

Risk Factors of Post-operative Neurologic Decline in Spinal Deformity Surgery

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Disclosures

- ▶ Nuvasive – Consulting, Royalties
- ▶ K2M – Consulting, Royalties

Overview

- ▶ Complex deformity surgery associated with high complication rate
- ▶ Loss of neurologic function is one of the most significant complications after complex ASD surgery
- ▶ Reported incidence 0-10%
 - ▶ Variability due to
 - ▶ Incomplete follow-up
 - ▶ Heterogeneous cohorts and procedures
 - ▶ Non-standardized outcome measures
- ▶ Limited prospective data

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Incidence and Risk Factors of Neurological Deficits of Surgical Correction for Scoliosis

Analysis of 1373 Cases at One Chinese Institution

Yong Qiu, MD, Shoufeng Wang, MD, Bin Wang, MD, Yang Yu, MD, Fang Zhu, MD, and Zehang Zhu, MD

- ▶ Large single center study
- ▶ Retrospective database review
- ▶ 1,373 scoliosis correction surgeries
- ▶ 1.89% new neurologic deficits
- ▶ Risk factors identified
 - ▶ Congenital scoliosis
 - ▶ Scoliosis with hyperkyphosis
 - ▶ Combined anterior/posterior surgery
 - ▶ Cobb > 90 °
 - ▶ Revision surgery

SRS M&M Committee; Spine 2011


- ▶ Largest review of new neurologic deficits after 108,419 spinal procedures
- ▶ 1,064 = ~1%
- ▶ Significant limitations of study
- ▶ Risk factors identified
 - ▶ Osteotomies for correction of scoliosis or kyphosis >80°
 - ▶ 3-CO
 - ▶ Direct manipulation of neurologic elements
 - ▶ Acute change in canal alignment and shape

The Role of Osteotomies

- ▶ A number of retrospective studies have addressed the role of spinal osteotomies for deformity in causing new neurologic deficits.
 - ▶ Suk – 70 adults VCR, 8.6% new deficits (incl. 2 cord and 4 root)
 - ▶ Buchowski – 108 adults PSO for fixed deformity, 11%
 - ▶ Lu – 54 single stage posterior VCR, 9.3%
 - ▶ Ma – patients with pre-op deficit had higher risk of decline
 - ▶ Xie
 - ▶ Kim
 - ▶ Charosky

Wang, XB; Spine 2016

- ▶ Deformity Angular Ratio (DAR)
 - ▶ Cobb angle/# of levels involved
 - ▶ Describes the severity of spinal deformity
 - ▶ Predicts the risk of neurologic deficit in posterior VCR surgery

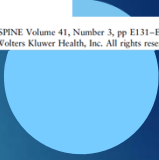


Delayed Postoperative Neurologic Deficits in Spinal Deformity Surgery

Joshua D. Auerbach,* Kristin Kean,¹ Andrew H. Milby,² Kenneth J. Paonessa,³ John P. Dormans,⁴ Peter O. Newton,⁵ Kit M. Song,⁶ and Baron S. Lonner^{1†}

SPINE Volume 41, Number 3, pp E131-E138 © 2016 Wolters Kluwer Health, Inc. All rights reserved.

- ▶ Survey of SRS members (36% response rate)
- ▶ 1/10,000 rate of DELAYED post-op neurologic deficits
 - ▶ Hours or days later
- ▶ Postulated explanations
 - ▶ Delayed ischemic cord event
 - ▶ Cord stretch
 - ▶ Post-op hypotension and/or anemia
 - ▶ Compressive lesion
 - ▶ Instrumentation related
 - ▶ Epidural hematoma



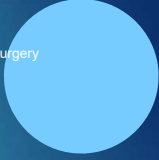
Neurologic Outcomes of Complex Adult Spinal Deformity Surgery

Spine 41(3):E131-E138, 2016

Results of the Prospective, Multicenter Spinal Deformity Study

Lawrence G. Lenke, MD,¹ Michael G. Fehring, MD, PhD,¹ Christopher J. Shaffner, MD,¹ Lawrence M. Chutkan, MD,² Tami Kawanishi, MD,³ Scott B. DeLuca, MD,⁴ Joseph J. Schaub, MD,⁵ Christopher Bessho-Edge, MD,⁶ Richard A. Kohnen, MD,⁷ Christopher P. Ames, MD,⁸ Irving L. Lee, MD,⁹ Nicholas M. Mendenhall, MD,¹⁰ Henry J. Smith, MD,¹¹ James W. Winkler, MD,¹² James P. Ferguson, MD,¹³ Stephen E. Brock, MD,¹⁴ and Sigurd H. Berven, MD¹⁵


- ▶ Prospective, international, multicenter study of complex ASD surgery
- ▶ 272 patients, ages 18-80; deformity apex C7-L2
- ▶ 2 groups: Normal (75%) vs. Abnormal (25%) pre-op LEMS
- ▶ Inclusion (any of the following):
 - ▶ Cobb >80 (29%)
 - ▶ 3-CO (76%)
 - ▶ Revision requiring osteotomy (61%)
 - ▶ Congenital deformity (5%)
 - ▶ Myelopathy due to deformity (12.5%)
 - ▶ Ossification of LF or PLL (2%)



Scoli-RISK-1 Study

Lenke; Spine 2016

- ▶ Neurologic Status (LEMS)
 - ▶ At discharge 23% worsened 13% improved
 - ▶ At 6 weeks 18% worsened 16% improved
 - ▶ At 6 months 11% worsened 21% improved
- ▶ Conclusion: complex ASD can restore neurologic function, but a significant portion experienced post-op decline.
- ▶ Who is at greatest risk, though?




Incidence and risk factors of postoperative neurologic decline after complex adult spinal deformity surgery: results of the Scoli-RISK-1 study

Fehlings, et. al.; Spine 2018

Risk factor analysis

10 variables/Univariable analysis

- ▶ Age
- ▶ Previous spine surgery
- ▶ Pre-operative neuro deficit
- ▶ Coronal DAR
- ▶ Sagittal DAR
- ▶ Approach (Ant/post vs post only)
- ▶ # levels involved
- ▶ Lumbar level osteotomy
- ▶ 3CO
- ▶ EBL




Scoli-RISK-1 Study

Fehlings, et. al.; Spine 2018

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Scoli-RISK-1 Study

Fehlings, et. al.; Spine 2018

Risk factor analysis


Multivariate Logistic Regression

- ▶ Older age; OR=1.5/increase 10 years
- ▶ Larger coronal **DAR**; OR=1.1/1unit
- ▶ Lumbar osteotomy; OR=3.3



Conclusions

- ▶ Risk factors to weigh heavily when contemplating deformity surgery
 - ▶ Age
 - ▶ Degree of deformity
 - ▶ Will the plan require osteotomies



Thank you

