Cutting Edge Treatments for Scoliosis

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Objectives
- Identify the various types and degrees of scoliosis
- Understand the various treatment options (surgical and medical for scoliosis)
- Be able to discuss: Anterior Vertebral Body Tethering
- Understand the nursing care post spinal surgery for scoliosis
- Be able to list the restrictions for patients post AVBT

Scoliosis

Scoliosis is a musculoskeletal disorder that causes an abnormal curve of the spine or backbone. From the Greek work skolios,

Types
- Infantile: Birth to 3 years old
- Juvenile: 3 to 9 years old
- Adolescent: 10 to 18 years old

Causes
- Congenital
  - Develops in utero that may result in absent or fused vertebrae
- Secondary
  - The result of neuromuscular conditions
- Idiopathic
  - Without a known cause (80% of patients)
- Degenerative
  - (Adult scoliosis) – joints in the spine degenerate

Signs and Symptoms
- Uneven musculature on one side of the spine
- A rib prominence and/or prominent shoulder blade
- Uneven hips, arms or leg lengths
- The head is not properly centered over the body
- When bending from the waist, the ribs on one side are higher
- Slow nerve action (in some cases)
SIGNS AND SYMPTOMS FOR SEVERE SCOLIOSIS

- Diminishing lung capacity
- Pressure on the heart
- Restricted physical activity

PROGNOSIS

- Mild (less than 20 degrees)
  - Requires no treatment other than monitoring
- Moderate (25 – 70 degrees)
  - It is not clear whether untreated moderate scoliosis causes significant health problems later on
- Severe (more than 70 degrees)
  - The severe twisting of the spine can cause the ribs to press against the lungs,
  - Restrict breathing,
  - Reduce oxygen levels
  - Cause dangerous changes in the heart

Prognosis Continued

- Very Severe (more than 100 degrees)
  - Patients are susceptible to
    - Lung infections
    - Injury to lungs & heart
    - Increased mortality rates
  - (NOTE: This is very uncommon in America)

TREATMENT

BRACING

- The only non-surgical treatment for idiopathic scoliosis
- May be combined with prescribed exercise
- Can be effective in stopping the progression of the curve
- Schedule and type of brace will depend on the location and degree of curve
- Compliance with wearing the brace is vital to the success of bracing treatment

When is Bracing used?

When:

- The child is still growing and has an idiopathic curve greater than 25 degrees
- If the child is a female, and has not had her first menstrual cycle
Bracing Options
- Milwaukee Brace (CTLSO)
  - Is a full torso brace that extends from the pelvis to the base of the skull to correct or prevent any curve
- Boston Brace (TLSO)
  - Usually prescribed for curves in the lumbar or thoraco-lumbar section of the spine.
- Providence Brace (ATLSO)
  - Is used for nighttime only and can be worn up to 8 hours while the patient sleeps

NOTE: The child may be asked to wear one type of brace during the day and the ATLSO at night.

SERIAL CASTING
- Is used for infantile scoliosis when the curve is progressive
- Straightens the spine through the continuous application of external force
- Parents prefer casting versus bracing secondary to compliance.

SPINAL FUSIONS
- Rods, hooks, wires or screws are attached to the curved part of the backbone and the spine is straightened
- Small pieces of bone graft are then put over the spine (this will grow together with the spinal bone, fusing it into the proper position)
  - Anterior Approach
  - Posterior Approach
  - Endoscopic Spine Surgery

VERTEBRAL BODY STAPLING (VBS)
- Fusionless
- Surgical application of staples to the front of the spine
- Staples are inserted between two vertebral bodies
- This squeezes the growth plates and slows the growth of that side of the spine

VERTEBRAL BODY STAPLING (VBS) CONTINUED
- Who is the best candidate?
- How does it work?
- How is it performed?
ANTERIOR VERTEBRAL BODY TETHERING (AVBT)

Components
- Titanium pedicle screws placed on the convexity (outside) of the vertebrae causing scoliosis
- Polyethylene-terephthalate (PET)* flexible tether connects to each screw and when tightened, compresses the adjacent screws to help straighten the spine
- Cable safety extensively studied
- Animal and computer simulation models show scoliotic correction

“Ideal” candidate
- Idiopathic scoliosis (adolescent or juvenile) or Idiopathic “like” (i.e. post syrinx decompression)
- >8 yrs old with remaining spine growth
  ( >10 yrs old may be preferred to decrease the risk of overcorrecting the curve)
- Thoracic curve 35° to 55°
- OR curve <35° but does not bend below 20°
- As an alternative to VBS + hybrid rod

Published Case Report
- 8.5 year old boy with juvenile idiopathic scoliosis
- Thoracic curve 40°, tethered T6-T12 (Jan 2005)
- Immediate post op curve correction 25°
- 4 years post op, continued correction with growth
  - Thoracic curve 6°
  - Total height increased 36 cm
  - Tethered spine increased 2 cm

TETHERING ADVANTAGES
- FUSIONLESS
- Allows the spine to grow
- One time surgery
- No “lengthening” required (no rod)
- Can be used with lumbar staples (VBS)
- “Burns no bridges”, can do a later fusion if needed
UNKNOWNs
- Not currently using for thoracolumbar or lumbar curves (but hope to in the future)
- New use of an existing technology
- No long-term follow-up
- Only a few cases so far
- Potential for overcorrection (curve opposite way)
- Refined criteria for “ideal” candidate
- Refined post op activity restrictions (temporary)

VERTICAL EXPANDABLE PROSTHETIC TITANIUM RIB (VEPTR)
- Surgically implanted
- Expandable device
- For growing children who have a chest wall deformity
- Should not be used in children who have stopped growing

How does it work?
- It is attached vertically on the patient’s ribs near the spine
- Is lengthened or replaced at specific times to allow for the patient's growth
- Adjustments are made through a small incision in the OR

Goals of the VEPTR
- More normal growth pattern
- Decrease chest, spine and rib deformities
- Decrease need for supplemental oxygen
- Helps to increase expanded lung volume
- Increases life span
- Increases physical activity capability
- Improves psychosocial health and self-image

Complications of the VEPTR
- Post-operative pain
- Infection
- Skin breakthrough
- Device fracture or device drifting
- Bone erosion
- Device removal
HYBRID GROWTH ROD
- Similar to the titanium rib in its attachment to the patient's natural ribs at one end and a vertebra at the other end.
- Used to help encourage straighter spine growth.
- The fusion of the upper portion of the spine is avoided.

GROWING RODS
- Allow for continued and controlled spine growth
- Outpatient
- Through the back of the spine
- Rods are attached to the spine both above and below the curve with hooks or screws.
- Returns every 6 months to have the rods lengthened

New Growing Rods
- Magnetically Controlled Growing Rods (MCGR)
- Newest treatment
- Eliminates the need for repeated lengthening surgeries
- External Remote Control (ERC) – portable, handheld unit that uses permanent magnets to automatically modify the length of the growing rod.
- Shilla technique - uses two rods that grow as the spine grows
- Similar to a track and trolley system
- Complication – rod breakage

Magnetically Controlled Growing Rods (MCGR)
- MAGEC Rods, External Remote Control, X-RAYS – before & after

CARE OF:
- Maintain hemodynamic stability
- Pain Management
- Skin/Wound Care
- Respiratory Management
- Physical Therapy
- Bowl Function
- Log Rolling

EDUCATION
Restrictions
- Depending on the surgery your restrictions will vary in length of time:
  - Bending
  - Twisting
  - Physical activity
  - Lifting
  - Shower limitations
  - Swimming/sports
  - School/work
  - Back Packs/school bags
Education Continued

- Skin care
- Signs and symptoms of infection
- Pain Relievers
- Brace Instructions
- Antibiotics
- Travel

COMPLICATIONS

- Hemodynamic
- Neurological
- Gastrointestinal
- Infections
- Failure of instrumentation and non-union
- Decompensation and increased deformity
- Pathology of adjacent level
- Vascular and visceral injuries

COMPLICATIONS CONTINUED

- Infections increased with or related to:
- Failure of instrumentation and nonunion
- Decompensation and increased deformity
- Pathology of adjacent level
- Vascular and visceral injuries

References


Questions?

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