Durability of Substantial Clinical Benefit in Adult Spinal Deformity Corrective Surgery Patients: A Minimum 5-Year Outcomes Analysis

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INTRODUCTION: Clinical outcomes for adult spinal deformity (ASD) patients have been extensively reported on, however factors associated with sustaining two year (2Y) substantial clinical benefit (SCB) till five year (5Y) remains unclear.
METHODS:
Operative ASD patients fused from at least L1 to sacrum with baseline (BL) and 5-year postop (5Y) data were included. Good Outcome (GO) was defined as: no reoperation, mechanical failure, proximal junctional failure (PJF) based on Lafage criteria, and [meeting either: 1) SCB for Oswestry Disability Index (ODI) (decrease of >18.8), or 2) ODI <15 and Scoliosis Research Society (SRS-22r) Total>4.5]. Thoracic decompensation (TD) was defined as >15° change in unfused thoracic vertebrae. Thoracolumbar inflection point (IP – vertebra level between lumbar lordosis and thoracic kyphosis) was assessed. Outcomes were assessed via ANCOVA adjusting for age, BMI, CCI, frailty, BL deformity (PT, PI, LL, PI-LL, SVA, C7PL,) BL HRQLs, and surgical variations. Multivariable logistic regression controlling for covariates was used to assess factors predictive of GO.
RESULTS:
A total of 330 ASD patients (Age 64.1±9.7yrs, 80% F, BMI 27.7±5.7kg/m^2, CCI: 1.86±1.71, Passias frailty index 7.7±5.0, BL ODI 46±16, BL SRS 2.7±0.6). Demographic, radiographic, surgical, complications in Table 1-3. 42% achieved GO at 2Y (2+) while 47% at 5Y (5+) did. In total, 71% of 2+ cohort attained 5+ (30% of total cohort). In 2- cohort, 29% achieved 5+ (17% of total cohort).
2+ vs. 2-: 2+ had higher rates of postoperative SAAS match, while 2- had worse SVA at 2Y (3.8±5.7cm vs. 1.7±4.2, p<.05).
2- (vs. 2+) complication rates by 2Y: Overall 72% (44%), 6% (0%) pseudarthrosis, 5% (0%) screw fracture, 17% (5%) rod fracture, 17% PJF, 9% (0%) reop or major neurological complications, 36% reoperations (all p<.05).
5+ vs. 5-: 5+ had higher rates of SAAS match at 2Y and 5Y, while 5- had significantly higher frailty and SVA at 2Y and 5Y (p<.05).
5- (vs. 5+) complication rates: 6.2% PJF, 23% (5%) cardiopulmonary complications, 7.4% (3.2%) gastrointestinal complications, 3.5% (1%) adjacent segment disease, 7% (0%) implant failure, 3% neurological complications, 7% pseudarthrosis
Isolating 2+ cohort, assessing 5+ vs. 5-: 5- had IP corrected 1 level cranial (at T12 mid body), and greater SVA deformity at 5Y (p<.05). 5-
Complications in 2+/5- (vs. 2+/5+): 36% (3%) cardiopulmonary complications, 8% (4%) gastrointestinal complications, 9% (5%) infection, 8% (0%) stroke, 5% adjacent segment disease, 12.5% PJF, 15% (1%) rod breakage, 25% thoracic decompensation, 5% reoperation, (all p<.05).
Regaining the level of activity postoperatively was associated with 4x higher odds of maintaining GO from 2Y to 5Y (p<.05).
Fewer restrictions on social life at 2Y and ability for personal care at BL, 2Y and 5Y had the highest likelihood of meeting 5+ (p<.05). The odds of achieving GO at 5Y in 2+ decreased by 47% for each additional comorbidity and decreased by 74% in those that had lower extremity paresthesias at BL (both p<.05). Back step regression adjusting for baseline patient factors and deformity predicted decreased number of levels fused, decreased correction in SVA and increased correction in PI-LL to be predictive of sustaining 2Y GO till 5Y [Levels fused OR: 0.87 (0.76-0.98), p=.028, SVA OR: 0.888 (0.806-0.978), p=.016, PI-LL OR: 1.043 (1.002-1.085), p=.038].
DISCUSSION AND CONCLUSION: Substantial clinical benefit was seen in 47% of patients at 5 years postoperatively. While the majority of patients (71%) at 2 year sustained their clinical outcome at 5 years, major contributors to its loss were more cranial IP adjacent segment changes, and rod fracture. The odds of achieving sustained clinical benefit till 5 years decreased by nearly 50% for each additional comorbidity a patient has. Decreased levels fused along with decreased correction of SVA and increased correction in PI-LL were predictive of optimal sustaining clinical outcomes.