Complications in Growing Rods

Behrooz A. Akbarnia, MD

Clinical Professor, University of California, San Diego
Medical Director, San Diego Center for Spinal Disorders
La Jolla, California

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Disclosures

Author	**Relationships Disclosed**
Behrooz Akbarnia	DePuy Spine,A Johnson & Johnson Company (a,b,d,e),K2M (b,d,e), Ellipse Technologies,Inc (b), Medtronic Sofamor Danek (a)

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(b) Consultant
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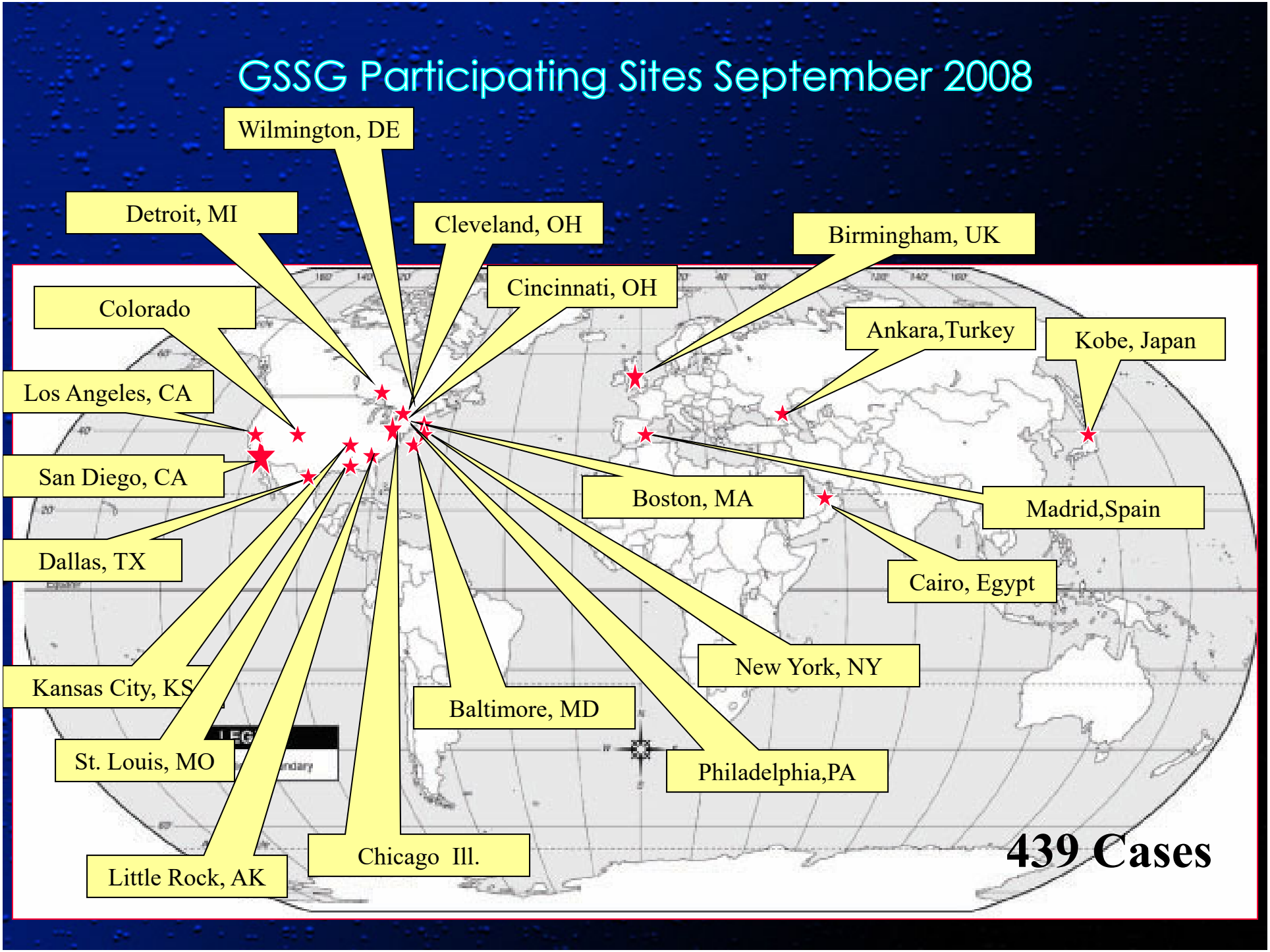
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Dallas, TX
Cairo, Egypt
New York, NY
Kansas City, KS
Baltimore, MD
St. Louis, MO
Philadelphia,PA
Chicago Ill.
Little Rock, AK
439 Cases

General Complications for Growing Rods

- Inherent challenges with fusionless procedures:
  - No bony fusion
  - Construct is weight bearing for the lifetime of its use
  - Susceptible to loosening and failure
- Growing rod constructs require frequent lengthening procedures and patients are susceptible to the risks associated with each procedure:
    - Skin, Anesthesia , Hospitalization

Specific Complications for Growing Rods

- Skin-related complications:
  - Superficial wound infection
  - Deep wound infection
- Implant-related complications:
  - Implant prominence
  - Rod fracture
  - Screw pull out
  - Hook dislodgement

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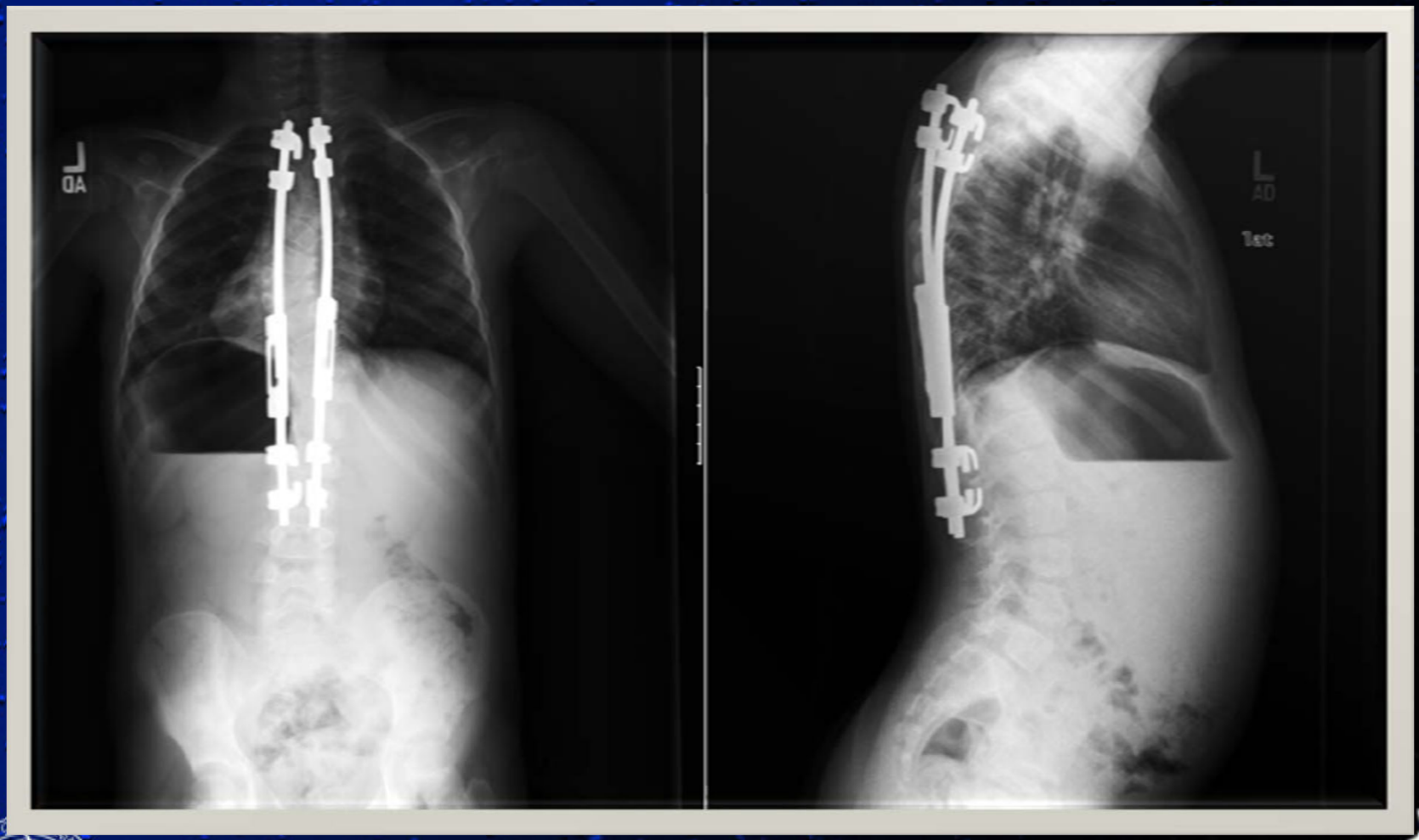
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Specific Complications for Growing Rods

- Alignment complications:
  - Coronal decompensation (C7 to sacrum)
  - Junctional kyphosis
  - Curve decompensation
- Neurological complications
  - Neurologic deficit caused by excessive lengthening

Specific Complications for Growing Rods

- Medical complications:
  - Dural tear
  - Pulmonary compromise
  - Unplanned surgery
- Single rod vs dual rod
  - Superficial wound infections more common in dual rod
  - Hook dislodgement more common in single rod
  - Unplanned procedures due to implant problems more common in single rod

Specific Complications for Growing Rods

- When compared to sub-muscular dual rods, sub-cutaneous dual rods had:
  - More total complications
  - More complications per patient
  - More wound complications
  - Greater number of prominent implants
  - Greater number of unplanned procedures due to implant problems

Complications in 910 Growing Rod Surgeries: Use of Dual Rods and Submuscular Placement of Rods Decreases Complications

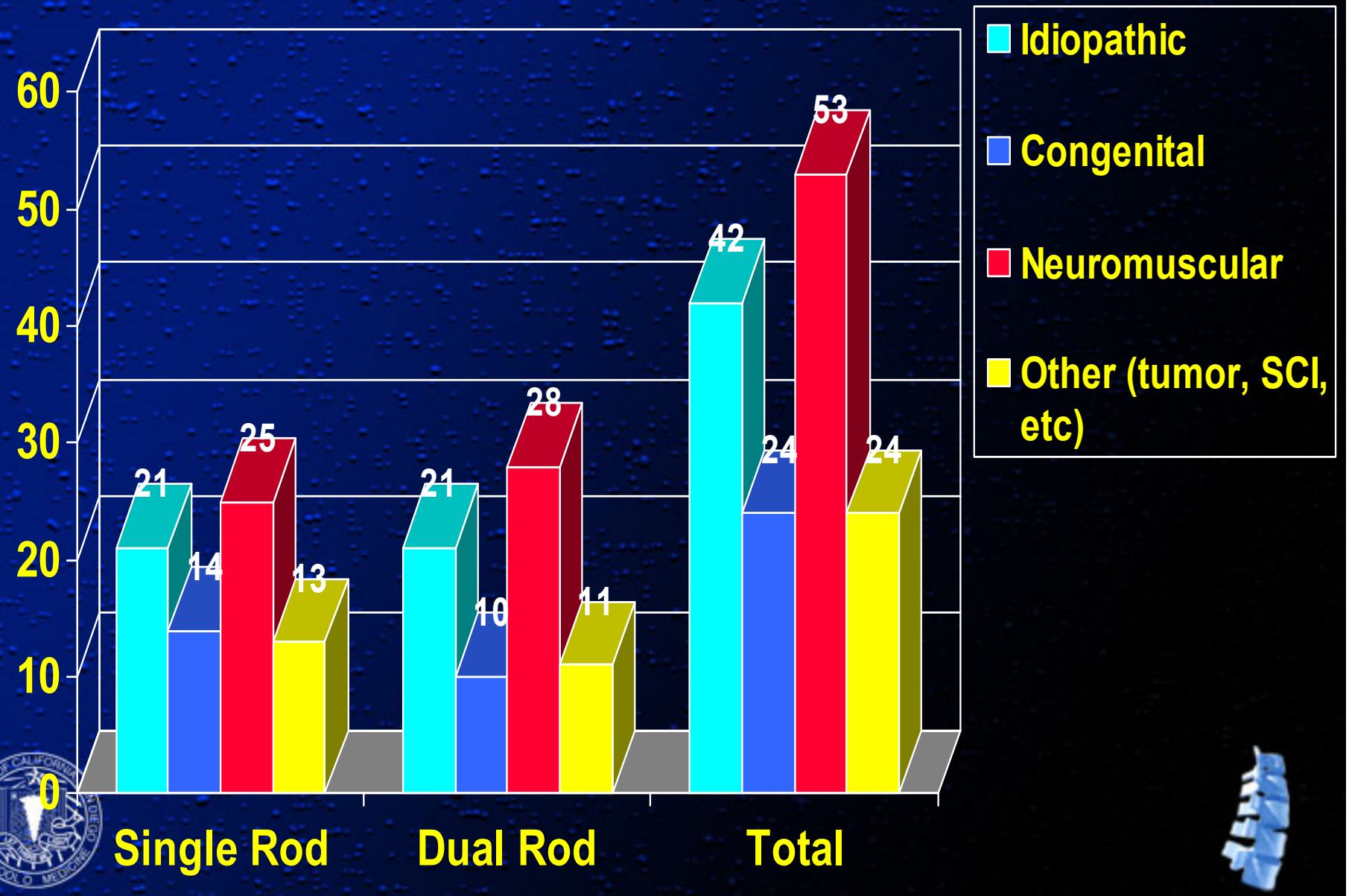
Growing Spine Study Group

Bess, Akbarnia, Thompson et al,
SRS 2008

Purpose; Materials and Methods

- Evaluate Complications GR Treatment in Growing Spine Scoliosis
  - Clinical
  - Radiographic
- Minimum 2 yr F/U
  - Initial GR implant
- Study Design; Multi-center, Retrospective
- Treatment Groups
  - Construct type
    - Single Rod (SI)
    - Dual rod (DU)
  - Implant placement
    - Subcutaneous (SQ)
    - Submuscular (MU)
- Complications
  - Wound (superficial, deep infection, etc)
  - Implant (rod/fixation failure, prominence, etc)
  - Alignment (curve progression, PJK, DJK, etc)
  - Medical and Other (GI, pulmonary, etc)
- Surgical procedures
  - Planned (PLAN = anticipated surgery due to routine GR treatment)
  - Unplanned (UNPLAN= surgery due to complications)

Results: Diagnosis

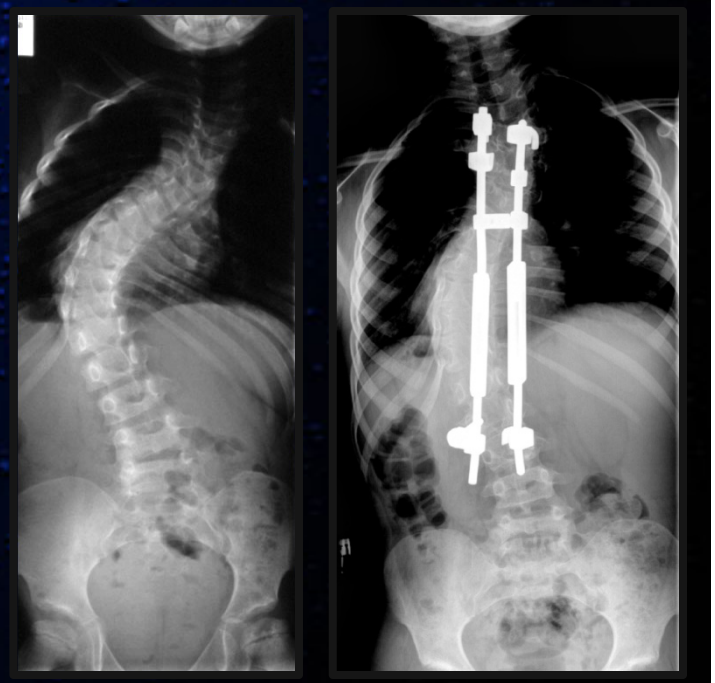


Results: Demographics & Treatment Groups

- 143 patients (1987-2005)
- Avg. age =73.2 mo. (19.5-144 mo.)
- 910 GR surgeries
  - 13.3 levels (7-18)
  - 6.4 procedures/ pt (2-15)
  - 4.5 lengthening/ pt (0-13)
  - Final fusion=53 pts (37%)
- Follow up=59.4 mo. (24-166 mo.)
- Treatment groups
  - Construct type (NS)
    - SI; n=73
    - DU; n=70
  - Subgroups (*=p<0.05)
    - SI SQ; n=17*
    - SI MU; n=55
    - DU SQ; n=35
    - DU MU; n=35

Conclusions

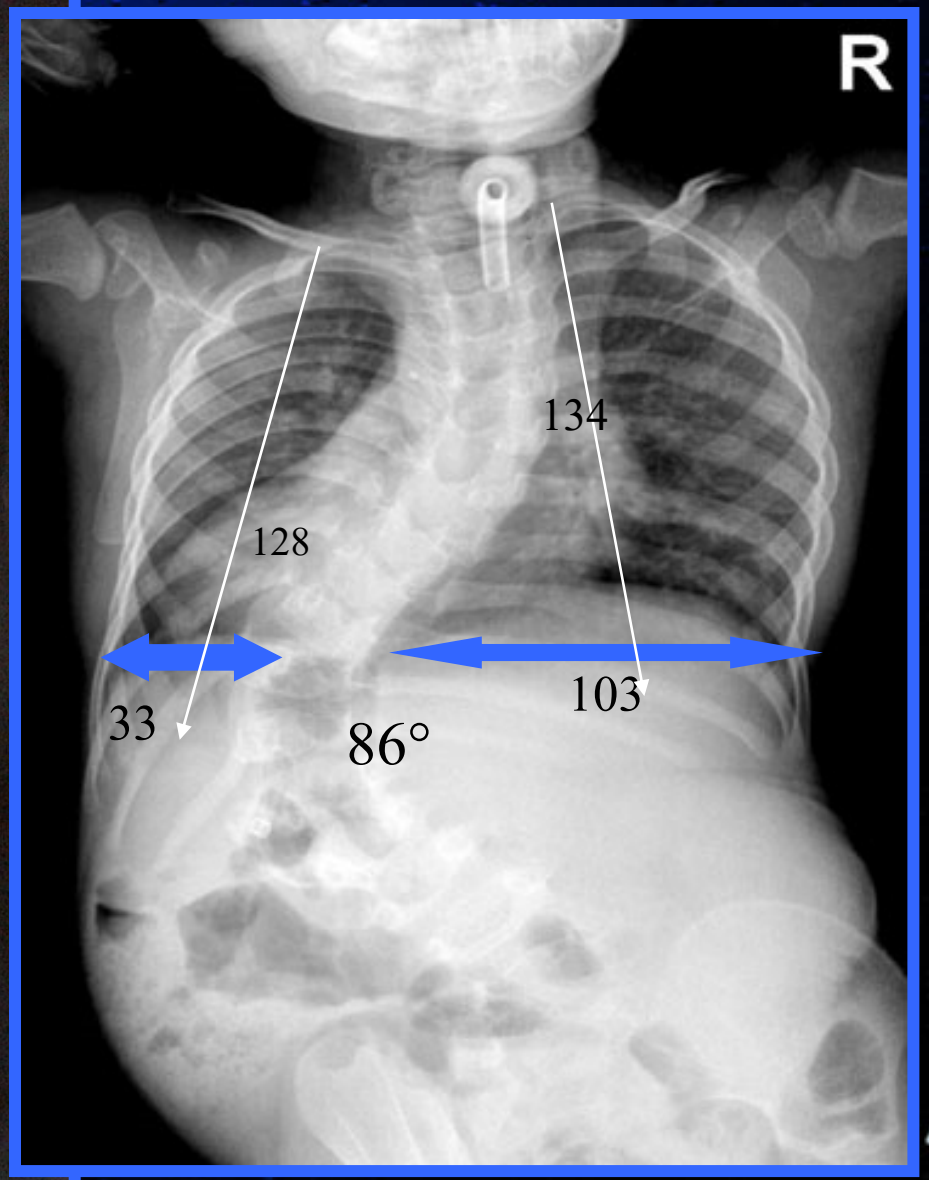
- Complication rates per growing rod procedure are comparable to other surgical treatments for scoliosis.
- Complications are likely due to multiple spine procedures per patient.
- Dual rod constructs reduce the number unplanned surgeries caused by implant-related complications.
- Sub-M placement decreases complication rates and wound problems, and reduces the number of unplanned surgeries.



C.C.

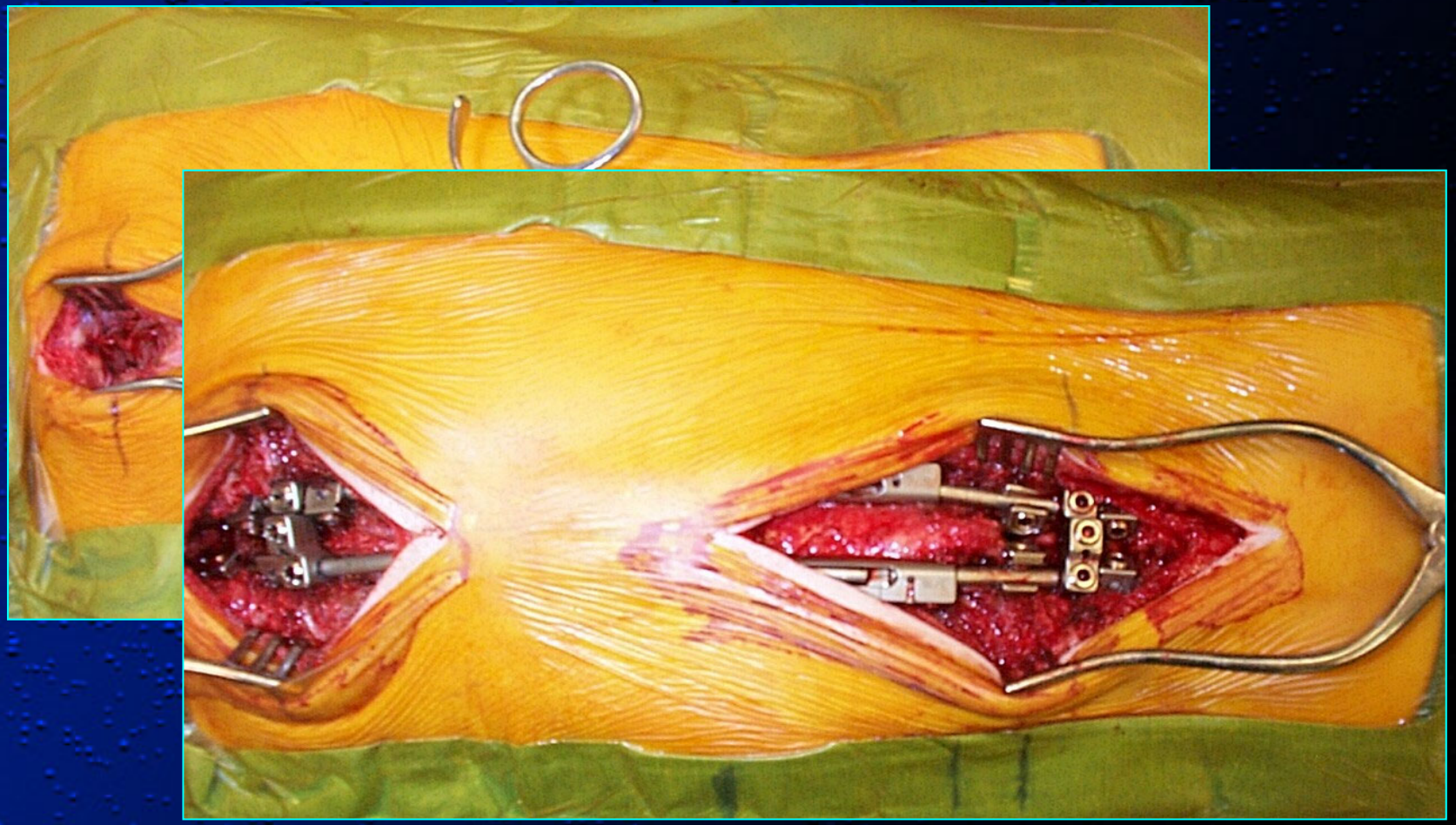
- 9+7 yrs Boy
- Multiple congenital anomalies
  - Tracheomalacia(s/p tracheostomy, g-tube)
  - Normal neuro/development milestones
  - History of multiple pneumonia's
- Initially presented 3/01 at age of 2.5 yrs
  - –20° curve progressed to 68°
  - –Failed Brace treatment x one year
  - 8/01:
    - Growing Rod T3-T4, L3-L4

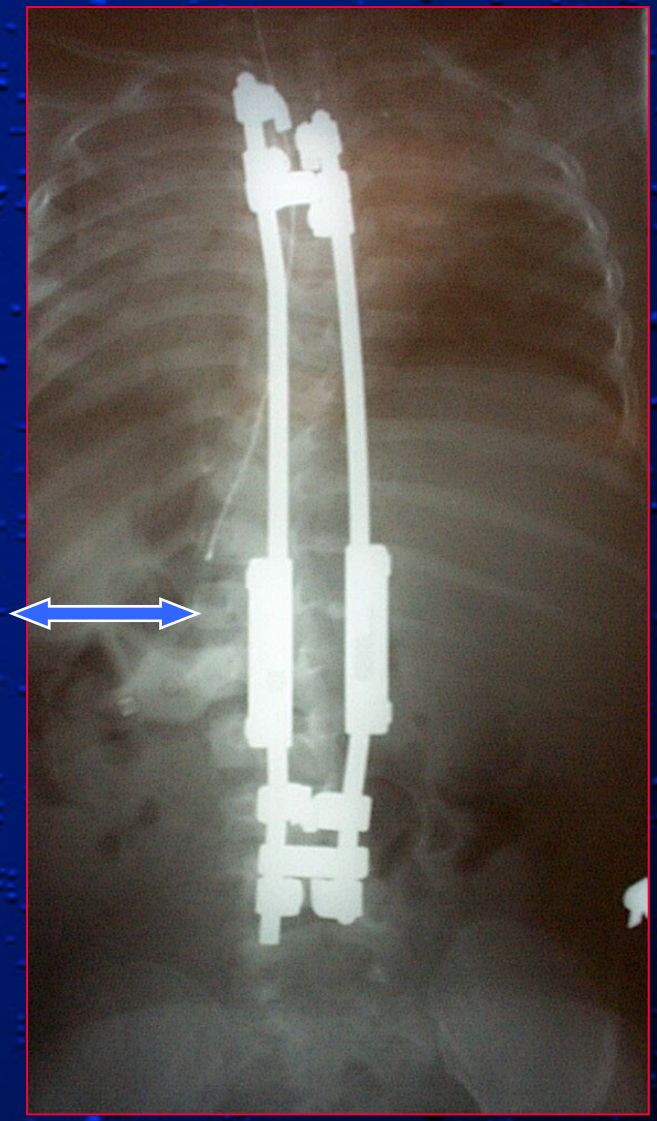
CC 2+6 M



CC 2+6 M.

Intraoperative Pictures- Initial Surgery

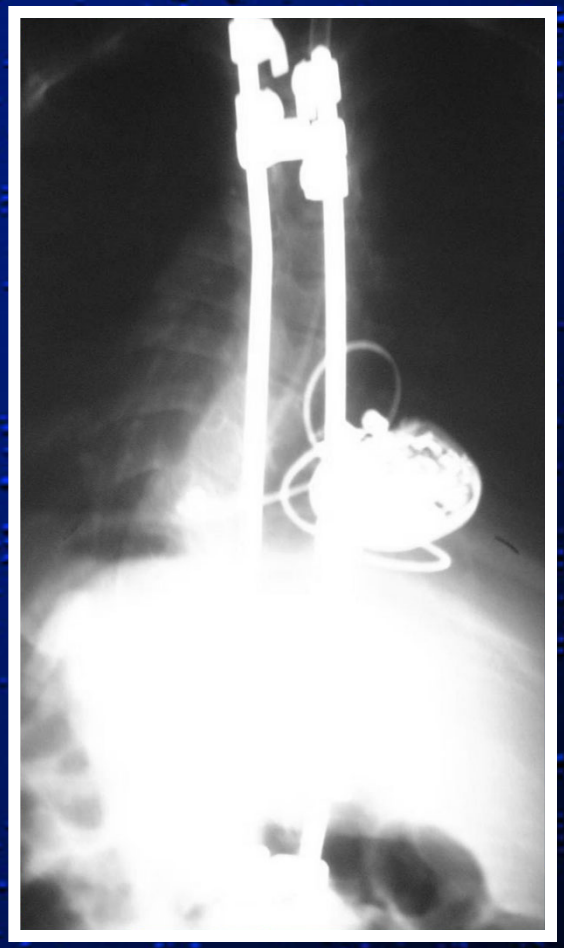


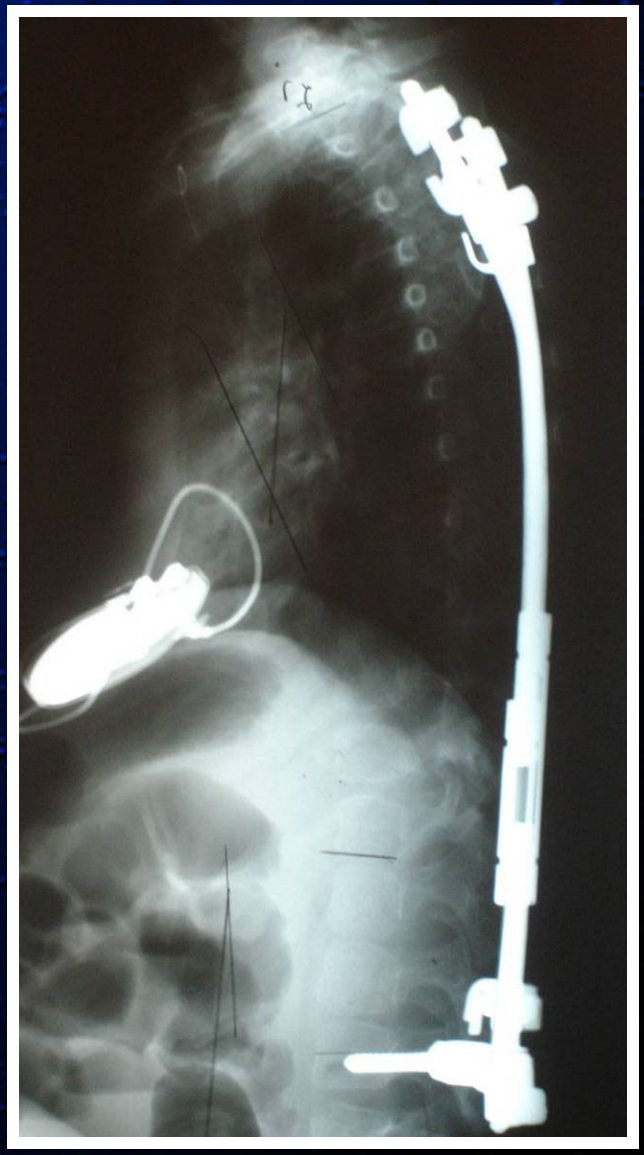


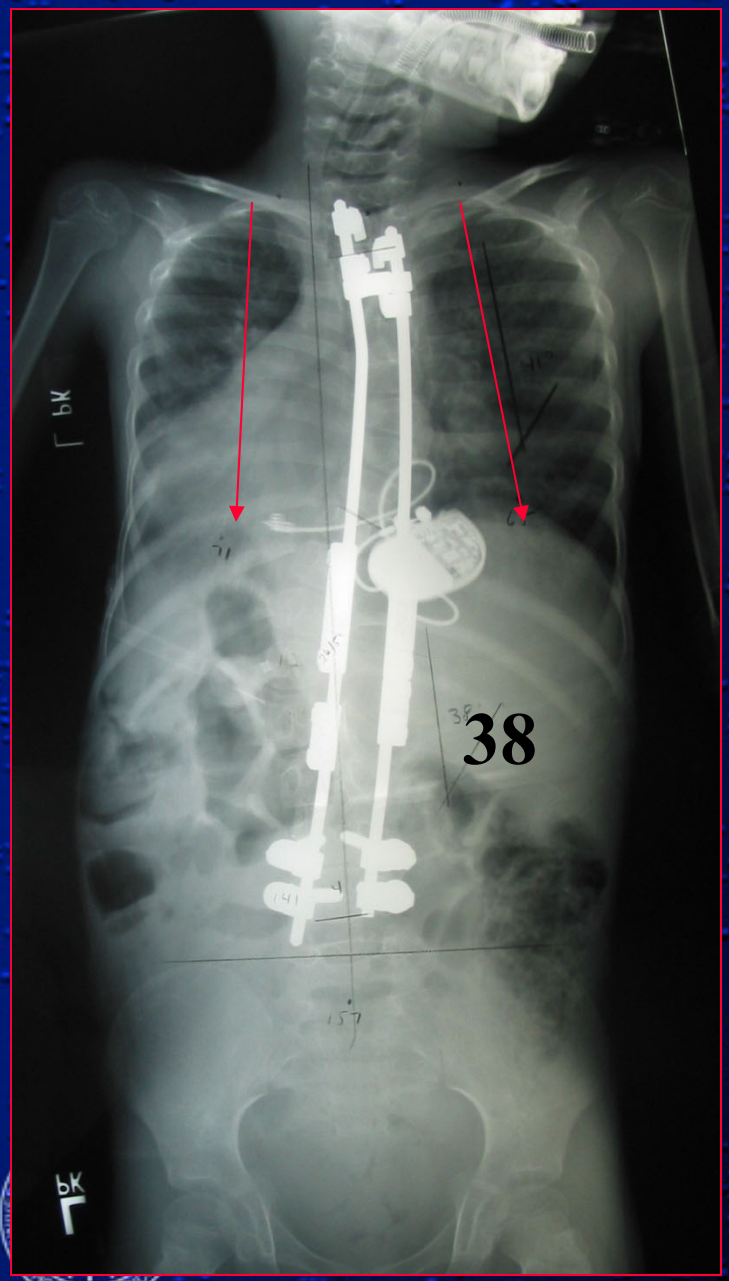
13 months FU

JUNE 2003

INFERIOR CONSTRUCT CHANGED TO SCREWS







57 months after initial surgery

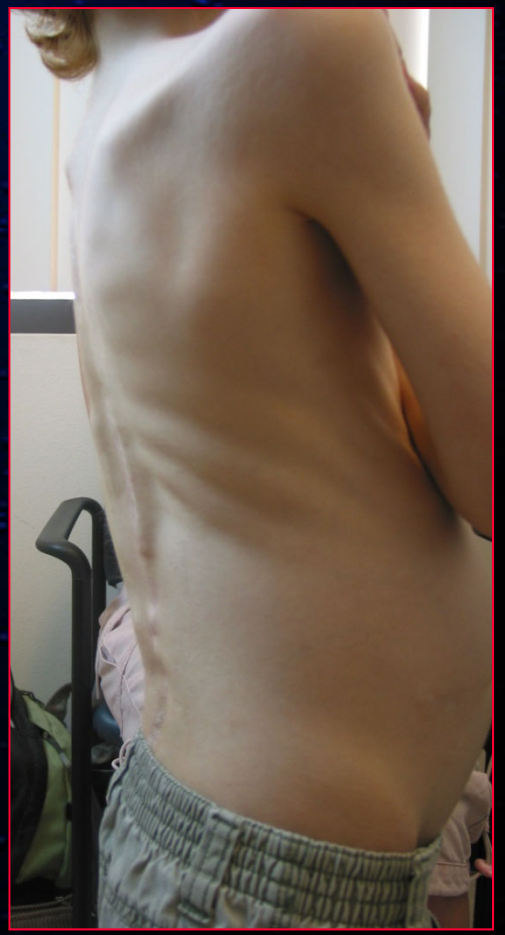
Cobb

Pre 86°
FU 38°

Pre 211mm
Post 247mm
FU 301mm

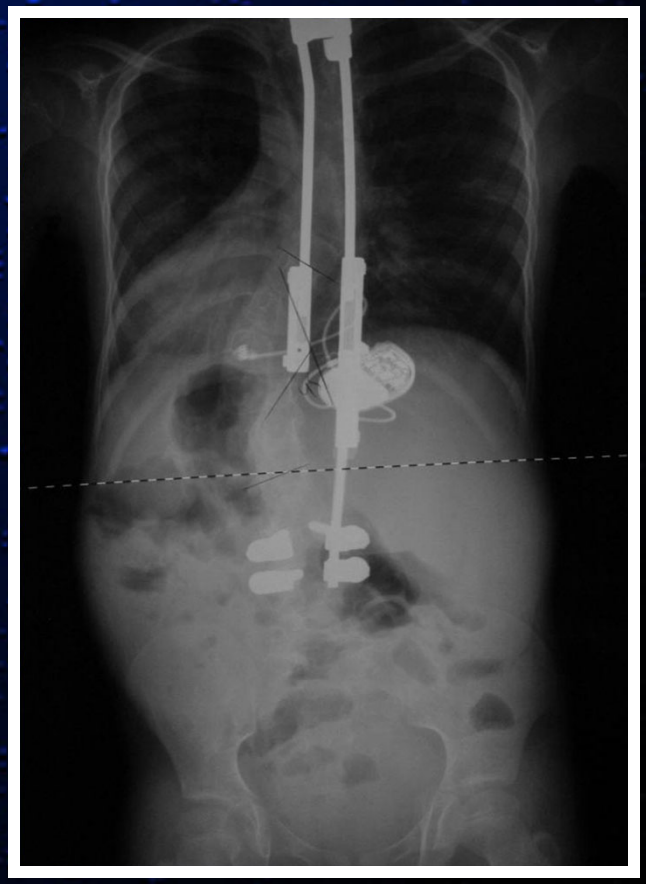
Initial

5 years Follow-up May 2006



1/23/2008

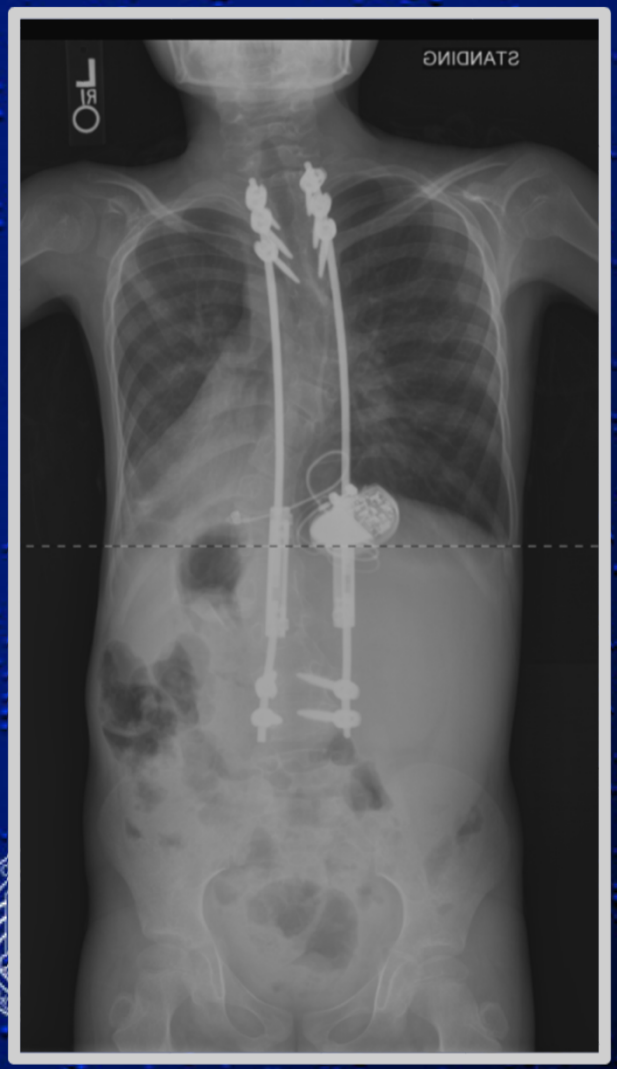
- I&D
- Removal left lower rod
- Closure via Plastics



April 2008

- Exploration of fusion
- Removal Implants
- New Implants
- Revision T3-T5 and L4-5 foundations
- Closure via plastics

April 2008 Post-op Xrays

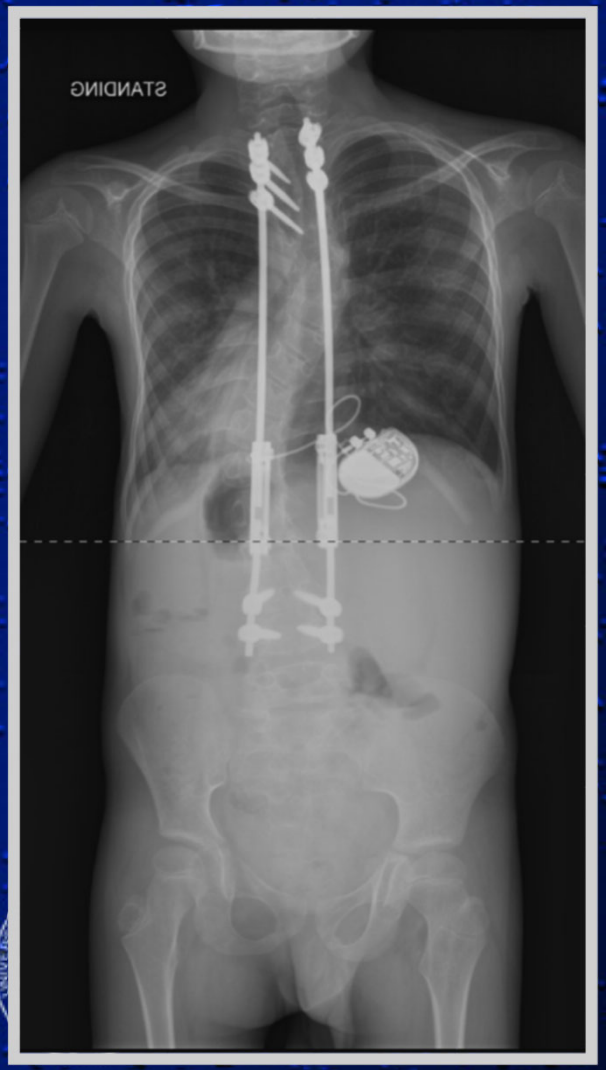


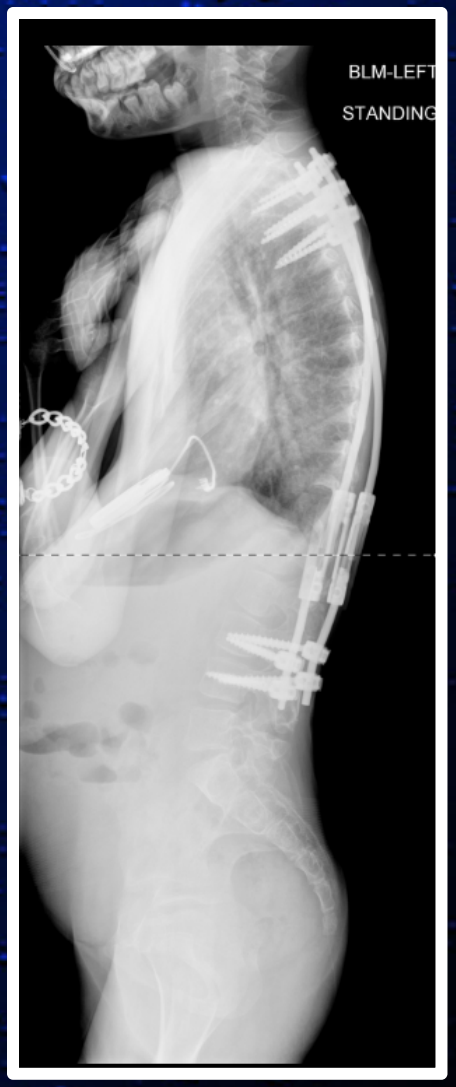
6.5 years after initial surgery

- Kyphosis 43 deg
- T9-L3: 43
- T2-T9: 37
- Balance:
  COR: 15mm Lt
  SAG: -31mm
- Scoliometer: 4 LT

Clinical Pics April 2008

9.3.2008- 7 years post op





Kyphosis
- T9-L3 40 deg
- T2-T9 45 deg
- T3-T12 48 deg
- T12-S1 42 deg

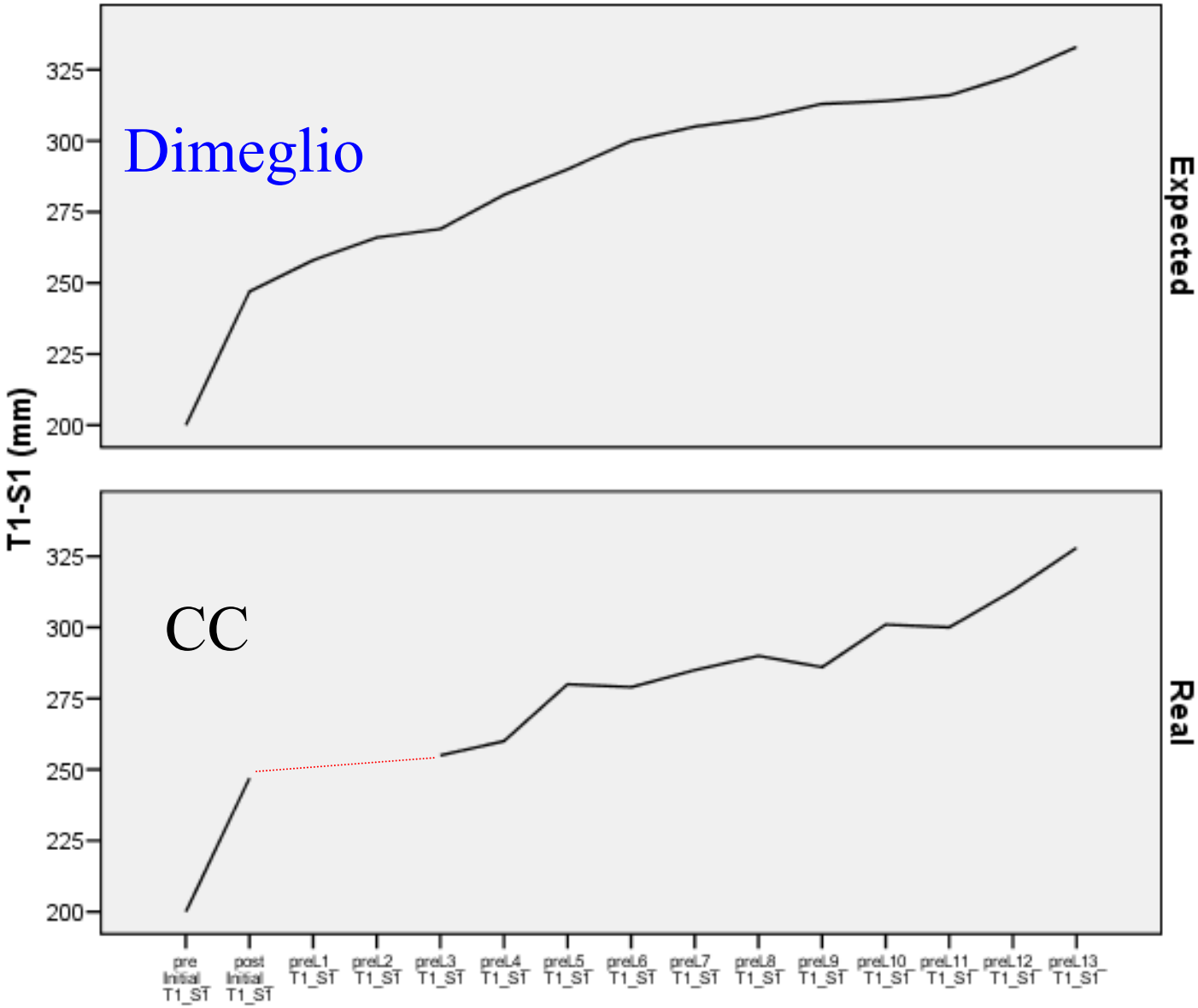
Balance
- Cor-10mm Lt
- Sag -10mm

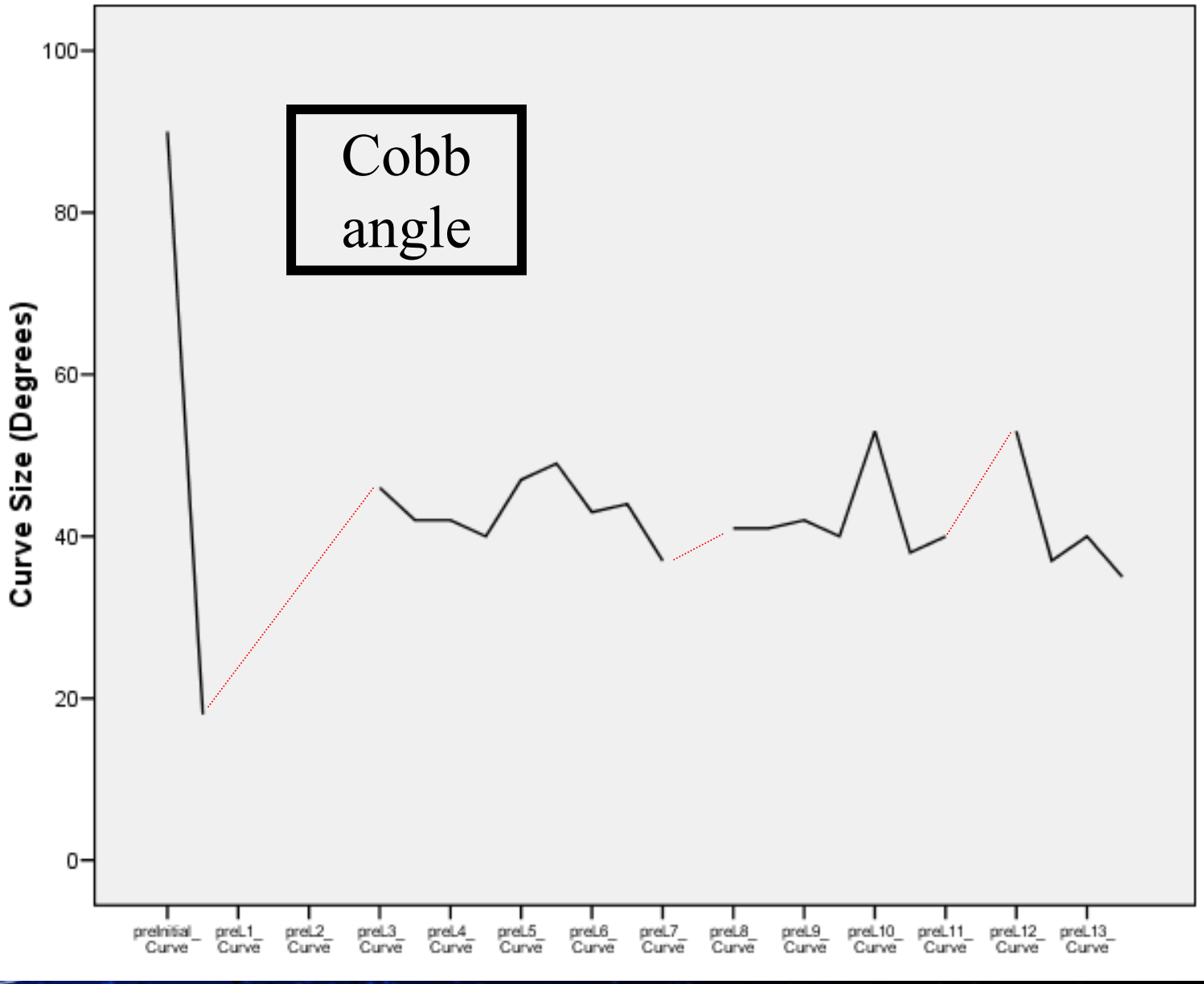
Scoliometer-10

Growth
T1-S1
Pre: 211 cm
Post: 247 cm
FU: 338 cm
Total lengh: 127 cm

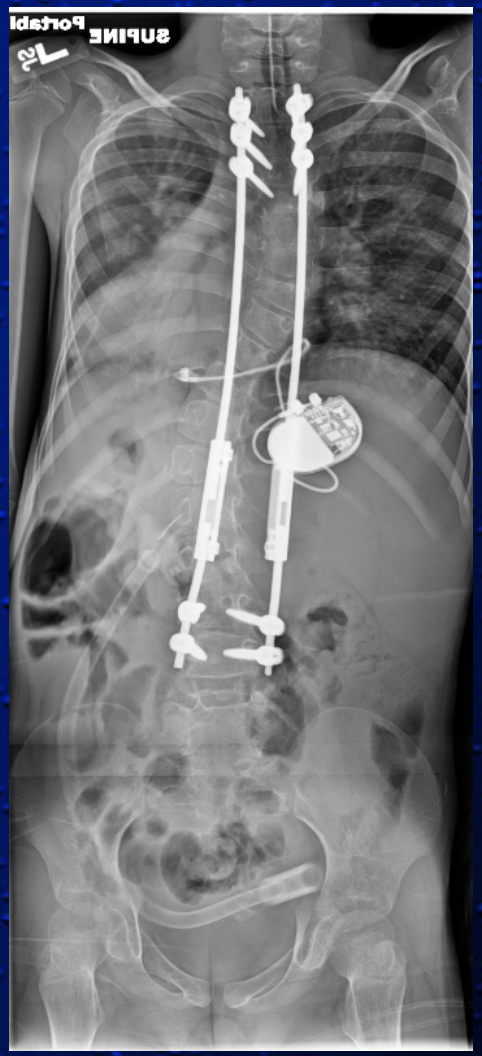
Expected growth-9 cm

Plan with
#lengthenings: 13


Dimeglio
CC
T1-S1 (mm)
325
300
275
250
225
200
Expected
Real
pre Initial T1_ST
post Initial T1_ST
preL1 T1_ST
preL2 T1_ST
preL3 T1_ST
preL4 T1_ST
preL5 T1_ST
preL6 T1_ST
preL7 T1_ST
preL8 T1_ST
preL9 T1_ST
preL10 T1_ST
preL11 T1_ST
preL12 T1_ST
preL13 T1_ST


Cobb angle
Curve Size (Degrees)
100
80
60
40
20
0
preInitial_ Curve
preL1_ Curve
preL2_ Curve
preL3_ Curve
preL4_ Curve
preL5_ Curve
preL6_ Curve
preL7_ Curve
preL8_ Curve
preL9_ Curve
preL10_ Curve
preL11_ Curve
preL12_ Curve
preL13_ Curve

Lengthenining 9.4.2008

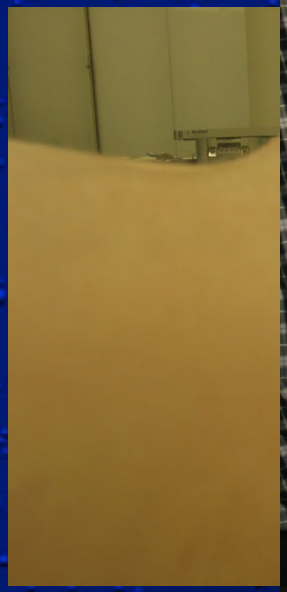


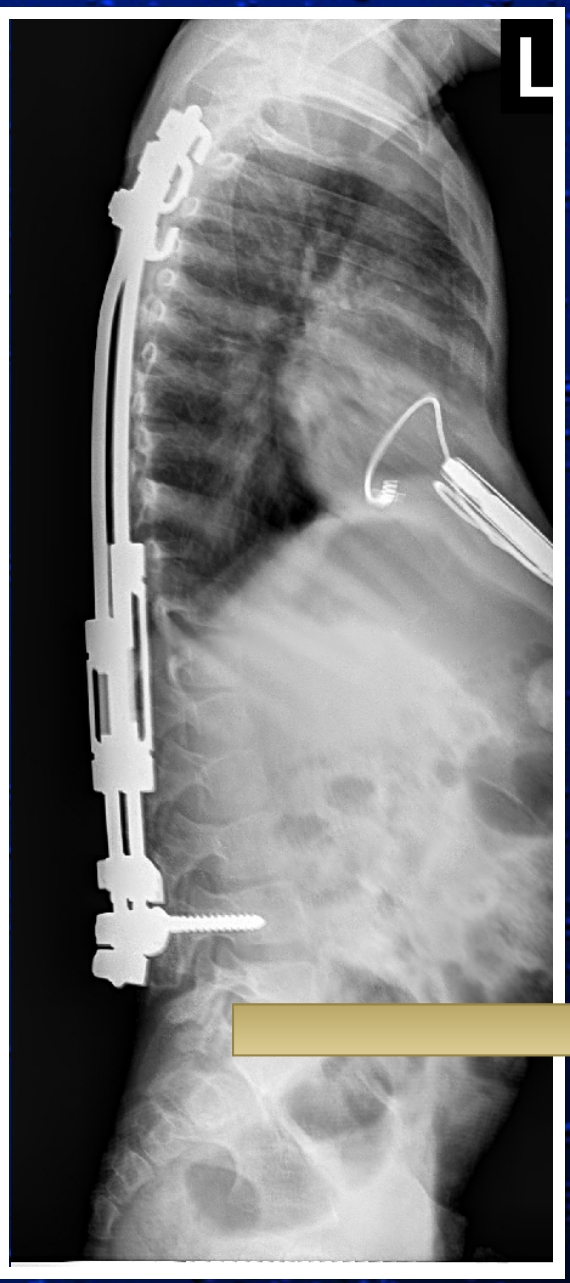
The bumpy road to success

- 9 years and 7 months
- 20 surgeries in last 7 years
- 13 lengthenings
- 6 revision surgeries (instrumentation)
- 5 Irrigation and Debridements
- 3 wound dehiscences requiring OR intervention
- 2 Deep infections requiring PICC line and 6 weeks of abx

Infection #1

Infection #2

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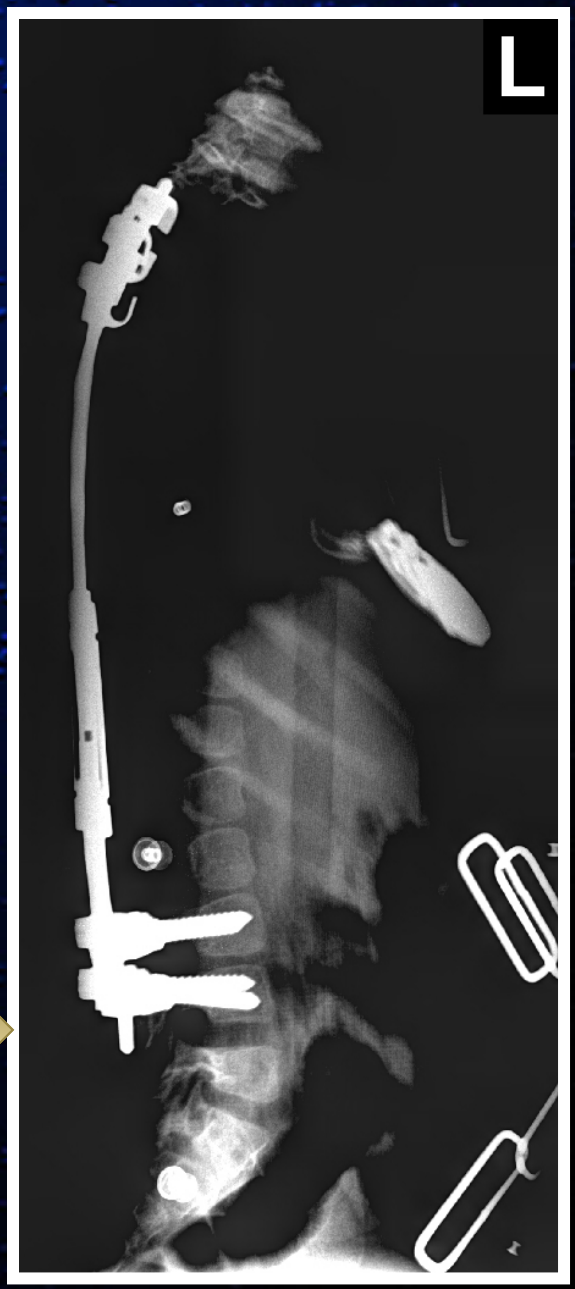
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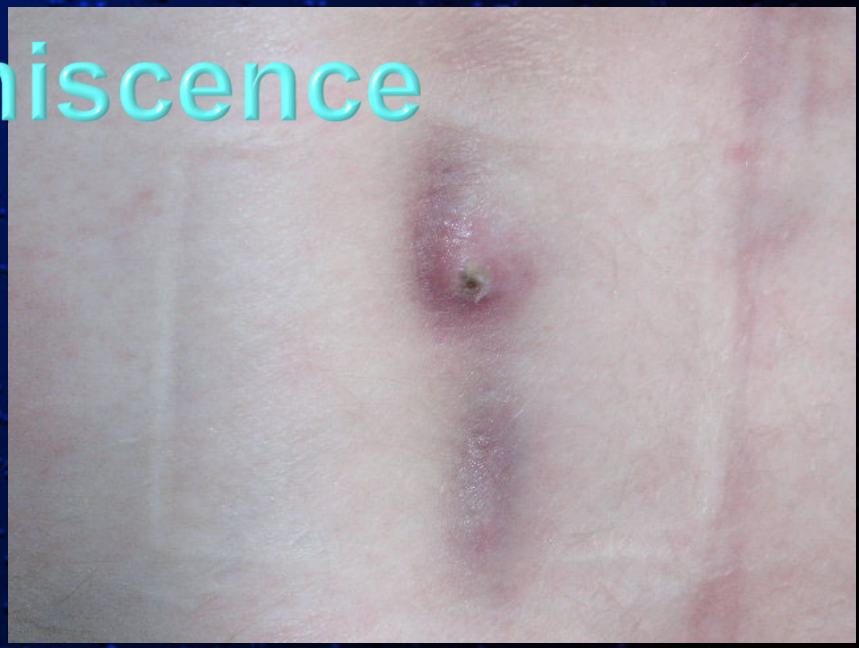
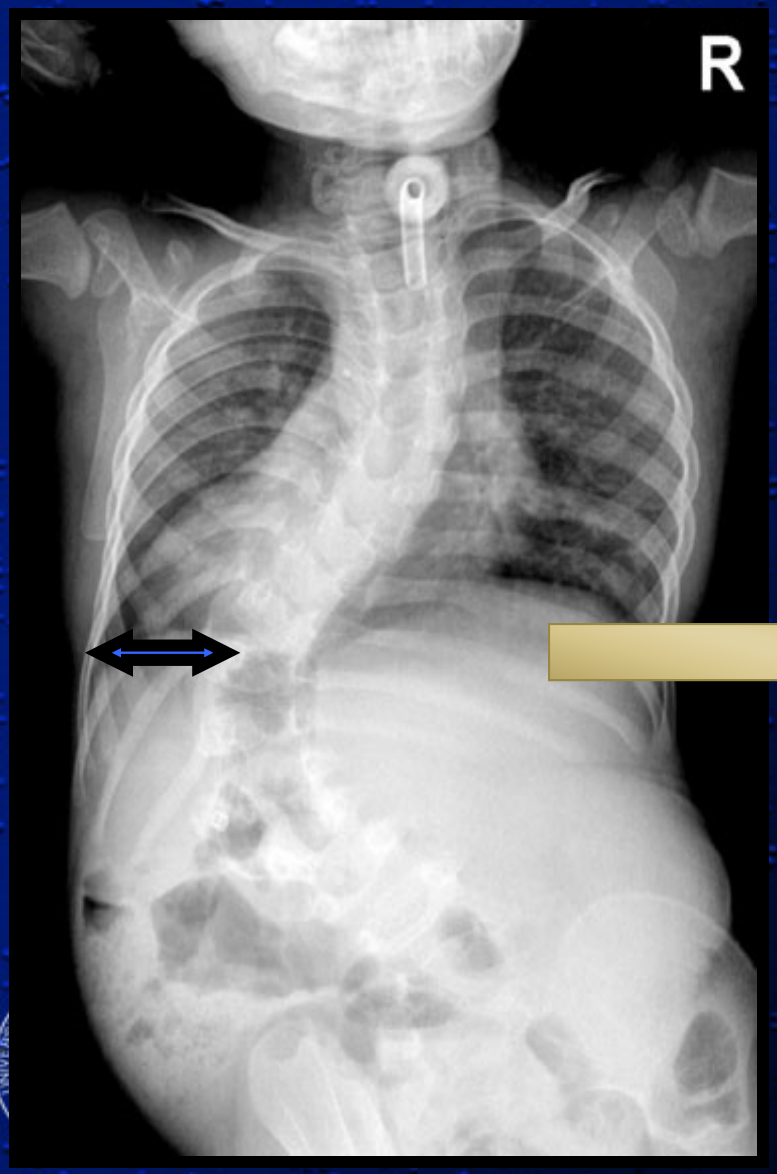
Wound dehiscence

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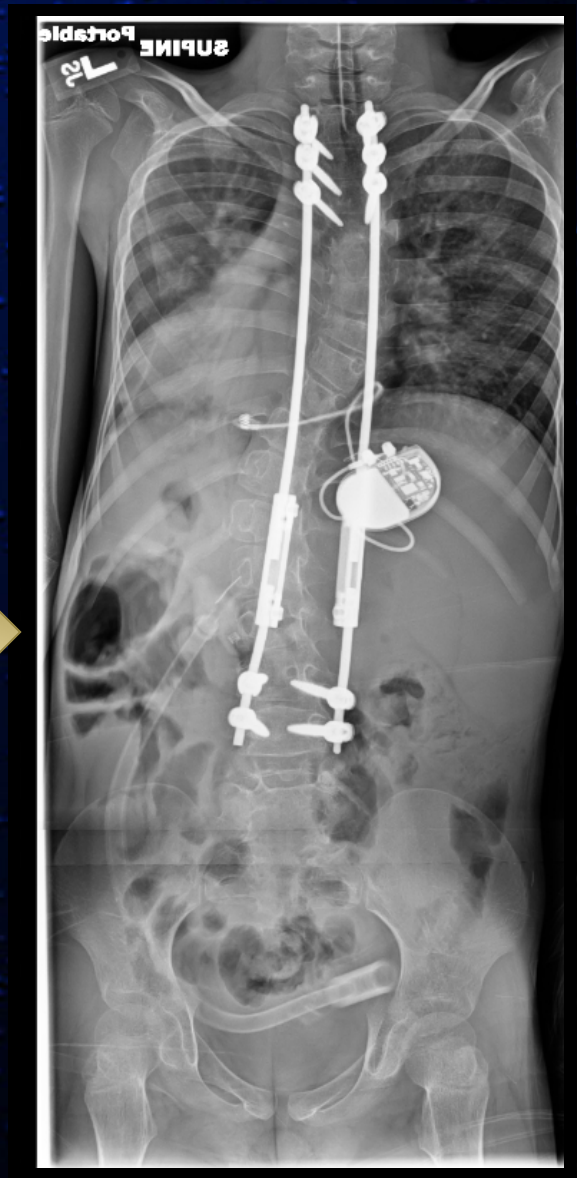
SUPINE
Portable

Now…

Is it worth it?

- Consider risk and benefits
- Consider alternatives
- Leave the implants in if possible
- Soft tissue coverage
- Do it right the first time
- Family support
- Refer if can not handle the complications

San Diego, California