

# Adult spinal deformity surgery outcome

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The outcomes of adult spinal deformity surgery can vary depending on various factors, including the specific condition being treated, the severity of the deformity, the patient's overall health, and the surgical techniques used. Here are some general aspects to consider regarding the outcomes of adult spinal deformity surgery:

**Improvement in Spinal Alignment:** The primary goal of surgery is to restore a more balanced and aligned spinal column. This can help alleviate symptoms such as pain, difficulty in maintaining proper posture, and problems with mobility. Surgery can correct the curvature, rotation, and overall alignment of the spine, leading to improved spinal balance.

**Pain Reduction:** Adult spinal deformities often cause chronic back pain and discomfort. Surgery can help alleviate pain by decompressing compressed nerves, stabilizing the spine, and reducing stress on the surrounding structures. Studies have shown that many patients experience significant pain relief following surgery, leading to an improved quality of life.

**Functional Improvement:** Surgery can enhance the patient's ability to perform daily activities and improve their functional capacity. By correcting spinal alignment, individuals may experience improved mobility, better balance, and an increased ability to participate in physical activities.

**Neurological Improvement:** In cases where spinal deformity is causing nerve compression or spinal cord compression, surgery can help relieve the pressure on neural structures. This can lead to improvements in neurological function, such as reduced numbness, weakness, or other symptoms associated with nerve compression.

**Psychological Well-being:** Adult spinal deformities can have a significant impact on a person's self-image, body image, and overall psychological well-being. Corrective surgery can improve body image, enhance self-esteem, and reduce psychological distress associated with the deformity.

**Potential Risks and Complications:** Like any surgical procedure, adult spinal deformity surgery carries some risks and potential complications. These may include infection, bleeding, blood clots, implant-related problems, nerve damage, and the potential need for revision surgery. The overall success of the surgery and the extent of the outcomes will depend on various individual factors.

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A prospective multicenter analysis demonstrated that operative ASD treatment provided significant improvement in health-related quality of life at a minimum 3-year follow-up (mean 4.1 years), suggesting that the benefits of surgery for ASD remain durable at longer follow-up. These findings should prove useful for counseling, cost-effectiveness assessments, and efforts to improve the safety of care <sup>1)</sup>

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The Scolio-RISK-1 study enrolled 272 ASD patients undergoing surgery from 15 centers. Inclusion criteria was Cobb angle of  $>80^\circ$ , corrective osteotomy for congenital or revision deformity, and/or 3-column osteotomy. The following PROs were measured prospectively at intervals up to 5-years postoperative: ODI, SF36-PCS/MCS, SRS-22, NRS back/leg. Among patients with 5-year follow-up, comparisons were made from both baseline and 2-years postoperative to 5-years postoperative. PROs were analyzed using mixed models for repeated measures.

**Results:** Seventy-seven patients (28.3%) had 5-year follow-up data. Comparing baseline to 5-year data among these 77 patients, significant improvement was seen in all PROs: ODI (45.2 vs. 29.3,  $P < 0.001$ ), SF36-PCS (31.5 vs. 38.8,  $P < 0.001$ ), SF36-MCS (44.9 vs. 49.1,  $P = 0.009$ ), SRS-22-total (2.78 vs. 3.61,  $P < 0.001$ ), NRS-back pain (5.70 vs. 2.95,  $P < 0.001$ ) and NRS leg pain (3.64 vs. 2.62,  $P = 0.017$ ). In the 2 to 5-year follow-up period, no significant changes were seen in any PROs. The percentage of patients achieving MCID from baseline to 5-years were: ODI (62.0%) and the SRS-22r domains of function (70.4%), pain (63.0%), mental health (37.5%), self-image (60.3%), and total (60.3%). Surprisingly, mean values ( $P > 0.05$ ) and proportion achieving MCID did not differ significantly in patients with major surgery-related complications compared to those without.

**Conclusions:** After complex ASD surgery, significant improvement in PROs were seen at 5-years postoperative in ODI, SF36-PCS/MCS, SRS-22r, and NRS-back/leg pain. No significant changes in PROs occurred during the 2 to 5-year postoperative period. Those with major surgery-related complications had similar PROs and proportion of patients achieving MCID as those without these complications <sup>2)</sup>.

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**Coronal balance** is a major factor impacting the outcomes in **adult spinal deformity surgery** (ASD). The **Obeid-coronal malalignment classification** (O-CM) has been proposed to improve the **coronal**

**alignment** in **adult spinal deformity surgery**. The aim of the study of Baroncini et al. was to investigate whether a postoperative coronal **malalignment** (CM) < 20 mm and adherence to the O-CM classification could improve surgical outcomes and decrease the rate of mechanical failure in a cohort of ASD patients.

In this multicenter retrospective analysis of prospectively collected data on all ASD patients who underwent surgical management and had a preoperative CM > 20 mm and a 2-year follow-up. Patients were divided into two groups according to whether or not surgery had been performed in adherence to the guidelines of the O-CM classification and according to whether or not the residual CM was < 20 mm. The outcomes of interest were radiographic data, rate of mechanical complications, and Patient-Reported Outcome Measures.

At 2 years, adherence to the O-CM classification led to a lower rate of mechanical complications (40 vs. 60%). A coronal correction of the CM < 20 mm allowed for a significant improvement in SRS-22 and SF-36 scores and was associated with 3.5 times greater odds of achieving the minimal clinically important difference for the SRS-22.

Adherence to the O-CM classification could reduce the risk of mechanical complications 2 years after ASD surgery. Patients with a residual CM < 20 mm showed better functional outcomes and 3.5 times greater odds of achieving the MCID for the SRS-22 score <sup>3)</sup>.

**Elderly patient** outcomes were inconsistent in the published studies. Overall, most elderly patients obtained favorable outcomes with low operative mortality following surgery for adult spinal deformity <sup>4)</sup>

<sup>1)</sup>

Elias E, Bess S, Line B, Lafage V, Lafage R, Klineberg E, Kim HJ, Passias PG, Nasser Z, Gum JL, Kebaish K, Eastlack R, Daniels AH, Mundis G, Hostin R, Protosaltis TS, Soroceanu A, Hamilton DK, Kelly MP, Gupta M, Hart R, Schwab FJ, Burton D, Ames CP, Shaffrey CI, Smith JS; International Spine Study Group. Outcomes of operative treatment for adult spinal deformity: a prospective multicenter assessment with mean 4-year follow-up. *J Neurosurg Spine*. 2022 Apr 29;1-10. doi: 10.3171/2022.3.SPINE2295. Epub ahead of print. PMID: 35535835.

<sup>2)</sup>

Zuckerman SL, Cerpa M, Lenke LG, Shaffrey CI, Carreon LY, Cheung KMC, Kelly MP, Fehlings MG, Ames CP, Boachie-Adjei O, Dekutoski MB, Kabeaish KM, Lewis SJ, Matsuyama Y, Pellisé F, Qiu Y, Schwab FJ, Smith JS; AO Spine Knowledge Forum Deformity and SRS Scolio-RISK-1 Study Group. Patient-Reported Outcomes After Complex Adult Spinal Deformity Surgery: 5-Year Results of the Scolio-Risk-1 Study. *Global Spine J*. 2022 Oct;12(8):1736-1744. doi: 10.1177/2192568220988276. Epub 2021 Feb 9. PMID: 33557622; PMCID: PMC9609523.

<sup>3)</sup>

Baroncini A, Frechon P, Bourghli A, Smith JS, Larrieu D, Pellisé F, Pizones J, Kleinstueck F, Alanay A, Kieser D, Cawley DT, Boissiere L, Obeid I; European Spine Study Group (ESSG). Adherence to the Obeid coronal malalignment classification and a residual malalignment below 20 mm can improve surgical outcomes in adult spine deformity surgery. *Eur Spine J*. 2023 Jul 2. doi: 10.1007/s00586-023-07831-0. Epub ahead of print. PMID: 37393421.

<sup>4)</sup>

Drazin D, Shirzadi A, Rosner J, Eboli P, Safae M, Baron EM, Liu JC, Acosta FL Jr. Complications and outcomes after spinal deformity surgery in the elderly: review of the existing literature and future directions. *Neurosurg Focus*. 2011 Oct;31(4):E3. doi: 10.3171/2011.7.FOCUS11145. PMID: 21961866.

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