USE OF THE VERTICAL EXPANDABLE PROSTHETIC RIB FOR MANAGEMENT OF SPINAL DEFORMITY IN NONE AMBULATOR SPINA BIFIDA PATIENTS

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- Immature children with myelodysplasia and spinal deformity are difficult problems for the orthopaedic surgeon
- Non-ambulatory children are most likely to develop progressive spinal deformity

- The dysplastic anatomy of the spine and chest wall in a paralytic spine secondarily affect other organ systems
- Thoracic insufficiency is due to increased sagittal plane deformity as the diaphragm invades the pulmonary cavity
- The decrease in pulmonary capacity may go unnoticed due to the child's limited physical activities

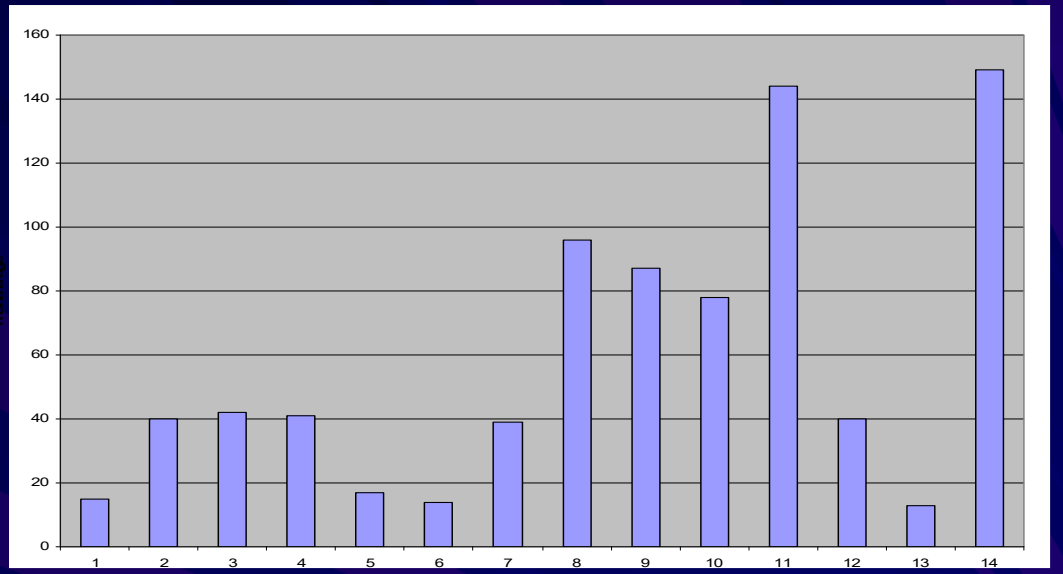
- The purpose of this report is to evaluate myelodysplasia patients with spinal deformity treated with the Vertical Expandable Prosthetic Titanium Rib (VEPTR)

- Data Obtained From The FDA Request For Approval Of Humanitarian Device Exemption For the Vertical Expandable Prosthetic Titanium Rib Indicated For The Treatment Of Thoracic Insufficiency In Children

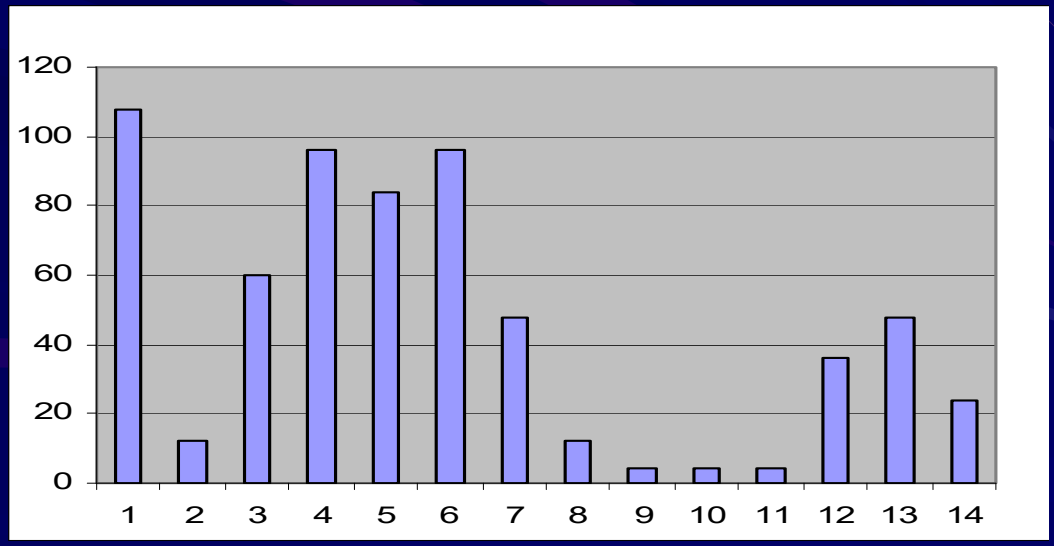
- San Antonio, TX 1991-1996
- Eight Centers 1996-2003

- 247 patients with surgeries performed at 8 centers
- 20 patients were myelodysplastic none ambulators
- 6 patients had less than 4 months follow up and were excluded

- Average age at the time of the first surgery was 60 months (range 1 – 14yrs)



- Average time of follow up was 47.3 months (range 5.0 to 106.4 mo)



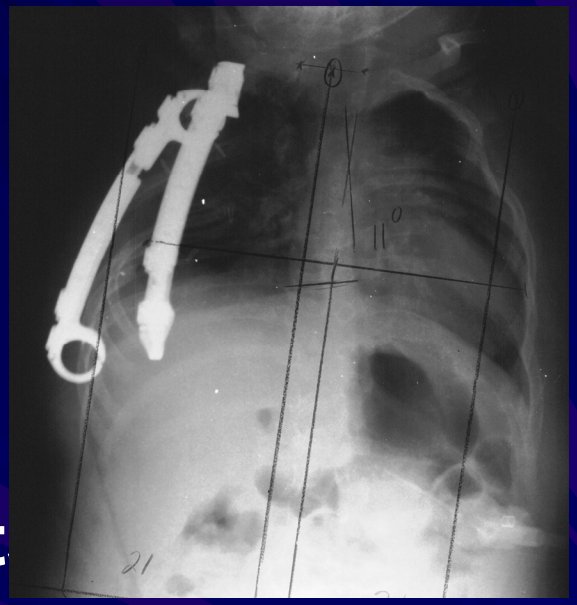
Indications for surgery

- Hypoplastic thorax in 3 patients
- Rib fusion in 7 patients
- Progressive scoliosis in 3 patients
- Flail chest in 1 patient

VEPTR Constructs

- **Unilateral single rib to rib in 4 pts**
- Unilateral double rib to rib in 2 pts
- Unilateral rib to rib and rib to pelvis in [illegible] pts
- Unilateral rib to rib / rib to vertebrae and rib to pelvis in 1 pt
- Unilateral rib to pelvis in 1 pt

VEPTR Constructs



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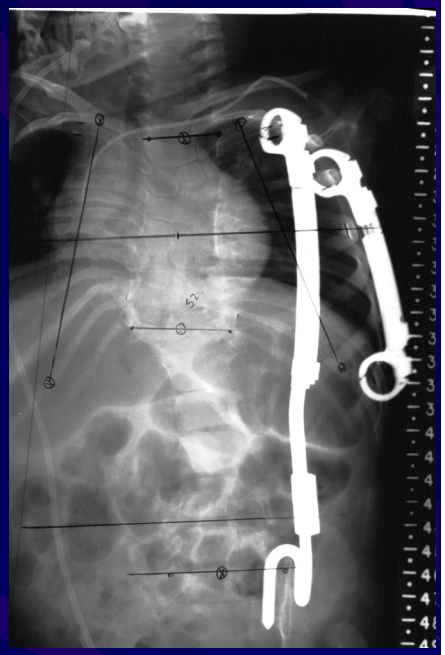
VEPTR Constructs



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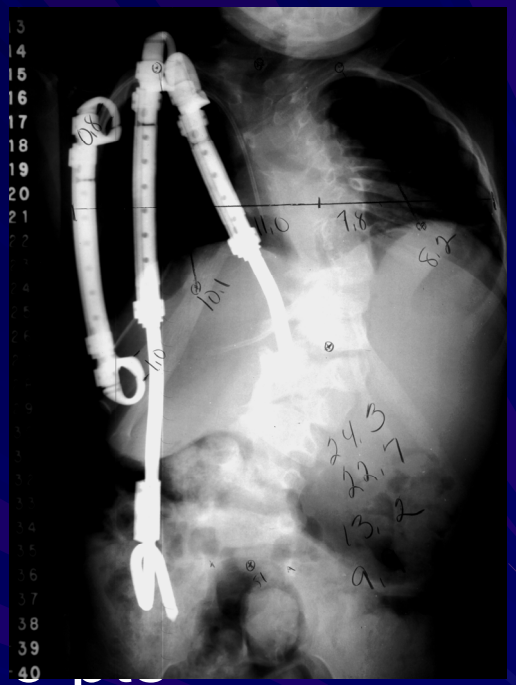
VEPTR Constructs



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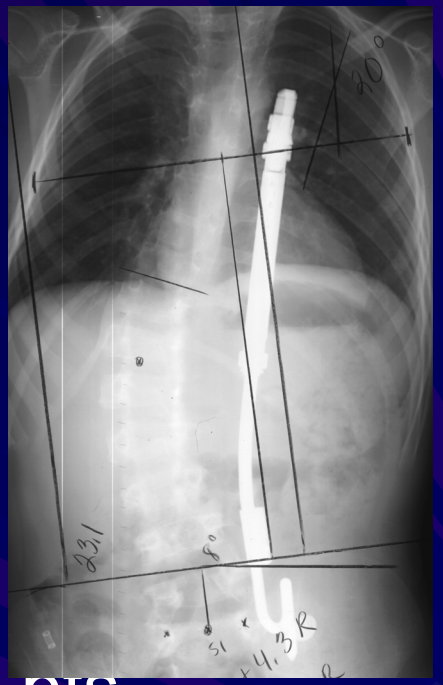
- Unilateral rib to rib and rib to pelvis in [illegible] pts
- **Unilateral** **rib to rib** **rib to vertebrae** **and rib to pelvis in 1 pt**
- Unilateral rib to pelvis in 1 pt

VEPTR Constructs



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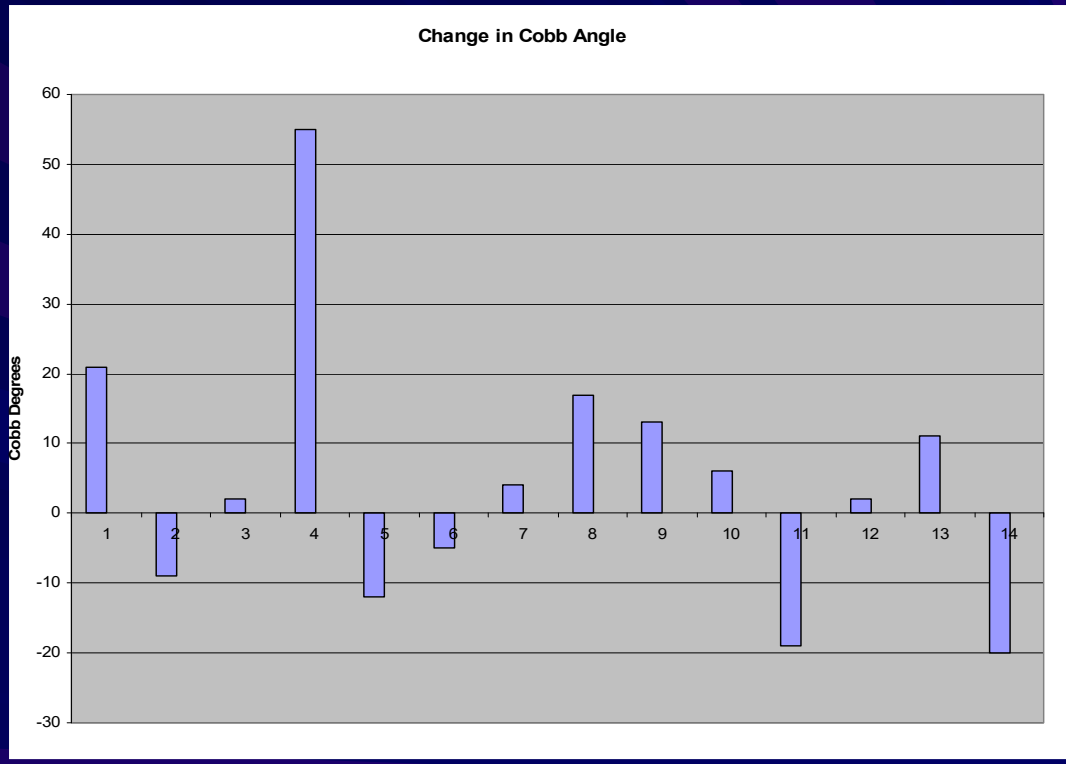
- **Unilateral rib to pelvis in 1 pt**

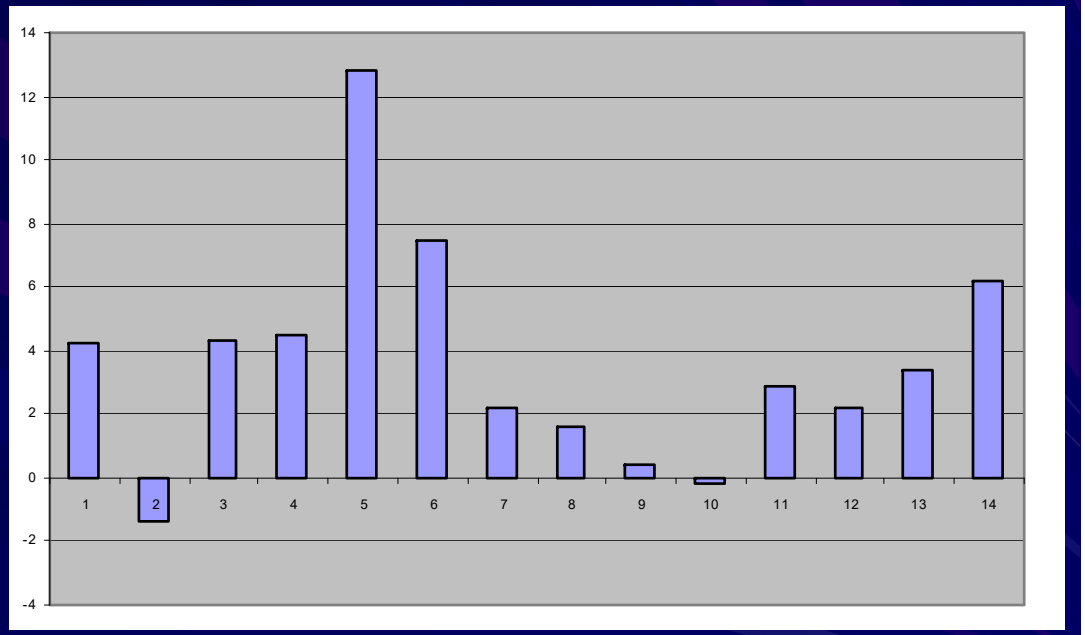
Change in Cobb Angle

- 9 patients Cobb angle was decreased an average of 14.4 degrees
- 5 patients Cobb angle increased an average of 12.6 degrees



Change in Thoracic Spinal Height

- Thoracic spinal height increased in twelve patients an average of 3.2 cm and there was a loss of thoracic spinal height in two patients an average of 0.8 cm



Pulmonary Evaluation

- Due to age and developmental considerations, pts were unable to follow instructions for the collection of pulmonary function tests
- Assisted ventilation rating (AVR) scores were chosen to measure a patient's pulmonary function
  - +0 - room air
  - +1 - supplemental oxygen
  - +2 - night ventilation
  - +3 - part-time ventilation or CPAP
  - +4 - full-time ventilation

Change in AVR From Baseline to Last Follow-up

- 12 patients improved in respiratory function
- 2 patients did not improve
  - One pt went from supplemental oxygen preop to part time use of ventilator
  - One pt went from room air to night time use of ventilator

Complications

- Deaths (2 Pts)
  - 20.2 mo after initial surgery
    - Choking, aspiration, cardiac arrest
  - 64 mo after initial surgery
    - Severe restrictive lung disease, cor-pulmonale, cardiac arrest
- No deaths directly related to surgery

Complications Not Related to Implants

- 5 pts multiple hospitalizations for pulmonary and cardiac problems

Complications Related to Implants

- Skin breakdown occurred in six patients
  - All had superficial infections
  - Four pts resolved w local care, debriedment and nutritional supplementation
  - Two pts required removal of exposed implant
- 1 pt had dislodgement of superior cradle and implant fracture

Advantages Of VEPTR

- Does Not Involve Fusion
  - Allows For Acceptable Control of Spinal Deformity During Growth
- Avoids Poor Skin In Midline
- Dual VEPTR Construct From Rib To Pelvis Is Load Sharing And Avoids Migration

Disadvantage Of VEPTR

- The disadvantage of using the VEPTR system is that multiple surgical procedures are required during the patients growth.
- Complication rate directly related to the implants occurred in 50% of the patients all were solved with no long term sequela.