographic thresholds affects future rates of PJF or mechanical failure.
METHODS:
ASD patients, fused from thoracic vertebrae to pelvis, with 2 year (2Y) data were included. Frailty was calculated using Passias ASD-mFI. Good Outcome (GO) at two years was defined as: no major mechanical complications, reoperations, PJF, and thoracic decompensation (>15 degree change from baseline in unfused thoracic kyphosis) and [meeting either: 1) Substantial Clinical Benefit for Oswestry Disability Index (ODI) (change >18.8), or 2) ODI <15 and Scoliosis Research Society Total>4.5]. (36007130) Poor outcomes (PO) were those that did not develop GO. Those that were overcorrected (O) 1 standard deviation (SD1) (O1) in each parameter were evaluated.
RESULTS:
A total of 302 ASD patients met inclusion (age 63±9yrs, 78% F, BMI 27±5kg/m2, CCI 1.9±1.7, ASD-mFI 7.2±4.7). BL radiographic deformity: mean pelvic tilt (PT) 26º, PI 55º, PI-LL 21º, TPA 25º. By 2Y, 62% developed PJK, 11% PJF, 19% TD, and 69% GO. PJK, PJF, and TD was associated with greater correction in SVA, PI-LL, and PT ($p<.05$). O+ was significantly younger, had lower BMI, CCI, and frailty. O+ that were GO+ had significantly lower CCI and frailty. PJF rates were twofold higher in O+ ($p=.02$). Implant malposition and operative complications were higher in PT O+ ($p<.05$). Reoperation due to implant failure had 2x higher rate of PILL being O+ ($p=.06$). Higher CCI was the most significant patient factor that lead to PJF and GO- (PJF OR: 1.4, GO- OR: 1.3, both $p<.05$). O+ had double the likelihood of development of GO- with higher CCI ($p<.05$). Age and BMI were significant predictors for the development of PO in O1 (Age OR: 1.1, BMI OR: 1.2, both $p<.05$). Threshold for CCI in O+ of less than 1 was associated with GO+, for TD: CCI <2, and PJF: CCI <3 (all $p<.05$). Frailty threshold was <2.368 for GO ($p<.05$). Age threshold for PJK was <65.3 ($p<.05$).
DISCUSSION AND CONCLUSION:
Overcorrecting is often necessary in adult spinal deformity to achieve good outcomes. Determination of patient-specific factors and radiographic parameters can lead to better outcomes. Our study suggests that overcorrecting in PT has the greatest impact in achievement of this and should be carefully considered, especially in those that have greater comorbidities.