

Durability of Satisfactory Functional Outcomes Following Surgical Adult Spinal Deformity Correction: A 3-Year Survivorship Analysis

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Introduction

Despite reports showing positive long-term functional outcomes following adult spinal deformity(ASD) corrective surgery, it is still unclear which factors may impact the durability of these outcomes.

Methods

Surgical ASD patients(scoliosis=20°, SVA=5cm, PT=25° and/or TK>60°)>18yr with 3-year ODI follow-up, 1-year postop(1Y) ODI scores reaching substantial clinical benefit threshold(SCB,<31.3 points). Patients were grouped: those sustaining ODI at SCB threshold beyond 1Y(sustained functionality) and those not(functional decline). Kaplan-Meier survival analysis determined postop durability of functionality. Multivariate Cox regression assessed the relationship between patient/surgical factors and functional decline, accounting for age, sex, levels fused.

Results

All 166 surgical ASD patients(57±15yr, 75%F, 11±4 lvls; 68% posterior approach, 2% anterior, 31% combined) showed baseline(BL) to 1Y functional improvement(ODI: 35±17 to 14±9,P<0.001), with 100% of patients reaching SCB at 1Y. After 1Y postop, durability of satisfactory functional outcomes was 89% at 2Y postop, and 71% at 3Y. Those sustaining functionality after 1Y had lower BL C2-S1 SVA(sustained: 61 vs deteriorated: 88mm,P=0.040) and T1 slope(26° vs 31°,P=0.022), and at 1Y postop, had lower thoracic kyphosis(40° vs 47°,P=0.035). From 1Y-3Y postop, patients who sustained functionality showed smaller alignment changes: PI-LL(0.4° vs 2.8°,P=0.020), SVA(0.5mm vs 15.5,P=0.022), TS-CL(2.7° vs 7.0°,P=0.017), cSVA (0.4mm vs 5.0,P=0.002). Those sustaining functionality beyond 1Y were also younger(55yrs vs 64,P<0.001), less frail at 1Y(mFI 1.4 vs 2.0,P<0.001), had lower BMIs(25 kg/m² vs 28,P=0.010), and lower rates of reoperation past 1Y(9% vs 23%,P=0.011), BL osteoporosis(9% vs 23%,P=0.019), heart disease(6% vs 21%,P=0.004), hypertension(28% vs 54%,P=0.001), and lung disease(1% vs 6%,P=0.040). Multivariate analysis showed lung disease(HR:4.8 [1.4-16.4]), 1Y frailty(HR:1.4 [1.1-1.9]), and posterior approach(HR:2.6 [1.2-5.8]) as associated with shorter time to functional decline.

Learning Objectives

Participants should be able to describe factors contributing to functional decline following ASD-corrective surgery.

Conclusions

71% of surgical ASD patients maintained satisfactory functional outcomes by 3-years postop. Those failing to sustain satisfactory functionality showed the greatest functional decline at 3-years postop. Frailty, comorbidity burden, and surgical approach all affected durability of functional gains.