

TETHERED CORD RELEASE AND CONCURRENT GROWING ROD IMPLANTATION: IS IT SAFE?

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Disclosure Statement

- ◎ Suken A. Shah, MD – Depuy Spine
- ◎ Jon E. Oda, MD – no financial disclosure
- ◎ William G. Mackenzie, MD – no financial disclosure

Introduction

- ◎ Historically, patients with scoliosis associated with a tethered cord were treated in a staged fashion.
- ◎ However, modern neurophysiologic monitoring techniques have greatly increased the margin of safety.
- ◎ Now with current neuromonitoring techniques, tethered cord release and concomitant growing rod implantation can be performed safely.

Materials and Methods

- ⦿ Retrospective case series with comparison control group
- ⦿ Tethered cord defined as a conus lying distal to the caudal aspect of the L2
- ⦿ Exclusion criteria – multiple neural axis abnormalities, absence of distal neurologic function (ie. spina bifida).
- ⦿ We identified 3 patients meeting criteria.

Surgical Technique

- ◎ Total intravenous anesthesia protocol
- ◎ SSEPs, TcMEPs, spontaneous and triggered EMG
- ◎ Neurosurgical release of tethered cord via L5-S1 laminectomy

Surgical Technique

- ◎ Dual growing rod instrumentation placed submuscularly with proximal and distal pedicle screw fixation
- ◎ Slow and gradual distraction of growing rod instrumentation under constant neurophysiologic surveillance
- ◎ Repeat lengthenings every 4-6 months

Results

	Age at surgery	Type of scoliosis	Comorbidities	Preoperative Neurologic Baseline	Surgical Procedures	Neuromonitoring	EBL	Preoperative Curve Magnitude	Immediate Postoperative Curve Magnitude	Postoperative Complications
#1	7	infantile	Partial sacral agenesis, VATER, TEF, developmental delay, hearing loss, GERD, asthma, short stature	Clinically no focal deficits	Tethered cord release via L5 laminectomy, PSF T3-T4 and L2-L3 with dual growing rod insertion	baseline SSEP with decreased posterior tibial nerve stimulation, normal baseline TcEMG, no change during procedures	80	90 T5-L2	36 T5-L2 (60% correction)	SIADH, resolved spontaneously
#2	4	Infantile	Unknown skeletal dysplasia, cervical stenosis status post C1 laminectomy	Neurogenic bladder, mildly increased tone left lower extremity	Tethered cord release via L5 laminectomy, PSF T3-T4 and L4-L5 with dual growing rod insertion	Poor SSEPs but functioning bilateral TcMEP, no change during procedures	125	90 T11-L3	53 T11-L3 (41% correction)	none
#3	6	Congenital, mixed type	Polycystic kidney, hip dysplasia treated previously in a pavlik, restrictive lung disease, hemiatrophy	Clinically no deficits	Tethered cord release via S1 laminectomy, PSF T2-T3 and L3-L4 with dual growing rod insertion	Baseline SSEP with decreased posterior tibial and ulnar nerve responses, normal TcMEP, no change during procedures	240	93 T7-L3	54 T7-L3 (42% correction)	none

Comparison Control Group

- ◎ 7 patients identified from the Growing Spine Study Group who had a tethered cord release and growing rod instrumentation for EOS
- ◎ All 7 patients had staged surgery
- ◎ Average immediate postop curve correction of 35.1 degrees (46.2% correction)

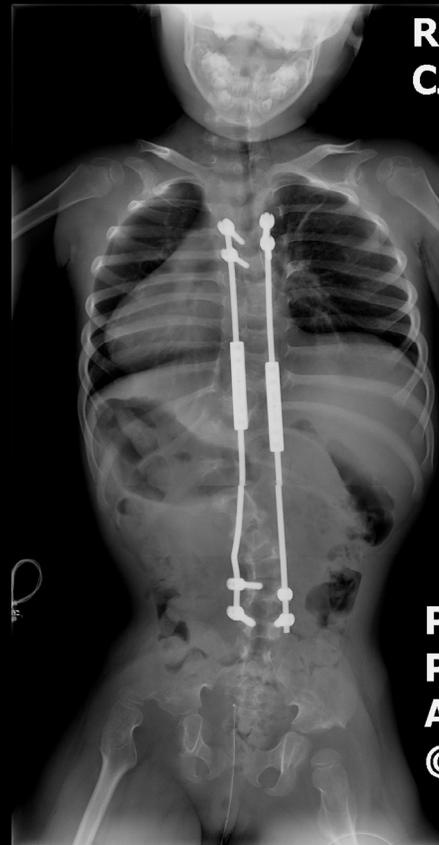
Patient #2

AP SUPINE



Preoperative supine AP
(90 degrees)

**RIGHT
CJP**



**PORTABLE
POST OP
AP SUPINE
@ 15:40**

Postoperative supine AP (53
degrees)

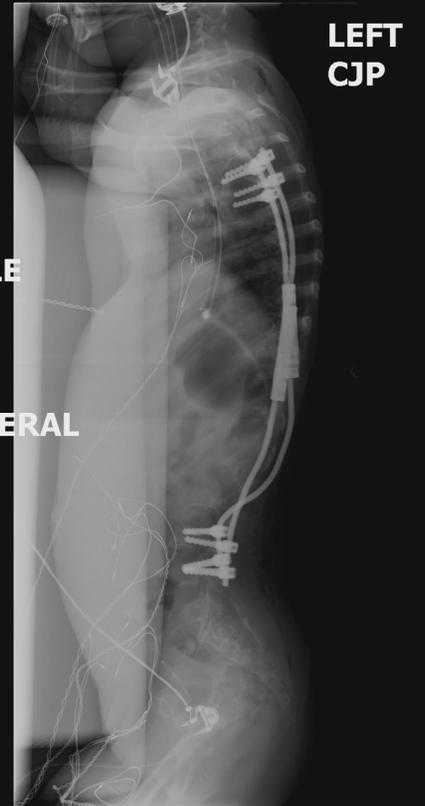
Patient #2

RIGHT
LATERA
RECUMBENT
EL/TM



Preoperative lateral (note thoracolumbar kyphosis)

PORTABLE
POST OP
PRONE
X-TABLE
LEFT LATERAL
@ 15:40



Postoperative lateral view

Discussion

◎ Staged Surgery??

- The difficulty of the surgical procedures
- Inability to intraoperatively detect neurologic compromise
- Theoretical concern of a “double insult” to the cord has led surgeons in the past to recommend staged neurosurgical and orthopaedic surgery.

Discussion

- ◎ Disadvantages of staged surgery
 - Multiple anesthetic exposures
 - Risk of infection
 - Patient comfort
 - Need for repeat surgical dissection in the region of a previous laminectomy

Conclusion

- ◎ We have performed 3 concomitant tethered cord release and growing rod insertion with an average correction of 43 degrees (48%), with no neurologic complications.
- ◎ Modern neurophysiologic monitoring with SSEPs, tcMEPs, trEMG is essential.
- ◎ We recommend slow and gradual distraction over several minutes.
- ◎ Further prospective studies are needed to better define efficacy and safety.