

Radiographic outcomes:

Cobb angles, CT Scans and other
ways X-rays might inform us

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Montreal

Cultural diversity
Four Universities
Two Medical Faculties
Two languages
One unique way of living





The health care system

Different

Government funded

Long waiting lists

Top medical care available to all

Two medical schools

Two different systems

Two pediatric centres

Montreal Children's Hospital

Ste-Justine Hospital

Two trauma centres, several teaching hospitals

Two mega-hospitals being approved

Patients treated in both languages

Introduction

- Early onset scoliosis
 - Thoracic insufficiency syndrome
 - Congenital anomalies (spine and chest cage)
 - Idiopathic scoliosis (early onset)

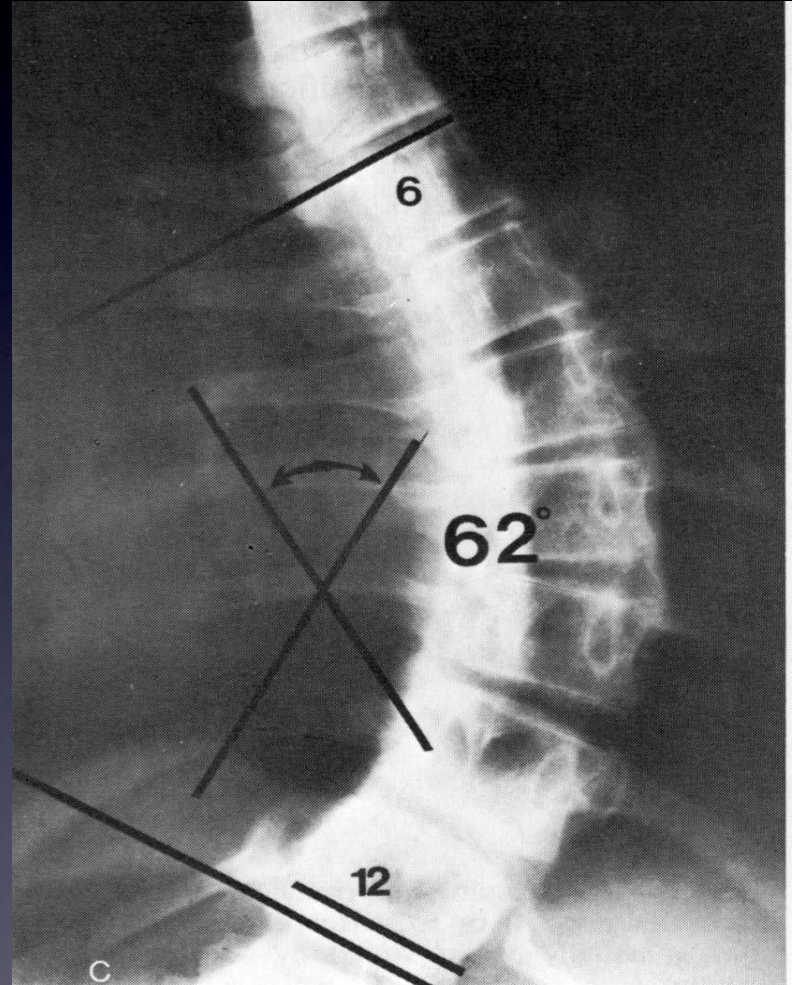
Introduction

- Cobb angle is the gold standard for assessment of spinal deformity
- It has limited applicability in a truly 3-D problem such as EOS
- Cobb angle does not take into account chest wall anomalies

Cobb Angle



PA View



Cobb Angle

Lefebvre, Patrick
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CHU SAINTE-JUSTINE
Série scoliotique
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Page: 1 of 2

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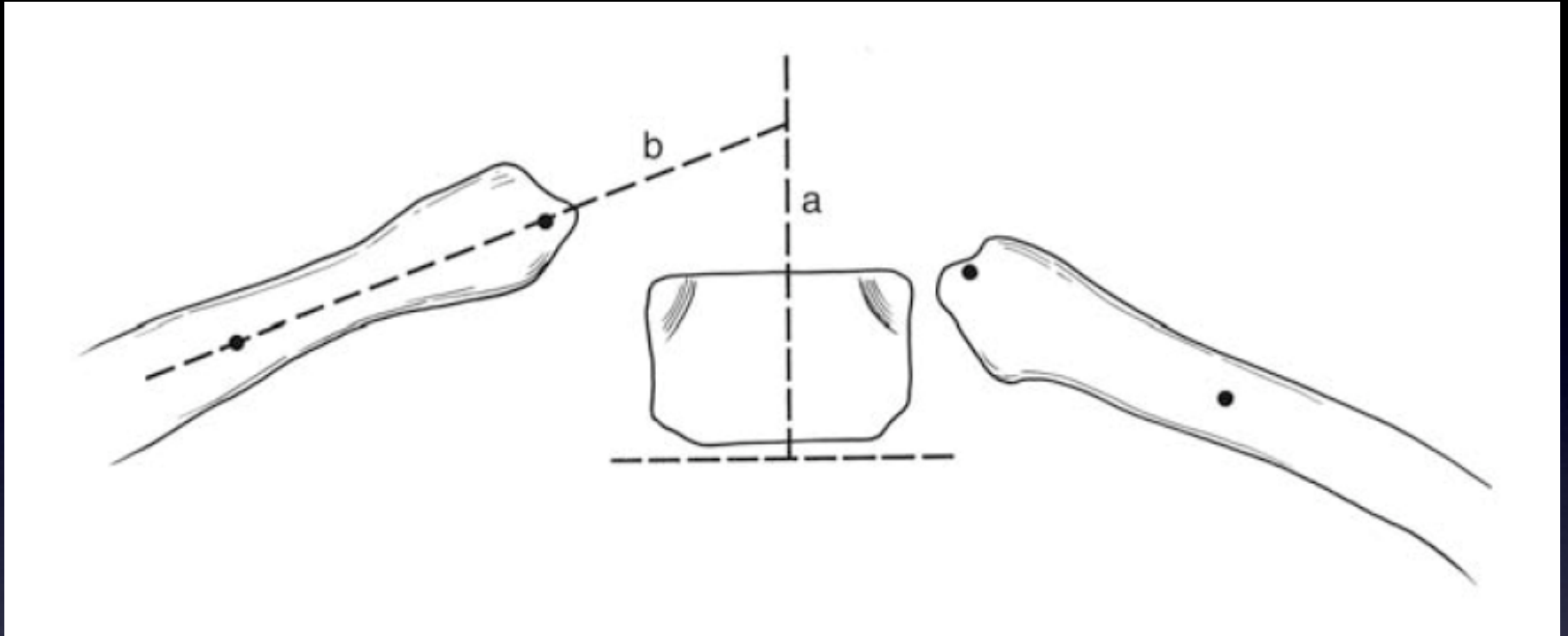
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Cobb Angle

- Cobb angle correction is usually the primary radiographic outcome following surgery
- No information on:
 - thoracic biomechanics
 - lung growth
 - health and longevity

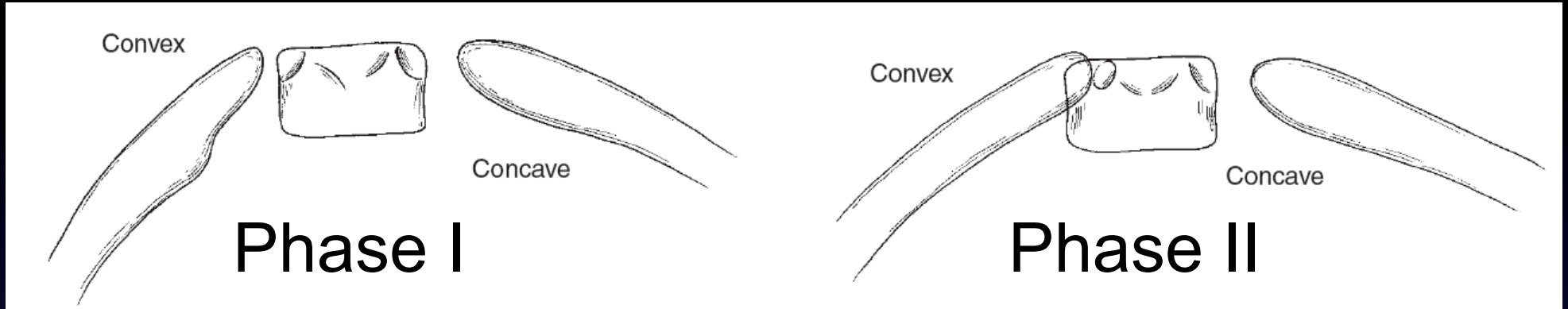
RVAD

- Rib-vertebral angle difference
 - Proposed by Mehta MH (JBJS Br 1972)
- Most reliable indicator of curve progression
- Typically, a curve RVAD $< 20^{\circ}$ will spontaneously resolve
 - Mehta MH JBJS Br 1972
 - Ferreira et al. JBJS Br 1972



Convex - Concave = RVAD

RVAD



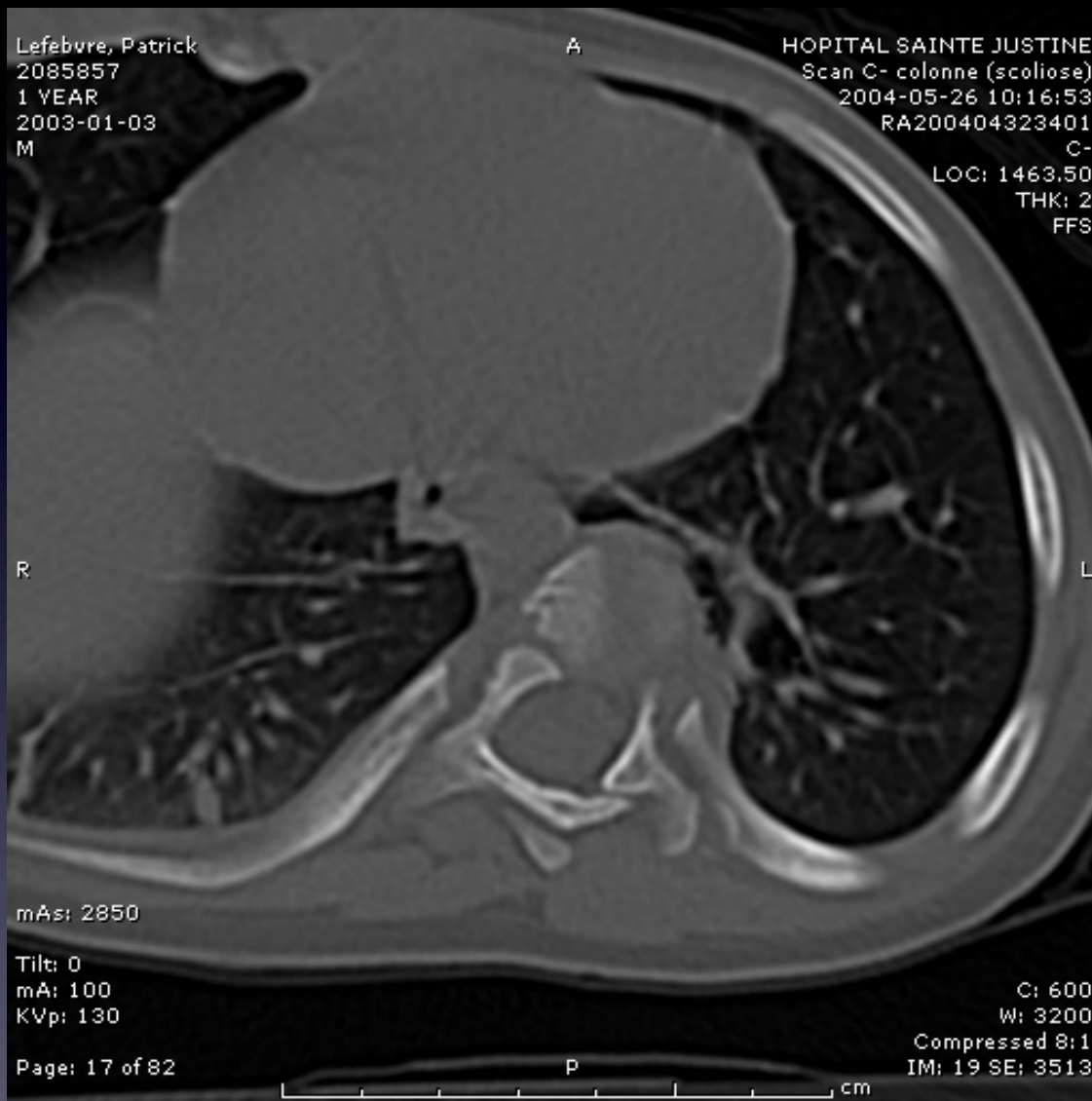
- Phase I: no overlap of rib head and vertebra
 - if $RVAD < 20^\circ$ low likelihood of progression
 - If $RVAD > 20^\circ$ high likelihood
- Phase II: overlap of rib head and vertebra
 - RVAD not measured; high likelihood

CT-Scan Evaluation

- Allows better visualization of thoracic structures
- Better understanding of the anatomy (congenital anomalies)
- Provides insight on compression of bronchial tree
- Helps determine Spinal Penetration index
- Can help determine lung volume

Lefebvre, Patrick
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2003-01-03
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HOPITAL SAINTE JUSTINE
Scan C- colonne (scoliose)
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mAs: 2850

Tilt: 0
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KVp: 130

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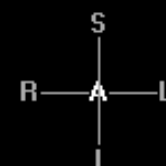
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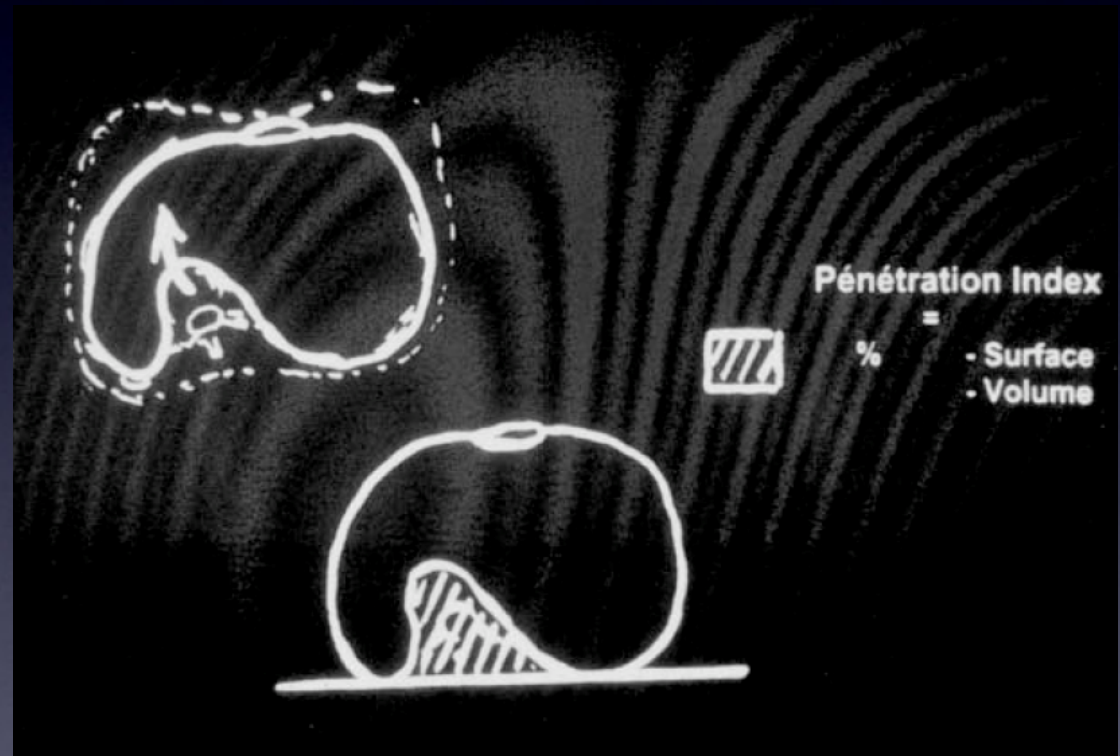


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Spinal Penetration index

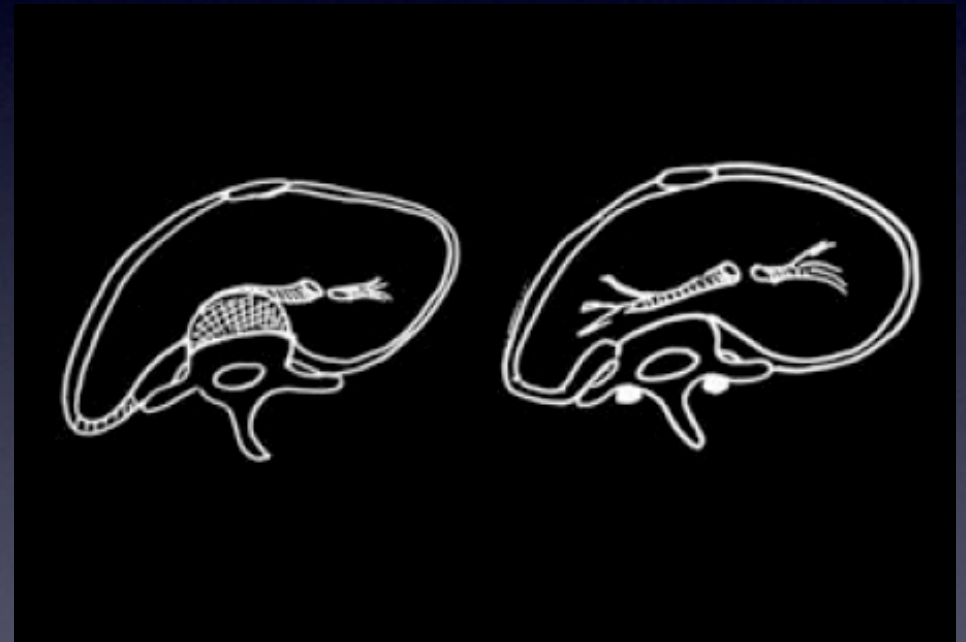
- Proposed by Dubousset
- Can be determined for surface and volume
- Provides information regarding the space occupied by the spine inside the thorax
- Increased thoracic lordosis increases ratio



Dubousset et al. J Orthop Sci (2003) 8:41–

Bronchial tree compression

- Illustrative case
(Dubousset et al.)
- Compression from
vertebral body
- Partial resection
provides improvement
in functional volume

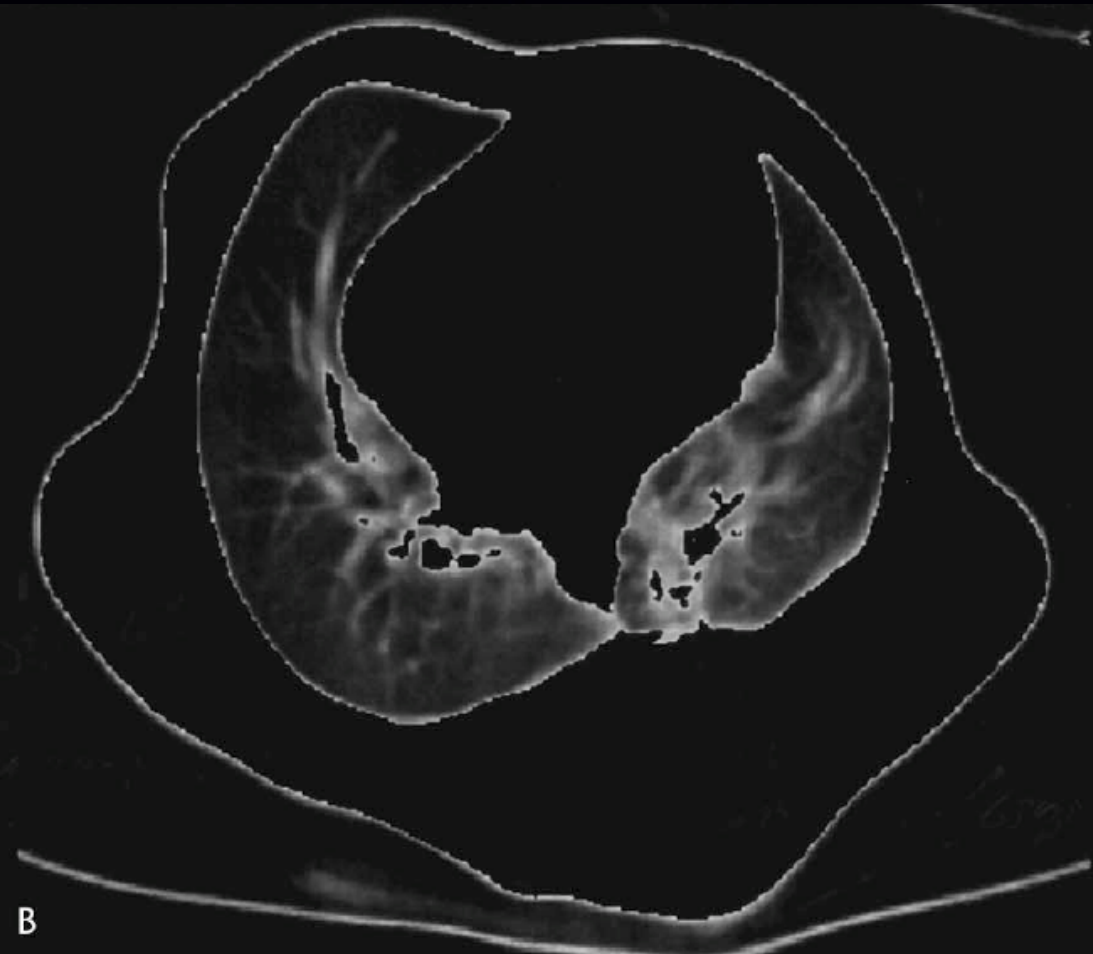


Dubousset et al. J Orthop Sci (2003) 8:41–

Thoracic volume

- Lung volume determination based on CT Scan Data
- 3D volume of lung obtained by changing the threshold level until the lung is isolated
- Volume is then calculated

Thoracic Volume

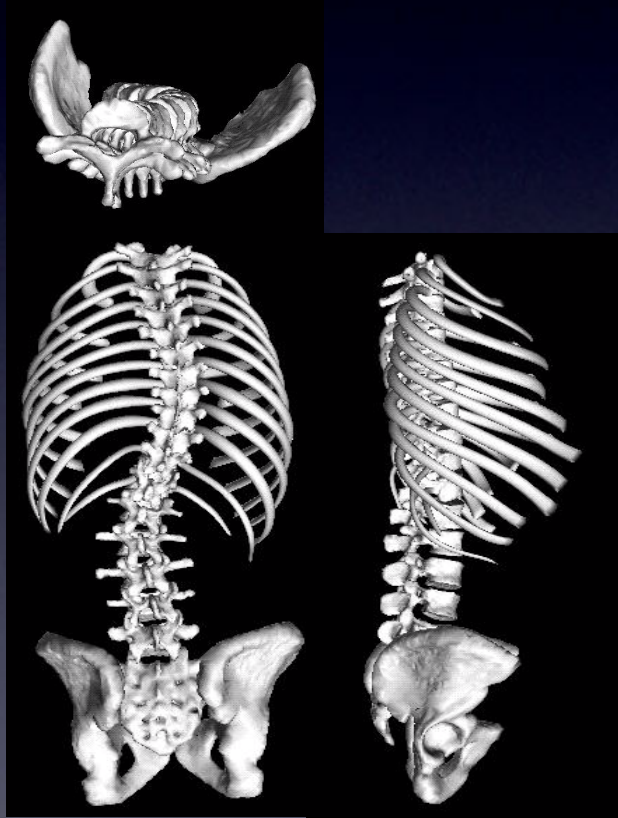


Gollogly et al. JPO 2004

Future directions

- 3D reconstructions of the spine and chest cage obtained from low-dose radiographs (EOS system)
- MRI derived total lung volume
- Surface topography to assess chest expansion

3D reconstructions



- Hospital Sainte-Justine and
Hospital Notre-Dame (2006) in Montréal



Hospital Notre-Dame (Montréal)



Hospital Sainte-Justine (Montréal)

- Dedicated to clinical and fundamental research

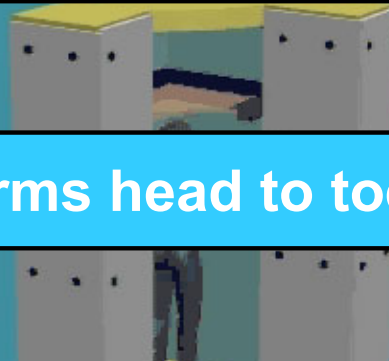
New system biplan EOS

5



digital X-ray imaging

Low dose



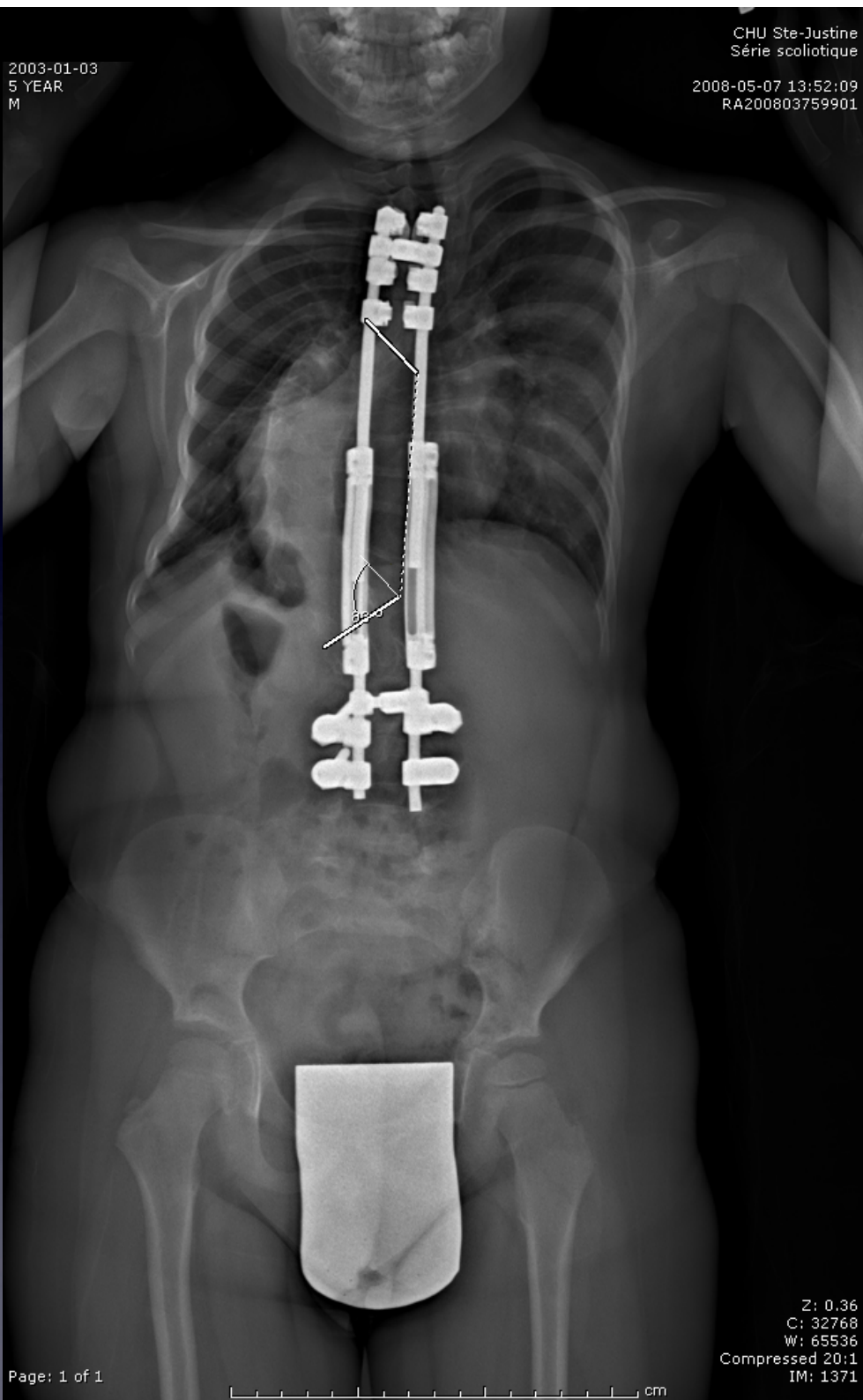
Performs head to toes

Scan two simultaneous
orthogonal planar X-ray



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