

COMPLICATIONS – WHAT IS ACCEPTABLE WITH CURRENT TECHNIQUES?

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3rd International Congress on Early Onset Scoliosis and Growing Spine (ICEOS)

Istanbul, Turkey
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DISCLOSURES

- Medtronic: Consultant (ended Jan 2009); Royalties (significant); Research support for certain studies (ended July 2009)
- DePuy: Research support
- Axial Biotech: Research support
- Quality Medical Publishing: Royalties

THE PROBLEM

- Difficulty with purchase onto small Post. Elements/Vertebral Body/Ribs
- “Lengthening” Implants without Erosion through living Bony Tissue
- Maintaining Normal Intervertebral Growth/Motion and/or Chest Wall/Respiratory function with Implants crossing the spine/Chest wall
- Multiple Surgeries required

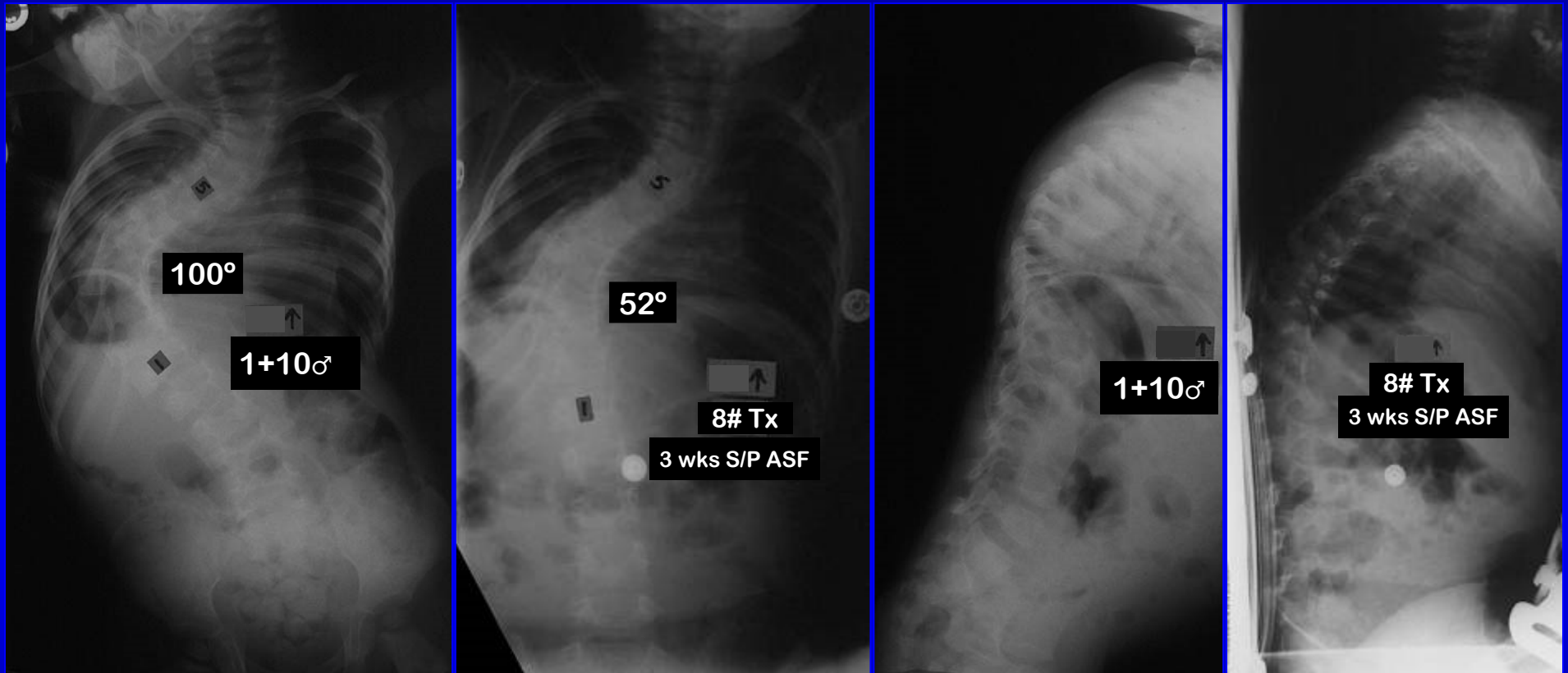
GROWTH = ENEMY!

- Progressive Kyphosis
- Progressive Crankshaft
- Progressive Remodeling of Deformed Fusion Masses
- Repeated Implant Failures along the way
- Repeated Surgeries- Implications?

WHAT CAN WE “ACCEPT” WITH OUR CURRENT RX’S??

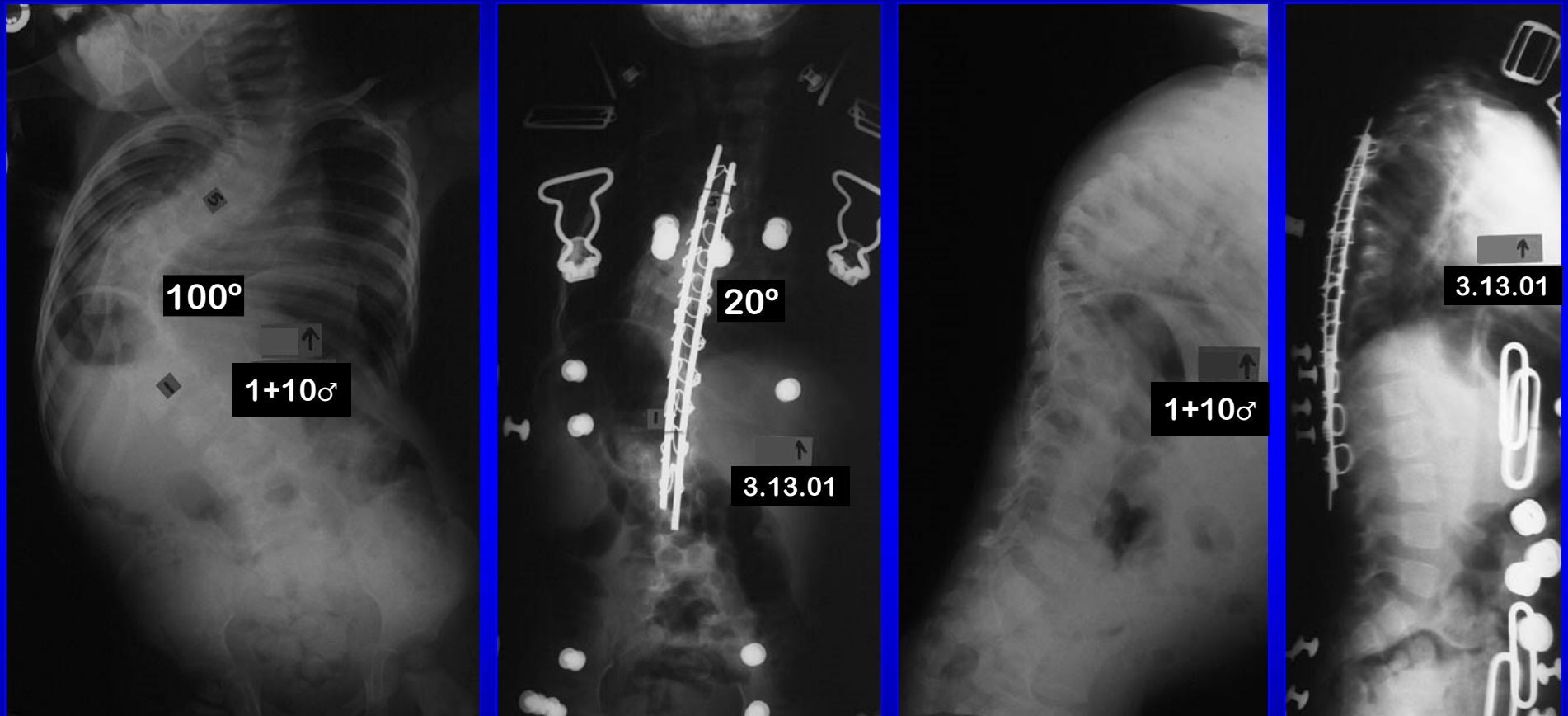
- Pull off of Spinal/Chest Wall Anchors over time- esp. Proximal
- Breakage of Spinal “Growing Rods” over non-fused regions
- Progressive Kyphosis during Surgical Treatments- mild?
- Stiffening of the Spine/Chest Wall over time
- Intermittent Wound issues from repeated surgeries

INFANTILE I.S.



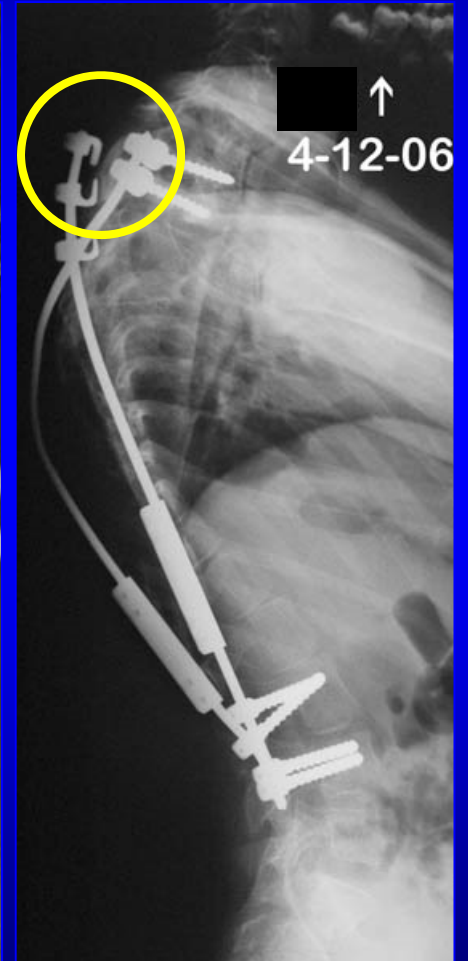
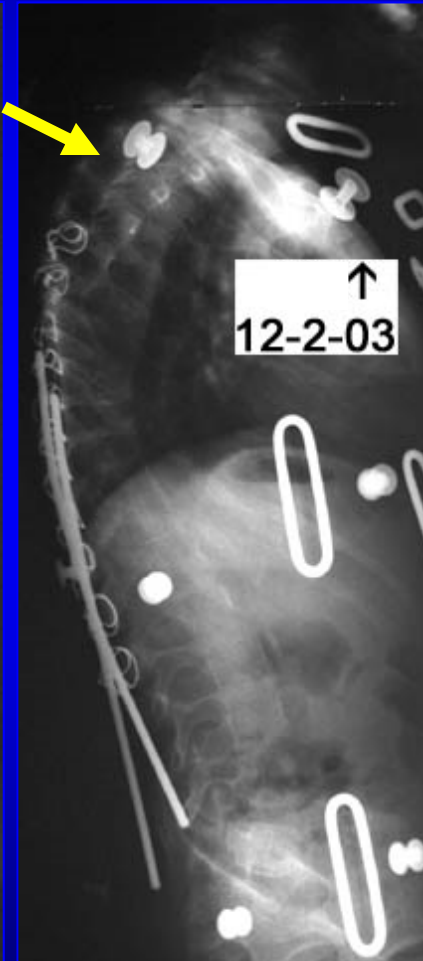
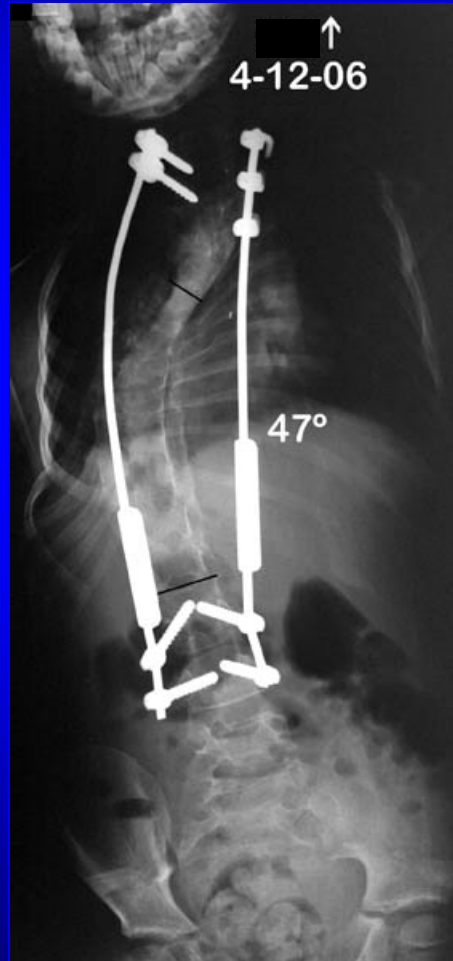
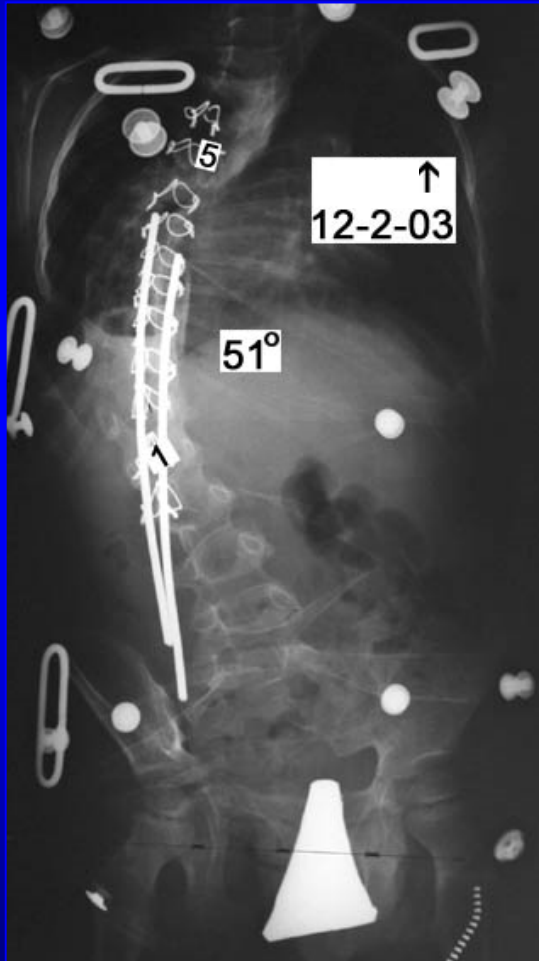
8# HALO-GRAVITY TRACTION

APICAL ASF/PSF



LUQUE TROLLEY

HYBRID RIB/VERTEBRA FIXATION

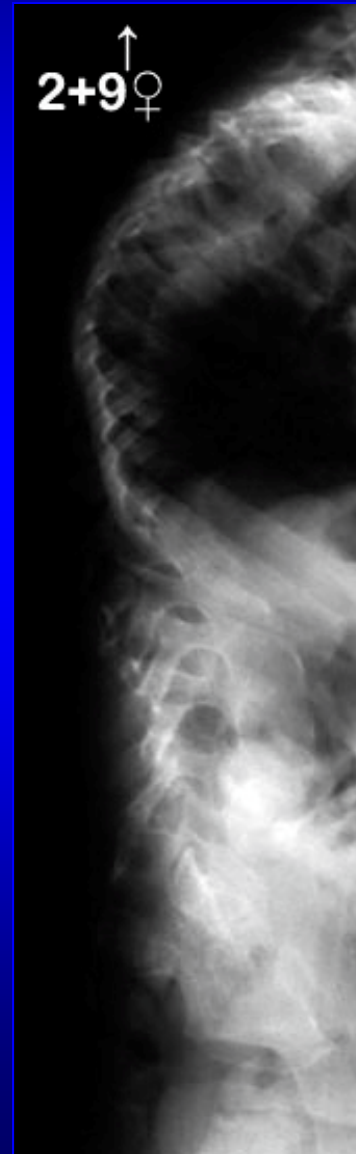
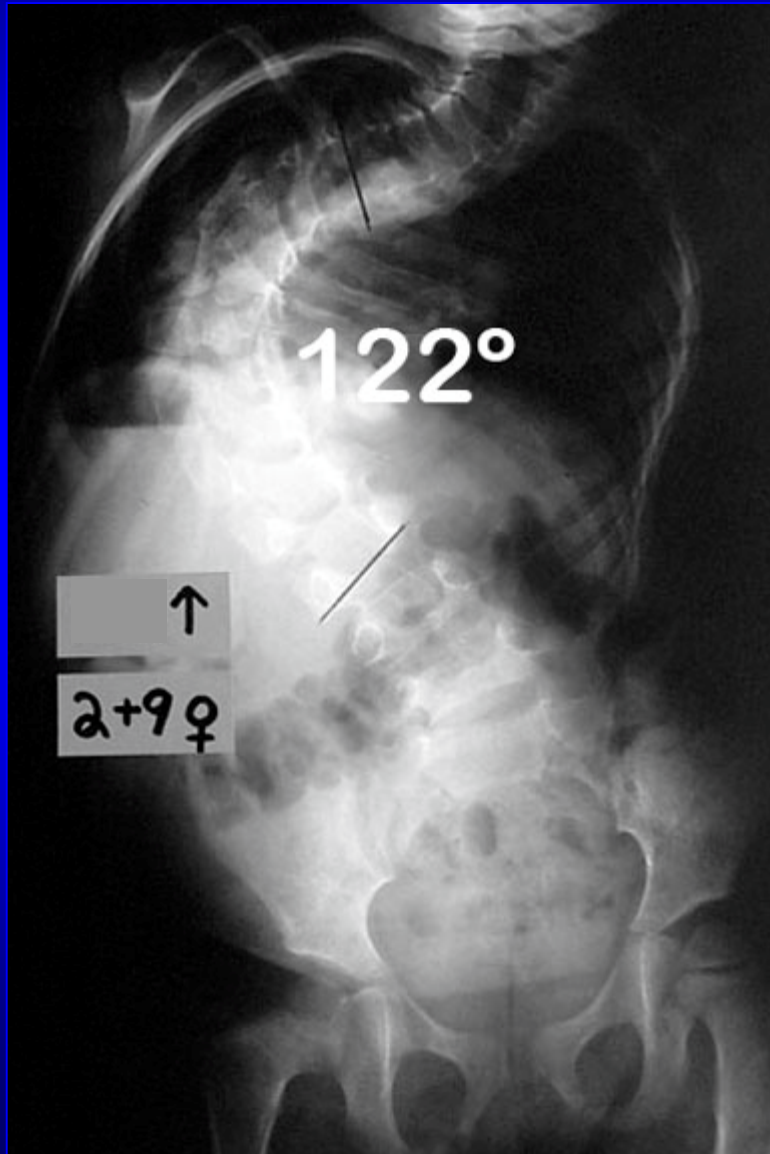


KYPHOSIS!

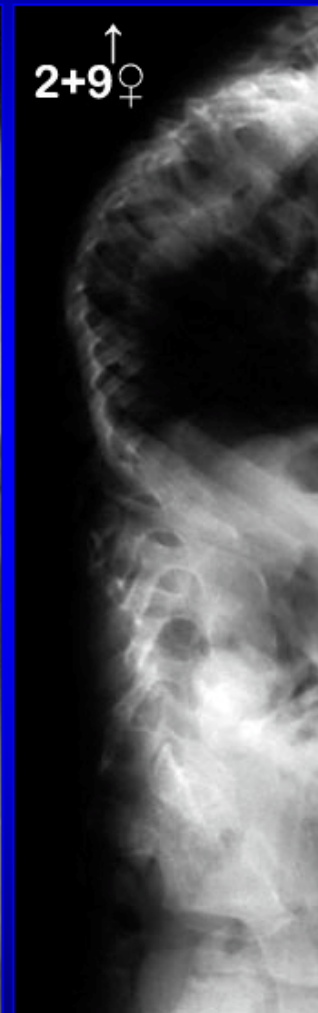
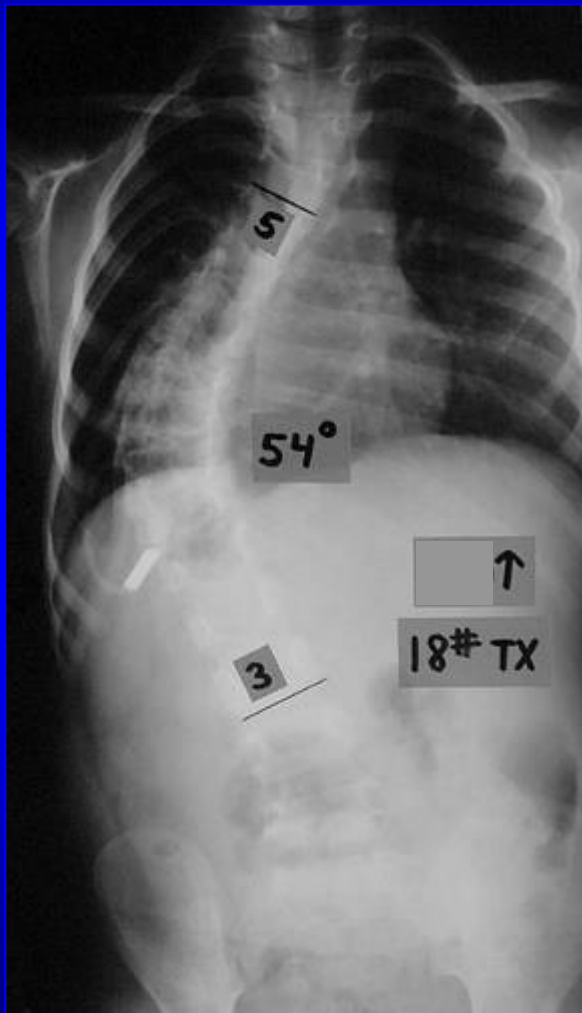
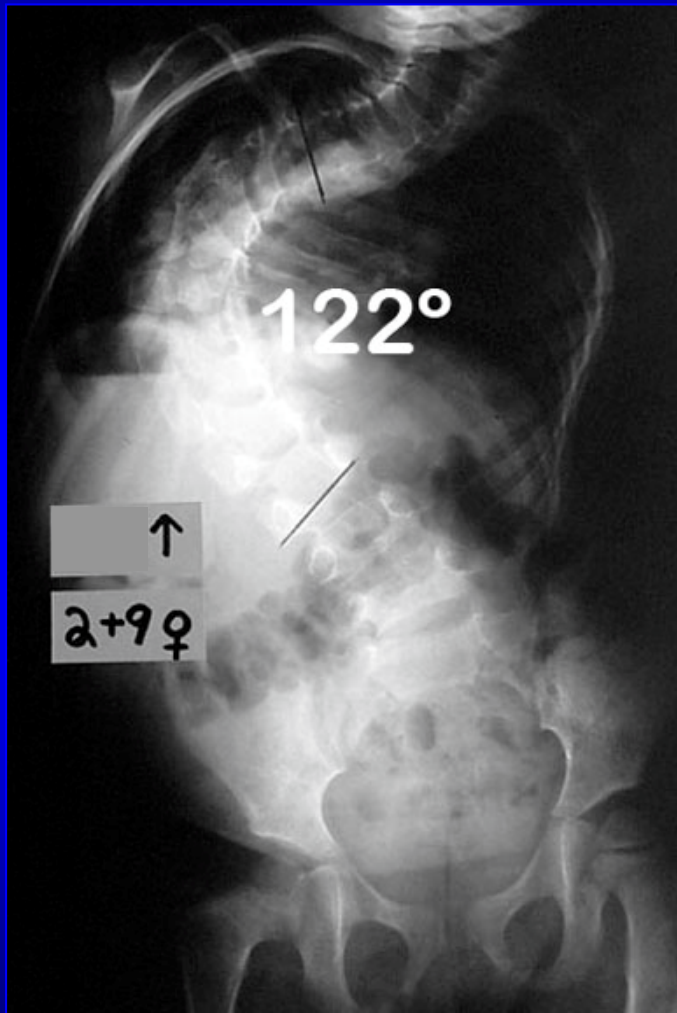
HOW TO MITIGATE/MINIMIZE???

- Utilize Pedicle Screws for Prox/Distal Anchors for Growing Constructs
- Utilize Smaller Diameter Rods (3.5mm vs 4.5mm vs 5.5mm) to increase Intervertebral motion (and rod breakage → Positive Sign of motion!!!)
- Delay Tactics at early age (Traction/Casting/Bracing etc)
- Preop HG Tx to stretch out Spinal/Chest Wall Deformity

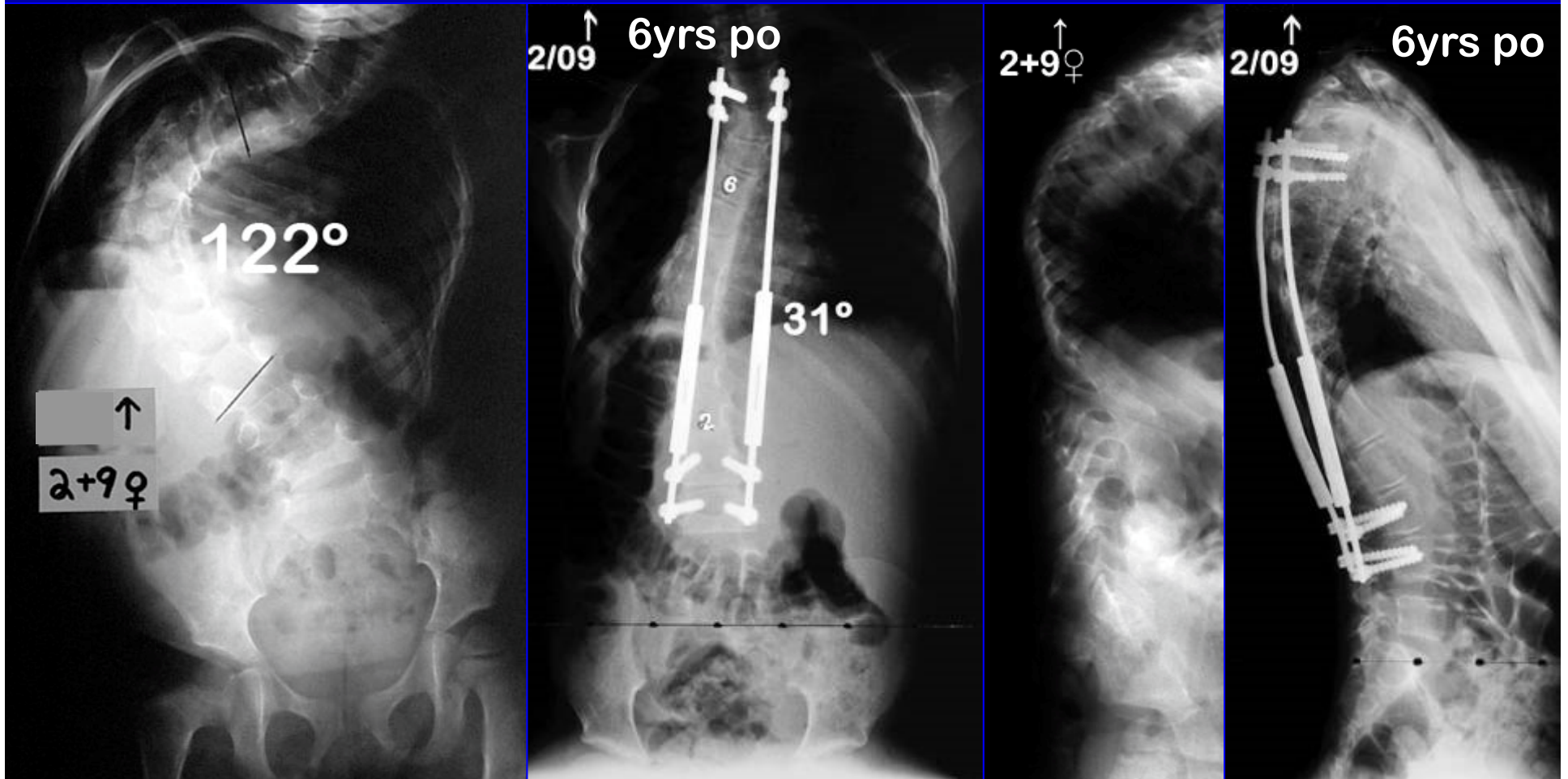
INFANTILE SCOLIOSIS



H-G TRACTION



APICAL ASF/PSF & GR



6 YEAR F/U- NO ANCHOR PROBLEMS!!!

PRE & POSTOP CLIN PICS



PREOP



POSTOP GRL # 7

Safety and Accuracy of Pedicle Screws Placed in Infantile and Juvenile Patients

Katsumi Harimaya, MD, PhD; Jochen Son-Hing, MD;
Lawrence G. Lenke, MD; Keith H. Bridwell, MD;
Richard M. Schwend, MD; Scott J. Luhmann, Jr, MD;
Linda A. Koester, BS; Brenda A. Sides, MA

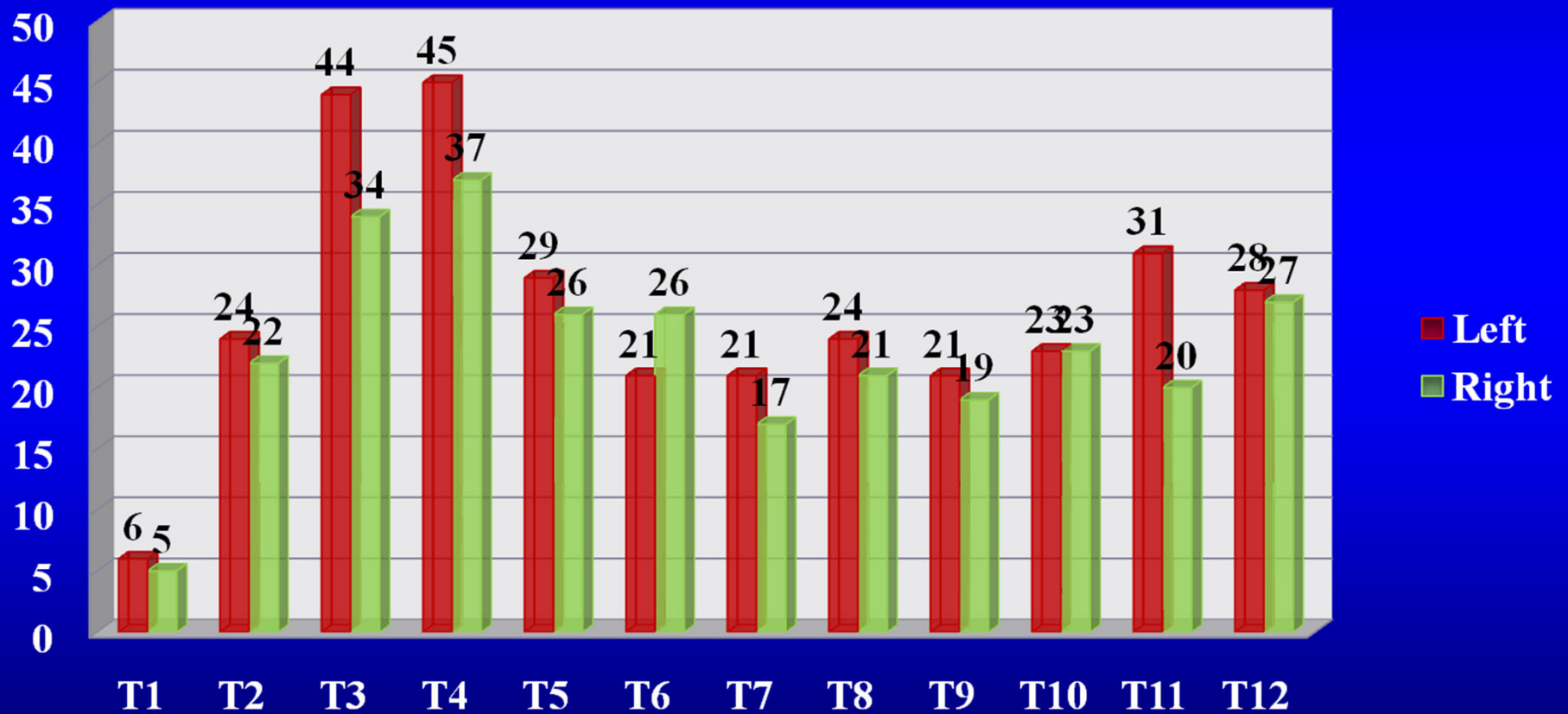
Spinal Deformity Service
Washington University School of Medicine
St. Louis, MO, USA

44th Annual Meeting of the Scoliosis Research Society
San Antonio, Texas
September 23-26, 2009

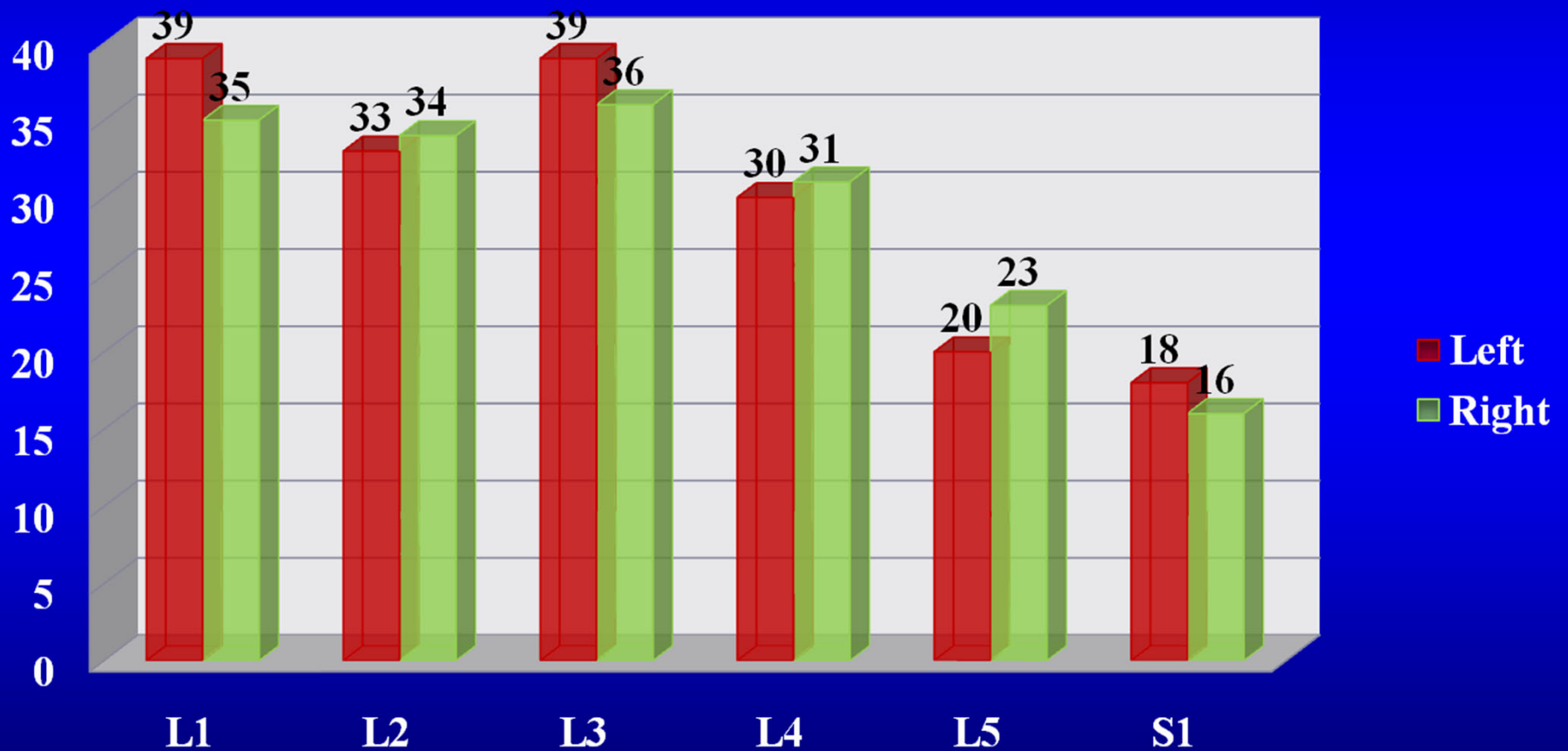
RADIOGRAPHIC MALPOSITION

- 948 Screws Evaluated
 - 3 Lateral wall violation
 - 2 Medial wall violation
 - 3 Inferior wall violation
- **n=8 total violations (0.84%)**
- **No Sequelae**

DISTRIBUTION OF THORACIC SCREWS (N=594)



DISTRIBUTION OF LUMBAR SCREWS (N=354)



COMPLICATIONS

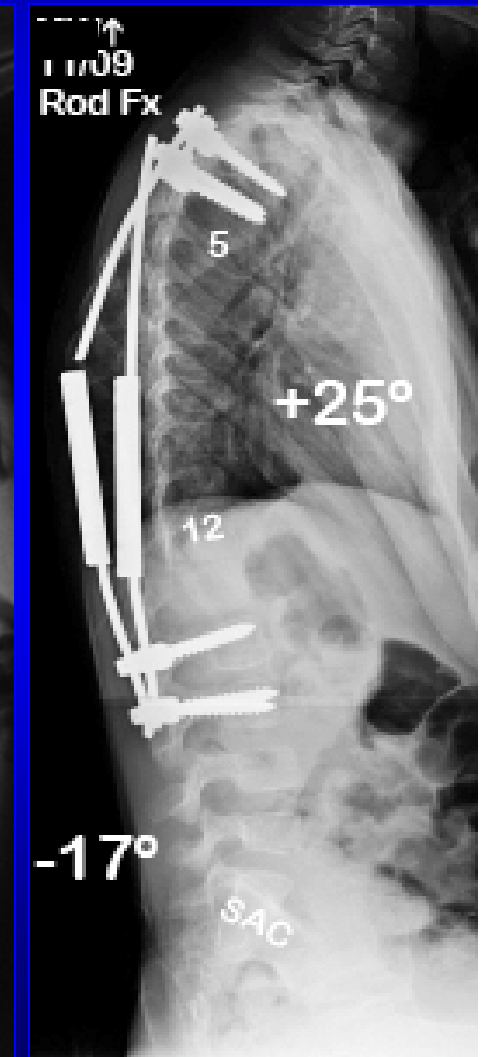
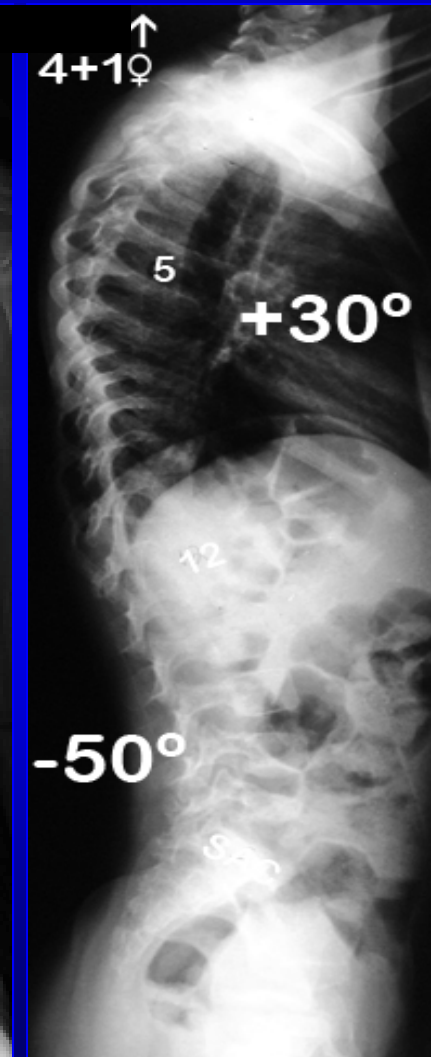
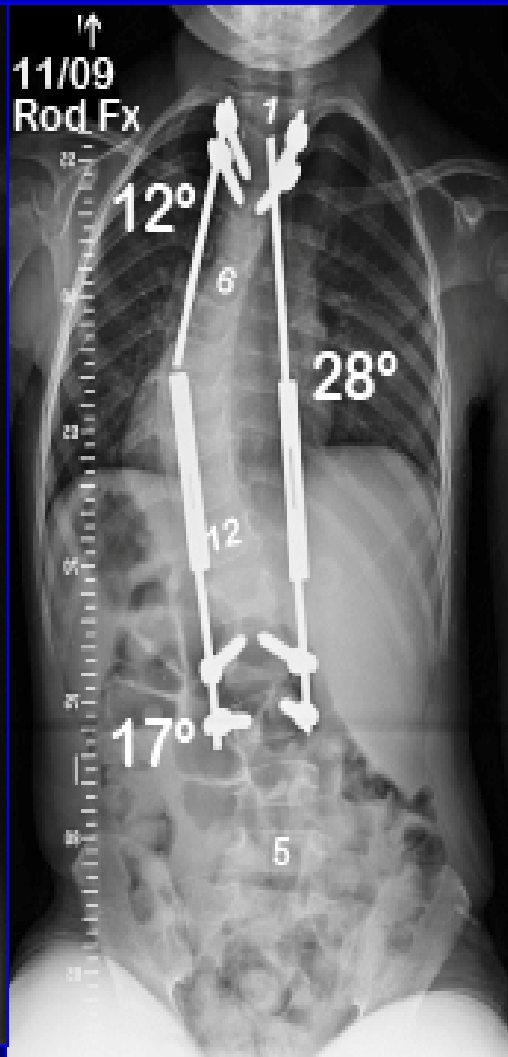
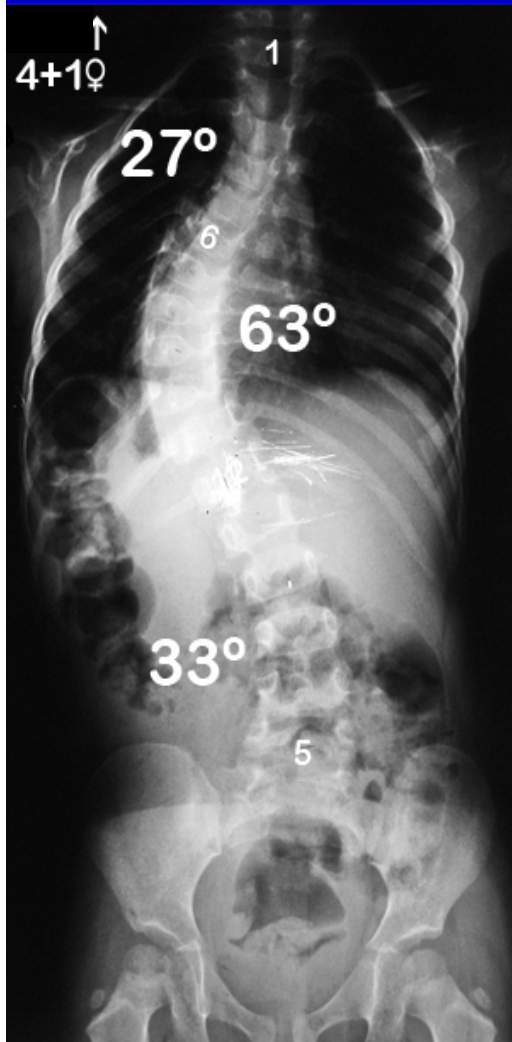
- Short-Term* → 9 patients (10.2%)
 - 4 Wound infections
 - 2 Foot drops (not screw-related, transient)
 - 1 due to osteotomy closure
 - 1 high-grade spondylolisthesis reduction

***No insertion or screw-related short-term complications**

COMPLICATIONS

- Long-Term → 9 patients (10.2%)
 - 3 Deformity progression – “Adding On”
 - 4 Pts- multiple Rod breakages
 - 2 Pts revised due to pull out/
prominence of proximal thoracic
pedicle screws placed in a growing
rod construct

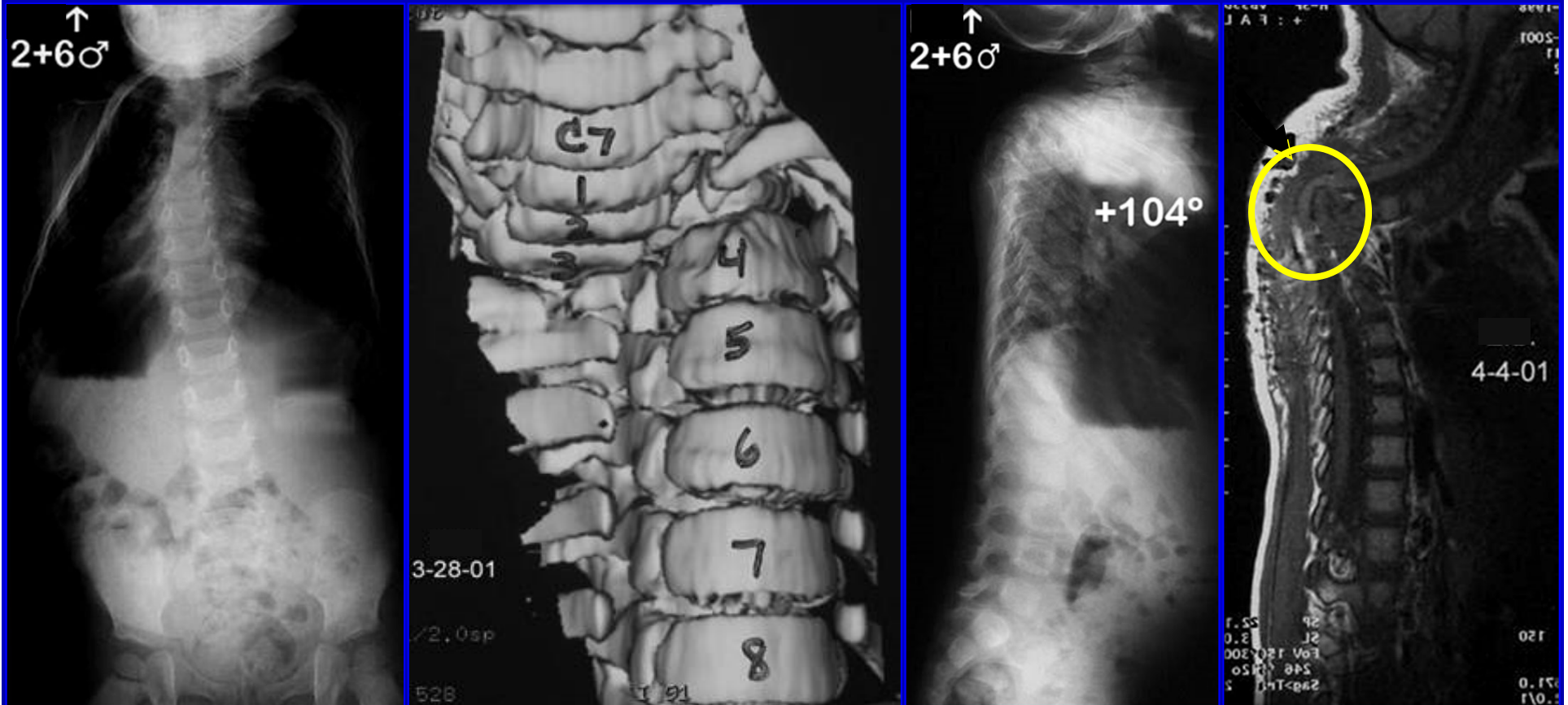
JUVENILE IS- 3.5mm GR FRACTURE 1 YR POSTOP



WHAT IS “UNACCEPTABLE”??

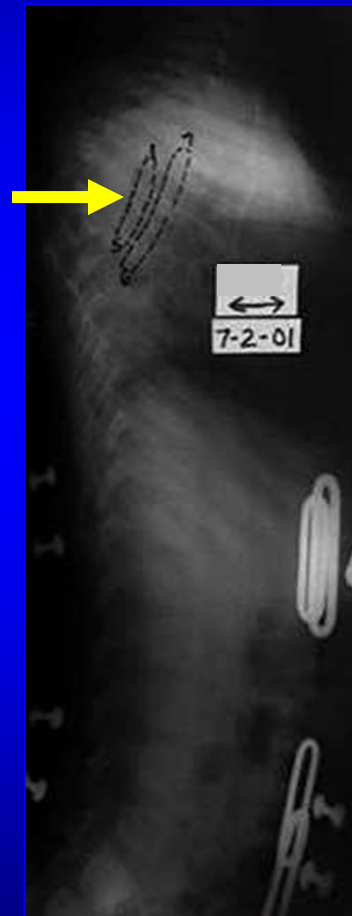
- Early Thoracic Fusion (unless necessary following SC Decompression for Myelopathy)
- Early Fusion In-Situ For Angular Cong. Def.- Pseudo vs Detrimental Remodeling over time
- Having repeated Implant Dislodgements Leading to Worsening Deformity- **“Losing Control of the Spine”**
- Neurologic Problems along the way- Kyphosis

CDS T3-T4/DIASTEMATOMYELIA/ SYRINGOMYELIA



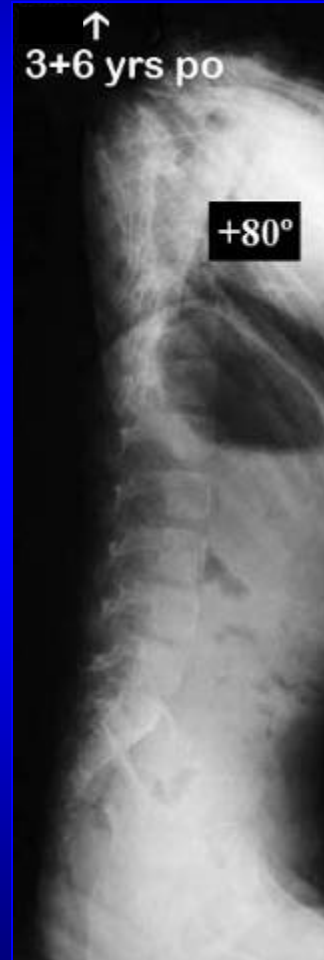
3/5 STRENGTH, CANNOT WALK!

POST “REACH AROUND” DECOMPRESSION



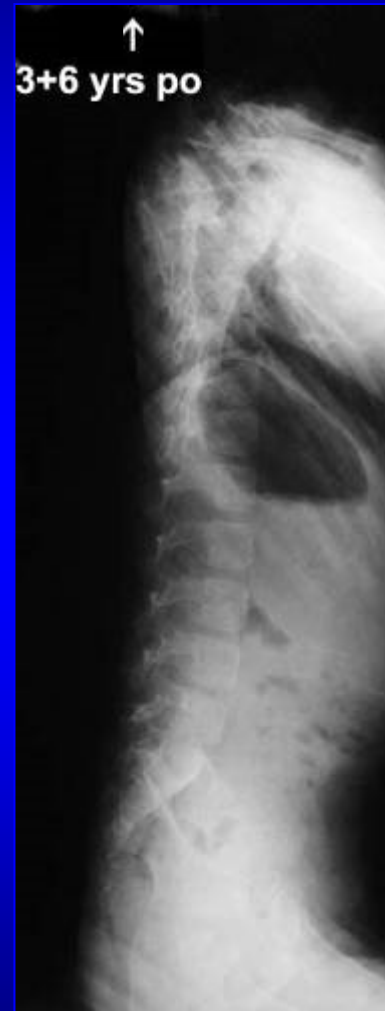
ASF/PSF

3 + Yrs PO -RECURRENT *KYPHOSIS/MYELOPATHY*



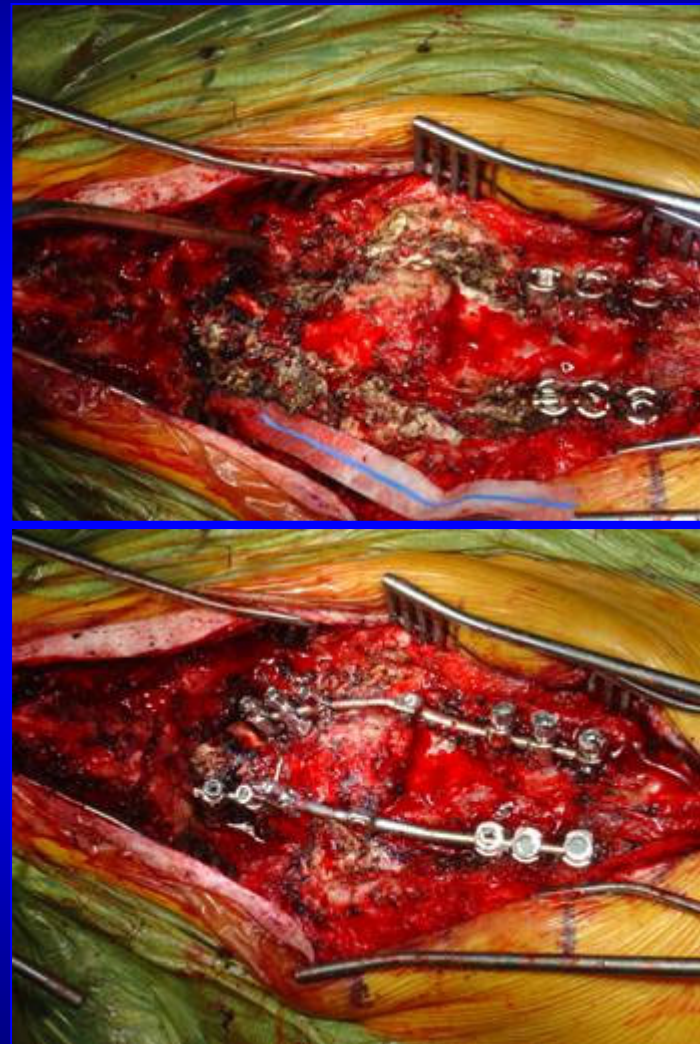
GRADE 2/5 STRENGTH

POST T3 & T4 VCR



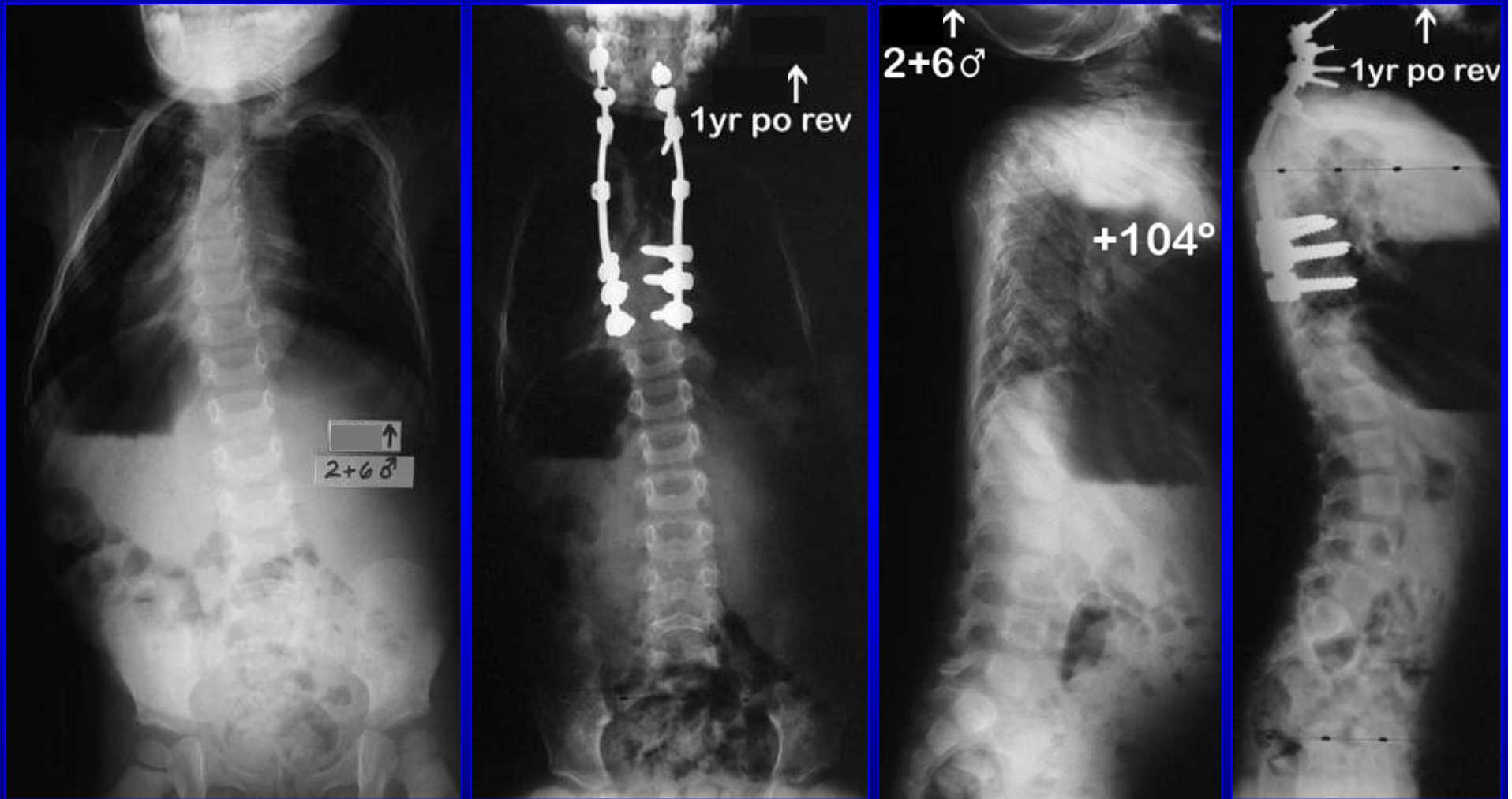
ASF T2-T5/PSF C5-T10

RELEASE OCC/√ FUSION



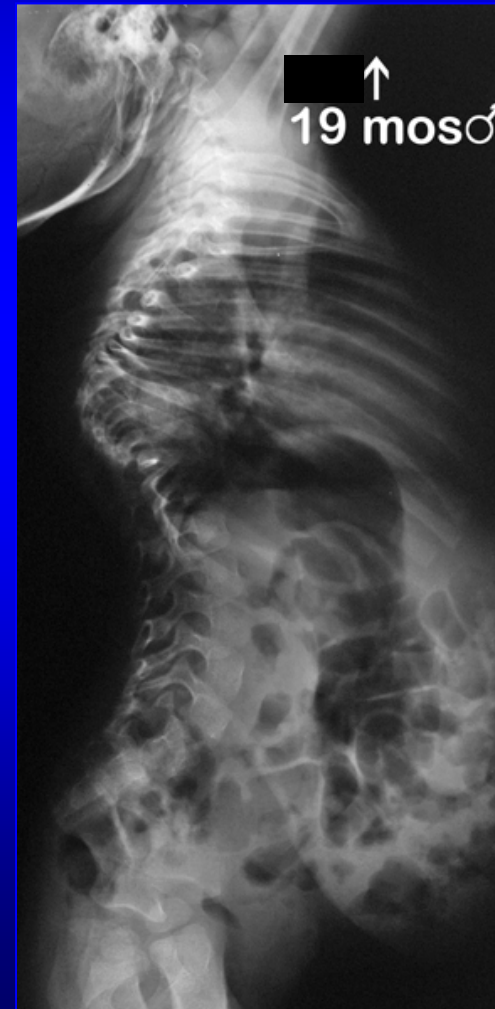
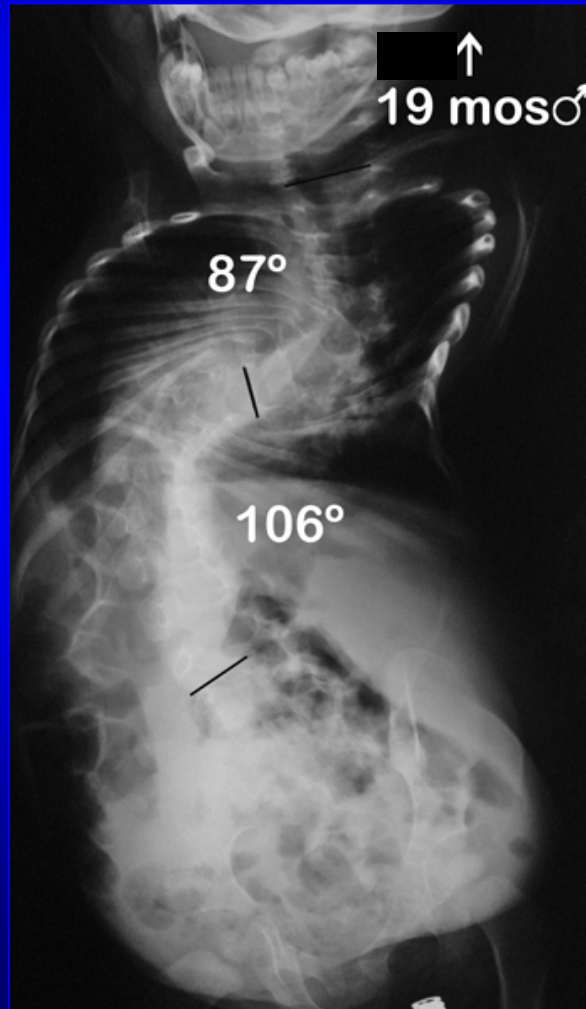
FUSION SOLID!! REINSTRUMENT

NEURO INTACT



Stable Spinal Column- age 8

PRUNE-BELLY SYNDROME-1997

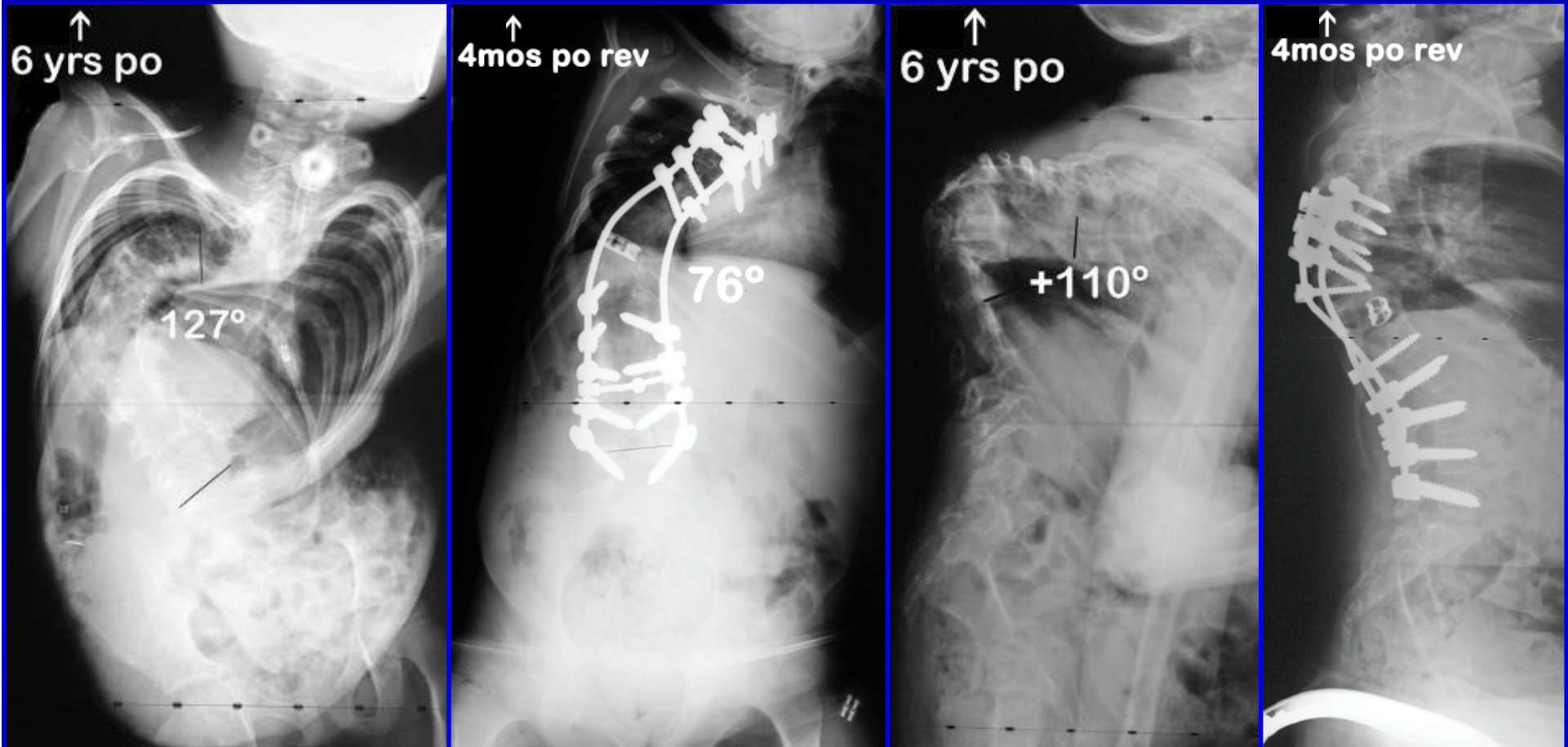


S/P ASF/PSF T9-L3



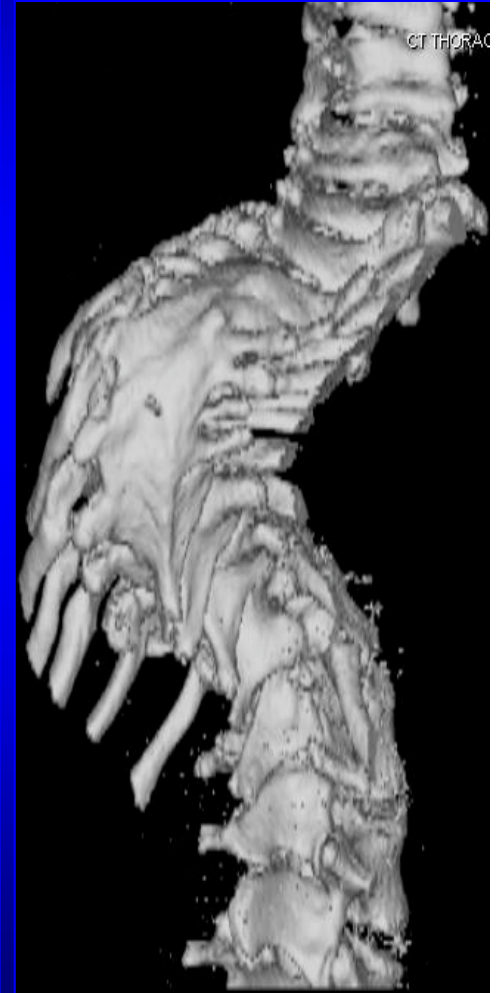
Solid Fusion > Progressive Kyphoscoliosis

REV PSF/VCR



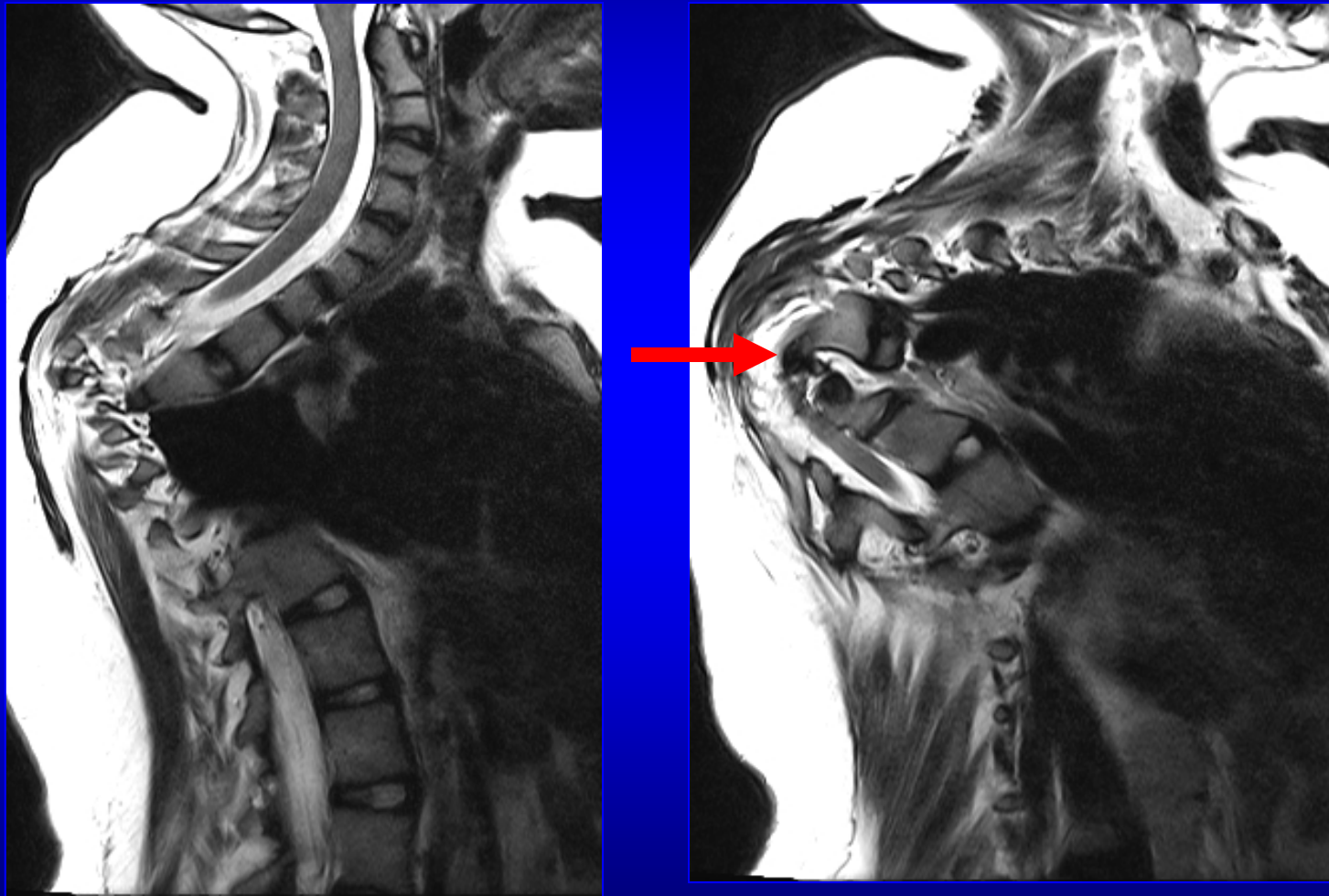
Salvage Surgery!

Cong Kyphoscoliosis



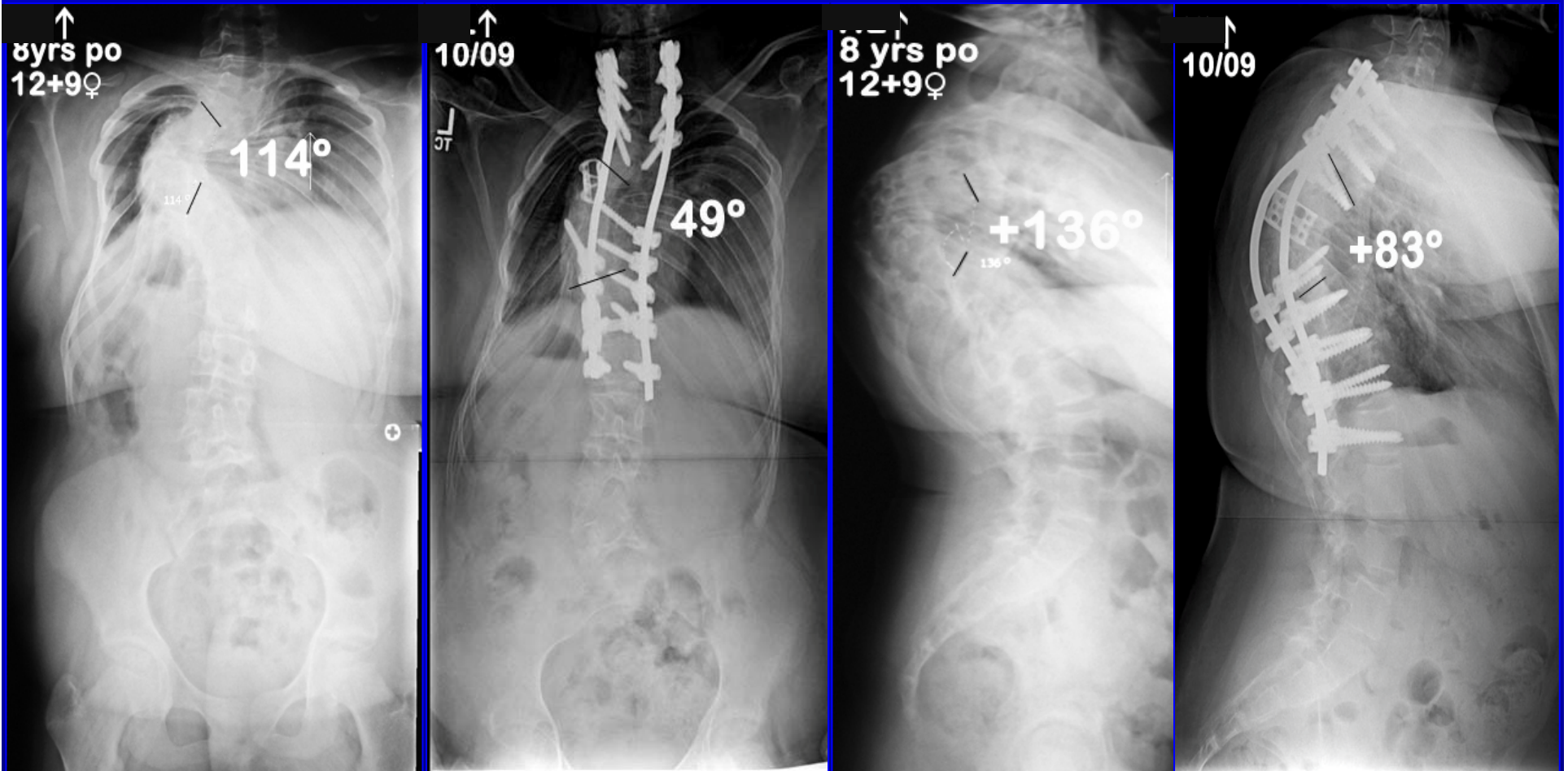
ASF/PSF AGE 3- NOW MYELOPATHIC

PREOP MRI



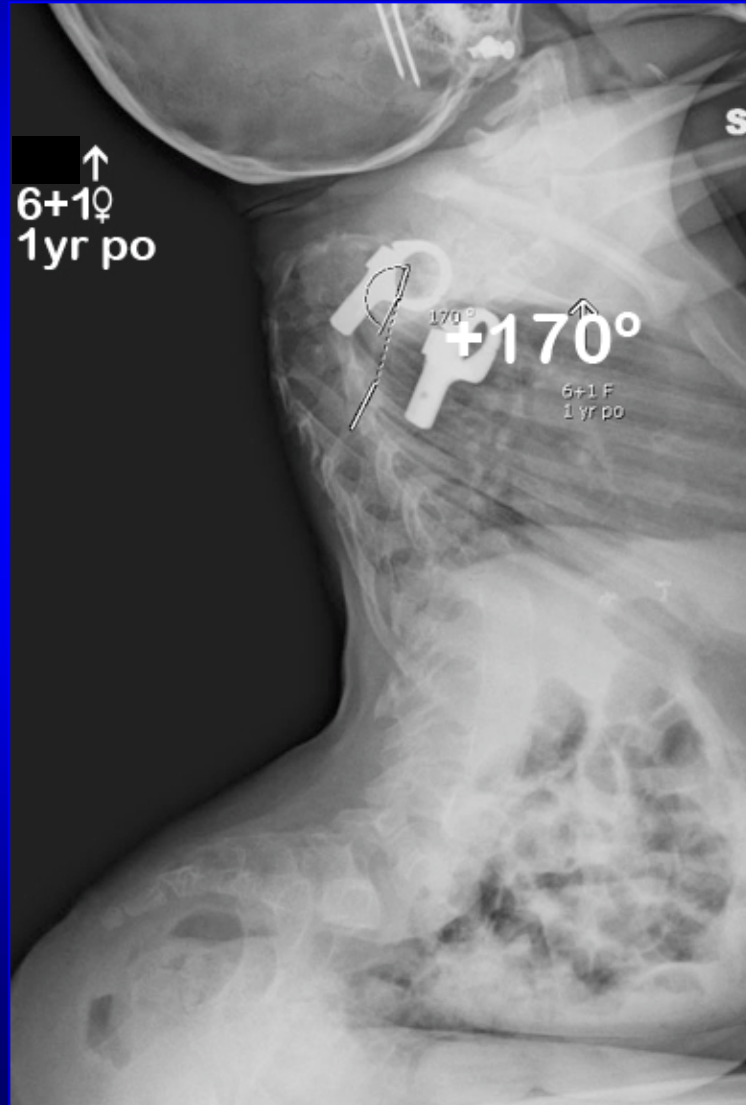
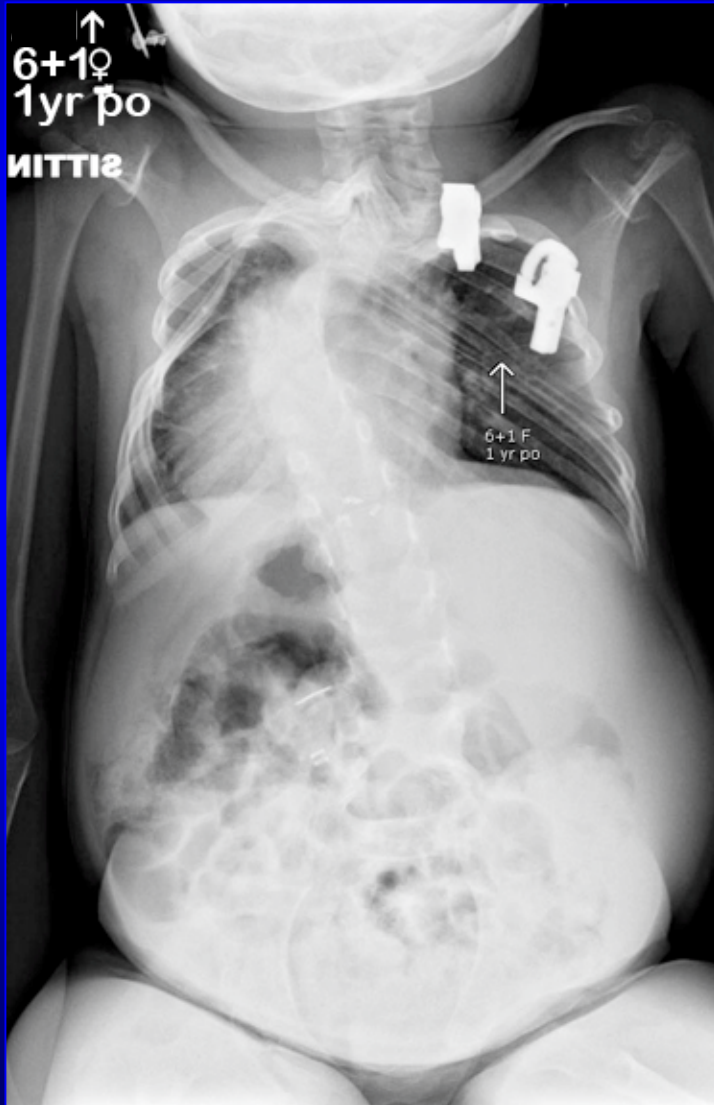
“Ribbon” Spinal Cord Draped over Apex

PSF/SC DECOMP/VCR



No SCM/Ant Cord Syndrome/Intact Sensation

PARAPLEGIA FOLLOWING VEPTR FOR KYPHOSCOLIOSIS



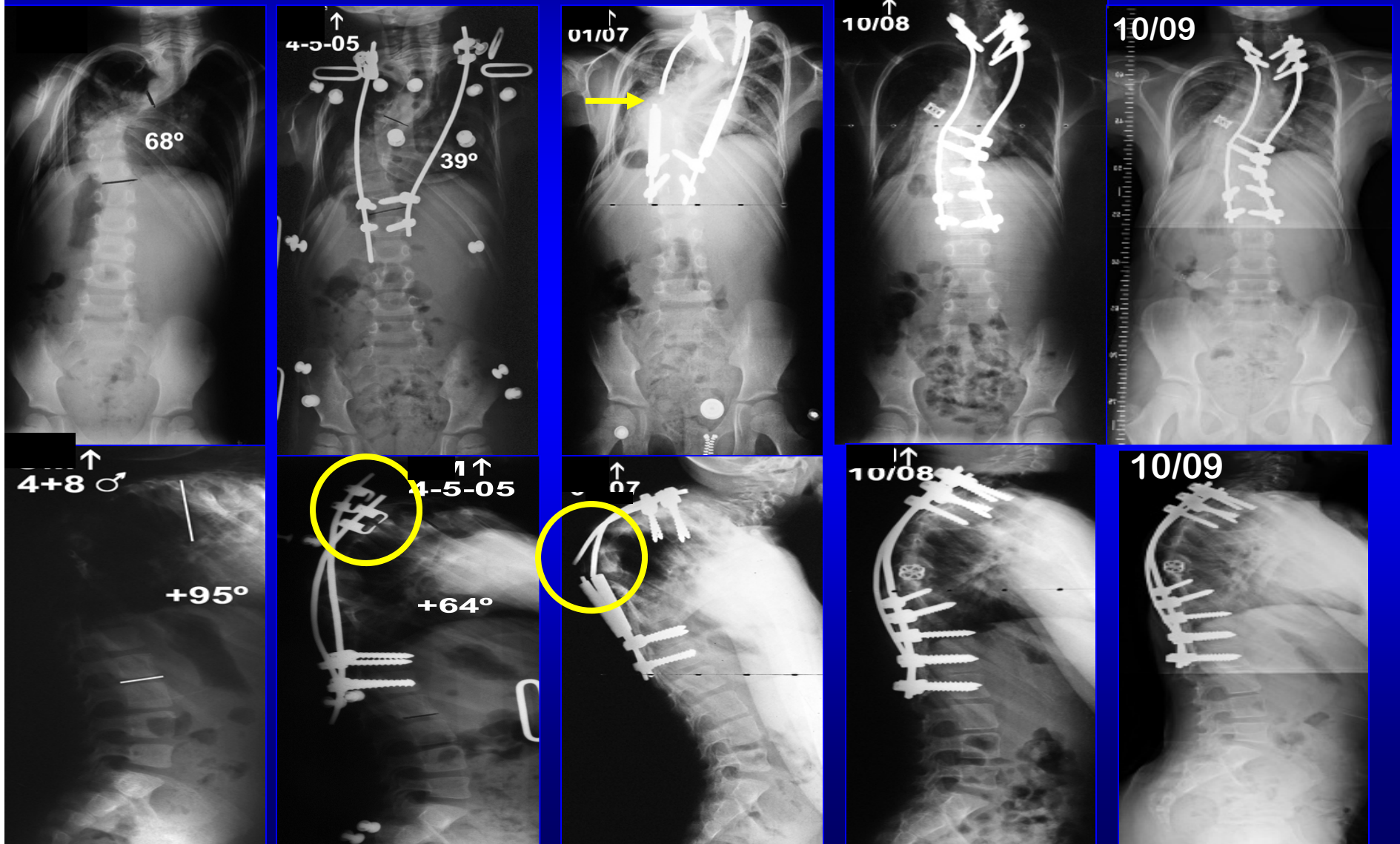
“LOSING CONTROL OF THE GROWING SPINE”

- Sagittal plane Kyphosis (esp Prox Thoracic region)
- Coronal Plane- Crankshaft/apical progression
- Inadequate Lever arms above/below Deformity apex
- Similar to multiple Adult Lumbar Spine surgeries leading to Progressive Deformity!

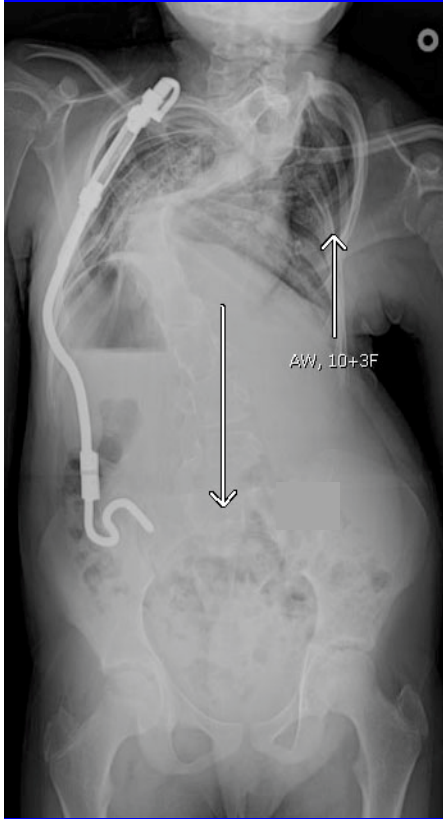
DEGEN SCOLIOIS- 5 PRIOR SURGERIES



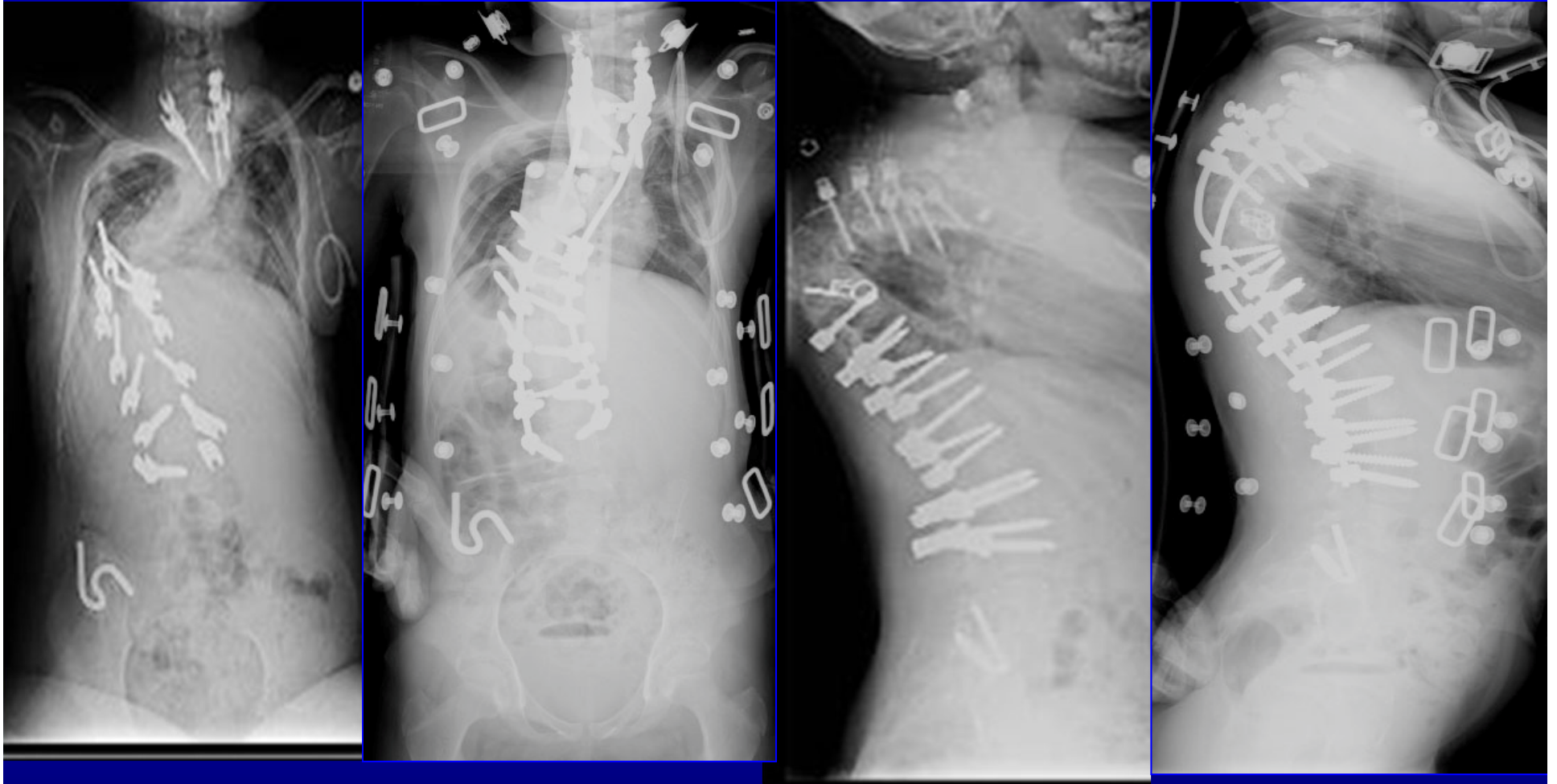
CONGENITAL KS- PROX KYPHOSIS- 5 YEARS OF “GROWING RX.”



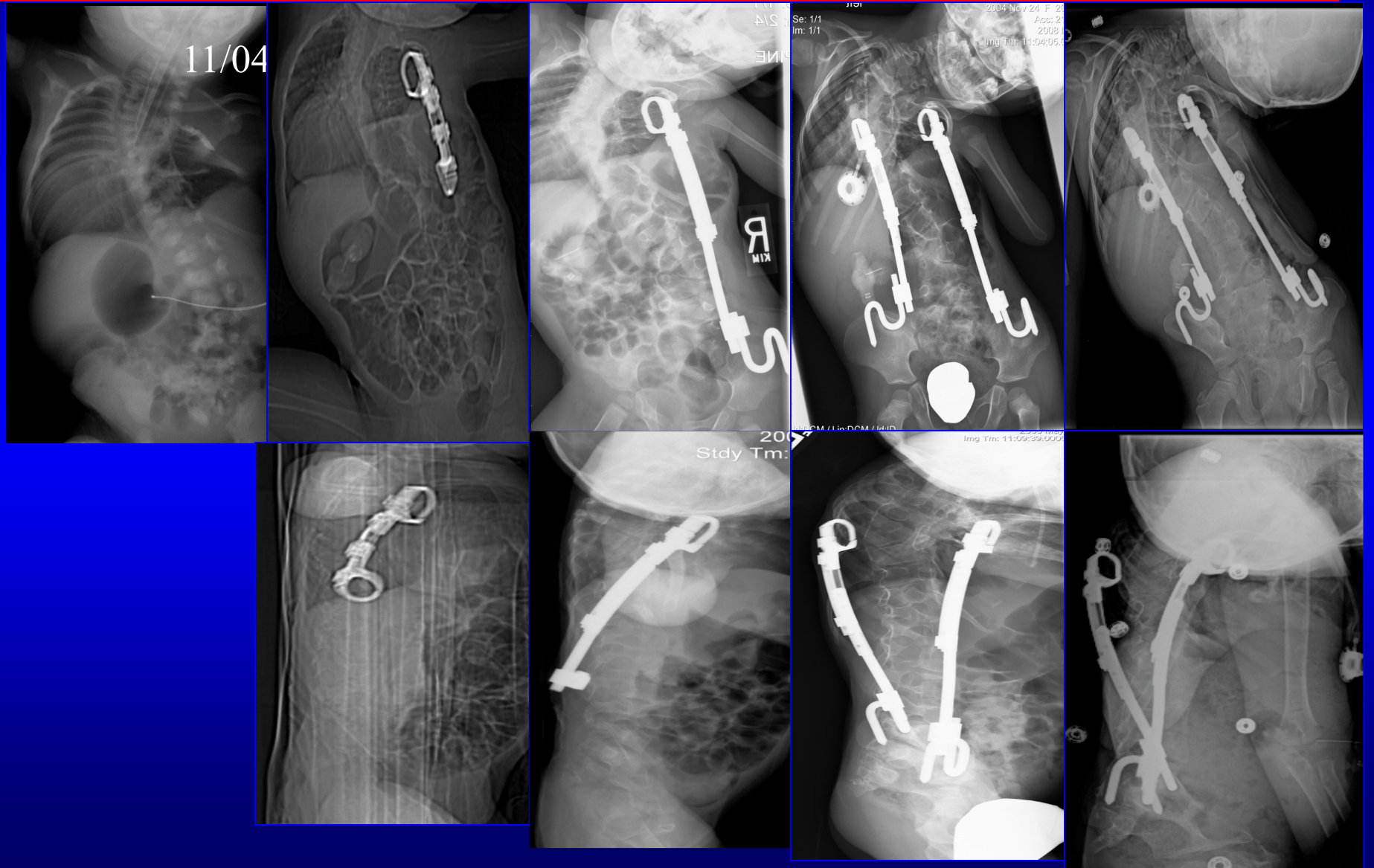
IIS- S/P 25 SPINE OPERATIONS BEFORE AGE 10!



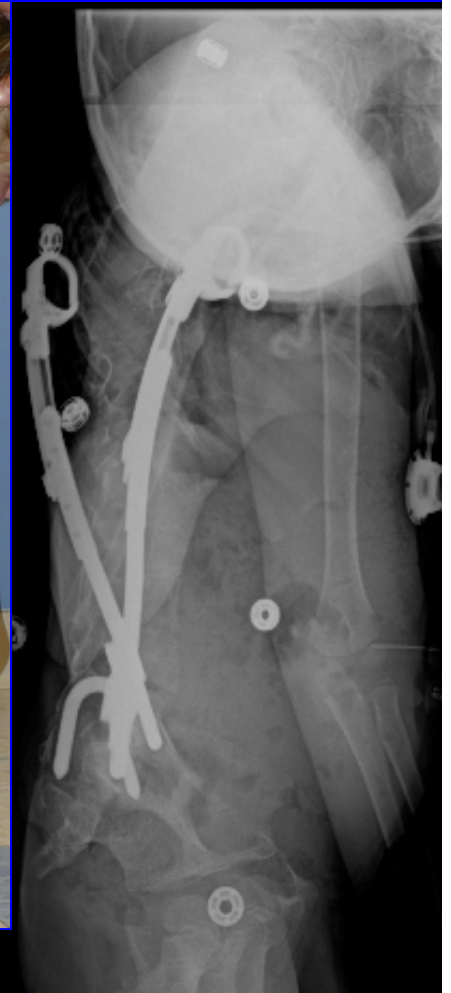
REV PSF T1-L4/T7 & T8 VCR



CONG SCOLIOSIS- 11 Surgeries



AGE 5-NOW WHAT???



CONCLUSIONS

- “Acceptable Complications” will occur with the operative treatment of EOS
- Must try to avoid them if possible (prelim HG tx/strong Anchors/careful f/u) or at least minimize
- No Indication for In-Situ fusion of Cong. Angular Deformities
- Watch out for Kyphosis- Spinal Column and Spinal Cord
- Do Not **“Lose Control of the Growing Spine”**

Scoliosis Research Society



SRS 45th Annual Mtg-
Kyoto Japan
September 21-25 2010

