Casting for Early Onset Scoliosis
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Background:
The primary purpose in treating early onset scoliosis is prevention of long-term pulmonary problems. Each of the technologies designed for treating curves in young children are meant to keep the curve under control during the growing years in order to preserve long-term lung function prior to a definitive fusion at maturity.

Infantile Scoliosis can either be Progressive or Resolving
1. How Do You Determine When A Curve Is Progressive?
   a. Curve Progression
   b. RVAD or RVAD Progression
   c. Rib Phase
   d. Curve Pattern
2. Mehta’s Criteria
   a. Phase 2 – All Progress
   b. Thoracic Resolving – 83% RVAD <20
   c. Thoracic Progressive – 83% RVAD >20
   d. If unclear, repeat x-ray to see if RVAD increased at 3 months
   e. Double Curves – all progress. May appear just thoracic but have marked 12th rib asymmetry with thoracic concave downward dropping rib
   f. Unfortunately, the natural history is still murky.
3. Which X-rays?
   a. Not Clear if Mehta’s X-rays were Supine, Sitting or Standing
4. Reliability:
   a. Apical Vertebra: 47.1% interobserver 69.4% intraobserver
   b. Phase : Substantial agreement (kappa = 0.67),
   c. RVAD : ICC 0.92 ICC inter and 0.86 intra
      i. 18% of the RVAD showed >10° variation
      ii. This can be a real problem in determining progressive vs. resolving with RVAD’s 15-25 or even broader.

Surgical Results
1. Understanding surgical results:
   a. “Growth Friendly” instrumentation is not all that “friendly” – unless your friends like beating you up.
   b. The law of diminishing returns is very real –
   c. You get 3-4 years of effective lengthening.
   d. The longer implants are in, the higher the complication rate.
   e. Proper casting does not seem to harm surgical results.

Cast Results
i. 27% resolved
ii. 56% improved but not resolved
iii. 14% stable
iv. 3% progressing
v. To date, only 10% surgery, and delayed surgery by avg 2.7 yrs
   28% of curves 50 degrees or more at the start.

Who and When?
1. Ideally, delay surgery until age 6 or 7.
2. Casting works best in younger patients with idiopathic smaller curves
3. But, can still help in:
   a. Older patients
   b. Larger curves
   c. Syndromic curves.
4. Be wary of neuromuscular and congenital curves.

Starting
1. Diagnosed with Progressive Infantile Scoliosis
2. Child OK for anesthesia
3. Goals are either cure or delay surgery

Negotiating the Start
a. Family must agree to 1 year of casting – minimum
b. Explain that even if the curve is not cured, delay for surgery has a purpose.
c. Repeat growing rod or VEPTR lengthenings are NOT easier than casting.

Why Not Brace since it is easy to remove it?
  a. Bracing’s benefit is also its deficit.
  b. Because it can be removed, it will be removed.
  c. Less correction is possible because flexibility is necessary for donning and
donning.

Stopping
a. The patient doesn’t need treatment.
b. Your treatment either isn’t working or is unlikely to work.
c. The problems of the current treatment aren’t worth it.
d. Another treatment is probably better.
e. The family wants a different treatment and understands the issues.
f. No way without surgery.

Sometimes a break can help
  a. Gortex pantaloon with fiberglass can be used in both smaller curves nearly
  resolved and in larger curves where the goal is delay.
  b. Non-resolving curves can use a summer time brace and recast with cooler
  weather
Scoliosis Casting Technique

I. Setup:
   a. A proper table – able to apply traction, rotation and access to the entire torso
   b. Intubation not LMA
   c. Head halter pelvic traction
   d. Have a mirror to look underneath

II. Correction – based upon the EDF cast of Cotrel and Morel and modified for infants by Mehta:
   a. Mold the pelvis well – it’s the foundation
   b. The correction is rotational and not a lateral push!!!
   c. No difference in over from under the shoulders casts for most because the typical apex is lower thoracic
   d. Make a concave window
   e. Abdominal and chest relief
   f. Trim pelvis sufficiently for >90 degree hip flexion

III. Cast patient management:
   a. Approximate cast change schedule – it makes everyone’s life easier:
      i. ≤2 yrs, q2 months
      ii. 3yrs, q3 months
      iii. ≥4yrs, q4 months
   b. Cast until gone or stabilized
   c. Bracing holidays periodically in older children.
   d. Brace for 1 year after correction
   e. Consider Gortex™ in smaller curves nearly corrected or in larger curves which have stabilized – more tricky because fiberglass is more rigid and not as easy to avoid sores. The Gortex pantaloon works well.

Equipment and infrastructure

1. Table: You need a proper table. Some people have used a spica cast table. But, this is difficult to do well. You need good control of the head and pelvis and the remainder of the torso and shoulders free for the cast.
   a. Risser or Cotrel table - Usable, but putting a small child on a strap in the middle of a big cast table is precarious. Unable to by these new.
   b. Mehta table – We use this. $8-10K. Can be purchased from Noel Industries or PUSH
   c. Salt Lake City Table - www.Pillarorthopedicdesign.com Robert Eldridge Pillar Orthopedic Design L.L.C. 360-773-8779 ~$10,000
   d. Other options – see Halanski, et al

2. Anesthesia
   a. Requires general anesthesia
      i. Chest pressures can be large while cast is setting
      ii. Bite block to prevent tube from being pinched with halter traction
      iii. Don’t let anesthesia use an LMA – you will regret it.

Finances
1. Opportunity Costs – hard to justify on reimbursement alone
2. Needs to be considered as part of building a full service pediatric spine program. Professionally, very satisfying:
3. It takes us 90 minutes for a cast and includes the surgeon and a cast technician paid through our practice plan.
4. Code 29010 Application of Risser jacket, localizer, body; only
   a. Since these are performed in a hospital, you receive the lower facility RVU of 4.15 total
   b. Comparison:
      i. 99204 New Level 4 non-facility of 4.72 RVU – can see 3 of these in 90 min.
      ii. Spica cast treatment of a femur fracture 27502 with 22.85 RVU – Takes ~60 min.
   c. My collections are ~$125.
5. Hospital: Charges average ~$4200 and collections ~$2400
6. Anesthesia: Charges ~$650 and collections $200-$600

**Barriers to Successful Cast Treatment:**
1. Children tolerate casting very well, but it can sometimes be difficult to convince the parents beforehand.
2. Although casting is not difficult, it does require some training and proper equipment.
3. Disappointment if the curve is not cured but only stabilized or decreased. Need early education and setting proper expectations on the real issues in early onset scoliosis.
4. Casting requires anesthesia every few months.
5. “Can’t you use a brace and get the same results?” – theoretically correct, but current braces must be flexible enough for donning and doffing so they cannot apply the same continual corrective forces and must be perfectly applied every time.
6. “Can’t you just do the surgery and be done with it?” – it takes a lot of talking to inform many parents that you are not “done with it” when you get growing rods.

**Office Staff and Logistics:**
1. Patient Compliance –
   a. Casting can assure compliance for a while, but you can’t force the family to replace it.
   b. Local versus jet set parents – the latter are often very vested in the treatment and will fly to the ends of the world to make it happen while the former may be nonchalant or even extremely disinterested.
2. Cast Removal - we usually see the child the day before, remove the cast and allow the skin a break before recasting the next day. Sometimes, a week for a beech vacation without the brace can help the families deal with the cast.
3. Radiographs – radiation is a concern. There are a couple of routes:
   a. EOS – we have had success in some 3 year olds but poor success in 2 and under.
b. Rarely take x-rays - the Larry Karlin approach.

c. “Wiggle-o-grams” – remember that x-rays are not exact and it is the trend that counts.

**Research:** Infantile scoliosis is a rare disorder. If you are going to treat these children, please take the time to study them, record their data and register them for one of the databases. This is the only way we will know what to do in the future.