



Perioperative Neurologic Injury Associated with Rib-Distraction Surgery

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Children's Spine Study Group



Disclosures

- Ron El-Hawary
 - Consultant: Depuy-Synthes, Medtronic, Halifax Biomedical
 - Institutional Research Support: Depuy-Synthes, Medtronic
- Youssef Mandourah Nothing to disclose
- Luke Gauthier
 Nothing to disclose
- Alex Soroceanu Nothing to disclose
- Amy MacIntosh Nothing to disclose

Introduction

- Neurologic injury can be associated with growth friendly spine surgery.
 - Spine-based neurologic complications (Sankar'09)
 - 0.1% Clinical Injury
 - 0.9% Implant neuromonitoring changes
 - 0.9% Exchange neuromonitoring changes
 - Rib-based neurologic complications (Skaggs'09)
 - 1.5% Implant clinical injury
 - 1.3% Exchange clinical injury
 - (original FDA-IDE data)

Purpose

- To define the rates of neurologic injury associated with contemporary rib-based surgery.
- To determine if pre-operative diagnosis organized by the Classification for Early-Onset Scoliosis (C-EOS) affects these rates.



Methods



- Children's Spine Study Group database
 - Retrospective review
 - 2004–2012
 - Inclusion:
 - Rib-based
 - Clinical Neurologic Injuries + Neuromonitoring Changes
 - Exclusion
 - Spine-based

Results



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Demographics Database				
Patient #	524 =			
Age (mean)	5.7y	→	C-EOS	
Scoliosis(mean)	68°		Congenital	222
Kyphosis (mean)	48°		Neuromuscular	163
			Syndromic	63



Neurologic Injuries (1.7%)

Demographics Injury Patients	N=9
Age (mean)	4.1y
Scoliosis (mean)	66°
Kyphosis (mean)	44°

Initial implantation:	8
Lengthening:	0
Exchange:	1

- Brachial plexus: 5
- Lower Extremity: 1
- Re-operations: 4
- Full resolution: 7

Neurologic Injuries (1.7%)

C-EOS	Neurologic Injury	Total	Rate
Overall (N)	9	524	1.7%
Congenital	8	222	3%
Neuromuscular	1	163	0.6%
Syndromic	0	63	0%
Idiopathic	0	67	0%



Chi-Square P=<0.05*

Additional Diagnoses (6 of 9)

- Neural Axis
 - 4 occurrences
- Congenital Intra-Spinal
 - 2 occurrences
- Congenital Extra-Spinal
 - 4 occurrences



Discussion

- Strengths
 - Large numbers
 - C-EOS
- Limitations:
 - Pitfalls of database
 - Heterogeneous definition



Discussion

- Sankar et al (Spine-based)
 - Clinical injury rate 0.1%
- Skaggs et al. (Rib-based)
 - Clinical: Primary 1.5%, exchange 1.3%
 - Monitoring changes: Primary 1.5%, lengthening 0.08%
- This study (Rib-based) 1.7%
 - Lower extremity (SCI?) 0.2%
 - Brachial plexus 0.95%

Neuromonitoring change 0.38%

Discussion

- Secondary Diagnosis
 - Neural axis
 - Extra-spinal anomalies (eg. Sprengel's)
 - 10% from single center study
 - Joiner et al. 2013 JBJS
 - Congenital Kyphosis
 - Known higher risk for SCI



Conclusions

- Neurologic Injury rate with rib-based surgery
 1.7%
- C-EOS is predictive of neurologic injury
 Congenital greatest risk (3%)
- Additional secondary diagnosis
 risk of neurological injury
 - 3.8% vs. 0.82% without secondary diagnosis



