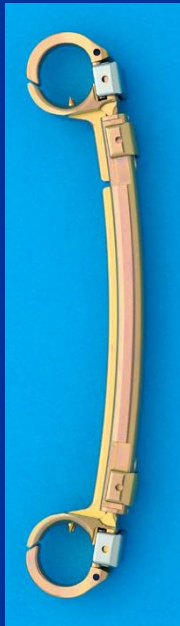


VEPTR : 2007 ICEOS Update



-Robert M Campbell , Jr., MD

President's Council / Dielmann Professor of Orthopaedics
Department of Orthopaedics
University of Texas Health Science Center

Executive Director
The Thoracic Institute
Christus Santa Rosa Children's Hospital
San Antonio, Texas, USA



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VEPTR Surgeries: 26 countries

- US
- Canada
- Austria
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Great Britain
- Luxembourg
- Norway
- Poland
- Portugal
- Spain
- Sweden
- Switzerland
- Turkey
- Argentina
- Brazil
- Australia
- Japan
- China
- Israel
- New Zealand
- Qatar
- Saudi Arabia



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The VEPTR “Parasol” Expansion
Thoracoplasty
for
Treatment of Transverse Volume Depletion
Deformity of the Convex Hemithorax Rib
Hump in Early Onset Scoliosis

R Campbell , M Smith , JT Woody , JW
Simmons , S Inscore , BR Cofer , J Doski
, C Grohman

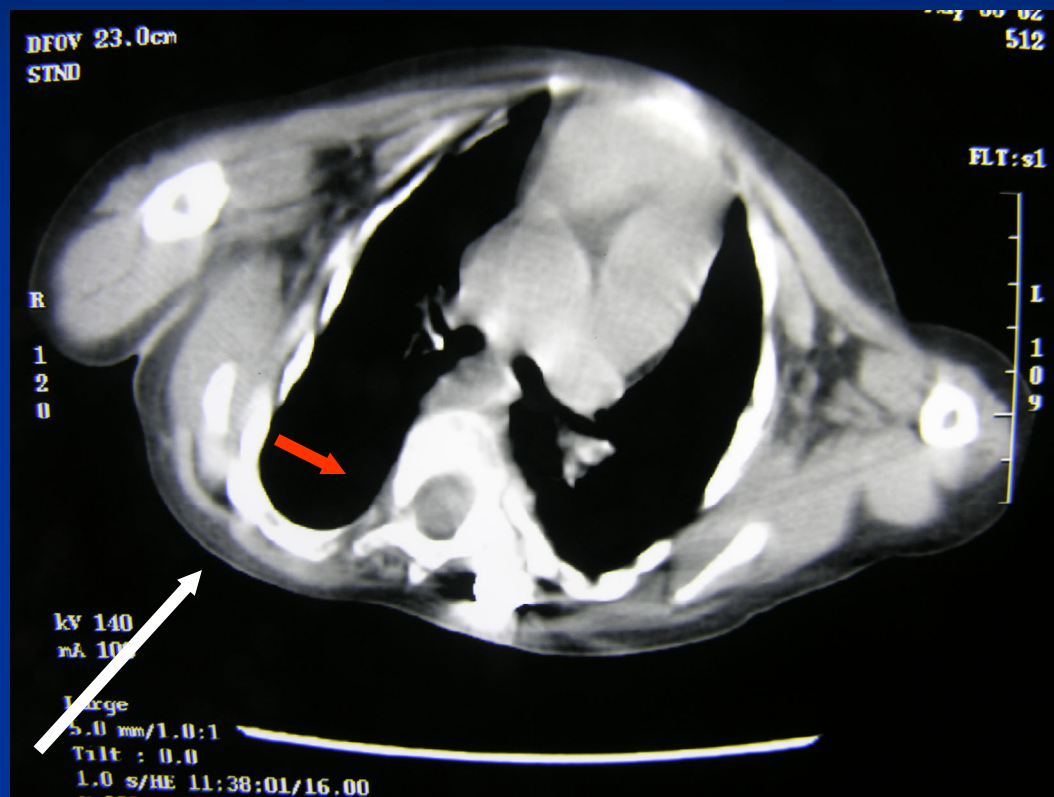
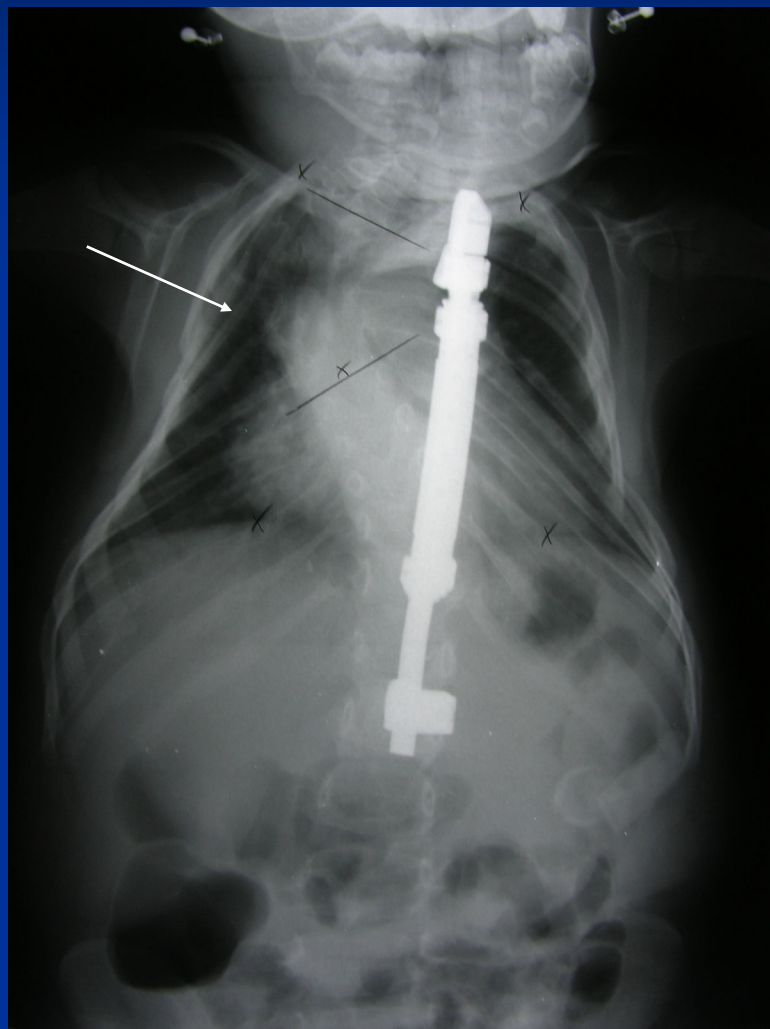
- SRS , 2007



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Problem: Persistent Volume Depletion Deformity of rib hump



The Convex Rib Hump



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Alain Dimeglio



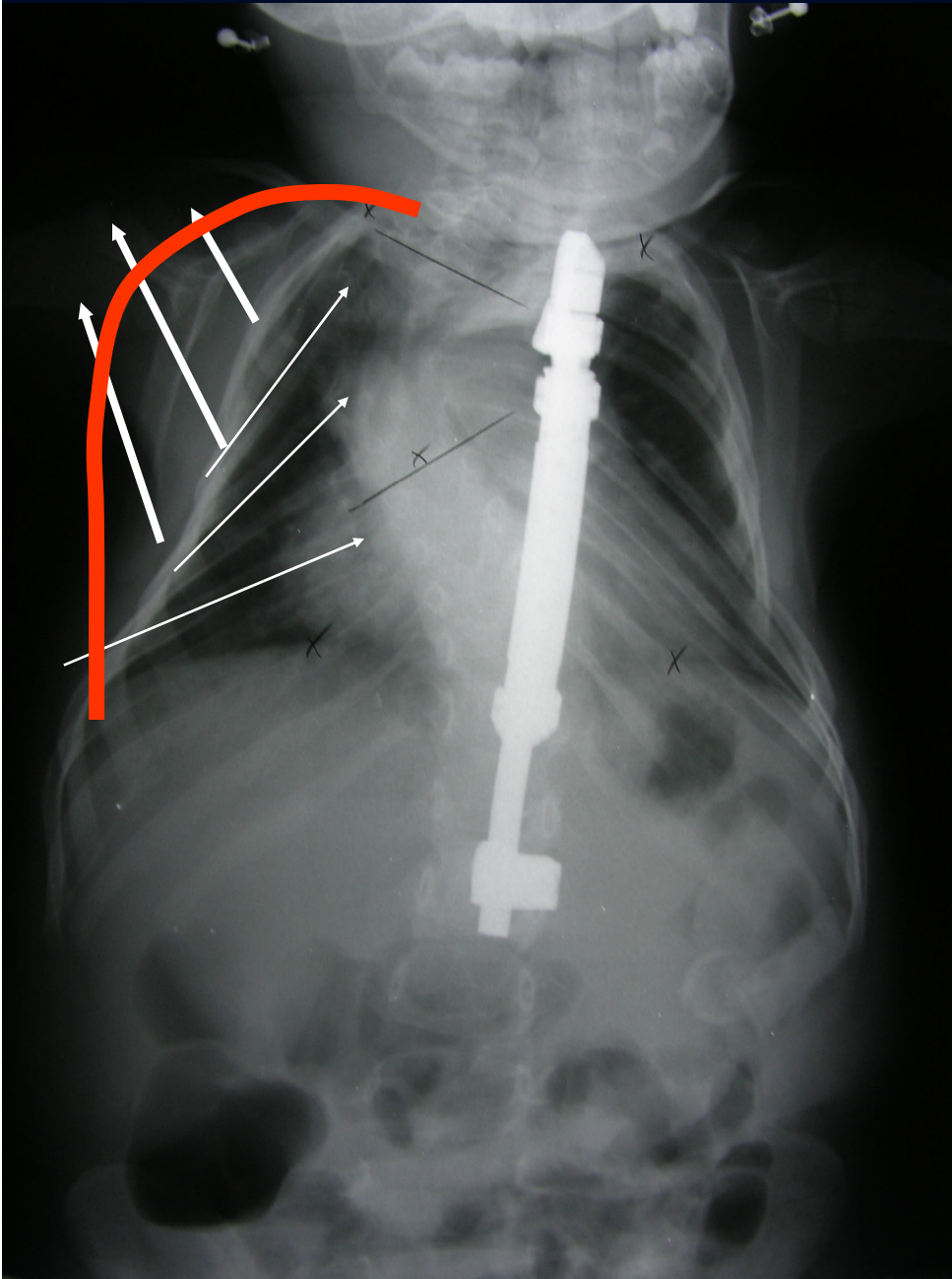
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The Dimeglio Parasol Analogy



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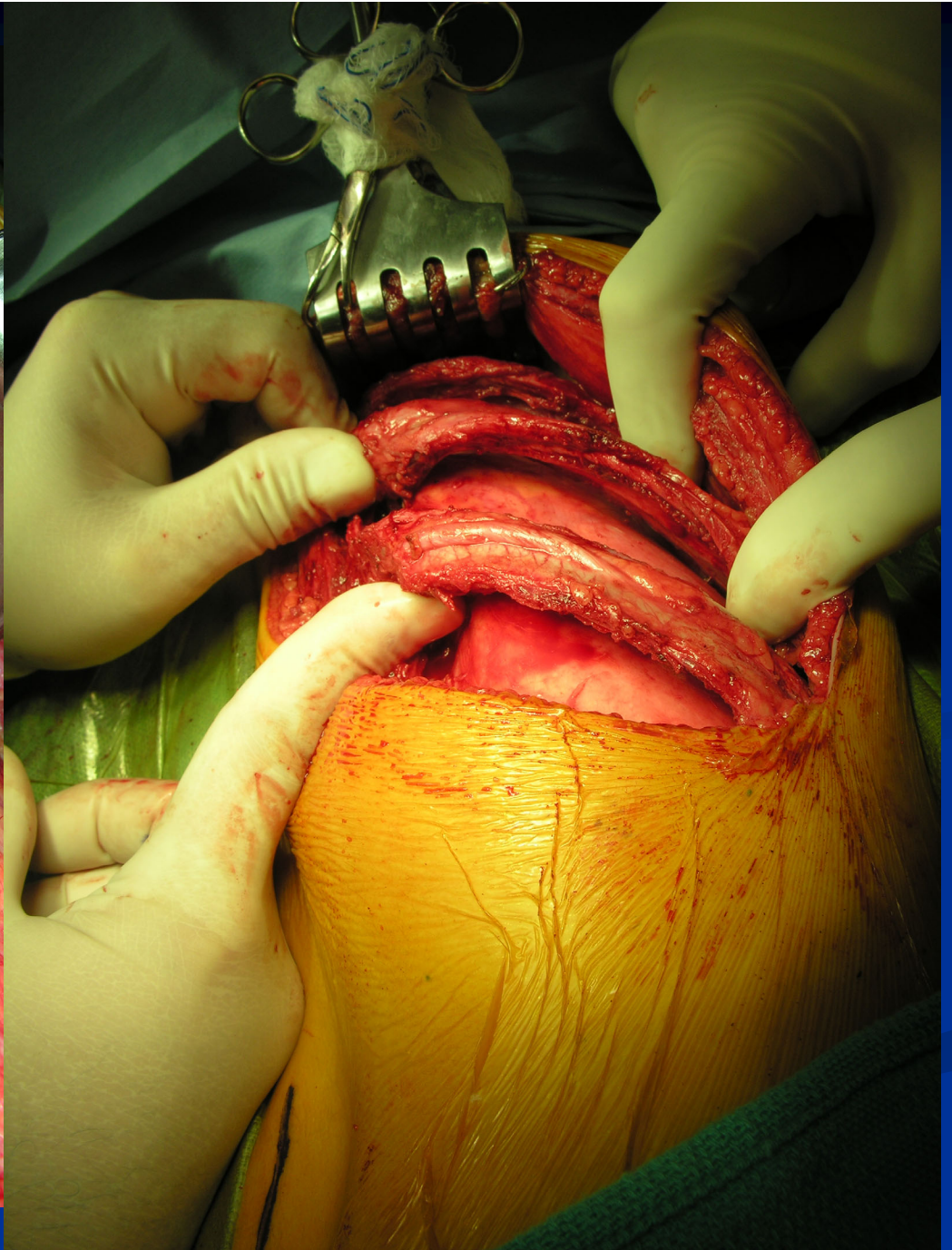
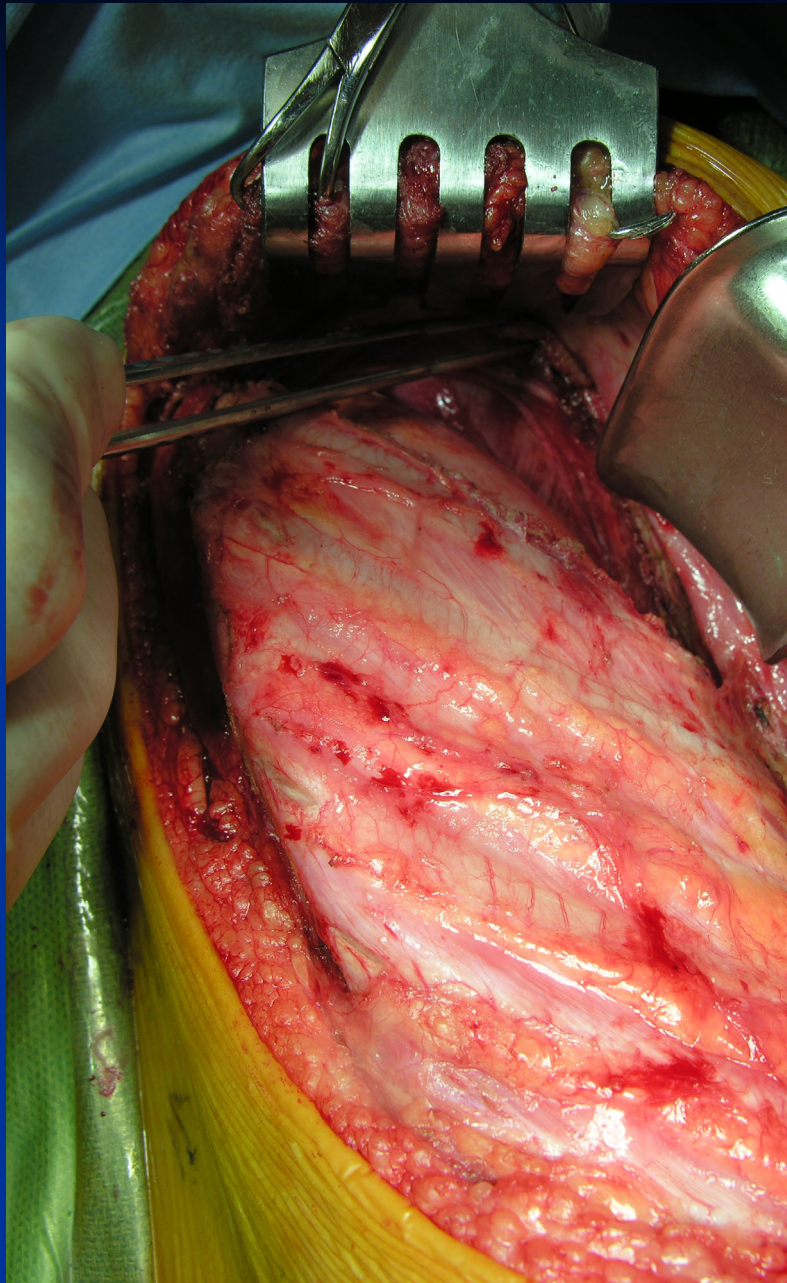
Rather than cutting up the umbrella, why not open the “parasol” ?

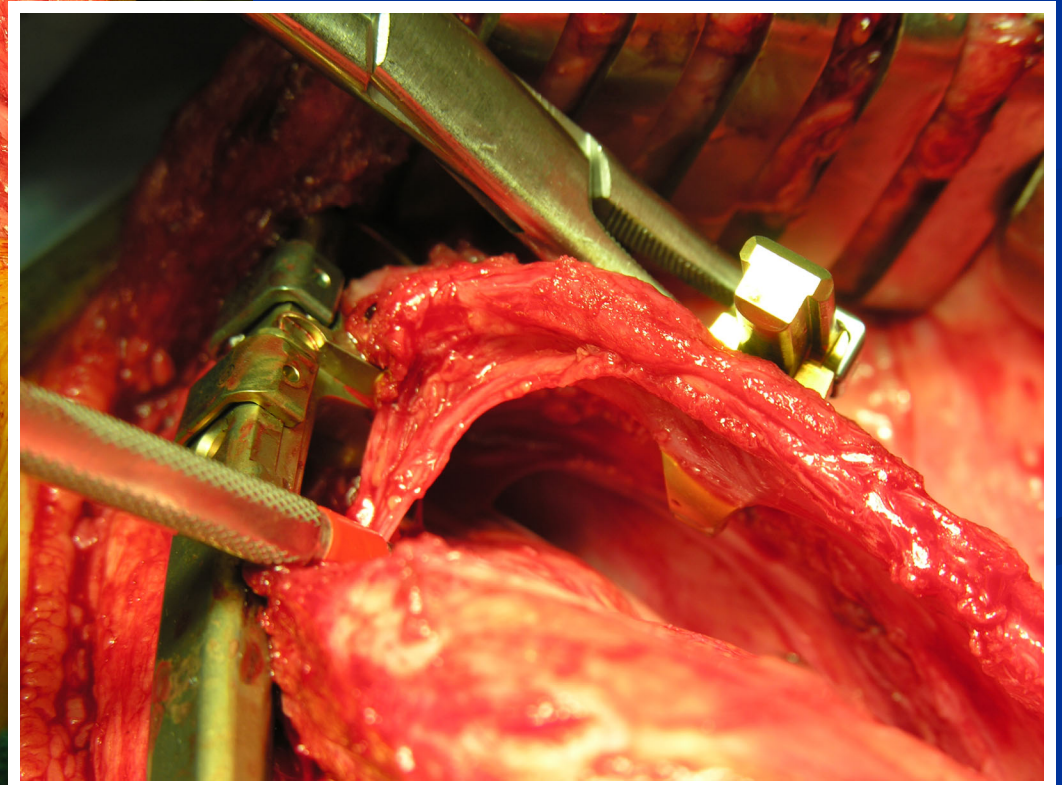
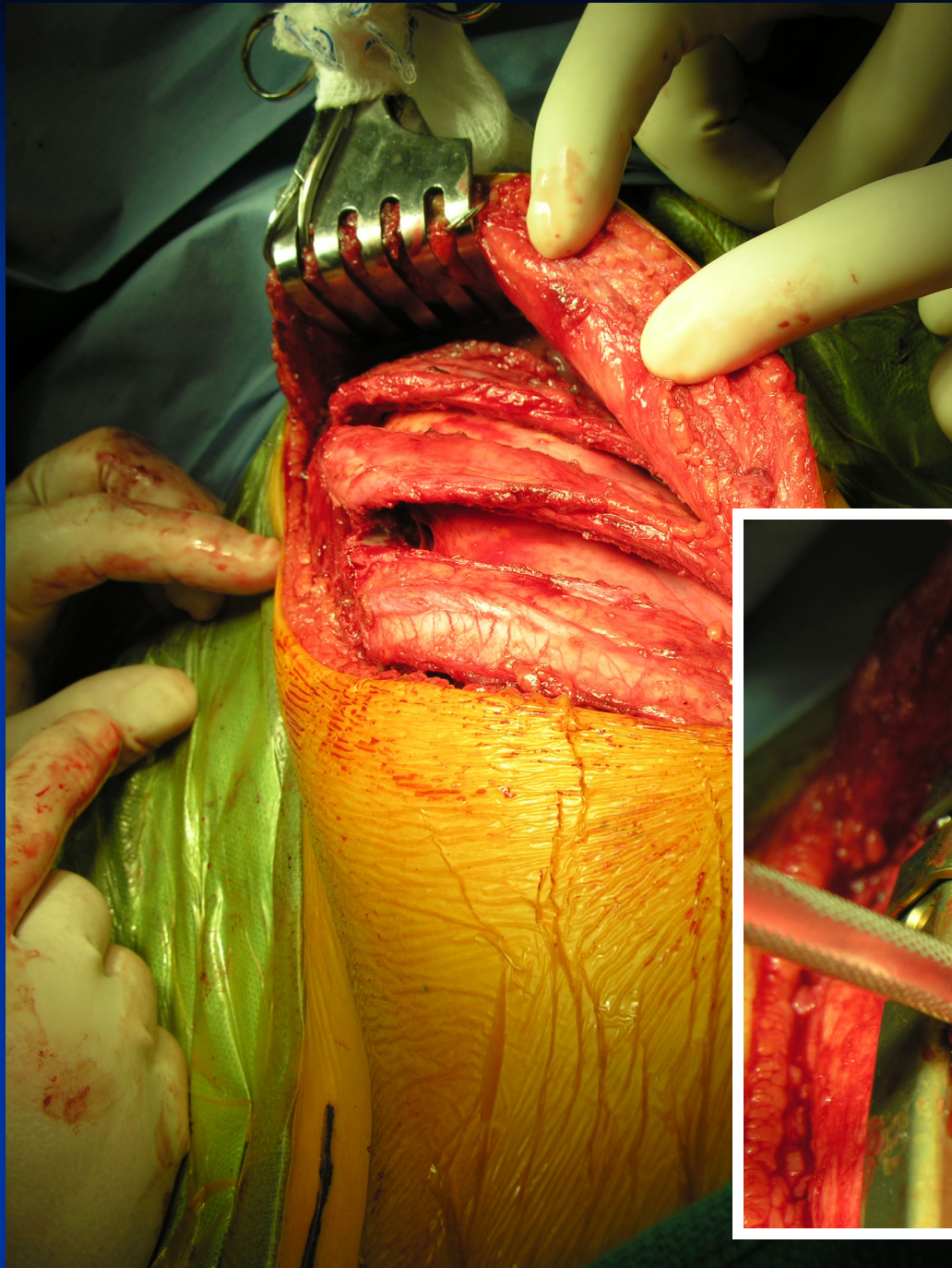
- Is it mechanically possible?
- Will it increase the scoliosis?

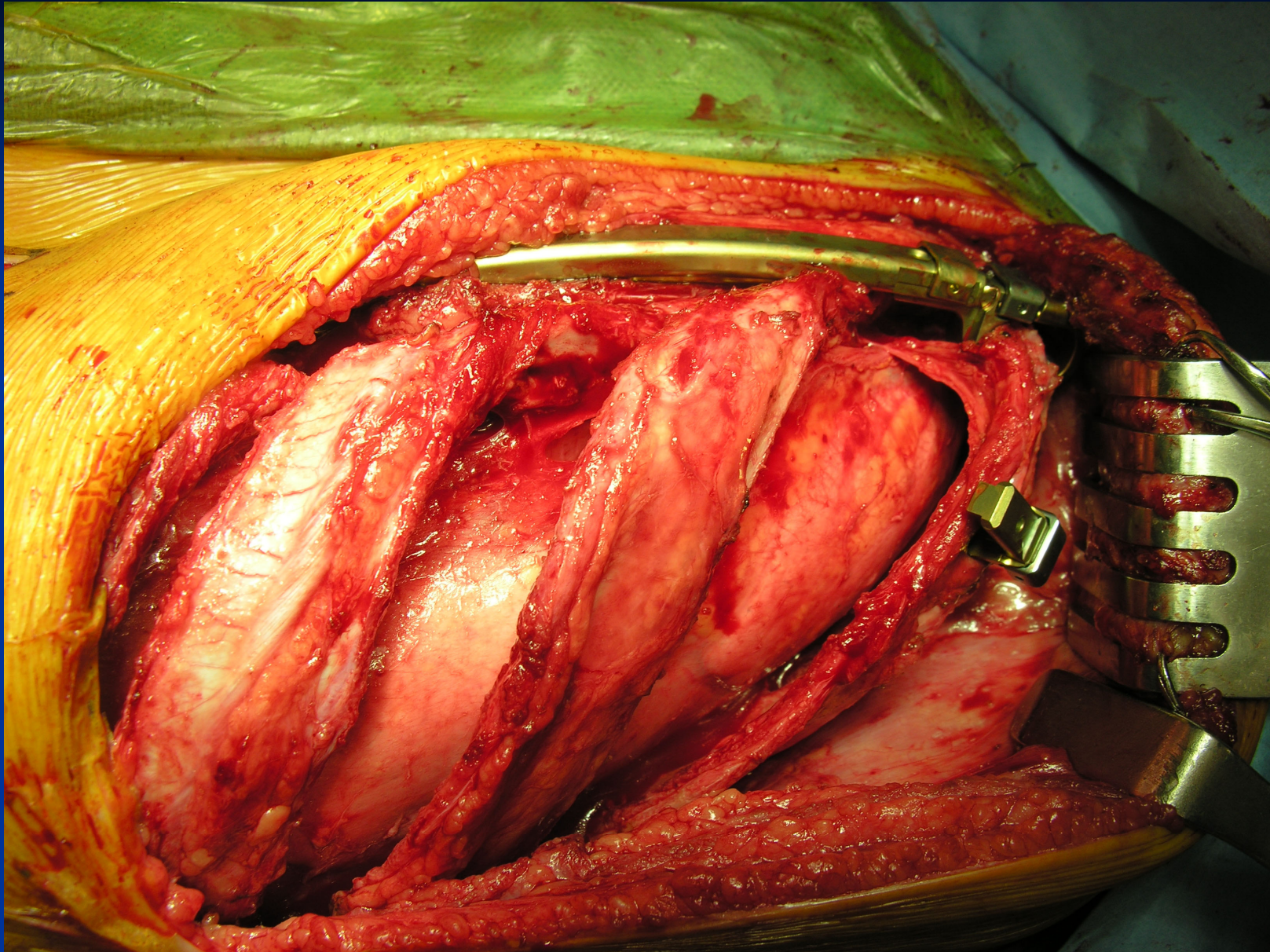


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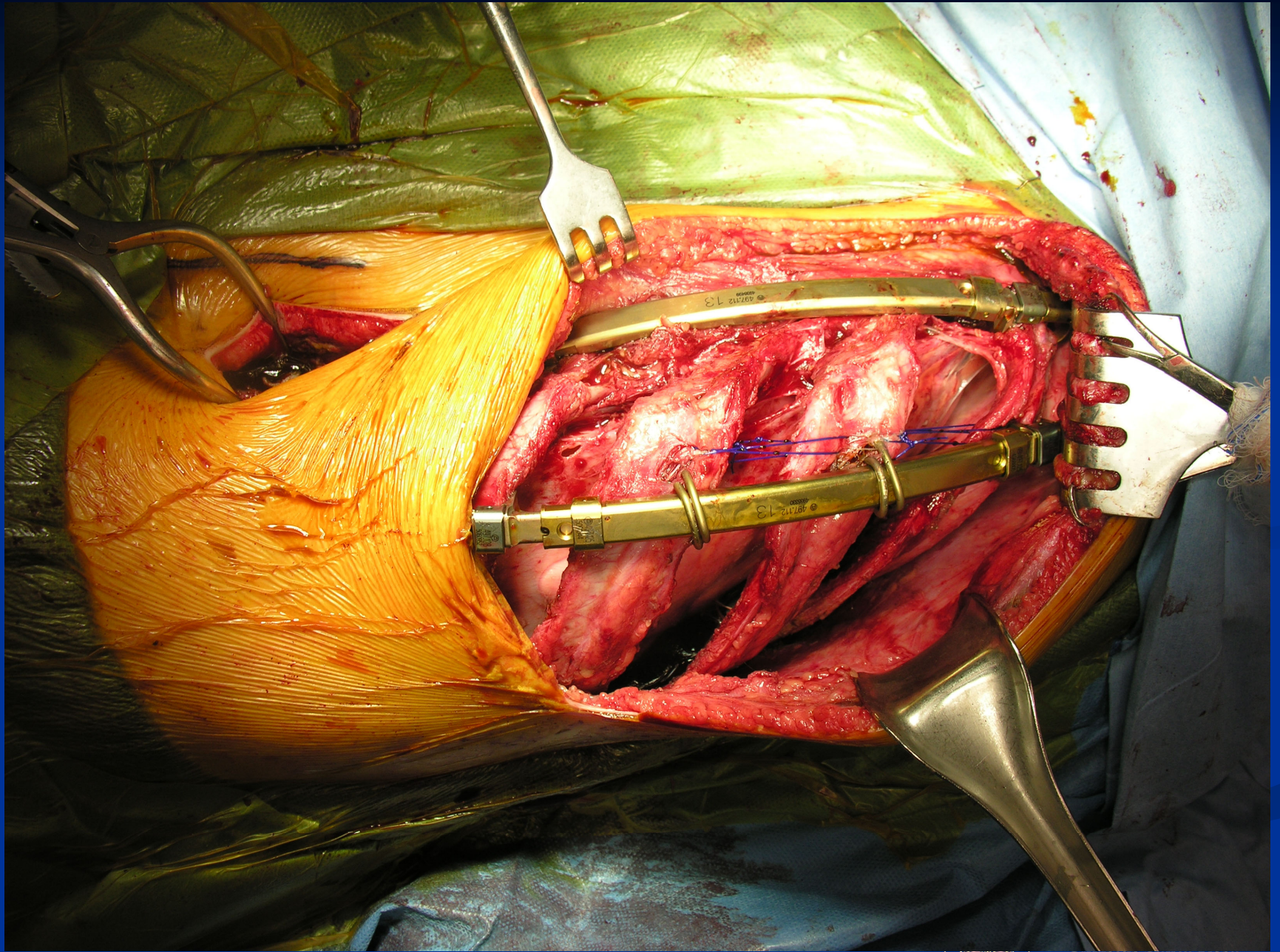
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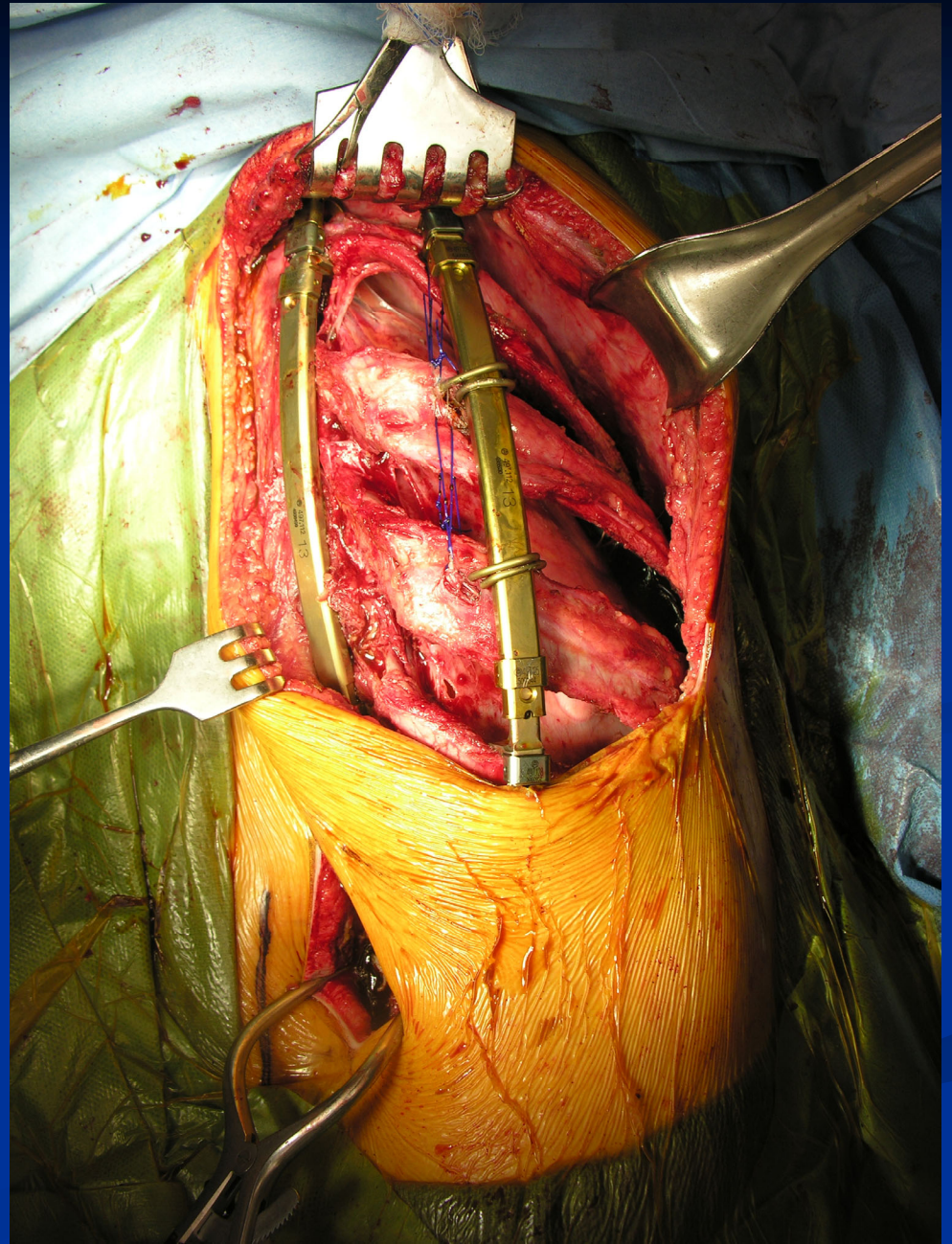
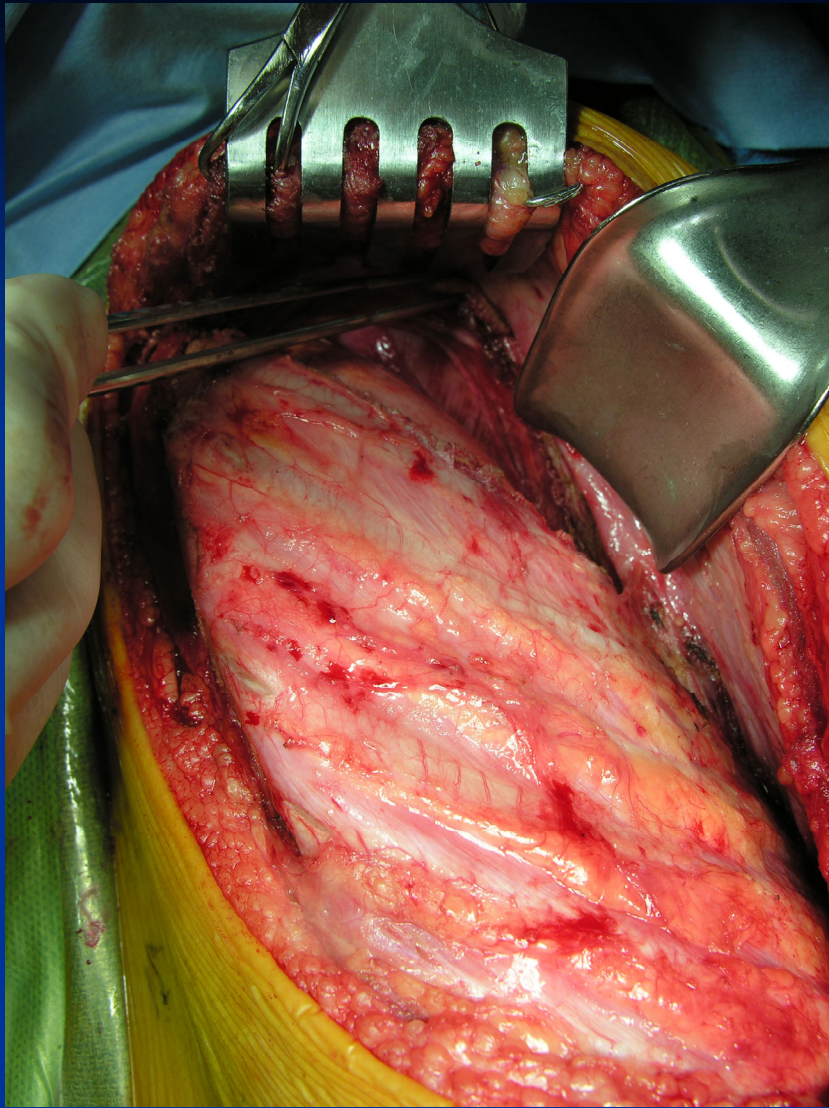






ic
Associate
Christus Santa Rosa
Children's Hospital





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Results

10 pts, mean f/u 4 years

- Mean Cobb angle pre-op concave procedure 79°
- Mean pre-convex procedure 51°
 49° at f/u.
- SAL 1.5 pre-op, 0.92 at f/u.
- Avg. vital capacity at f/u was 37.8% predicted (n=9) .



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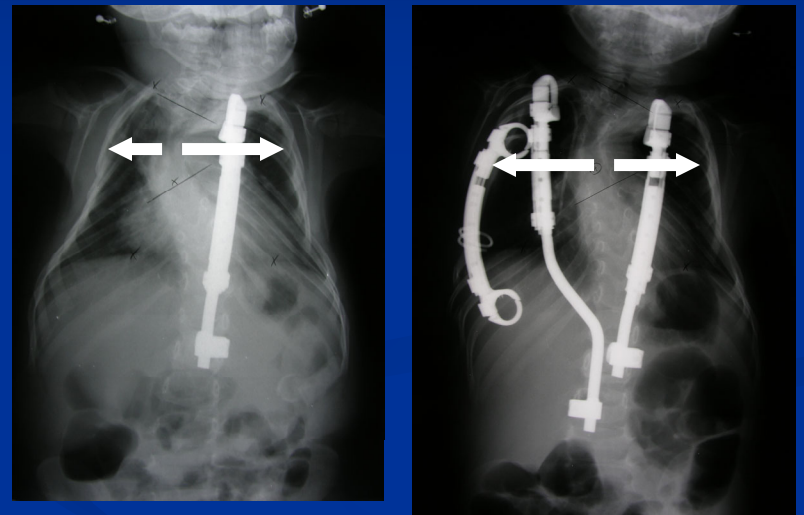
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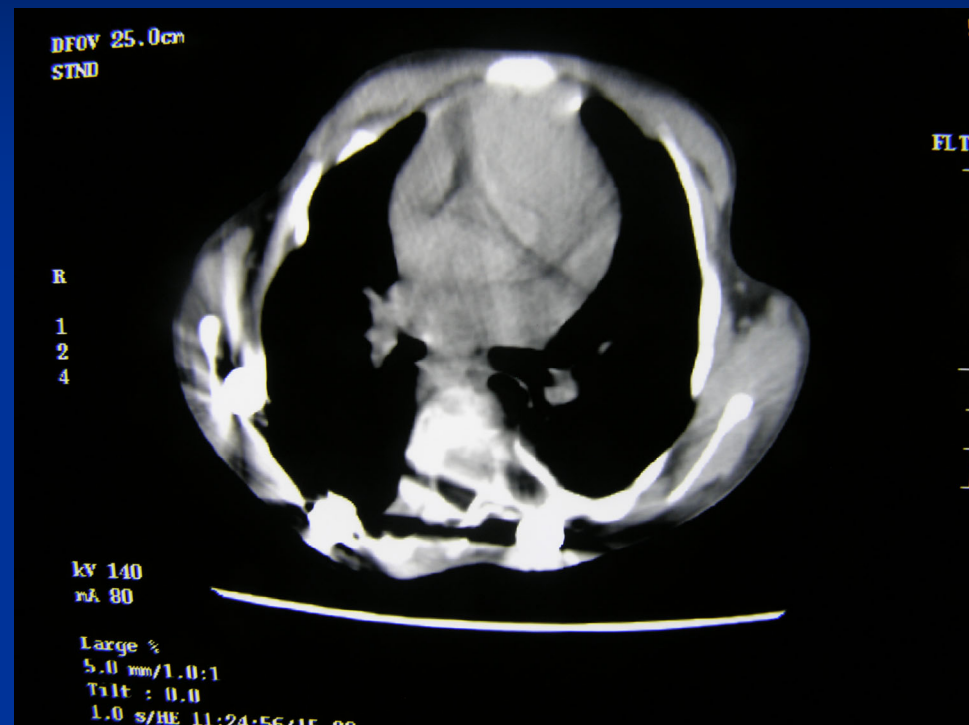
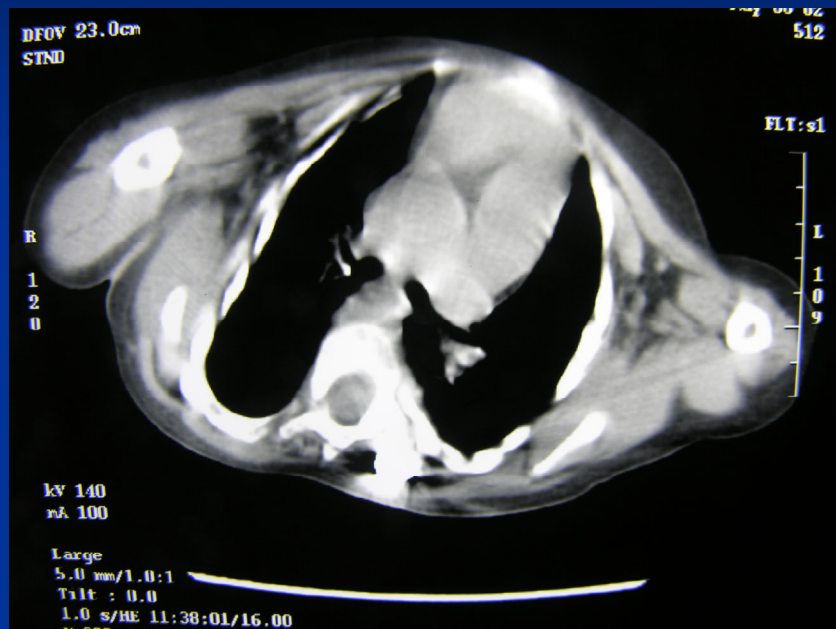
Results

Ratio Convex/concave
hemithorax width was
2.79 pre-concave implant
3.07 pre-convex implant

■ **2.17 f/u.**

- CT lung volumes
(n = 6): pre-implant
convex/concave lung
volume ratio was 0.87,
0.91 at f/u.





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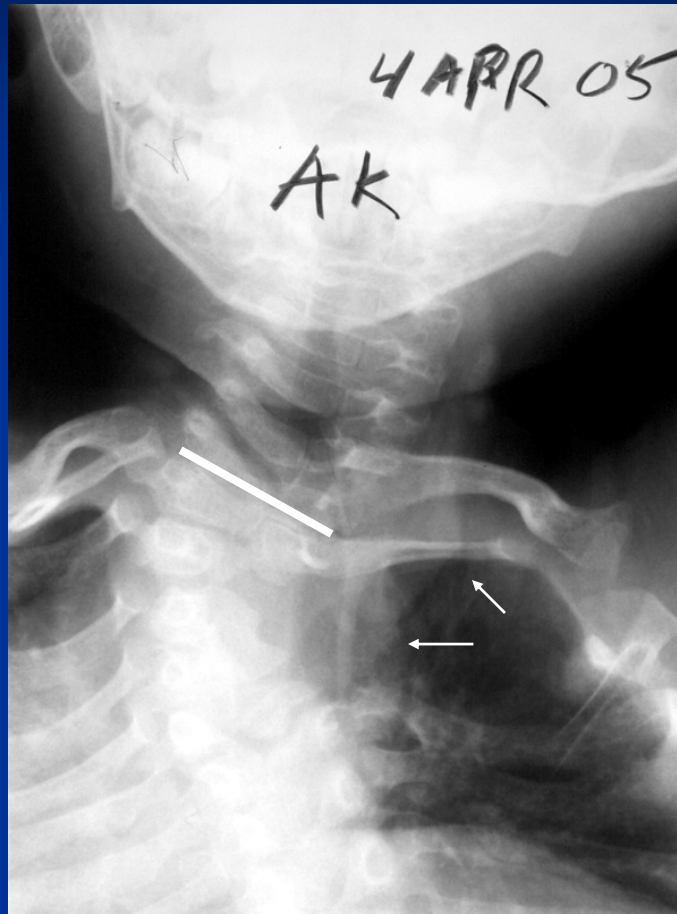
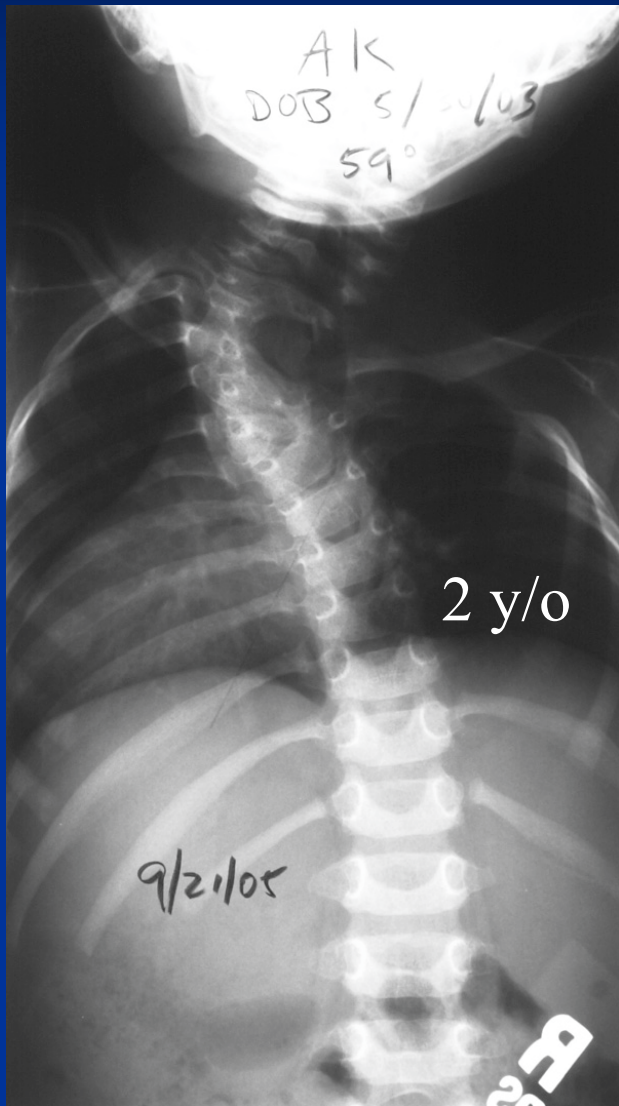
New VEPTR Indications



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Cervical Tilt: Solved problem?

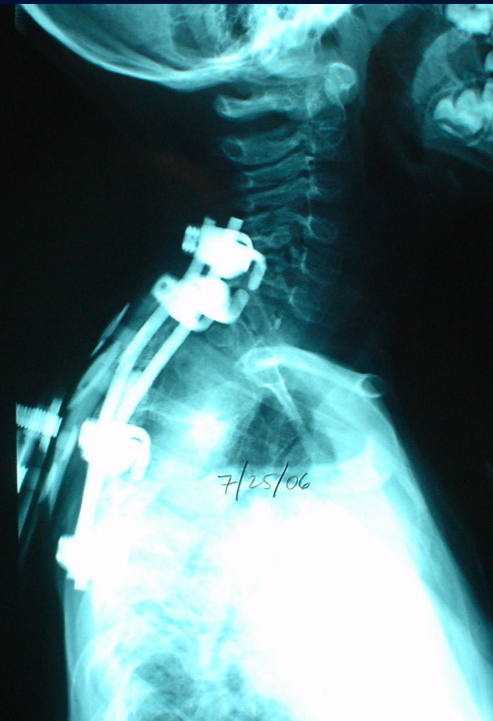
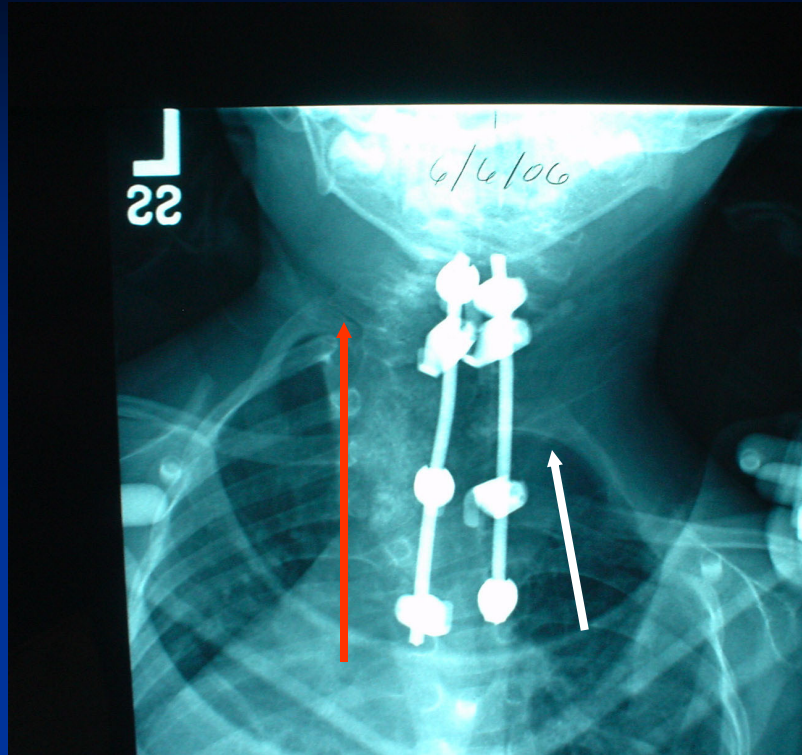


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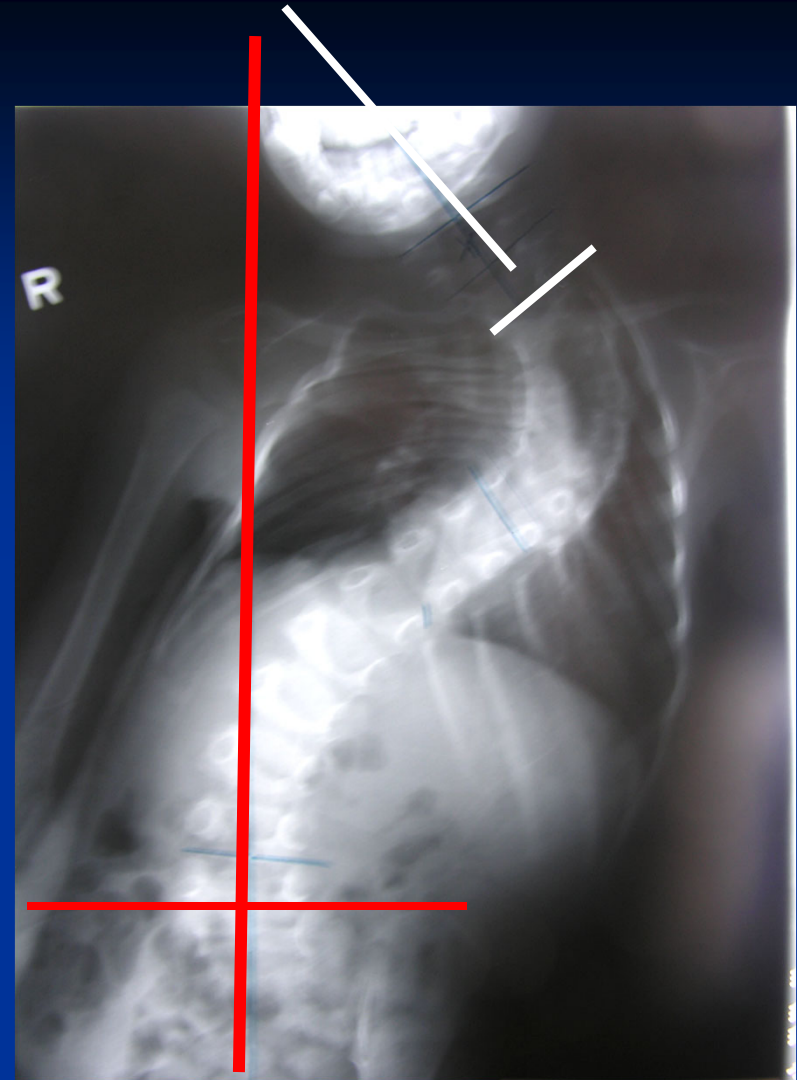
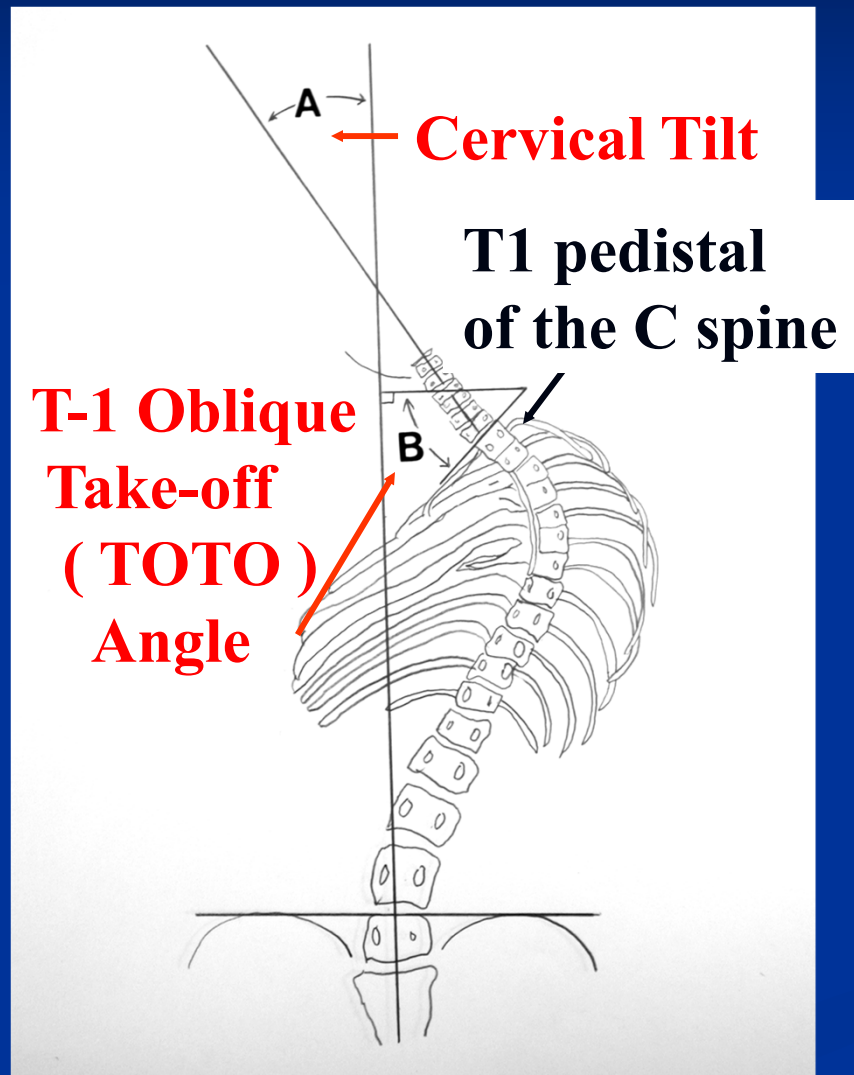
T1-8:
(66% of T spine)

VEPTR Treatment of Cervical Tilt



- Campbell, Adcox, et al., SPINE, Sept, 2007

Effect of VEPTR on Cervical Tilt



-Campbell, Adcox, et al.
Spine , 2007



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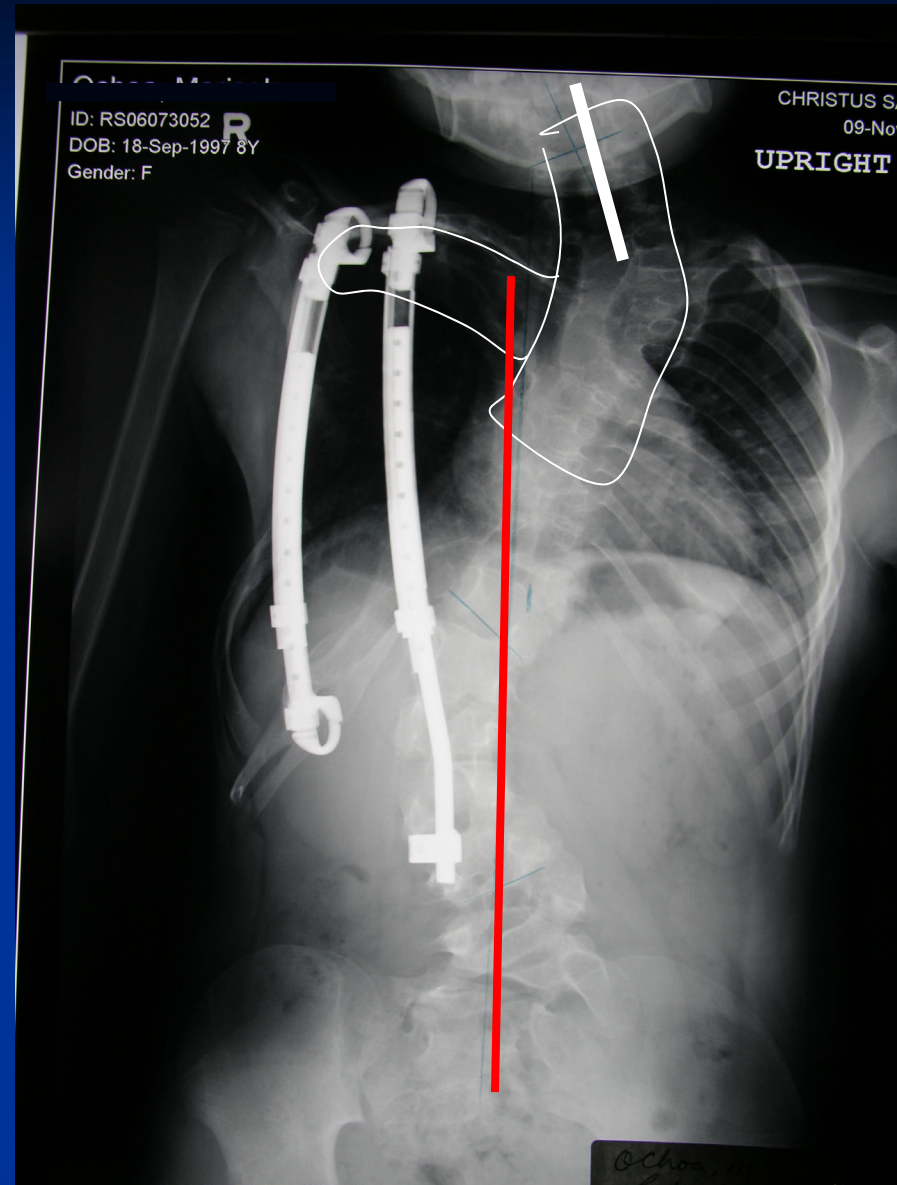
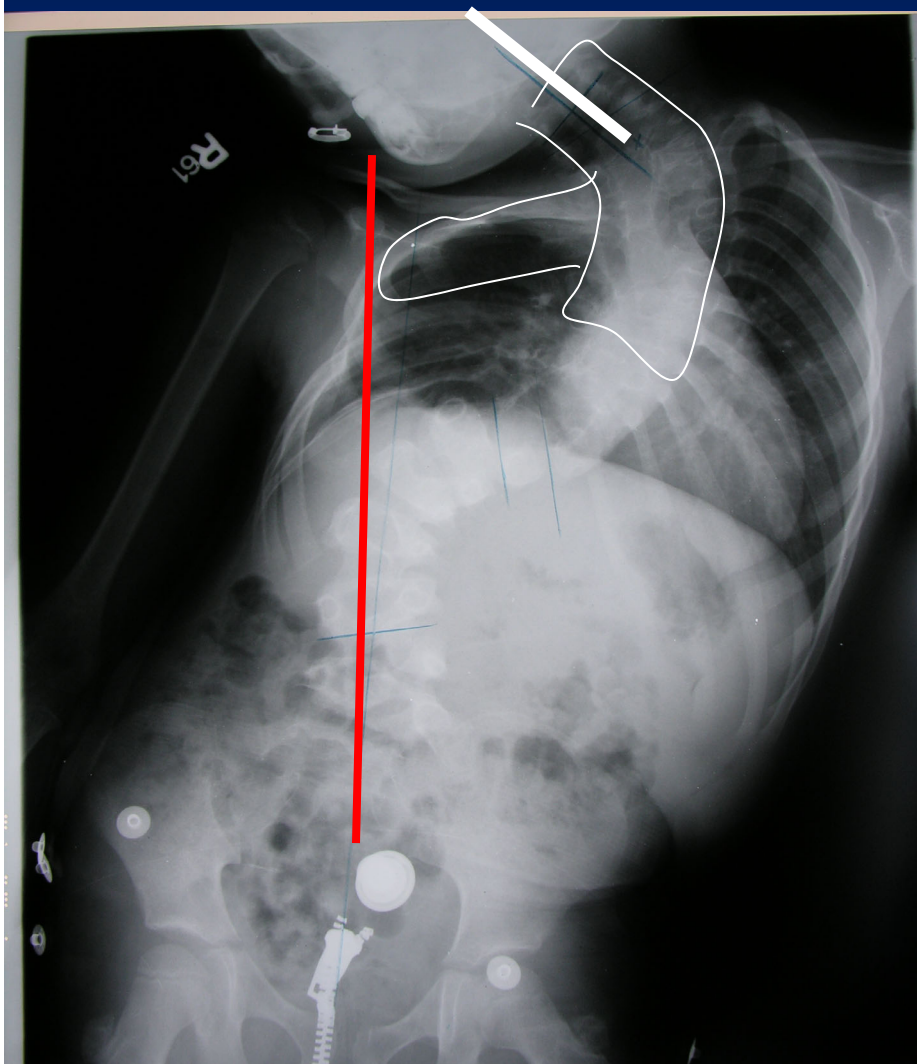
10 pts. Avg f/u 5.75 yrs (2-11.5 yrs)

- Co-Morbidities
 - 36% C spine anomalies
 - 21% cong heart disease
 - 21% renal abnormalities
- 43% spinal cord abnormalities
 - 1 syrinx
 - 5 tethers



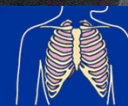
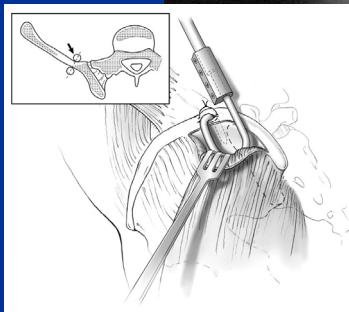
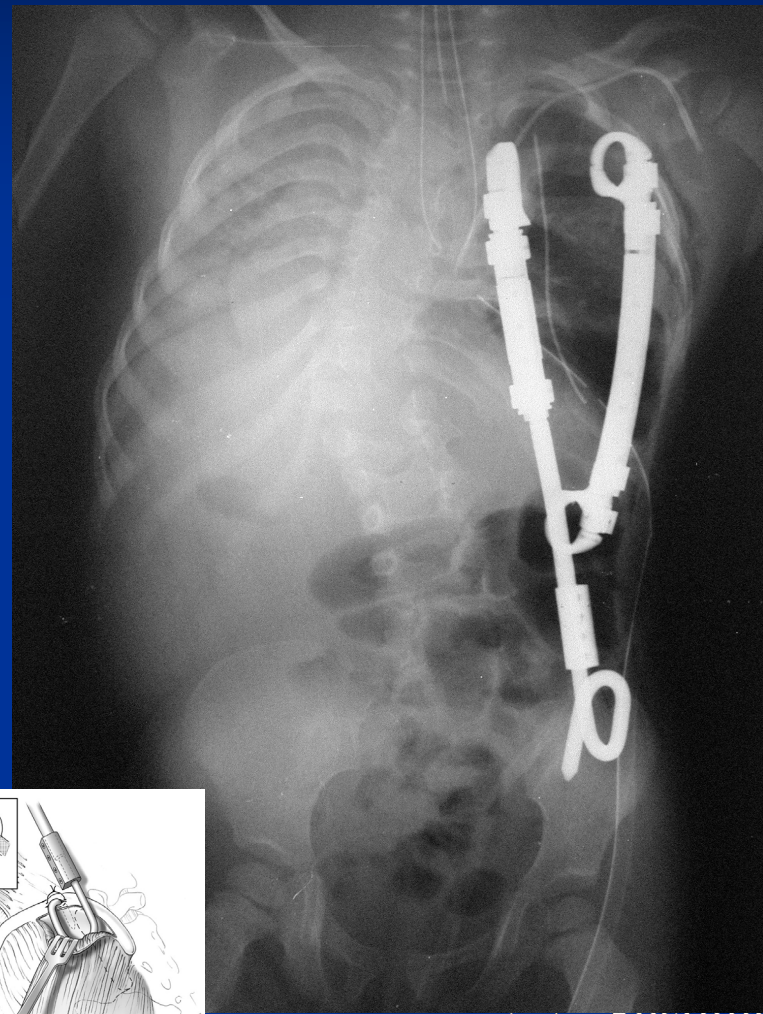
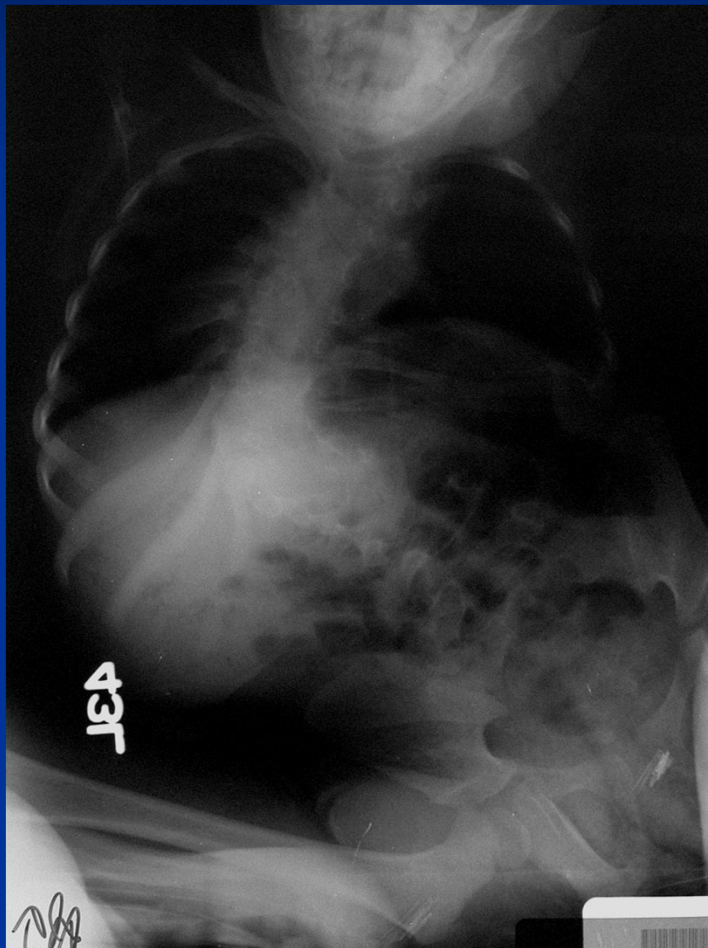
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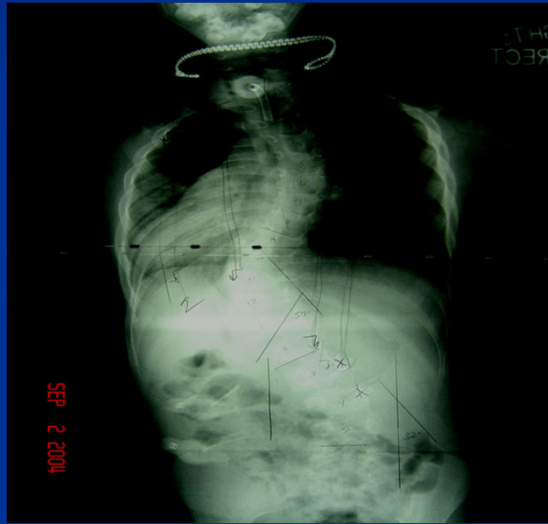
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VEPTR S-Hook Iliac Crest Pedestal Fixation



Percutaneous Bilateral Rib to Pelvis VEPTR without thoracostomy

-John Smith, MD, Utah



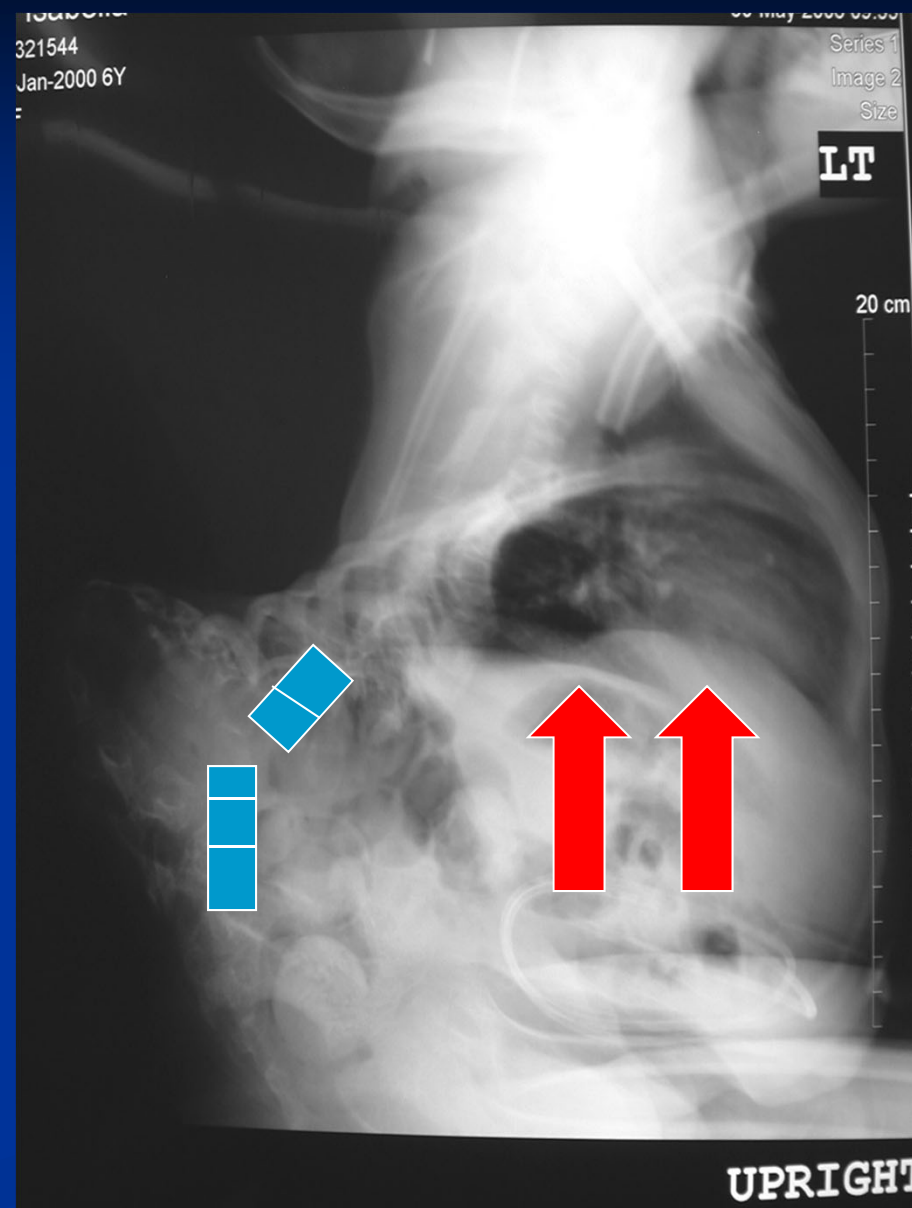
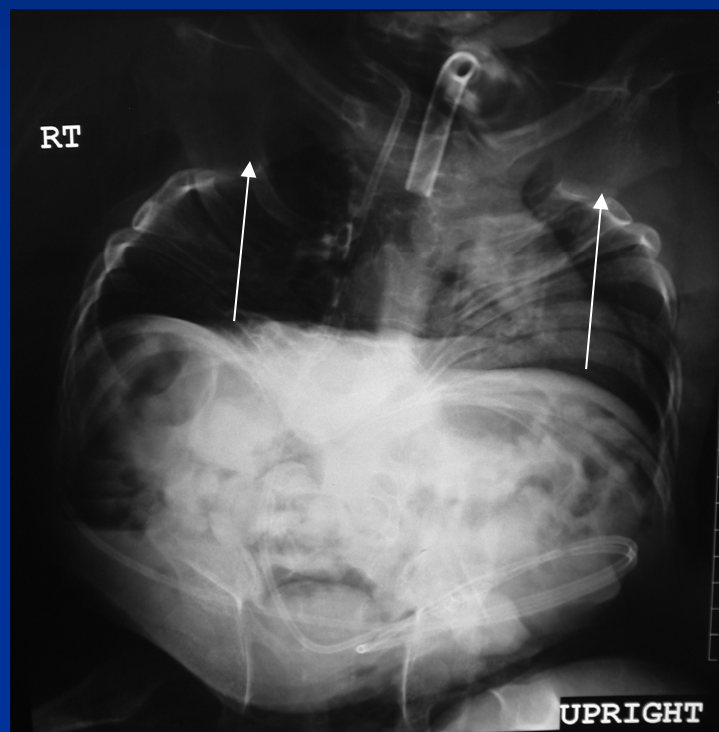
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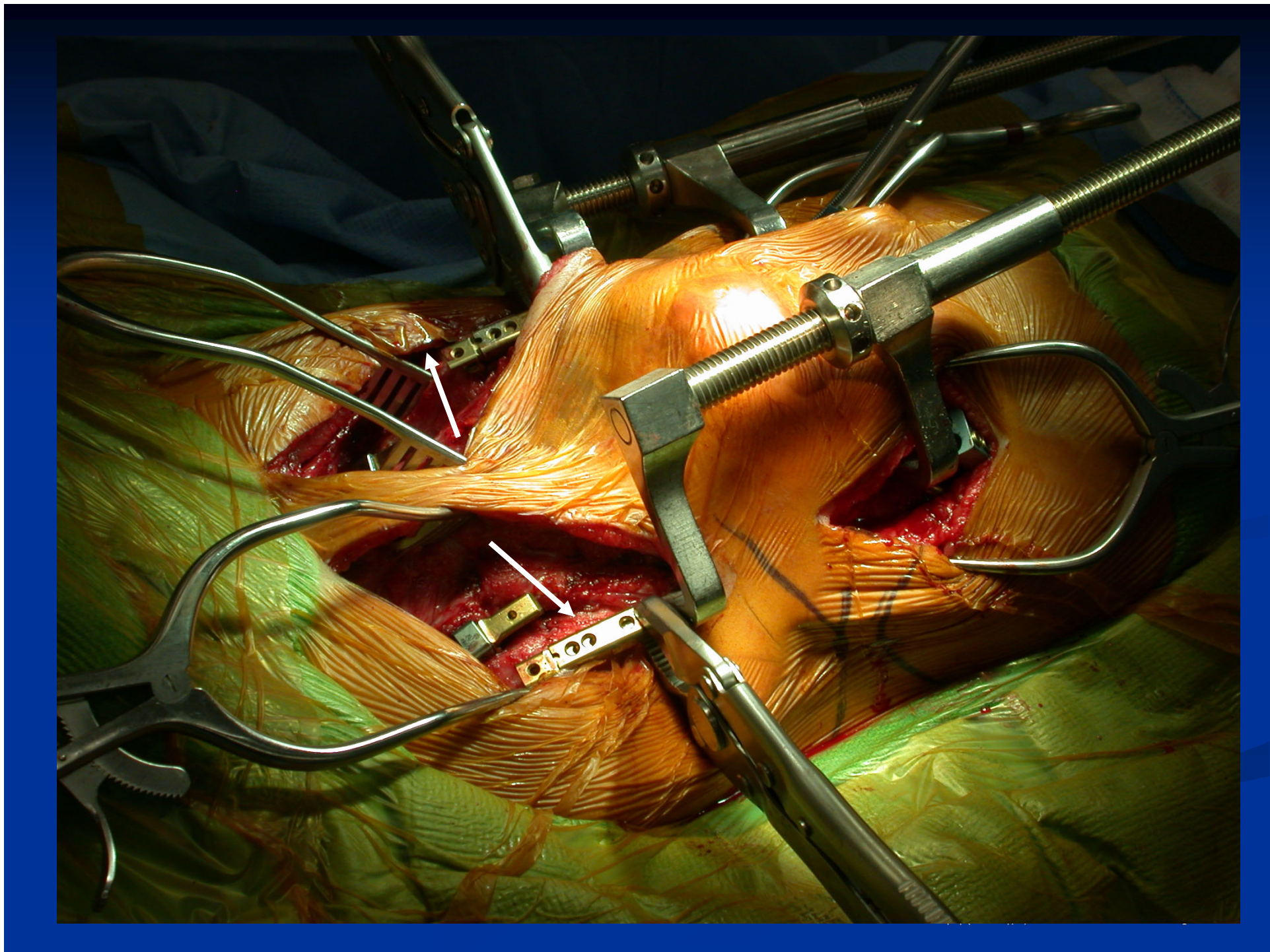
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Myelomeningocele Gibbus Treatment

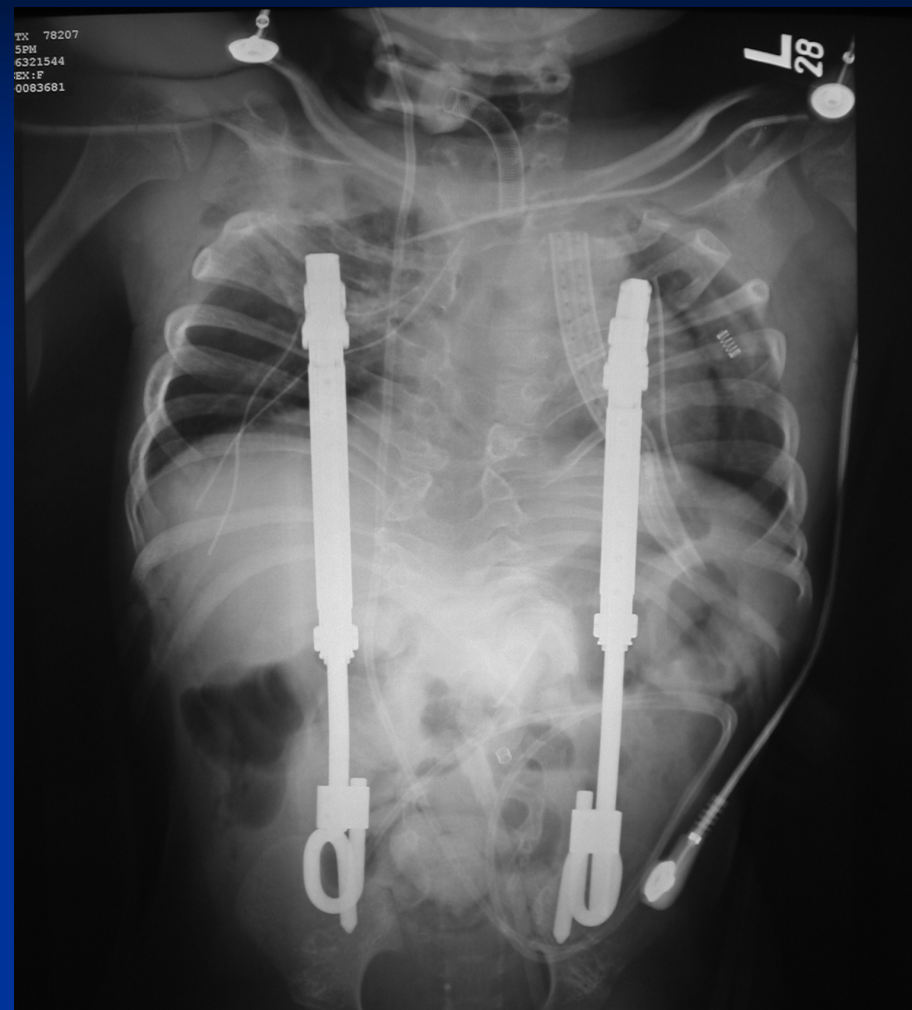
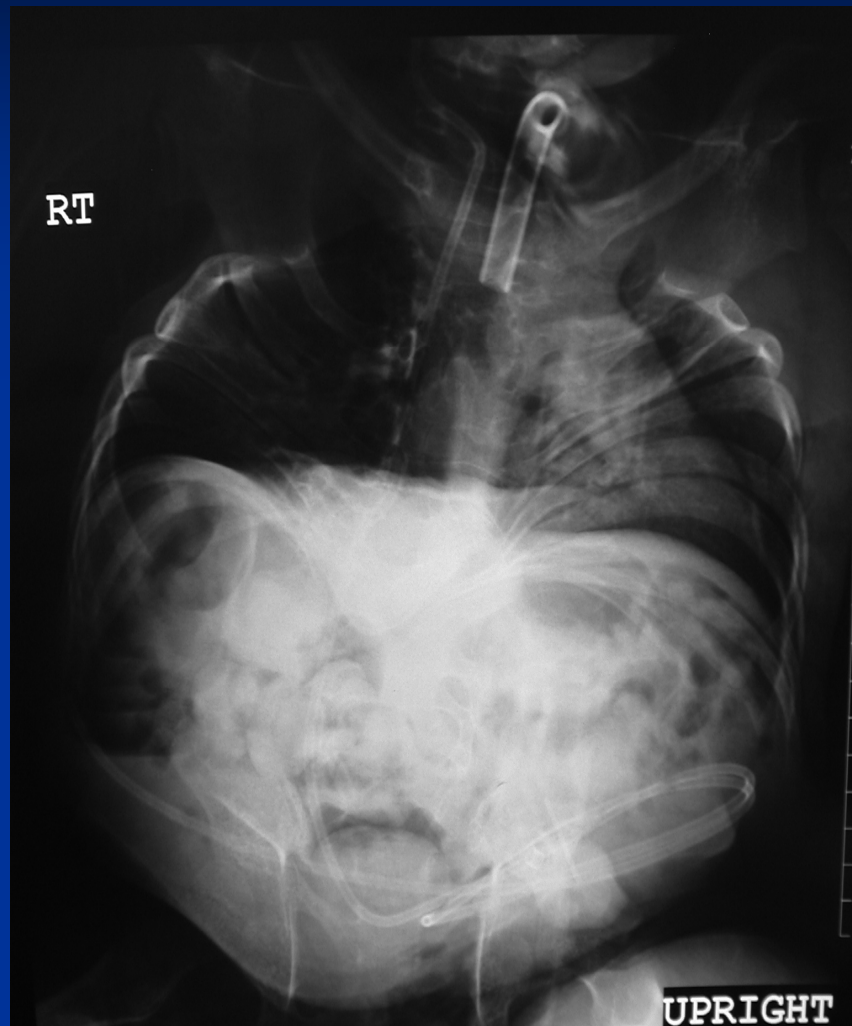
6 y/o myelomeningocele ventilator dependant



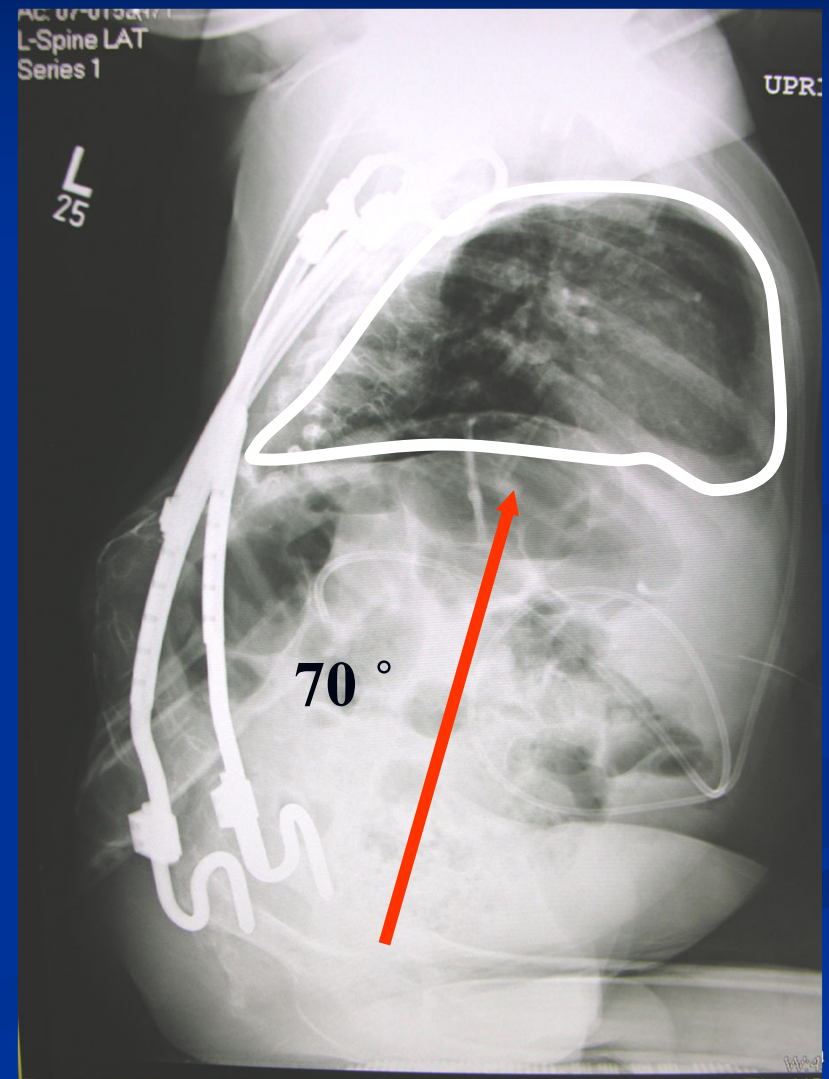
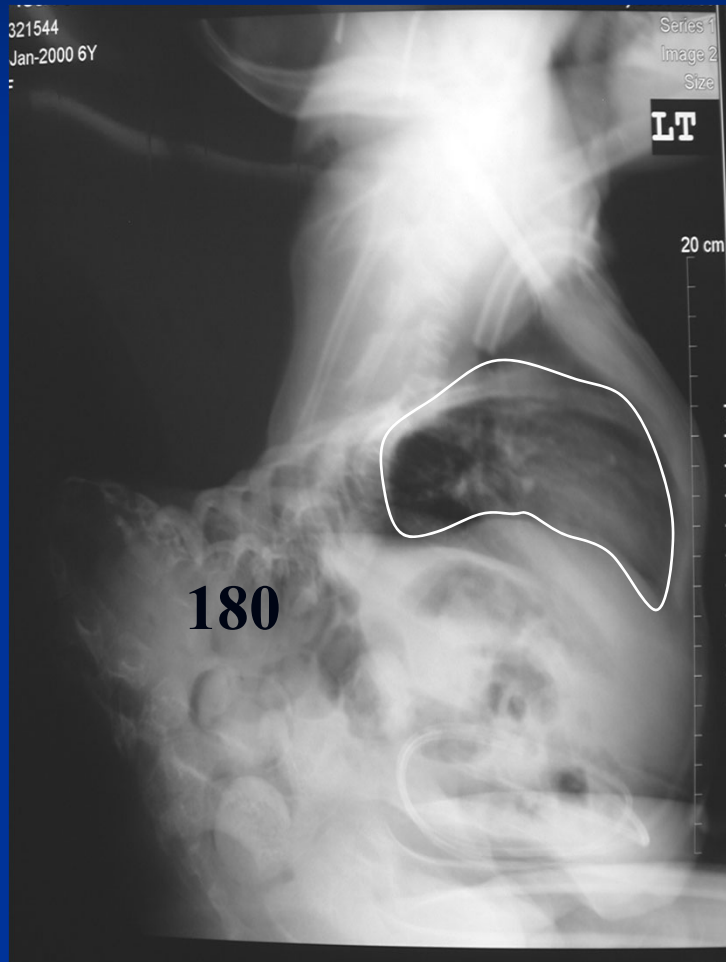




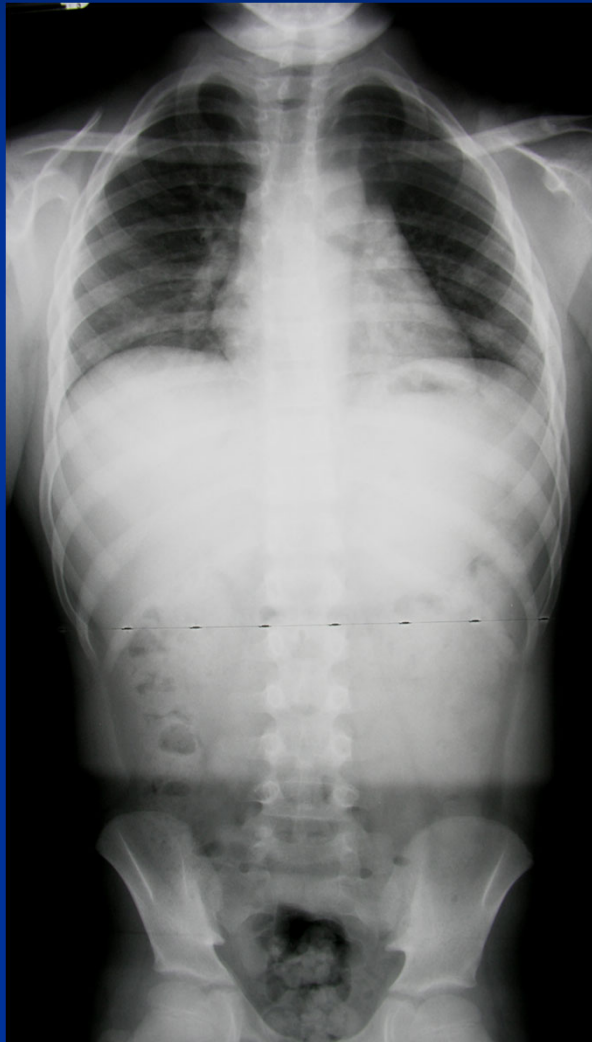




18 Month follow-up

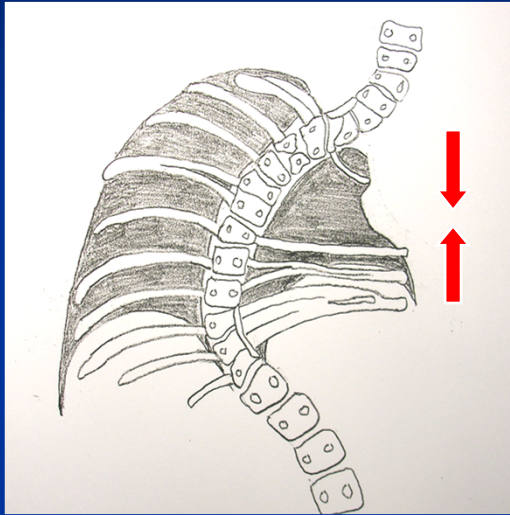


The Future

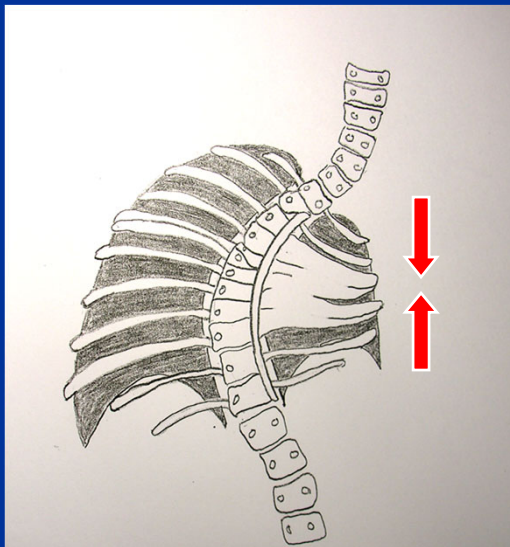


Volume Depletion Deformities of the Thorax

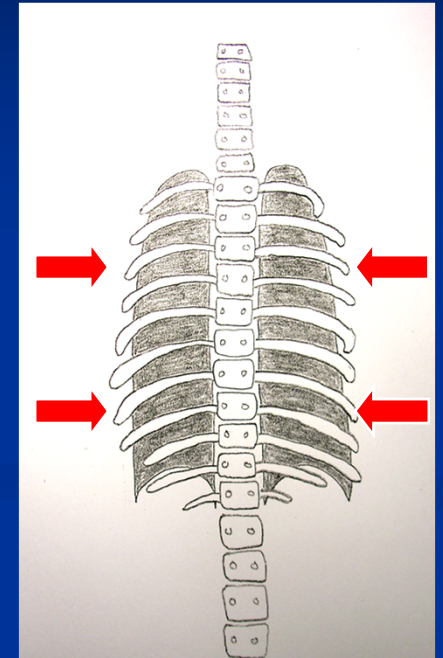
I



II



III a



III b

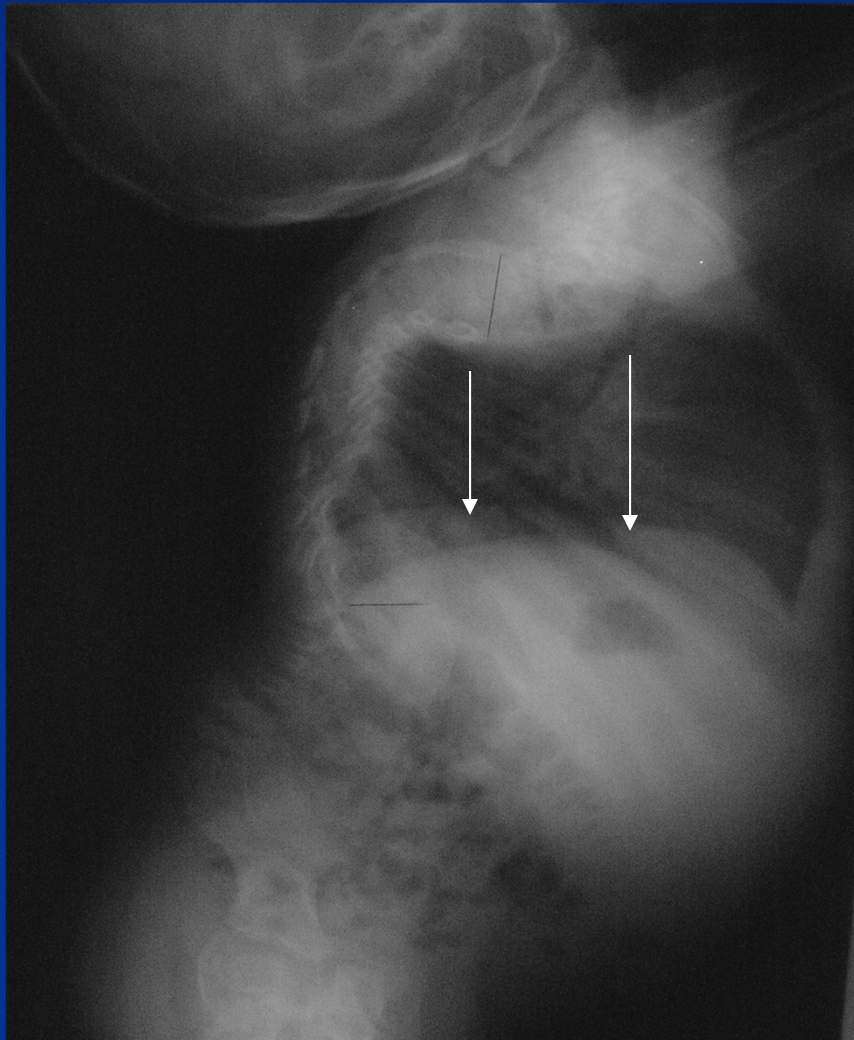
-Campbell Smith,
JBJS, supp, 2007



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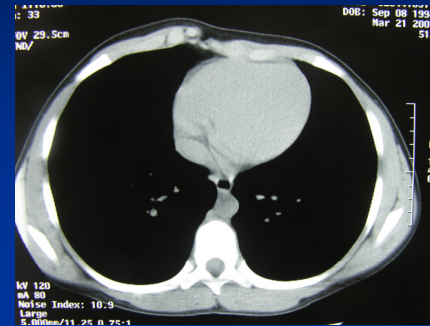
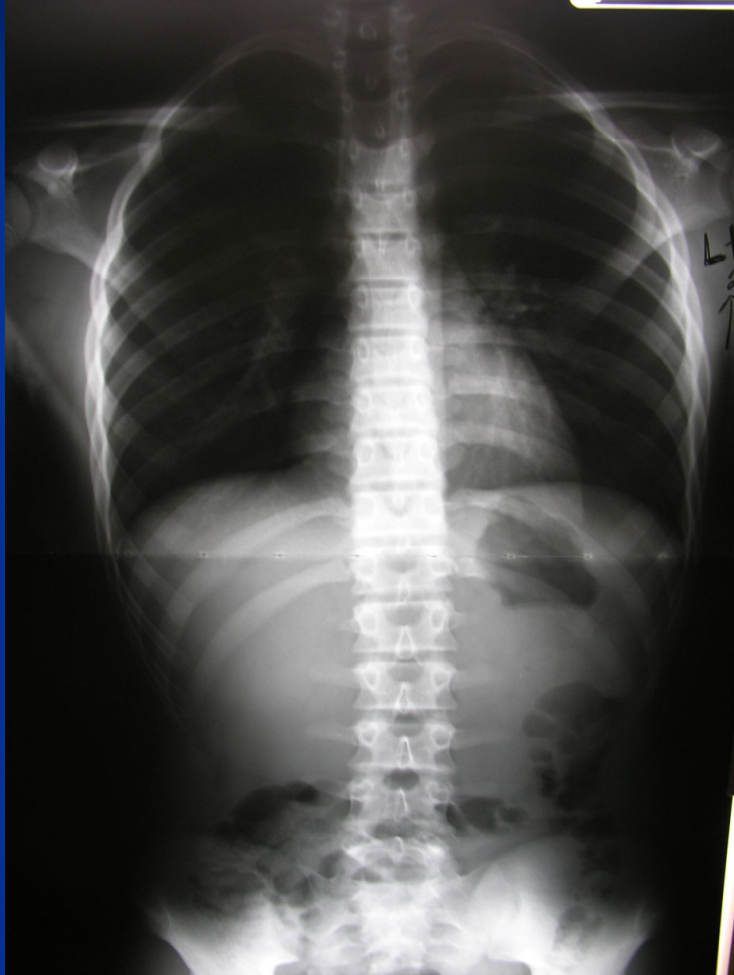
Type III a VDD from severe kyphosis



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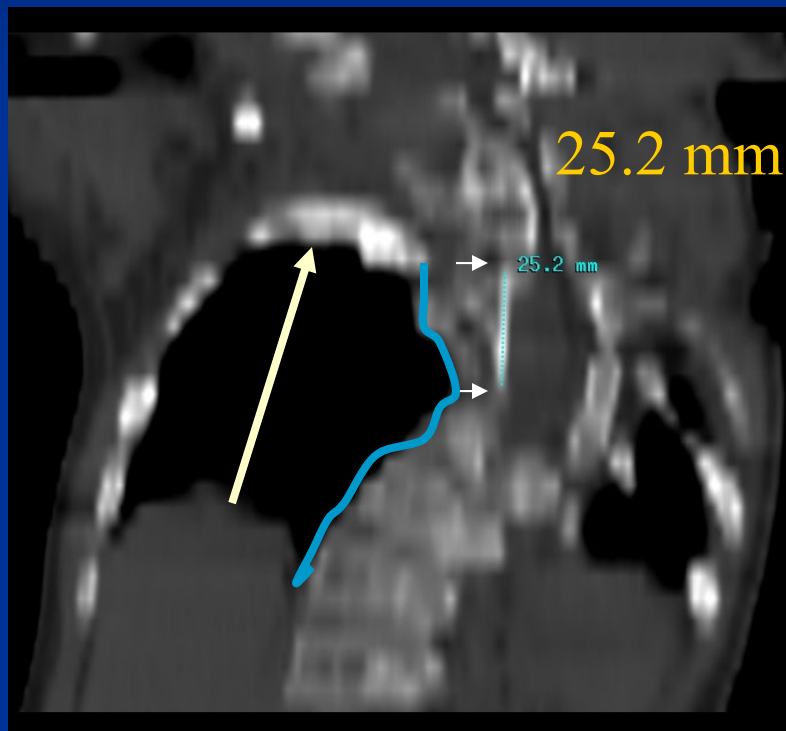
CT Scans: 3-D Thoracic Deformity



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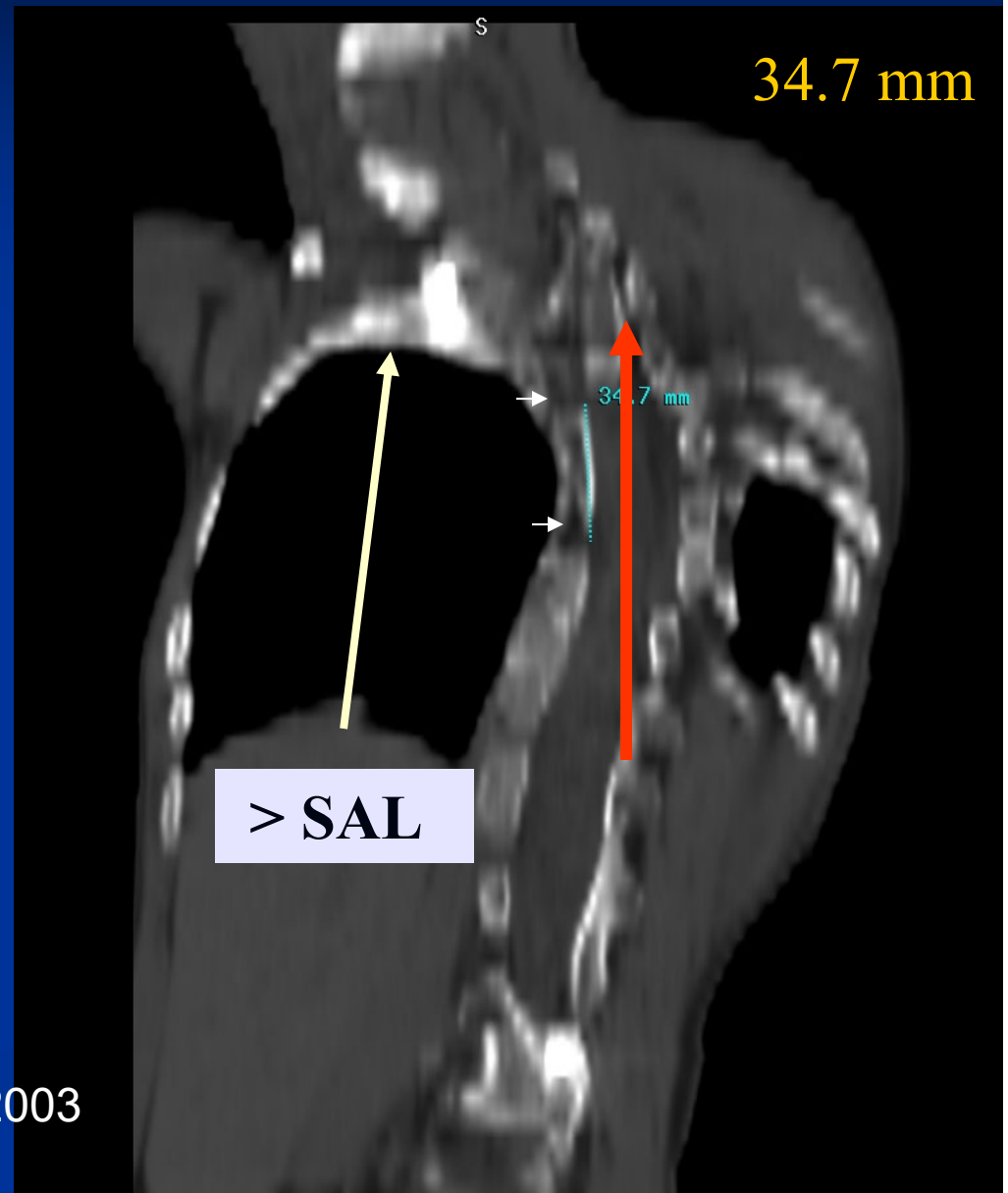
Growth of Bars / Concave side of Spine



-Avg 7% increase length
concave side and bars

P < 0.0001

-JBJS, 2003



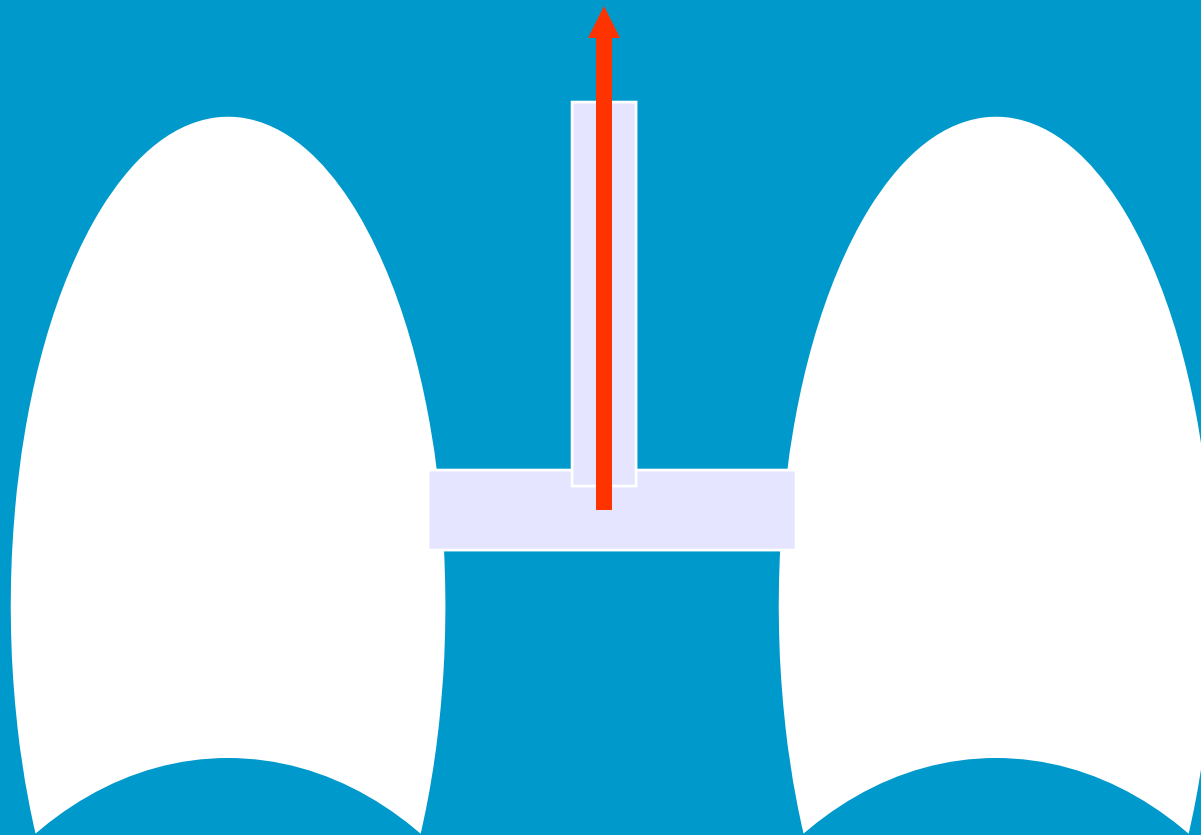
Additional Thoughts



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FVC, TV, Etc ..



Rt Lung

Lt Lung

PFT's are Lacking Biomechanically

Respiration

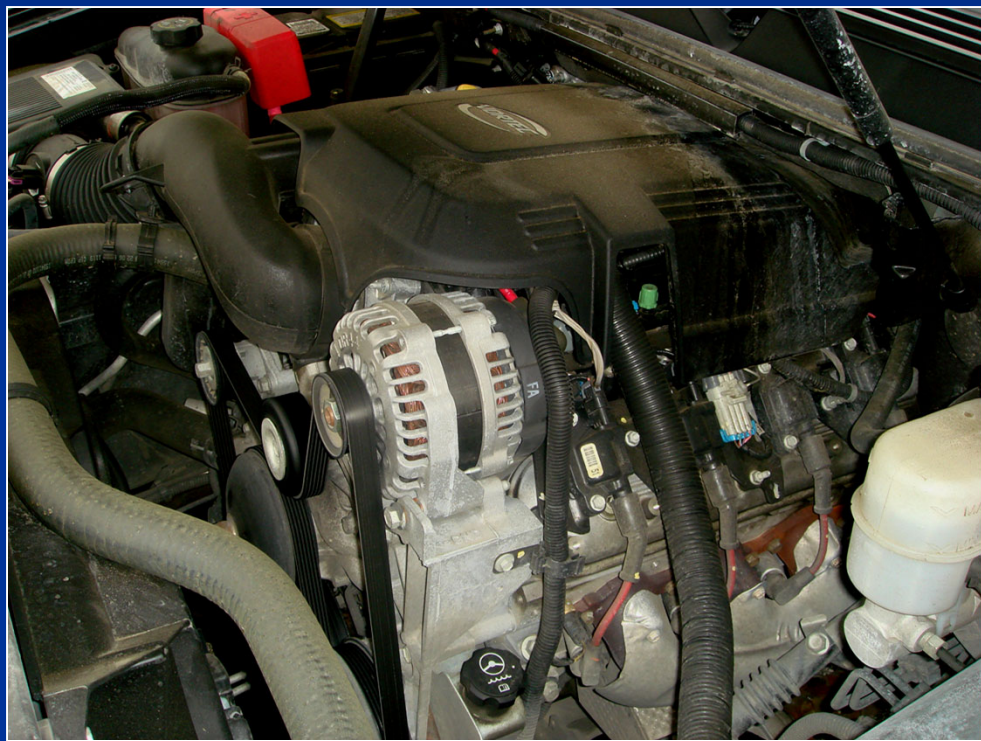
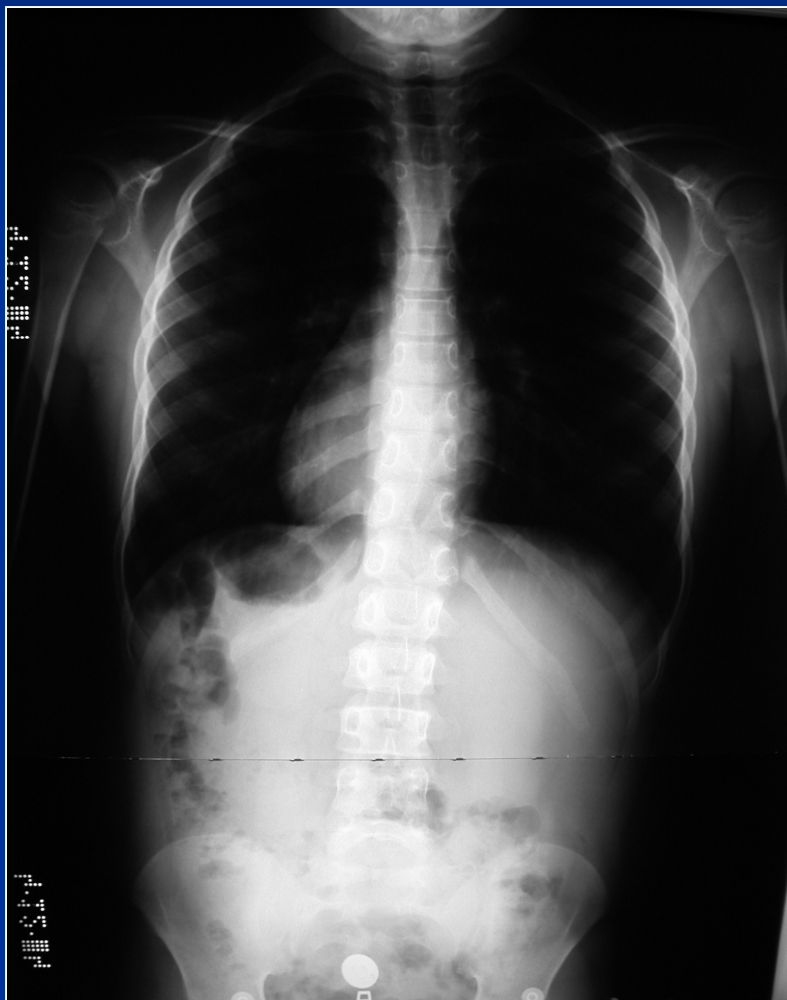
Where we live

- Normal “at rest” breathing
 - **Tidal Volume**

The Respiratory “Sprint”

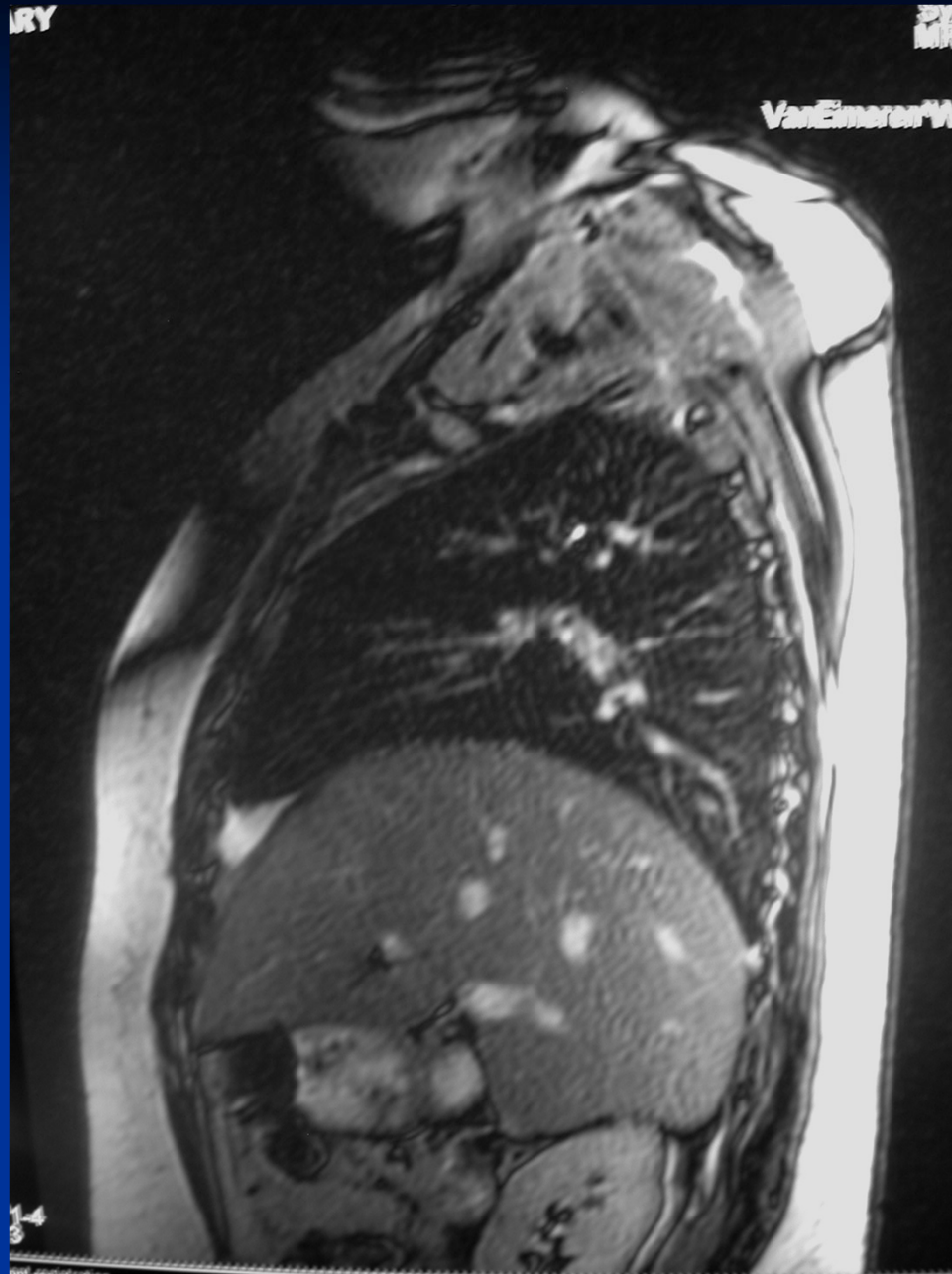
- High demand “maximum inspiratory effort” breathing
 - **Forced Vital Capacity**

The Thorax is the Engine of Respiration



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Dynamic Lung MRI and Spine Deformity

Kotani, T. et al.
Spine, 2004.

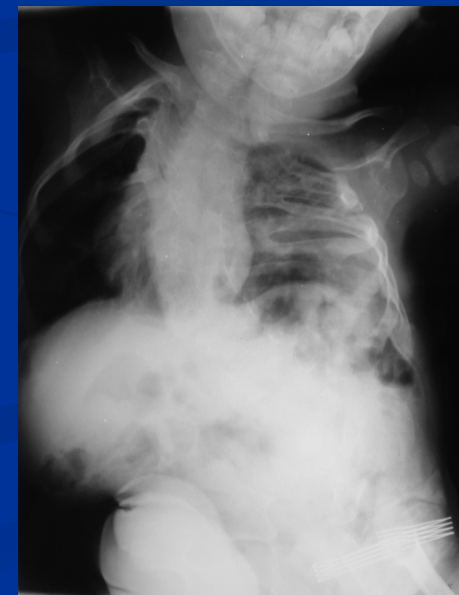
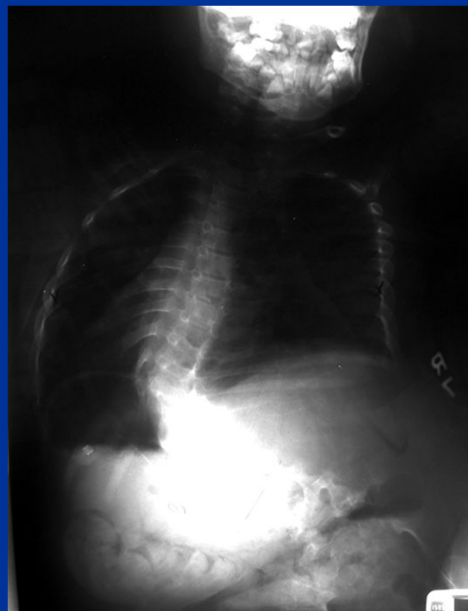
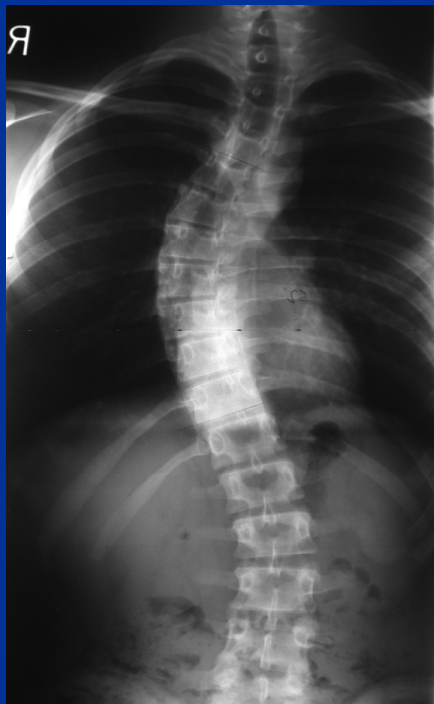
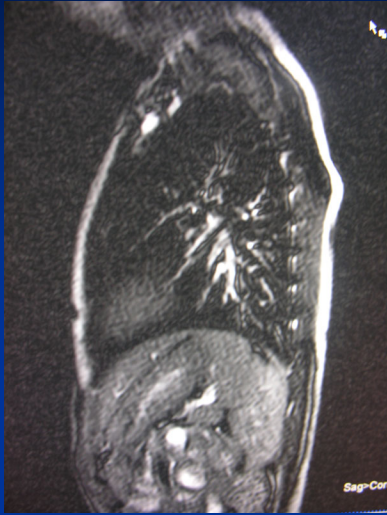
Chu, WCW, et al.
-SRS 2005



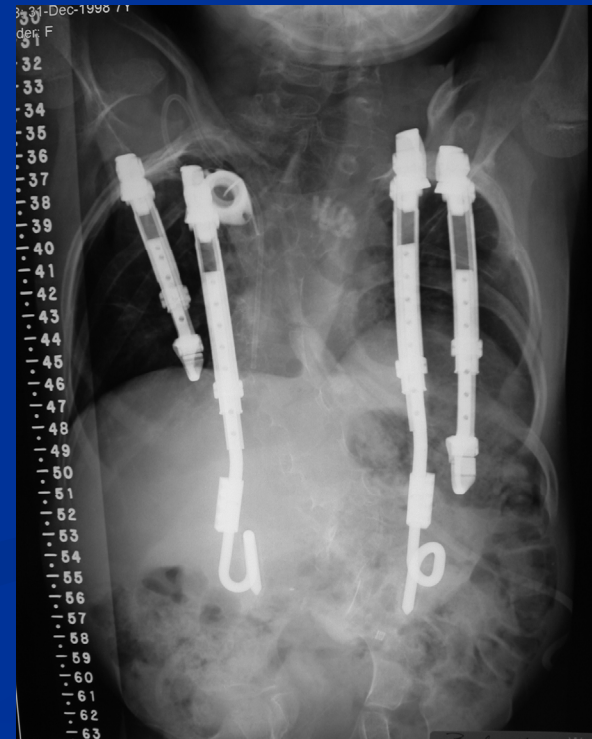
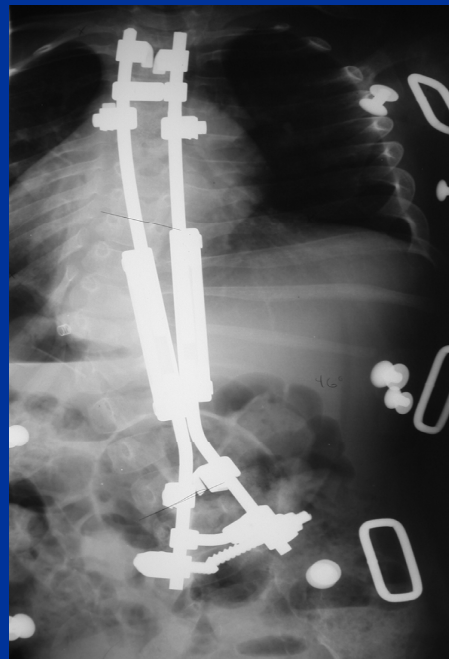
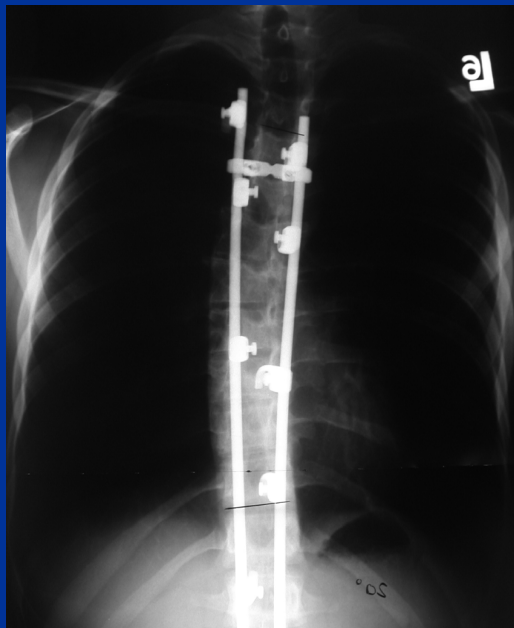
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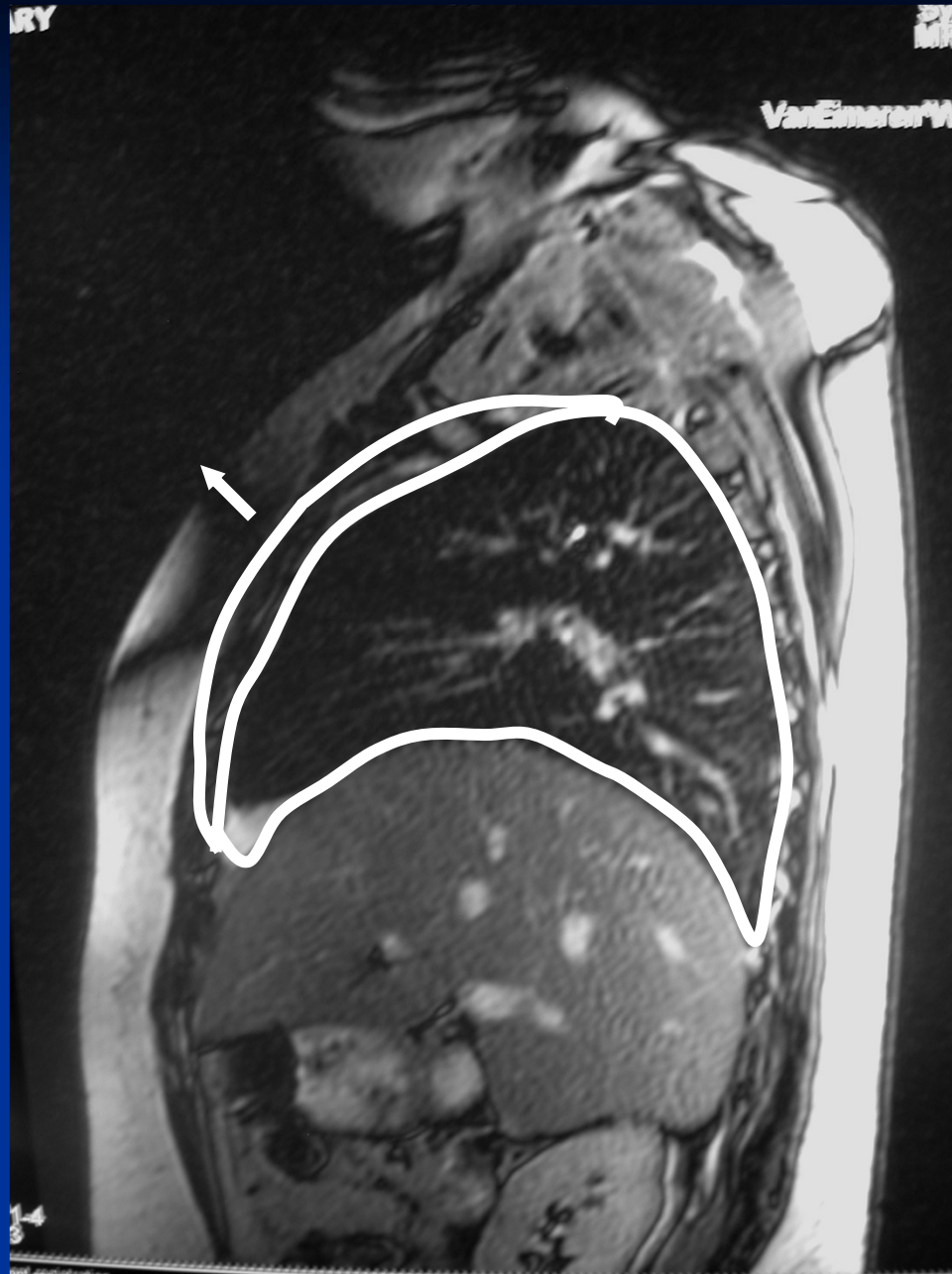
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Effect of Deformity on the Engine



Effect of Treatment on the Engine





Respiration:
Change in Lung
Volume from
Rib Cage Expansion
(20% FVC)



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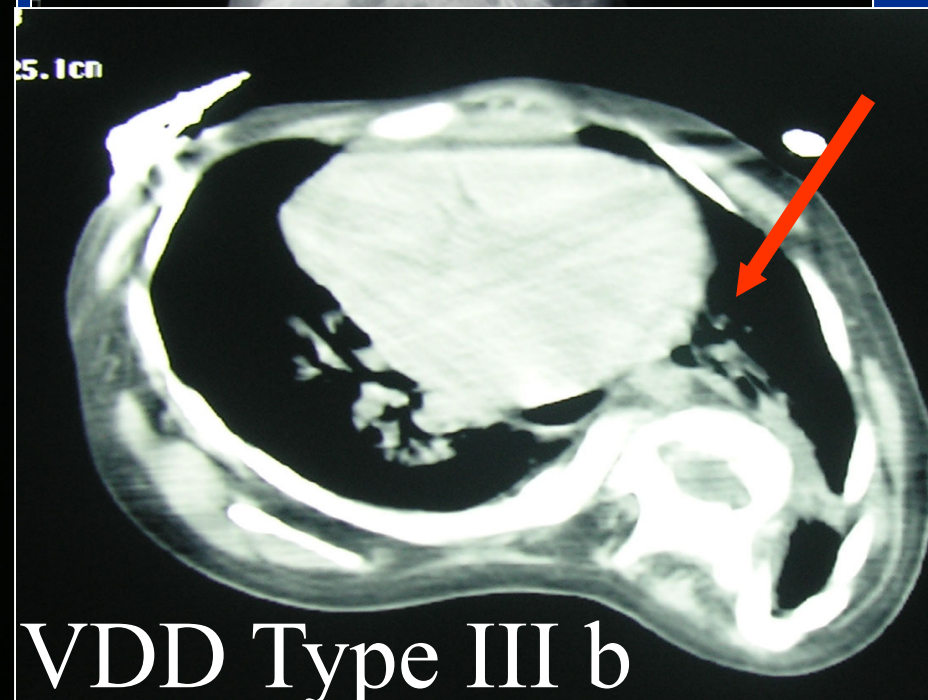


Respiration: Change
in Lung Volume from
Diaphragm
Contraction
(80% FVC)



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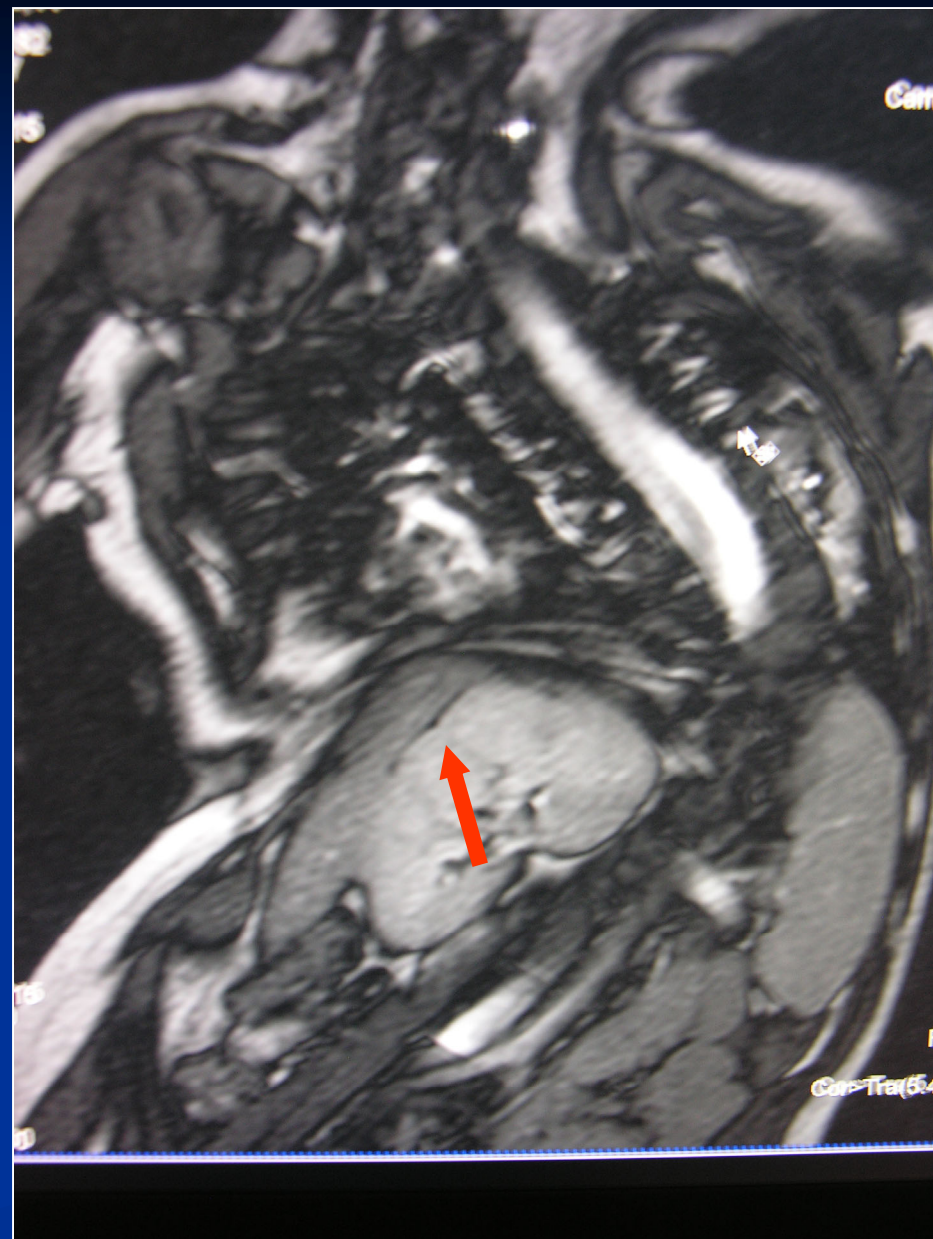


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Positive Marionette sign

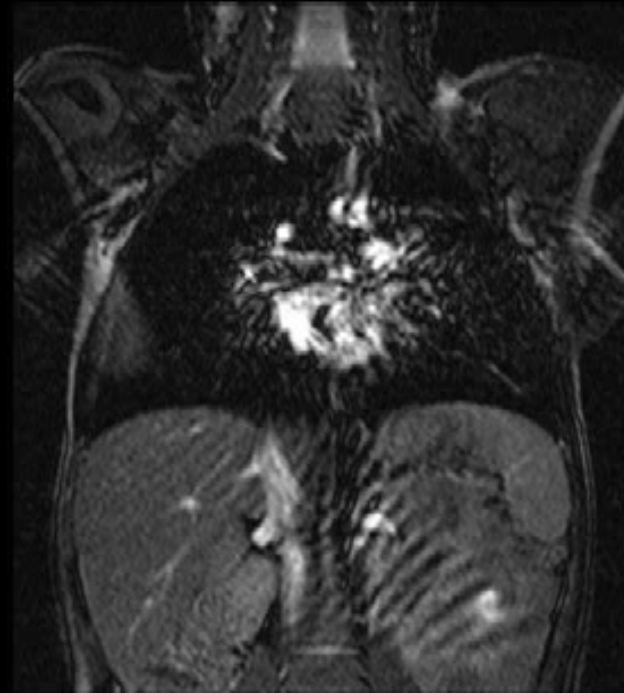
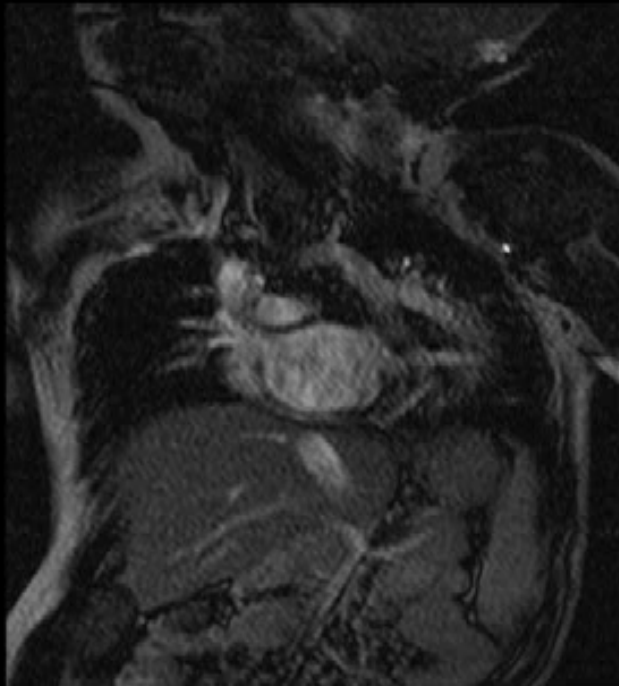




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Patient

Normal 4 y/o

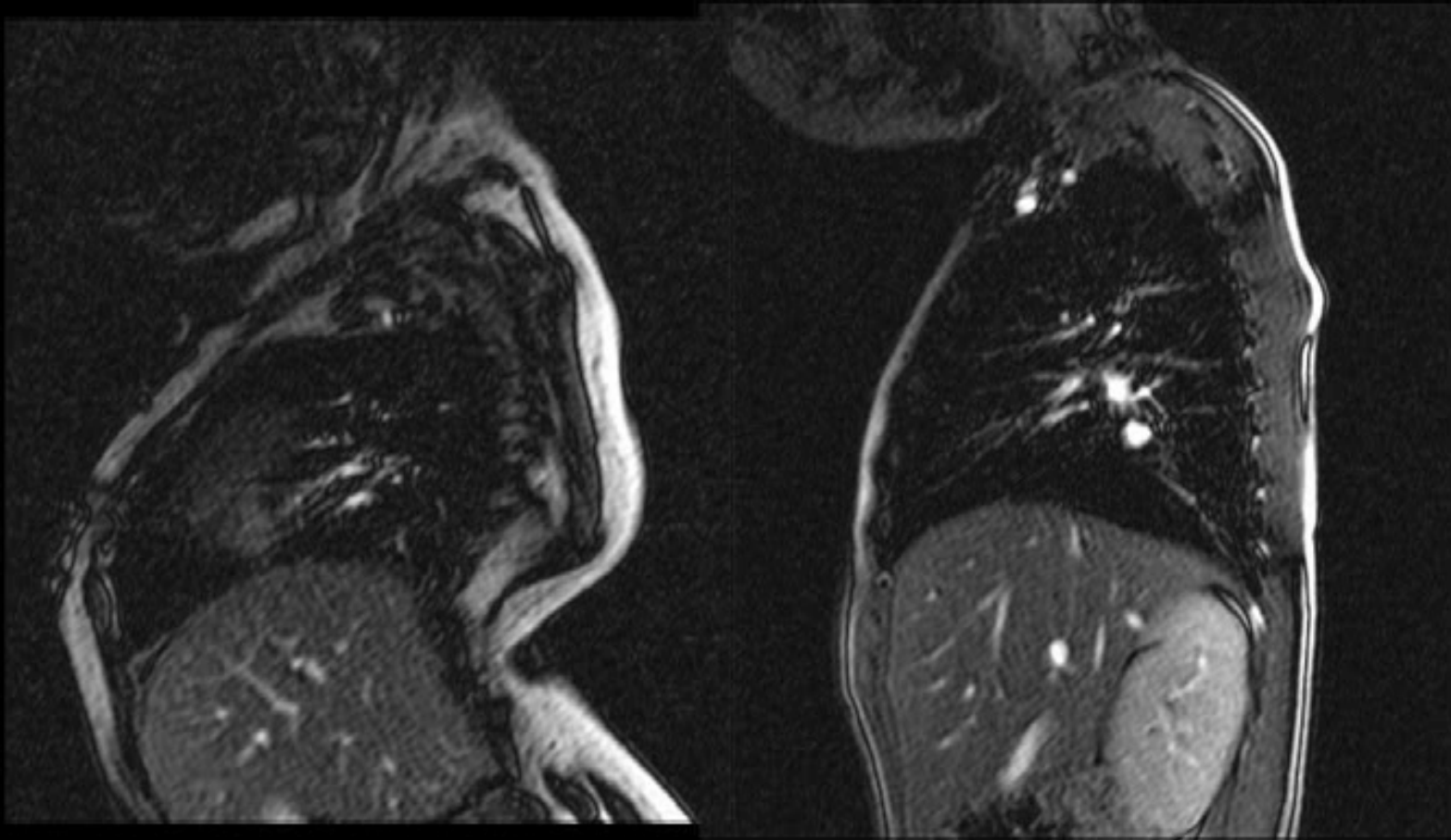


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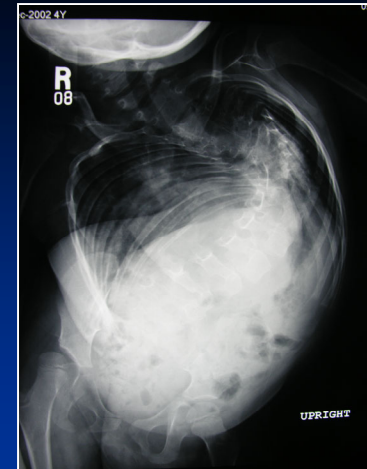
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TL 58 s.c. Δ LRC 6.3 (11%) Δ LD 5.2 (9%) **TL 89 s.c. Δ LRC 5.3 (6%) Δ LD 6.9 (8%)**

Normal



EOS



(N=6)

Δ Diaphragm

% total lung area

Δ Rib Cage

% total lung area

- Convex hemithorax 8.2 %
- Concave hemithorax 8.3 %

1.1 %

2.5 %

- Campbell, Aubrey, et al. , unpublished data



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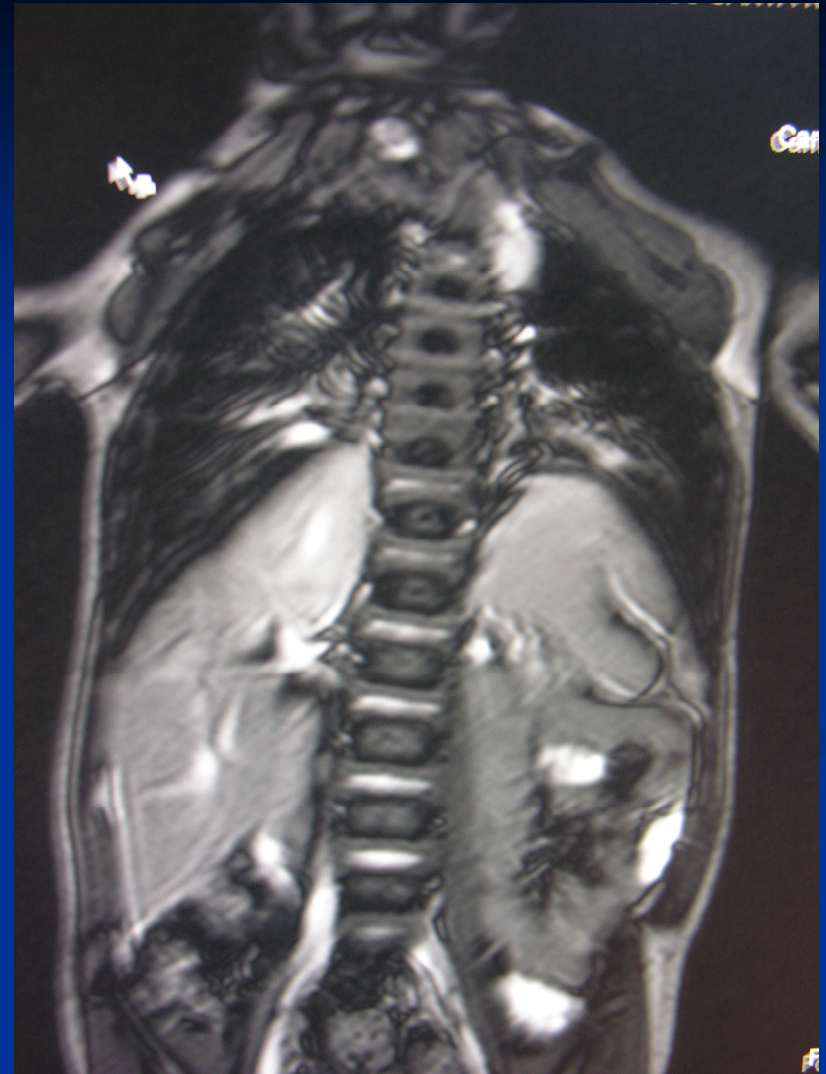
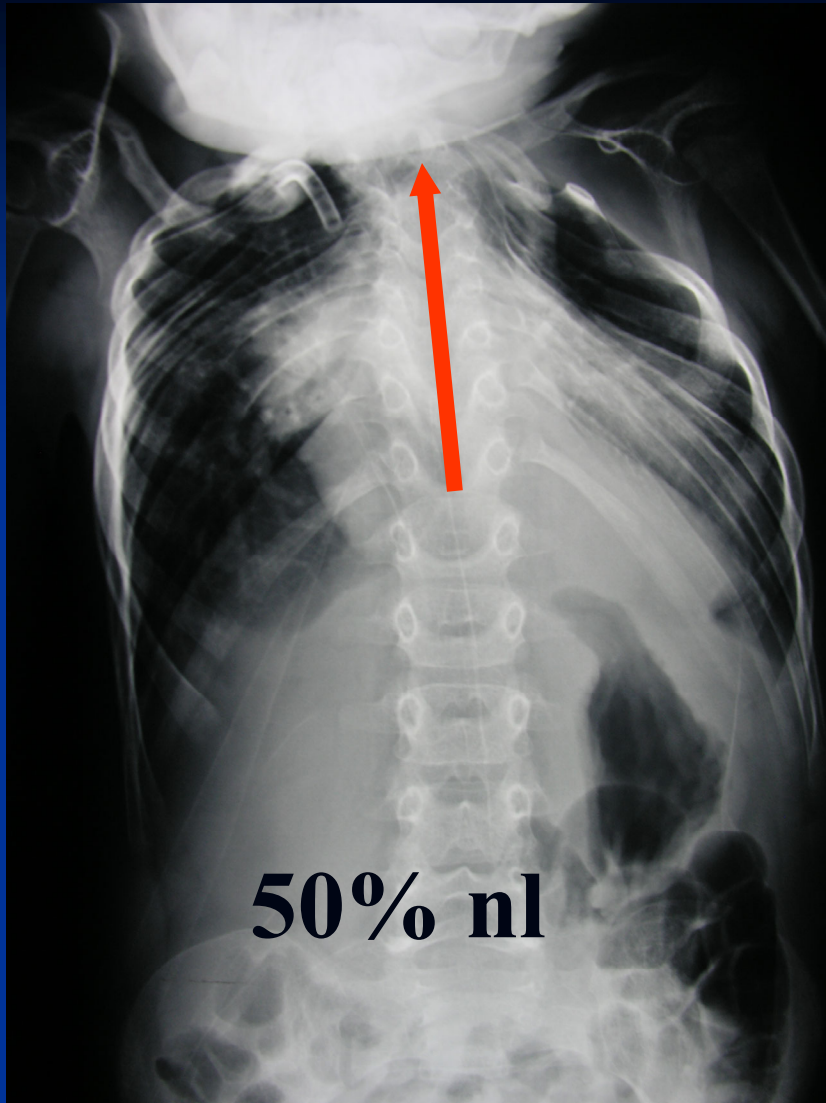


VDD Type IIIa



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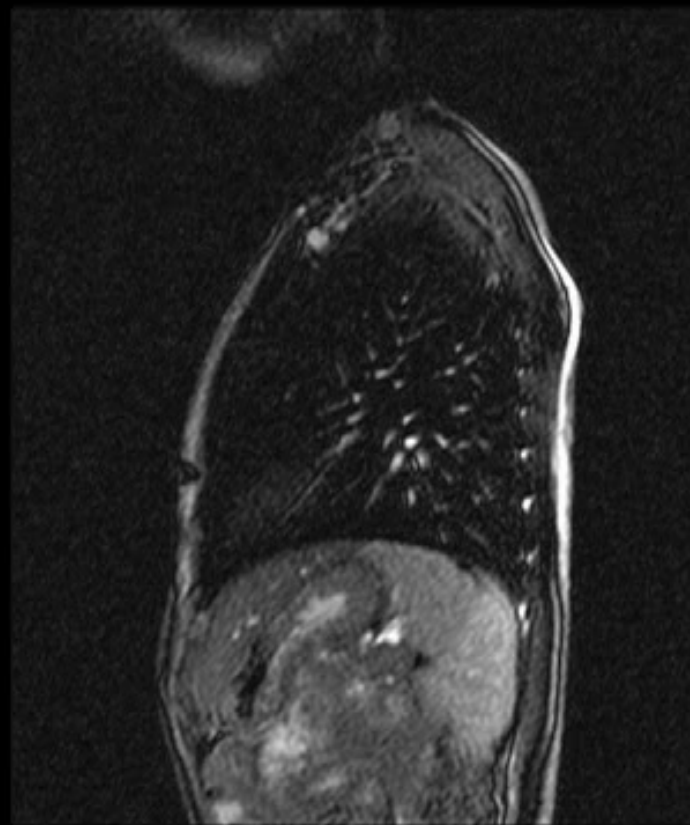
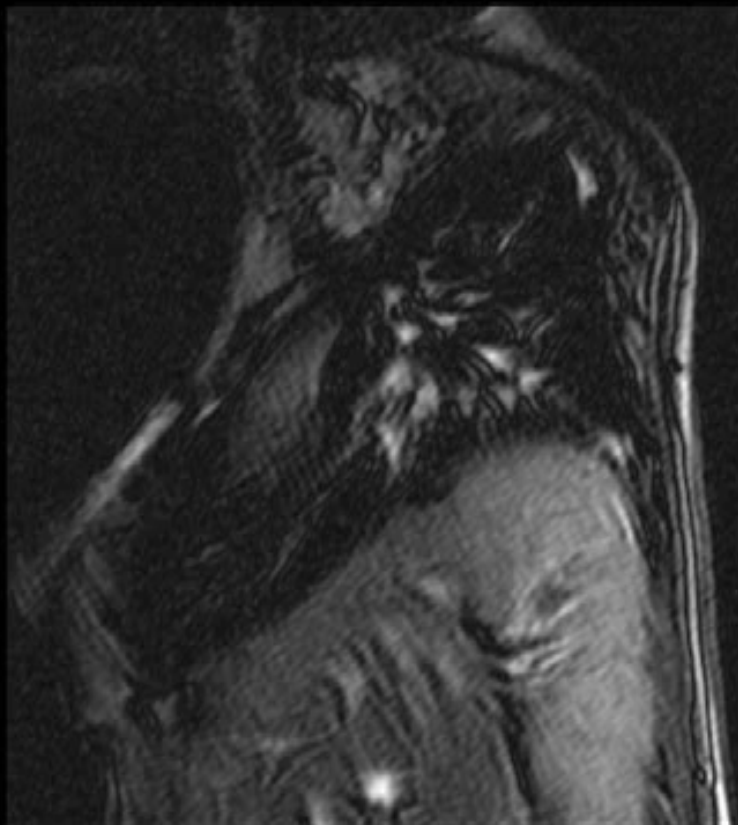




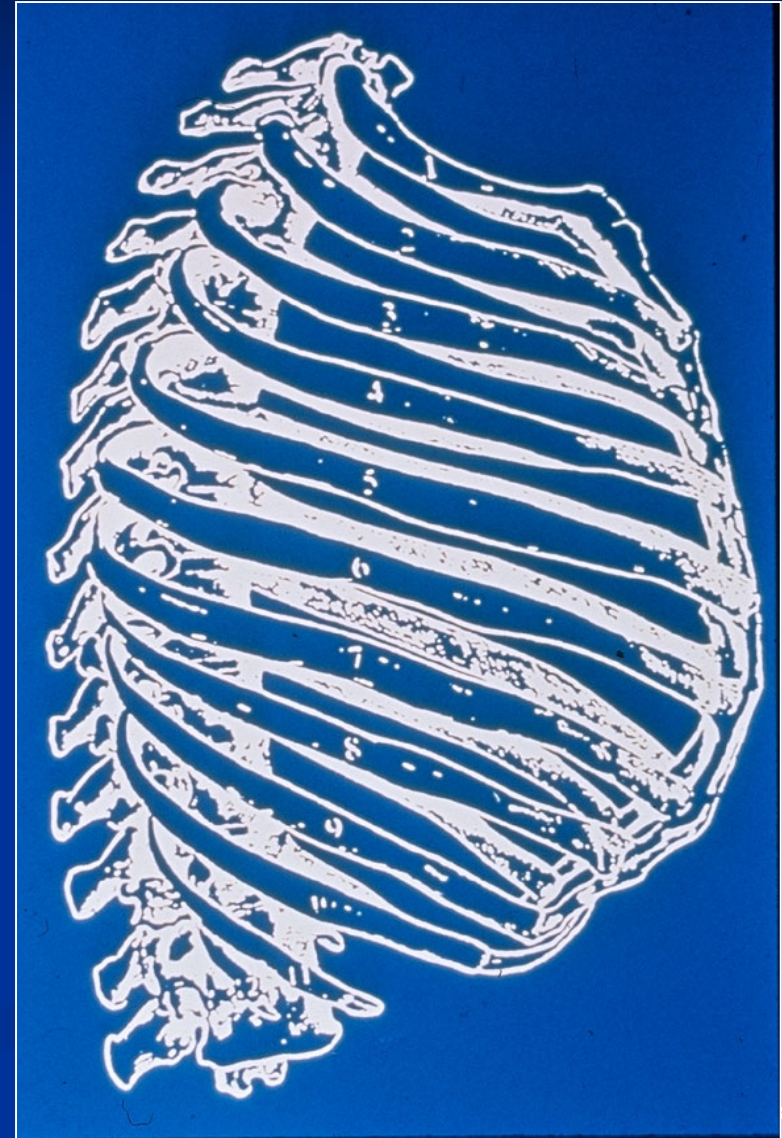
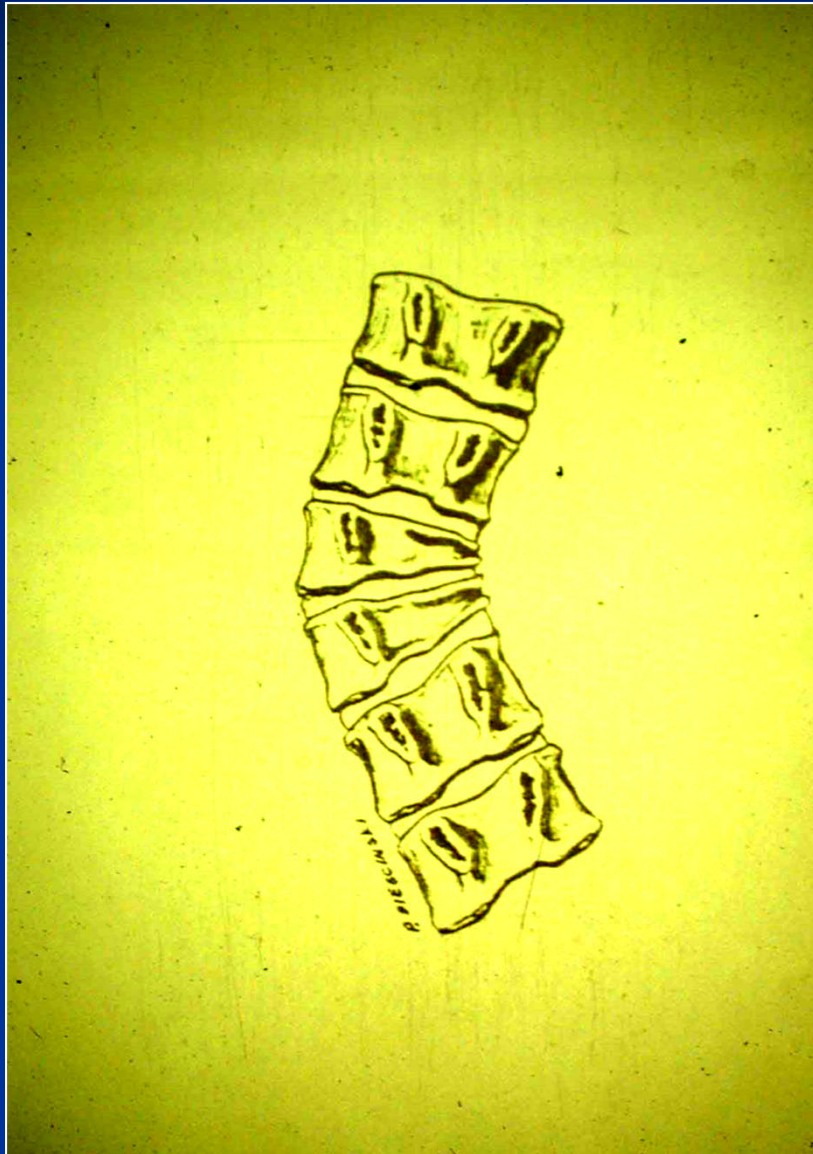
TL 74 s.c. Δ L RC 0.37 (0.4%)
(7 y/o) Δ L D 8.4 (11%)

TL 89 s.c. Δ L RC 5.3 (6%)
(4 y/o) Δ L D 6.9 (8%)

Normal



Is Scoliosis an obsolete term?



Thank You!

The Thoracic Institute
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Children's Hospital

Department of
Orthopaedics,
UTHSCSA
San Antonio, Texas



rcampbell.thoracic.institute@christushealth.org



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