Casting in Early Onset Spinal Deformity

When I Do and When I Don’t

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Goals of Treatment for EOS

- Control curve progression
- Optimize pulmonary function
- Maintain spinal growth, motion
- Limit complications
- Facilitate care of the patient
- Improve quality of life
Casting

- Re-emerging as treatment for EOS
- Why?
- Morbidity of early fusion
- Complications of TGR
- Search for something better
- Definitive treatment or delaying tactic?
Casting

- Cast is applied using the elongation, derotation and flexion technique described by Cotrel and Morel.
- Anterior and posterior windows are made in the cast to allow abdominal/chest expansion and curve derotation as described by Mehta.
- d’Astous and Sanders, JPO 2009.
Prospective study of 136 children with progressive IIS treated under 4 yrs, f/u 9 yrs.

“Scoliosis can be reversed by harnessing the vigorous growth of the infant... by serial corrective casts.”

94 patients referred & treated early, scoliosis resolved with casting (avg age 1.6 yrs, Cobb 32°)

42 patients referred late, casting could reduce, not reverse the deformity (avg age 2.5 yrs, Cobb 52°)
Results of Casting

  - Best results in less than 20 mos, 60 degrees
- Fletcher ND, J Pediatr Orthop 2012
  - Delay tactic, increased thoracic height
  - Increased PIP – anesthesia issue
New Data Suggests Benefit in Delaying Surgery

- Decrease in complications in older children
  - Better soft tissue
  - Larger implants
- Weight gains seen only in children > 4 years old
- Average length gains diminish over time
- Force to distract increases over time
- Complications vs. risks of delaying surgery
Who Do We cast?

- Idiopathic infantiles
- Sturdy phenotype, normal BMI
- Non syndromic
- Young (before 18-24 months)
- Flexible, long curves
- Low thoracic apex, TL junction
- Delay surgical intervention
Who Don’t We Cast?

- Syndromic patients?
- Too old?
- Too stiff?
- Restrictive lung disease
- Skin sensitivity / allergies
- Thoracic / abdominal wall contraindications
- Deep venous thrombosis risk
Who Don’t We Cast?

- Pectus carinatum / rib/sternal deformities
- Osteogenesis imperfecta
  - Chest wall deformation
- Metatropic dysplasia
  - Very stiff curves with restrictive lung disease
- Quadriplegic cerebral palsy
- Spinal muscle atrophy
- C spine contraindications
- Psychological issues
Complications

- Skin irritation / breakdown
- Muscle weakness / developmental delay +/−
- Joint pain / stiffness
- Sleep disruption (cast intolerance)
- Difficult ventilation during casting
  - Increase in PIP - Dhawale et al, JPO 2013
- Subclavian vein thrombosis
Psychosocial Effects of Repetitive Surgeries in Children with Early Onset Scoliosis

Methods

Instrument used

- Child Behavior Checklist (a parent-report instrument)
- Strength and Difficulties Questionnaire (a parent report behavioural screening questionnaire)
- Care Giver Support

Abnormal psychosocial scores observed in patients with EOS. The at risk patients are younger at the time of their initial scoliosis surgery and the number of repetitive surgeries.

Evidence: Level III
(Matsumoto, Williams et al. 2013)
Issues with Repetitive Anesthesia

Anesthetic Effects on the Developing Nervous System

If You Aren’t Concerned, You Haven’t Been Paying Attention

“Children repeatedly exposed to procedures requiring general anesthesia before age 2 years are at increased risk for the later development of ADHD even after adjusting for comorbidities.”
Factors Associated with Response to Treatment

- Iorio et al, JPO 2017
- Idiopathic infantiles
  - BMI was predictive of curve improvement
  - Less than 1.8 years
  - Derotation to correct RVAD < 20°
Congenital Scoliosis

- Cao et al, J Ortho Surg Res 2017
- Cohorts of congenitals vs non-congenitals
- Congenitals had
  - Larger curves at first cast and follow up
  - Lower correction rates
  - Lower thoracic growth rates
- Demirkiran et al, JPO 2014
- Reasonable treatment to delay surgery even in congenitals
Based on the current evidence, a trial of casting in EOS, regardless of curve etiology, should be considered a treatment option.

Yang et al, Pediatrics 2016
Thorsness et al, JAAOS 2015
Canavase et al, WJO 2015
Thank You

Nemours Spine and Scoliosis Center
www.nemours.org/spinecenter