

Multi-Center Assessment of Neurological Changes in Distraction-Based Surgery for Early-Onset Scoliosis

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- Some instrumentation and / or techniques shown may not be approved for use in the US by the FDA but are approved for use in the UK

Introduction

- Growing rod surgery for early-onset scoliosis has a high rate of complications
- The first report of neurological complications in a large series was reported in *Spine*, 2009.

Spine (Phila Pa 1976). 2009 Aug 15;34(18):1952-5. doi: 10.1097/BRS.0b013e3181afe869.

Neurologic risk in growing rod spine surgery in early onset scoliosis: is neuromonitoring necessary for all cases?

Sankar WN¹, Skaggs DL, Emans JB, Marks DS, Dormans JP, Thompson GH, Shah SA, Sponseller PD, Akbarnia BA.

Introduction

- **Skaggs, Emans, Marks et al.**
 - Multicenter study
 - 782 growing rod surgeries in 252 patients
 - 73% of procedures had intra-op neuromonitoring (IOM)
 - IOM alerts:
 - 2 index surgeries (2/231, 0.9%)
 - 1 revision (1/116, 0.9%)
 - 1 lengthening (1/222, 0.5%)
 - *Lengthening case had IOM alert at index surgery*
 - 1 neurological injury (1/782, 0.1%)
 - Pedicle screw placement during revision
 - Resolved in 3 months

Introduction

- Skaggs, Emans, Marks et al.
- **Authors' conclusions:**
 - *“The question may be raised as to whether IOM is necessary for simple lengthenings... caution should be maintained when interpreting our results as anecdotal cases of neurologic changes from simple lengthenings do exist outside of this series.”*

Study Aim

- Determine if incidence and patterns of neurological events have changed over the past 7 years using the same database with a larger series of patients

Methods

- Multicenter EOS database
- Inclusion criteria
 - Primary traditional growing rod surgery
 - No minimum follow up
- **Neurological event defined as:**
 - **IOM alert or ‘new’ neurological deficit**
- All sites with qualified patients were surveyed to provide supplemental information
(data has been updated since original abstract submission)

Results

- Database query identified
 - 748 growing rod patients
 - 5,793 surgeries (782 in previous published study)
 - *782 index surgeries (some were staged)*
 - *3,536 lengthenings*
 - *1,201 revisions*
 - *274 final fusions*

Results

- 40 patients (5%) had 47 neurological events

	n	Incidence
Index Surgery	11 / 782	1.4%
Lengthening	11 / 3,536	0.3%
Revision	10 / 1,201	0.8%
Final fusion	10 / 274	3.6%
Post Discharge	5	
Total	47	

Results

- Current study vs. Skaggs, et al.

	n	Current Study	Skaggs, et al.
Index Surgery	11 / 782	1.4%	0.9%
Lengthening	11 / 3,536	0.3%	0.5%
Revision	10 / 1,201	0.8%	0.9%
Final fusion	10 / 274	3.6%	N/A
Post Discharge	5		

Results: IOM Alert Types

	IOM Alert	IOM Alert Type
Index Surgery	9	7 MEP only; 1 SSEP only; 1 clonic activity/EMG
Lengthening	10	5 MEP+SSEP; 5 MEP only
Revision	8	1 MEP+SSEP; 5 MEP only; 1 SSEP only; 1 unclear
Final fusion	7	1 MEP+SSEP; 4 MEP only; 1 SSEP only; 1 EMG
TOTAL	34	<i>7 MEP+SSEP; 21 MEP only; 3 SSEP only; 2 EEG/EMG; (1 IOM type unclear)</i>

Results: Neurological Deficits

	Deficit Type
Index surgery	2 brachial plexus; 1 lower extremity paraplegia; 3 lower extremity weakness (1 with neurogenic bladder)
Lengthening	1 lower extremity weakness; 1 painful ambulation
Revision	2 lower extremity weakness (1 with neurogenic bladder); 1 brachial plexus; 1 abnormal gait
Final fusion	6 lower extremity weakness; 1 neurogenic bladder

Results: Neurological Deficits

	Surgeon's Suspected Cause of Deficit
Index surgery	2 patient positioning 2 halo traction 2 abnormal spinal cord
Lengthening	2 over distraction? (unknown)
Revision	1 rod placement 2 pedicle screw placement 1 patient positioning 1 bone tap
Final fusion	1 rod placement 2 pedicle screw placement 1 CSF leak 1 unknown cause

Results: Neurological Deficits

	Resolution
Index surgery	4 full resolution 2 partial resolution
Lengthening	1 full resolution 1 partial resolution
Revision	2 full resolution 2 partial resolution
Final fusion	6 full resolution 1 partial resolution
13 full resolution 6 partial resolution	

Results: Neurological Deficits

- **Post discharge events**

Neuro Deficit	2 Upper Extremity sensation 2 Lower Extremity weakness (1 with neurogenic bladder) / 1 paraplegia
Suspected Cause	3 proximal pedicle screw migration 1 curve progression 1 unknown cause
Resolution	3 full resolution 2 partial resolution

Conclusions

- Recommend monitoring with MEP and SSEP for all 'growth friendly' procedures performed under GA - including lengthenings
- Lengthenings can result in neurological deficit
 - 1 patient only partially resolved
- Majority of events related to the final fusion (3.6%)