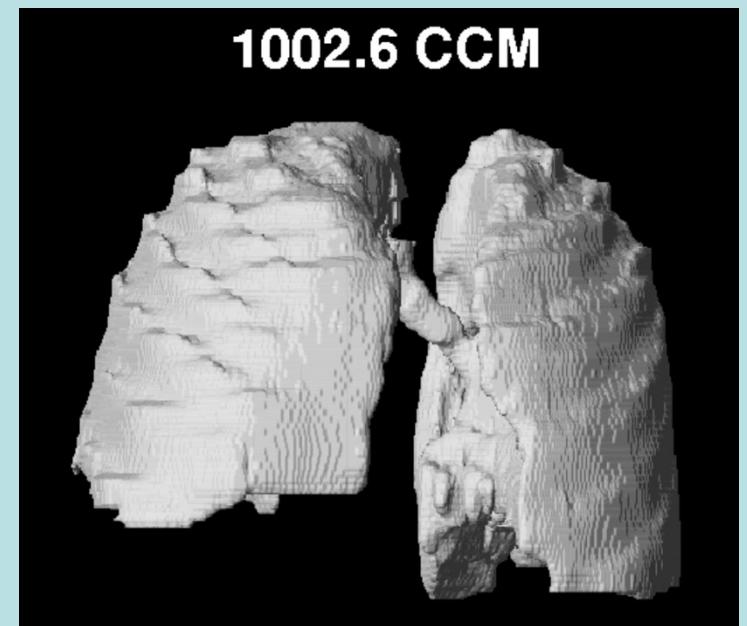


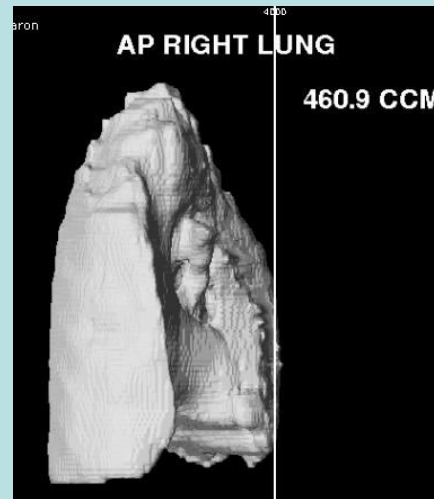
CT Lung Volume in EOS Clinical Application

Charles E Johnston MD
Anna McClung, RN
TSRHC, Dallas Tx.
ICEOS Istanbul '09



CT lung volumes

concave > convex

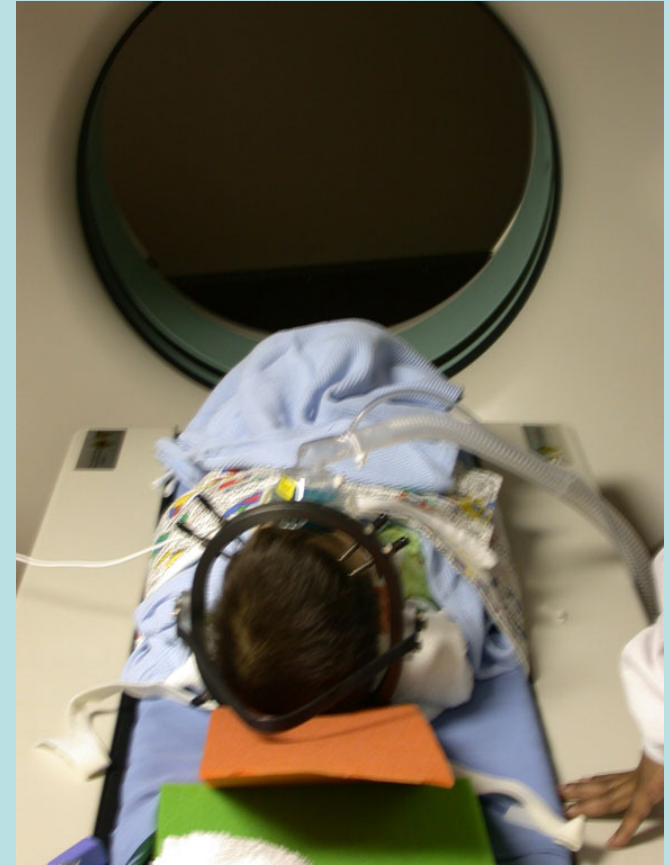


Lung vol 860 cc

Best method to evaluate anatomic results of treatment, especially in patients too young to perform traditional PFT (physiologic measure of outcome)

Methods

- 22 patients mean age 33.6 mo (5-74) @ initial scan (usually w/ MRI)
- F/u scan mean 28 mo later (IRB protocol = q 2 yr)



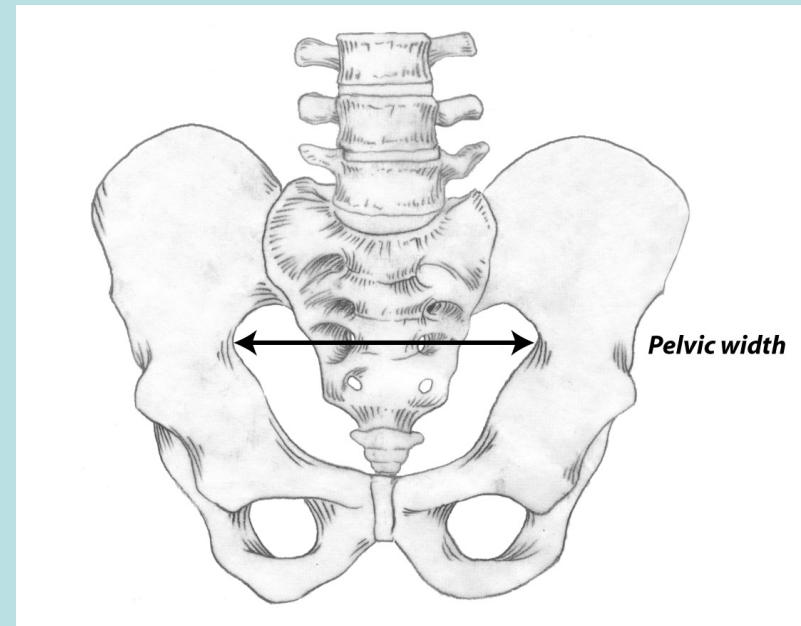
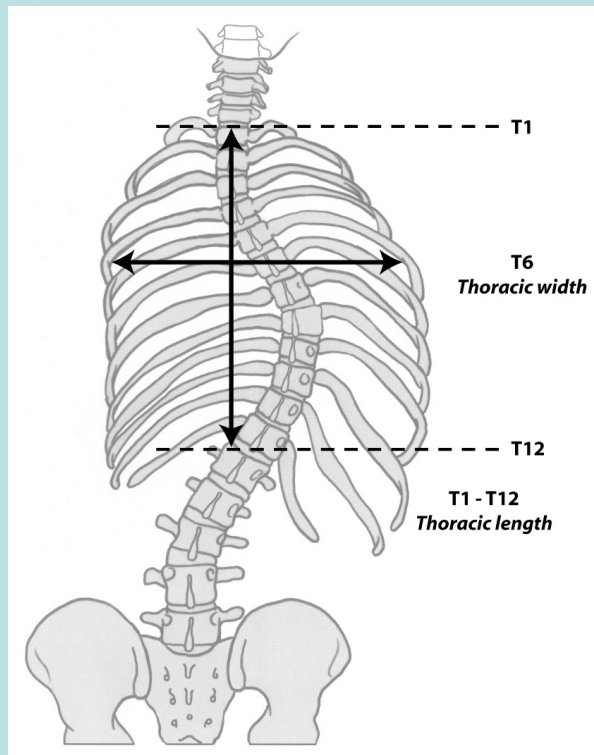
Frederick R. Long, MD
Robert G. Castile, MD
Alan S. Brody, MD
Mark J. Hogan, MD
Robert L. Flucke, RTT
David A. Filbrun, RTT
Karen S. McCoy, MD

Index terms:
Children, respiratory system
Computed tomography (CT), in
infants and children, 60.12118
Lung, CT, 60.12118
Lung, function

Radiology 1999; 212:588-593

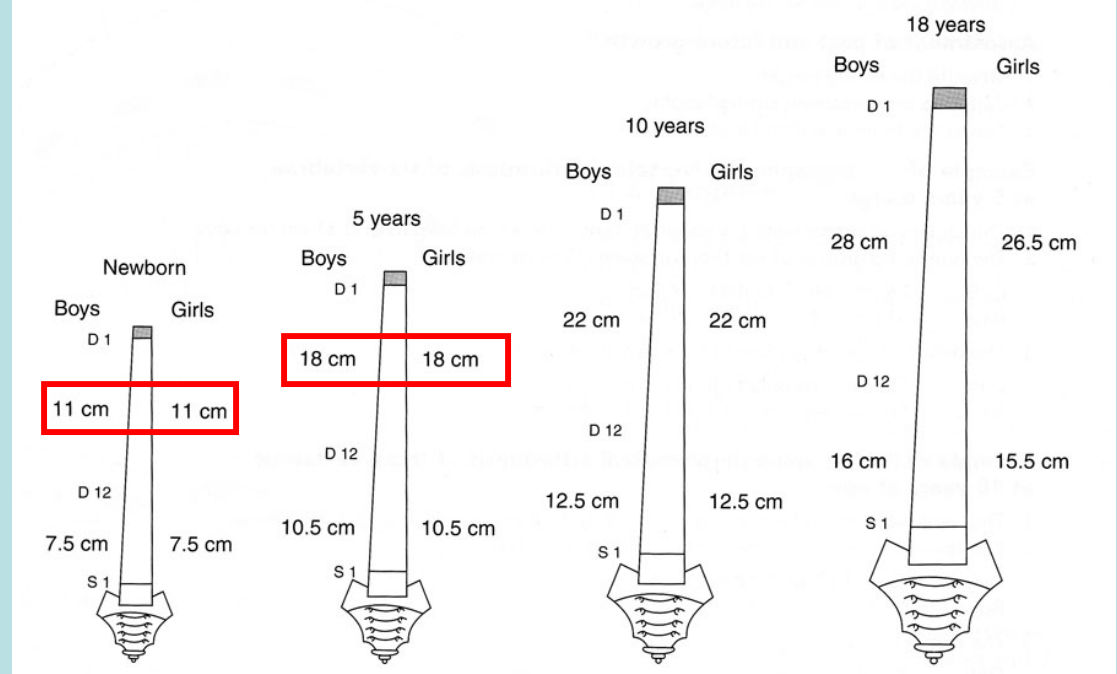
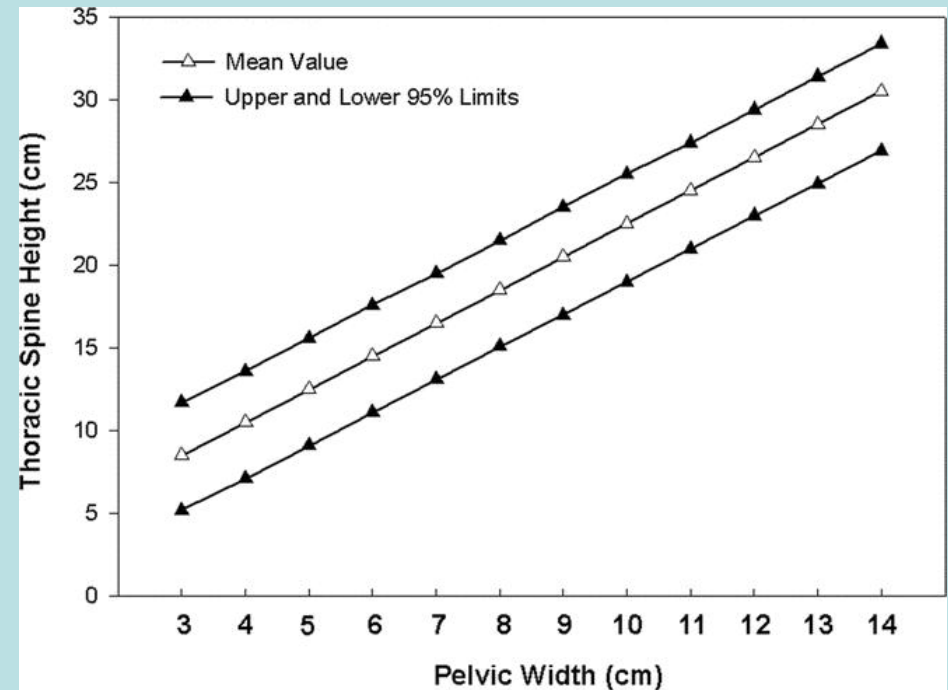
Lungs in Infants and Young Children: Improved Thin-Section CT with a Noninvasive Controlled-Ventilation Technique—Initial Experience¹

- 11 patients - surgical rx pre & postop
- 11 patients - nonop
- Cobb angle (coronal & sagittal)
- Thoracic height & width, pelvic width



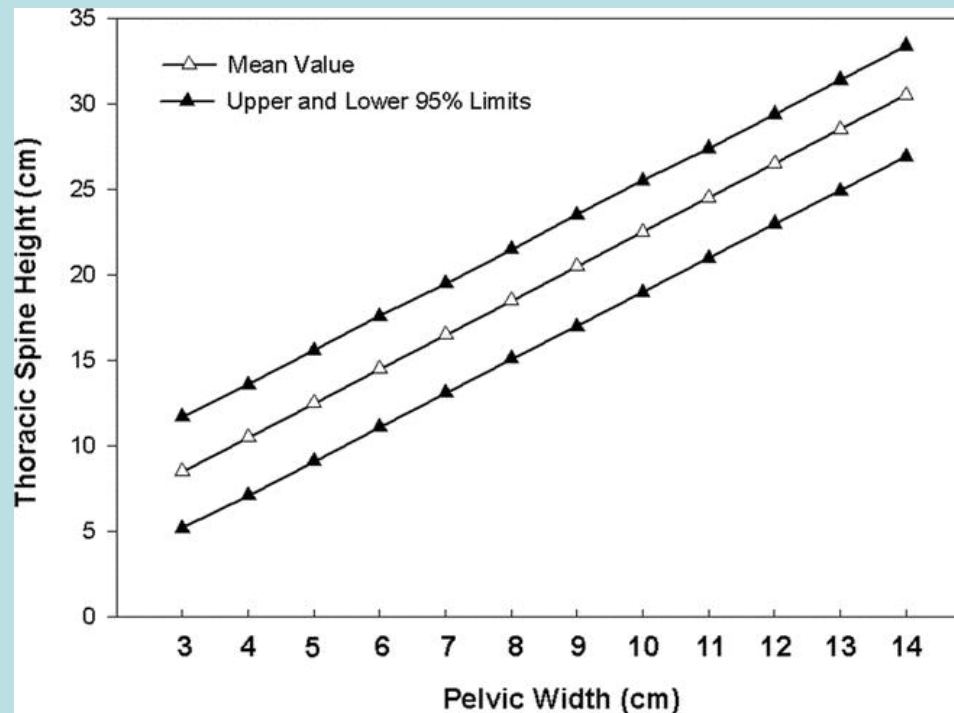
Outcomes

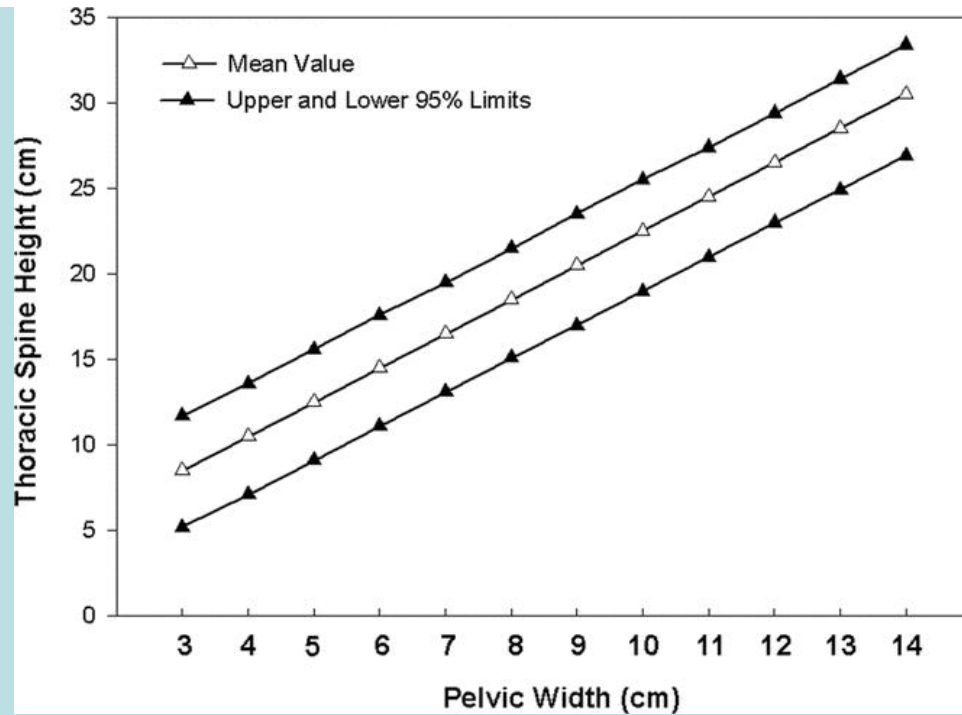
- Determine Thoracic spine height & width %tiles (Emans et al, Dimeglio)



Prediction of Thoracic Dimensions and Spine Length Based on Individual Pelvic Dimensions in Children and Adolescents: An Age-Independent, Individualized Standard for Evaluation of Outcome in Early Onset Spinal Deformity

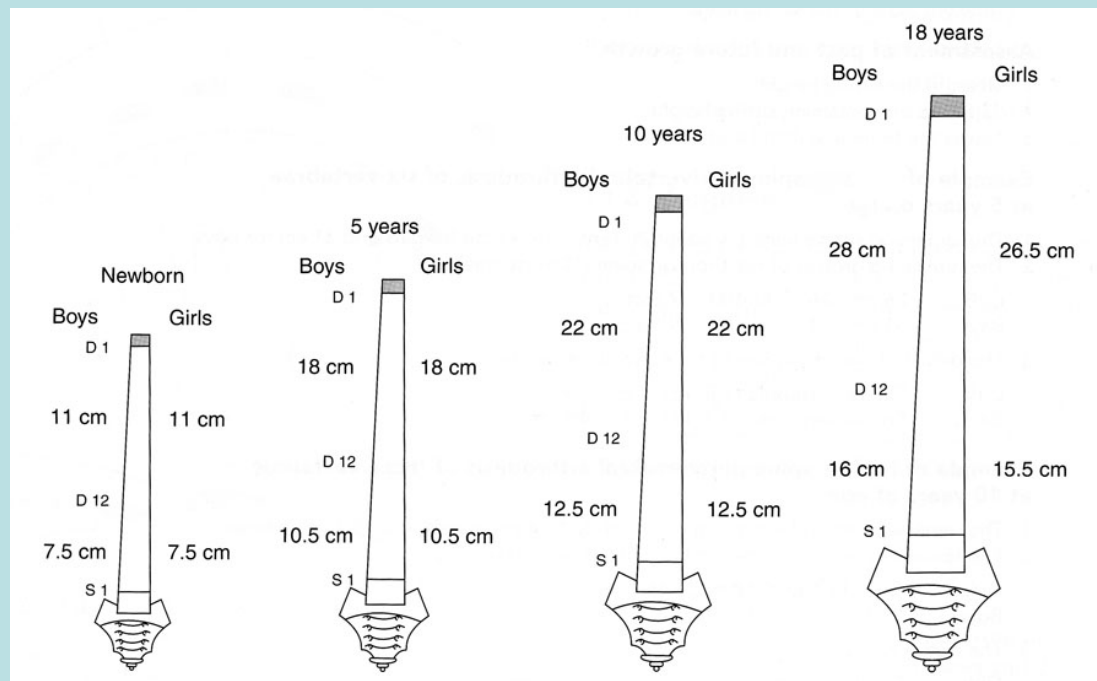
Emans, John B. MD*; Ciarlo, Michelle BS*; Callahan, Michael MD†; Zurakowski, David PhD*





Emans

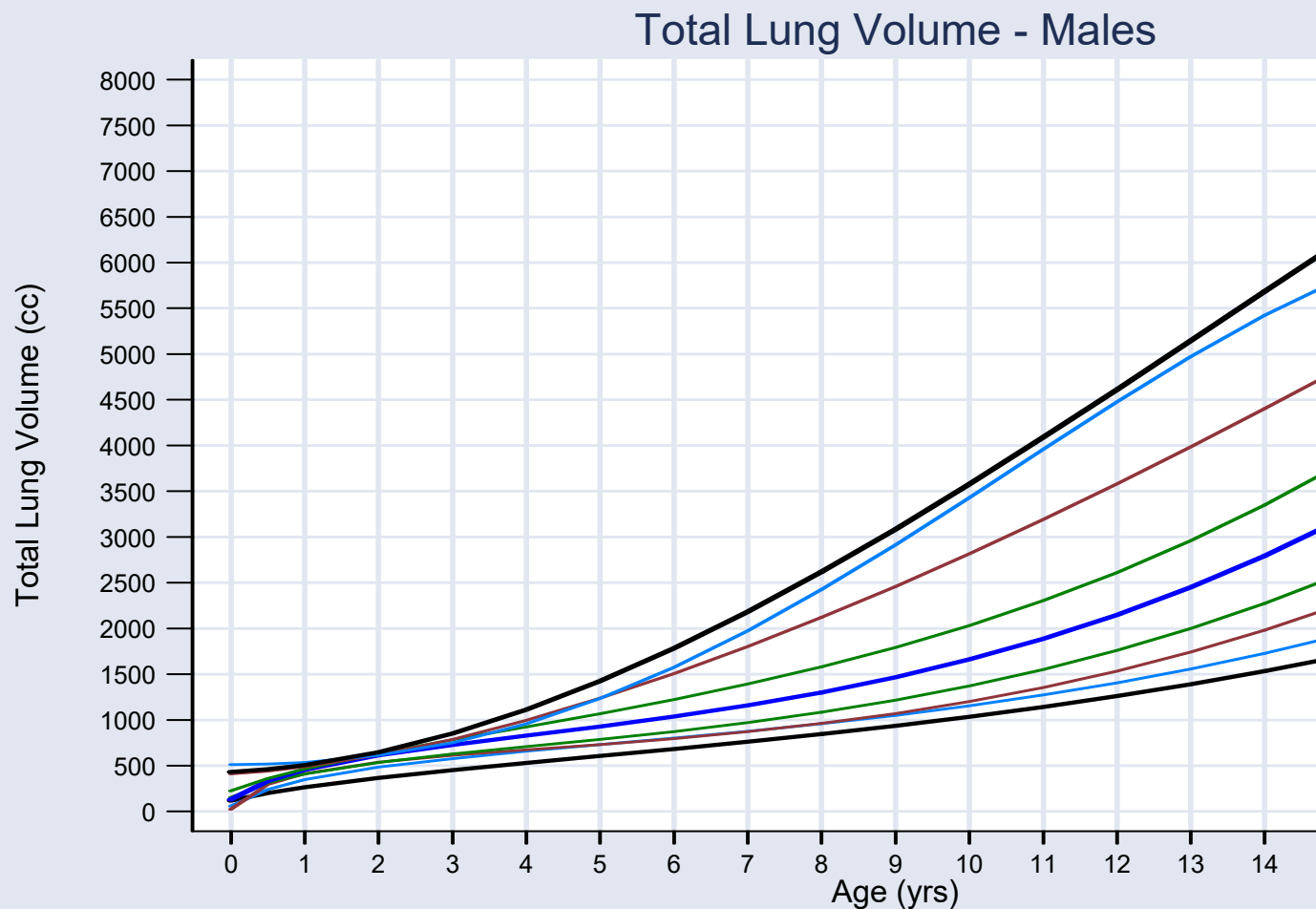
Dimeglio



Absolute & %tile CT volume

(inspiration/expiration status unknown)

Gallogly, Smith



Technique not
standardized
from center
to center

Results

- Initial vol Convex > concave 14 vs 8
 - PW correlated with initial Th Ht ($r^2=.64$, $p<.001$) and initial CTvol ($r^2=.45$, $p<.001$)
 - No correlation between CT volume change (abs. or %) and
 - time between studies
 - Δ Cobb
 - Δ Th Ht or Th Wd
- } Entire group
22 pts.

Results - operative cases only

- ΔTh Ht & ΔTh Wd correlated with $\Delta CTvol$ ($r^2=.53-.63$, $p=.001-.008$)
- ΔTh Ht operative > non-op ($p<.01$) whew
- Many outliers

% CT vol Δ unchanged or -ve 2/11

operative and 3/11 non-op $\Rightarrow$

? Reliability/reproducibility of CVCT method

? Accuracy of xray calibration

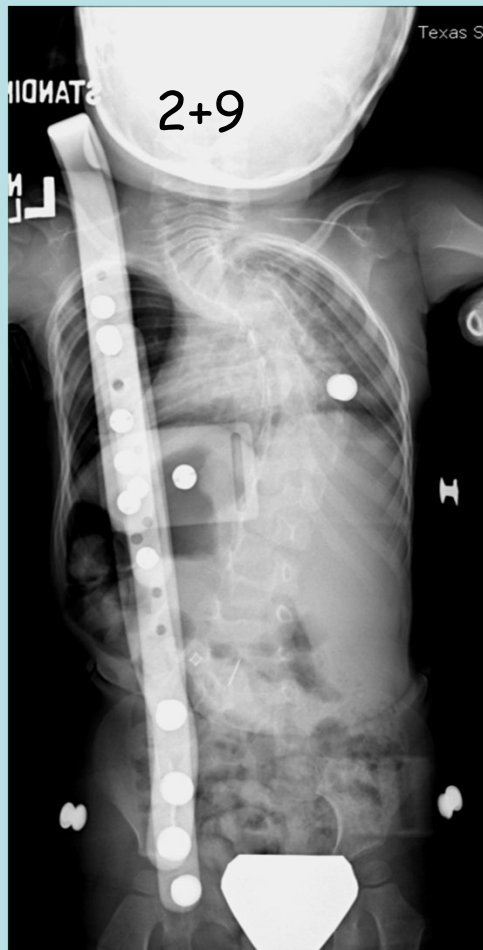
Results

	operative	nonop
Init. Cobb	70° (25-95)	48° (17-90)
f/u Cobb	57° (28-116)	47° (13-70)
Init. T1-12 (cm)	11.8 (3.9-15.4)	13.2 (10.4-17.1)
f/u T1-12 (cm) →	14.5 (6.1-20.1)	14.2 (10.9-10.2)
Init. T6 wid (cm)	13.4 (9.9-16.6)	13.4 (9.9-16.5)
f/u T6 wid (cm) →	14 (10-18.4)	13.8 (10.6-16.1)
Init CTvol (ml)	637 (201-1079)	775 (440-1266)
f/u CTvol (ml) →	883 (444-1572)	1027 (550-2020)

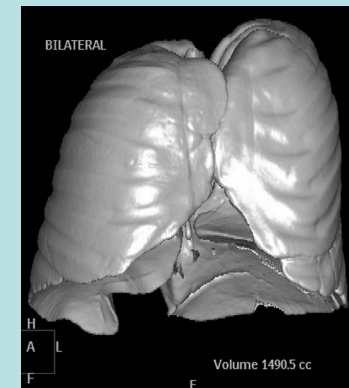
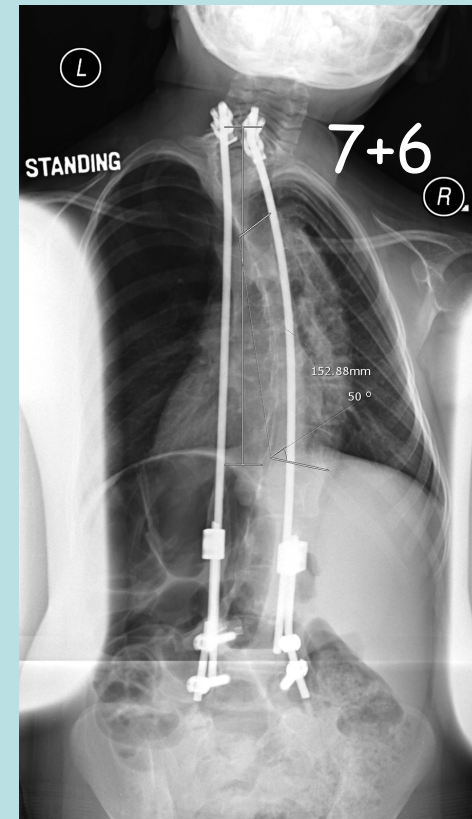
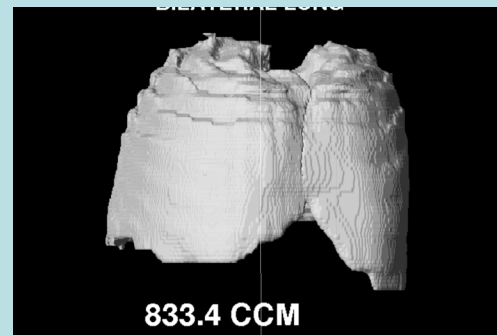
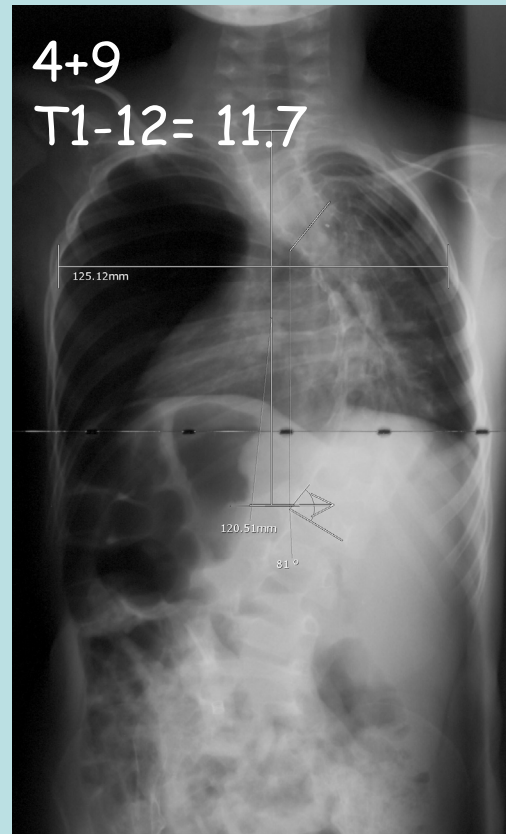
Results

- 8/11 operative cases had improved Cobb angle (not all had distraction instr) vs 5/11 non-op
- 11/11 operative cases experienced T1-12 ht increase 0.2-4.9 cm
- 2/11 non-op cases had decrease T1-12 ht
- 9/11 operative cases had CT volume increase vs. 8/11 non-op
- Mean 28 mos between scans (all ≥ 2 yr)

Non-op → Operative

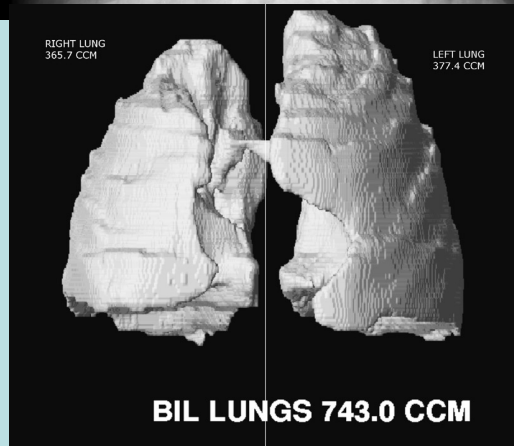
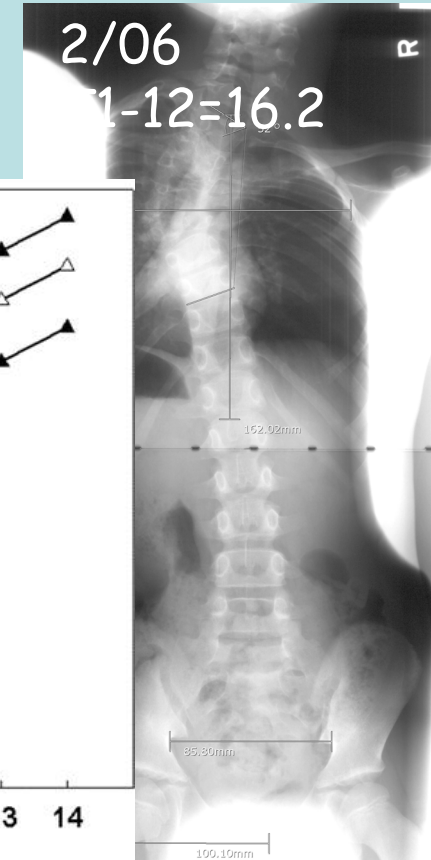
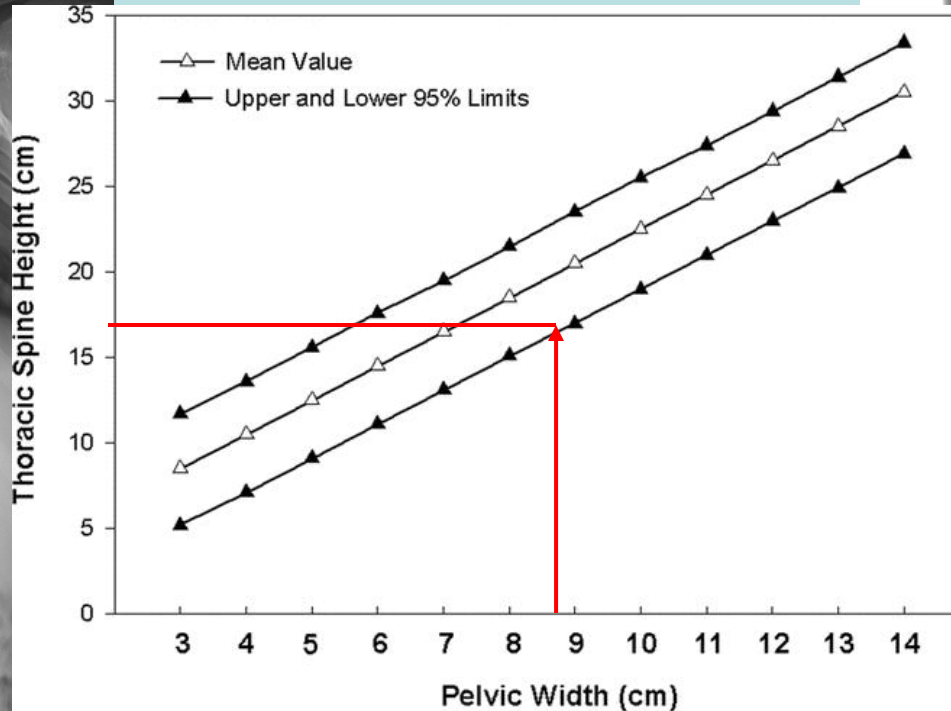
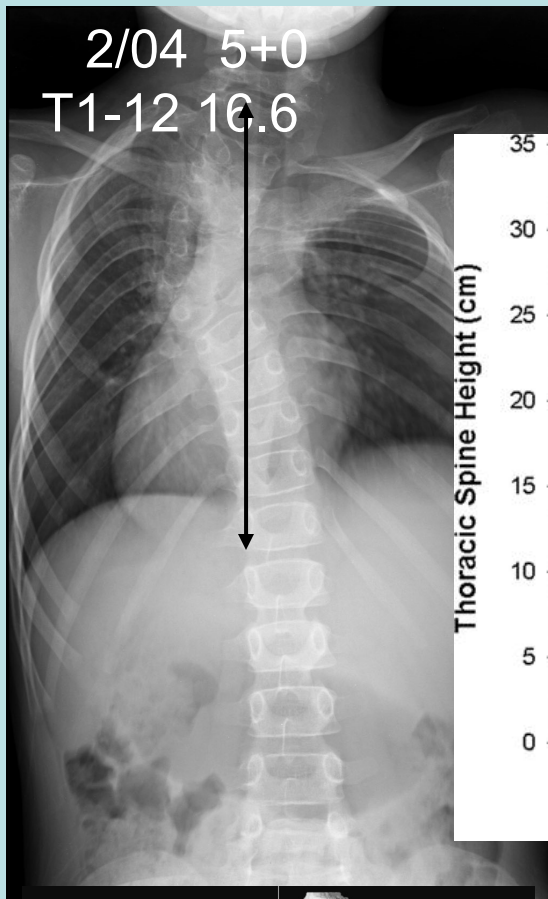


T1-12 = 11.3 cm
R 379 L 415 =
794

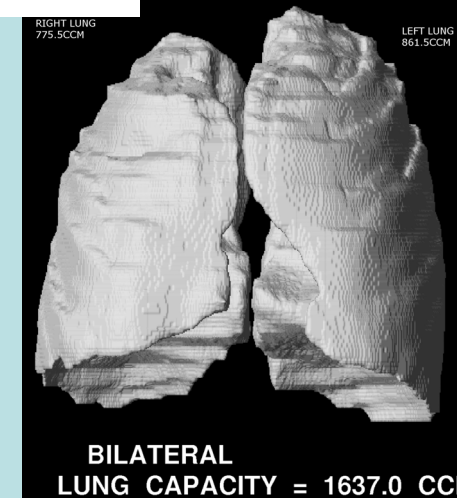


T1-12= 15.4
R 679 L 801
= 1480

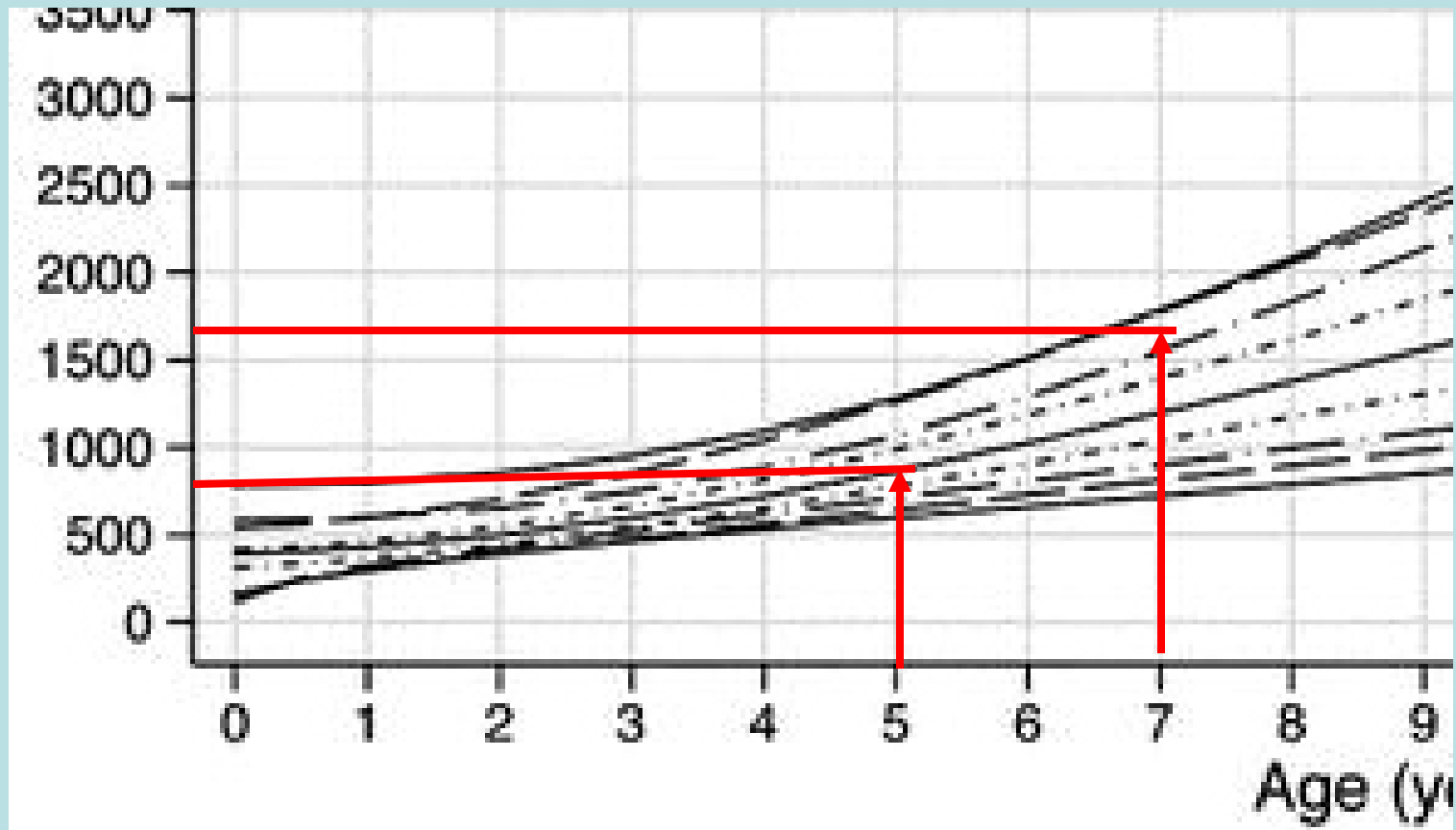
Non-op



No Δ T1-12
ht over 2 yr,
but CT vol
doubles



CT volume - Gallogly



....Observation continues

CT volume - Summary

- Objective measure to determine if thorax is growing or has been enlarged by rx
 - Serial data best utilized to control rx in individual patient
 - Xray calibration
 - CVCT reproducibility
 - Small cohort
 - Mix of rx
- } Inability to show significant Δ 's over time & with rx

Final note

Considering recent PFT findings in postop Veptr patients, anatomic volume measurement and documented increase with treatment may be misleading or less important outcome measure

	No.	Pre-VEPTR	Post-VEPTR	P
FVC	53	0.94 ± 0.07	0.97 ± 0.06	0.107
FVC%	53	61.5 ± 3.6	54.3 ± 2.5	<0.001
FEV1	53	0.83 ± 0.05	0.87 ± 0.06	0.189
FEV1%	53	58.9 ± 3.7	52.1 ± 2.4	0.003
FEV1/FVC	53	89.1 ± 1.2	89.5 ± 1.1	1.000
TLC	9	1.92 ± 0.16	2.10 ± 0.15	0.111
TLC%	9	66.2 ± 4.8	65.6 ± 3.7	0.809
RV	10	0.52 ± 0.09	0.68 ± 0.10	0.029
RV%	10	79.8 ± 13.3	101.1 ± 16.6	0.083
RV/TLC	10	35.2 ± 2.5	41.5 ± 3.8	0.012
Cobb angle, degrees	40	57.9 ± 4.5	46.5 ± 3.6	<0.001

Pre-VEPTR and post-VEPTR insertion data for FVC, FEV₁, TLC, and RV, as volume and as percent predicted, and for FEV₁/FVC, RV/TLC, and Cobb angle. Values are expressed as mean ± SEM.

Mayer, Redding JPO
1/09



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SCOTTISH RITE HOSPITAL
FOR CHILDREN

