2007 ICEOS Debate: VEPTR vrs Growing Rods for Congenital Scoliosis

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Potential Conflict of Interest Disclosure

- I was offered a bribe by a prominent GR surgeon to state that growing rods are better than VEPTR
- I returned it to the donor and notified the authorities



VEPTR Growing Rod





"Hybrid" Rib to Spine/Pelvis



Spine to Spine

Both are placed longitudinally
Both distract
Both are lengthened periodically



There is no Debate



Indications

 VEPTR treats Thoracic Insufficiency Syndrome



 Growing Rods treat "lateral curvature" of the spine





Surgical approaches are radically different

VEPTR

- Acute thoracic reconstruction
 - Expand and lengthen the constricted hemi-thorax
 - VEPTR is then added to maintain correction
 - Side effect is correction of scoliosis
 - No compromise in thoracic spine growth : even the bars grow

Growing Rods

- No thoracic reconstruction
 - The rods must do all of the work
- The spine is the corner of the "thoracic room"
 - How well can straightening the corner help the rest of the room?
- At least 25% of the thoracic spine is fused proximally







Outcome Measures



Cobb Angle Correction, SAL











Results: Congenital Scoliosis and Fused Ribs

Avg. preop curve 74° (35 - 140°) (avg. progression 15° / yr)

Avg. post op curve 49° (4 - 84°)
 Avg. 25° correction

Avg. thor. spine height growth 0.71 cm/yr
Avg. increase thor. width 0.51 cm/yr

-Campbell, Smith, JBJS, 2004



Space Available for Concave Lung

All Pts- Avg. Space Available for Lung Ratio





rigid 79 cobb 66 8+7 yo

Campbell , Smith et al., JBJS, 2004



Wind Swept Deformity of the thorax

VEPTR stabilizes transverse plane deformity - Campbell, et l, JBJS, 2004







Emans, et al. Spine, 2005

Lung volume by CT:Pre-op: $369 \pm$ 279 cm3First Post-op $394 \pm 289 \text{ cm3}$ Last Follow-up: $736 \pm 462 \text{ cm3}$

Lung on side of VEPTR increased: 219% ± 306% (range, 13%– 1,160%)

Lung not on side of the VEPTR increased: 147% ± 176% (range, 24%–731%)

The ratio of right to left lung volume compared with a normal value of 0.85 improved by 13%















Avg. Predicted Normal Vital Capacity atfollow-up:Avg. % Predicted Normal Vital Capacity at F/U

80 70 60 58 % 50 % Normal 44 % 40 36 % 30 20 >2 y/o w/ > 2 y/o <2 y/o spine fusion 10 p < 0.001 ns 0 error bars =+/- 1 SD osa Cumuren s mospital ₹/\`

< 2 yr

>2yr

>2 yr w fusion

-Campbell, et al JBJS 2004



Histology - Mehta, Snyder et al. + Disease Control **Normal Control VEPTR Treated 200x** 200x 200x



400x



Growing Rod Colleagues: Please Show us the Data



Iliac Crest S-hooks to ribs









VEPTR/ Growing Rod Hybrid





Children's Hospital

Complications



Growing Rods



San Antonio VEPTR device complications All patients (n=220), 1989-2004 San Antonio Klemme et al. Tello f/u 6 yrs **3.1 yrs** 4.75 yrs $0.09 \operatorname{mig/yr} 0.1 \operatorname{mig/yr}$. 0.029 mig/yr Migration index 27%31% Percentage pts 14% **3.2 yrs** ■ Time ? 3.3%Infect rate/proc 1.5% 5.3% 8.5% 4.5%Skin slough 13.6%- JBJS, 2007 **Christus Santa** Rosa **Children's Hospital**

Complications of Dual Rod Technique in EOS

48 pts

- 60% complication rate
- Increased Complications: 67 months f/u vrs 46 months
- Infantiles: 8/9 had complications

- Akbarnia, et al. SRS 2006



SA VEPTR Neurological Problems 1987-2007 n > 270

- UE's
 - Handful of transient brachial plexopathies
- LE's
 - 1 pt: Monoplegia, transient, canal violation
 - 1 pt: Severe Congenital kyphosis, paraplegia, traction injury
 - 1 Pt: Transient "paraplegia", VP shunt problem ?

(predicted neurologic injury in this population - 10% -personal communication, Dean MacEwen)



A final thought

Do Growing Rods really "grow" ?



-Growth Plates ? -Appositional Growth ?



A suggestion



"Periodically Lengthened" in Out Patient Surgery" Rods

PLOPS Rods





Thank You!



