Staged Index Surgery in Growth Rod Instrumentation

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HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Staged Index Surgery in Growth Rod Instrumentation

One strategy to consider when there is increased risk of anchor site failure due to poor bone stock, as seen in metabolic bone disease or osteogenesis imperfecta, or problematic deformities (kyphosis).

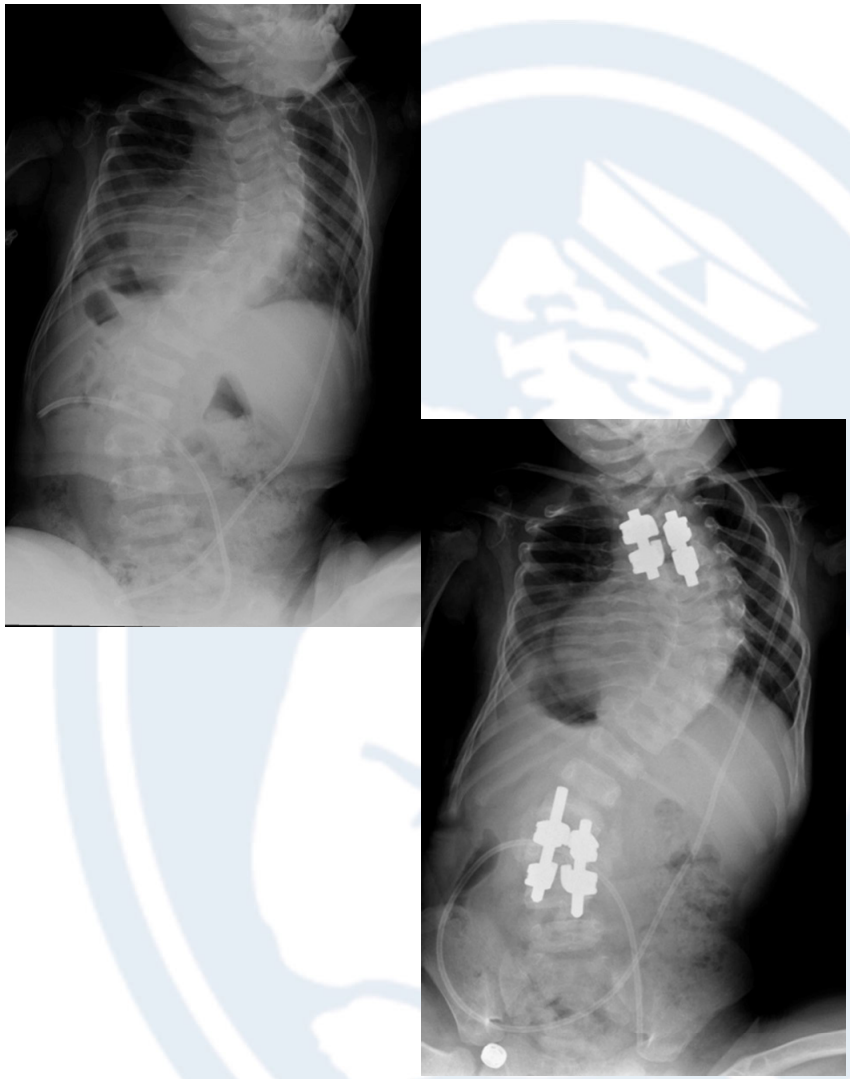
Staged Index Surgery in Growth Rod Instrumentation

Stage 1: Insert anchors with intra-segmental rods

Allow fusion (3 mos.)

?Brace/?Traction

Stage 2: Insert inter-segmental rods and distract



Historical

- **Winter, R.B.: ” For very young children or those with soft or deficient bone at the hook purchase sites, it is wise to fuse the two vertebrae at each end of the curve. This creates a solid mass of bone into which the hooks can be inserted 6 months later.”**

(“Congenital Deformities of the Spine”, Thieme-Stratton Inc. N.Y., 1983)

Historical

- **Marchetti PG, Faldini A : “End fusions in the treatment of some progressing or severe scoliosis in childhood or early adolescence.” (Scoliosis Research Society, Hong Kong, 1977)**

BCH Experience

(Jaime Gomez, M.D.)

1	Thoracogenic	Hyperkyphosis	Poor bone quality
2	Prader-Willi	Hyperkyphosis	Peri-op Paraplegia
3	Marfan		NM change
4	Chondrodysplasia punctata		NM change
5	Osteogenesis Imperfecta	Cobb 97	Poor bone quality
6	Spinal Muscular Atrophy	Kyphosis 68	Poor bone quality
7	Idiopathic	Cobb 87	Poor bone quality
8	Osteogenesis Imperfecta	Cobb 62	Poor bone quality

BCH Experience

- **Age: 5.25 yrs. (3-8yrs.)**
- **# Lengthenings:7 (4-18)**

	Pre°	first°	last°
scoliosis	87 (67-97)	40 24-50)	40 27-53)
kyphosis	45 10-80)	38 9-61)	41 (17-65)

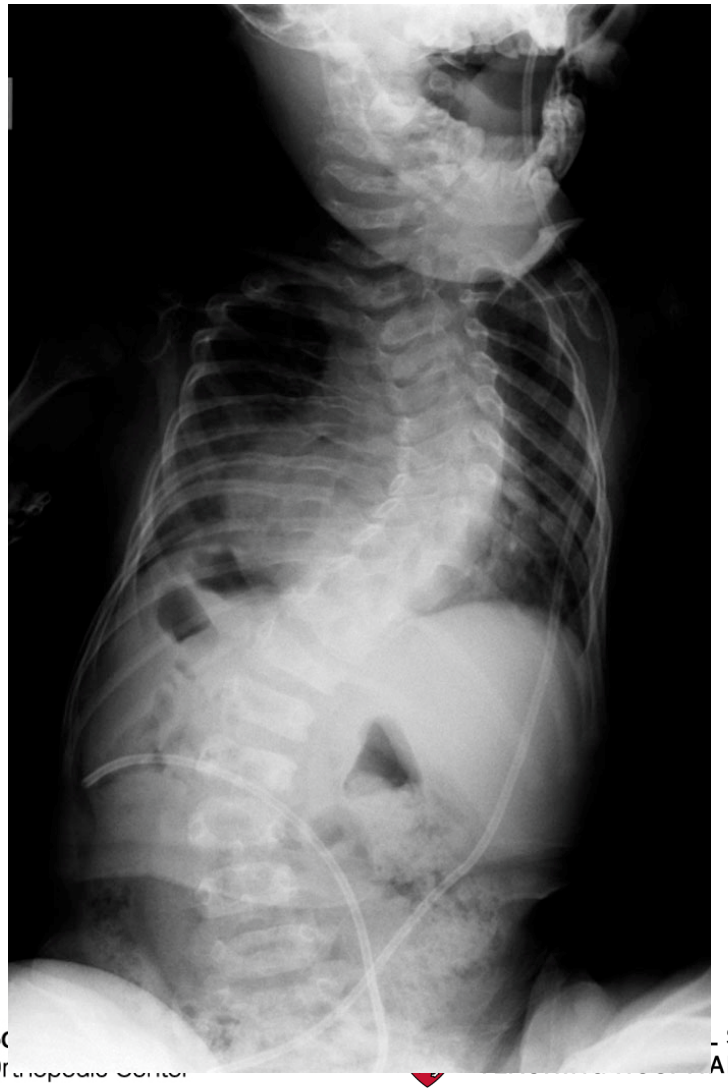
COMPLICATIONS

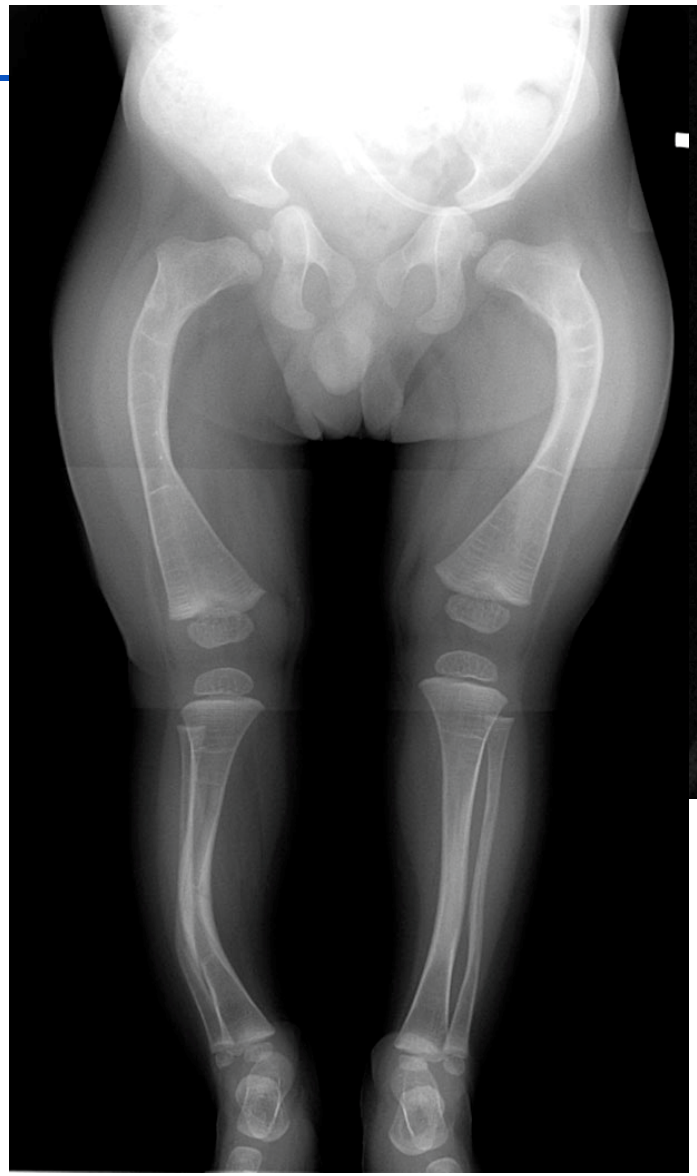
Complication	Occurrence Frequency	Patient Frequency	Mean Yrs. from index	Resolved by
Superficial wound	7	4	2.7 (0.02-5.7)	Local care
Rod fracture	6	2	5.2 (3.0-7.0)	Exchange at scheduled or unscheduled
Proximal migration	2	2	5.8 (4.2-7.4)	Revision @ scheduled time
Implant prominence	2	1	2.1 (0.3-3.9)	Revision @ scheduled time

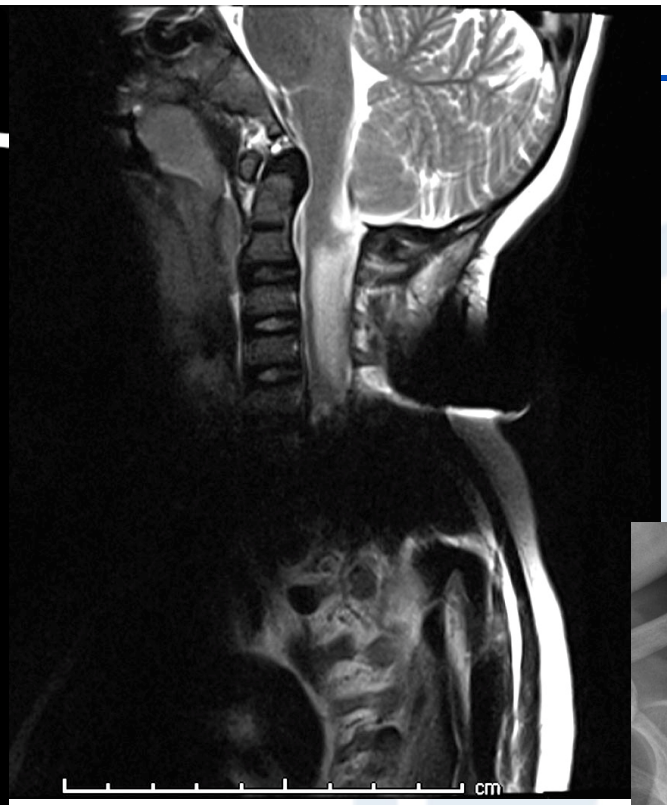
COMPLICATIONS

No anchor failures

Osteogenesis Imperfecta



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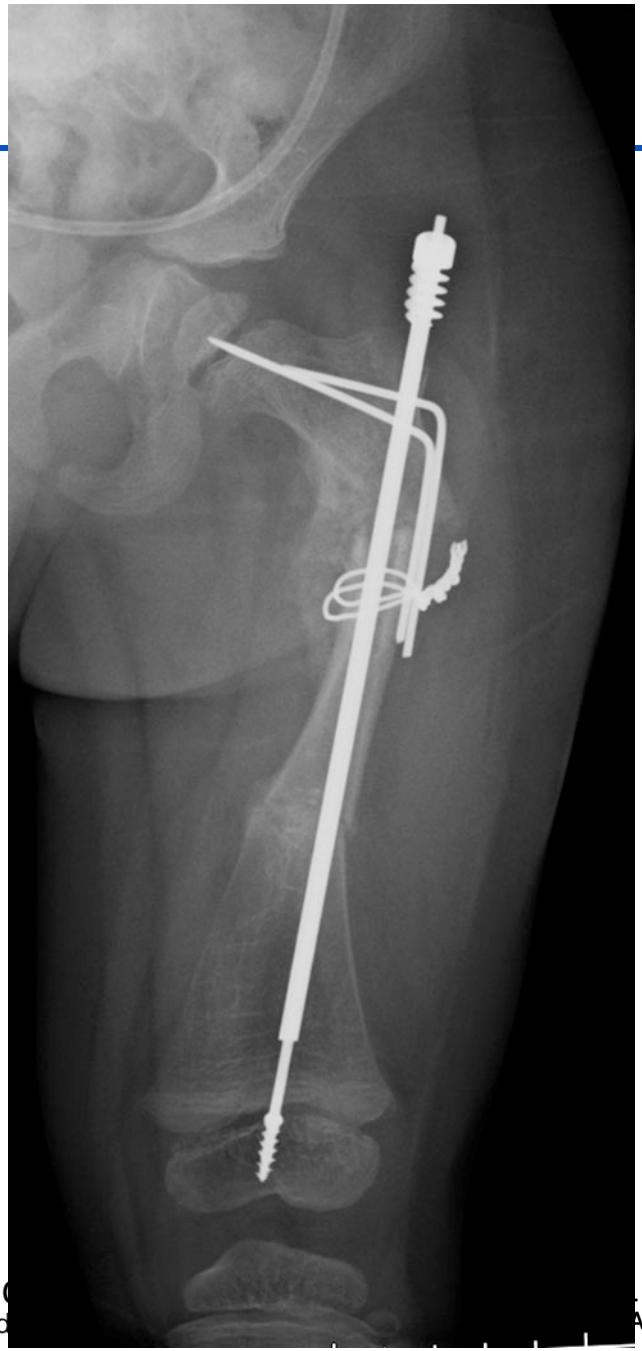
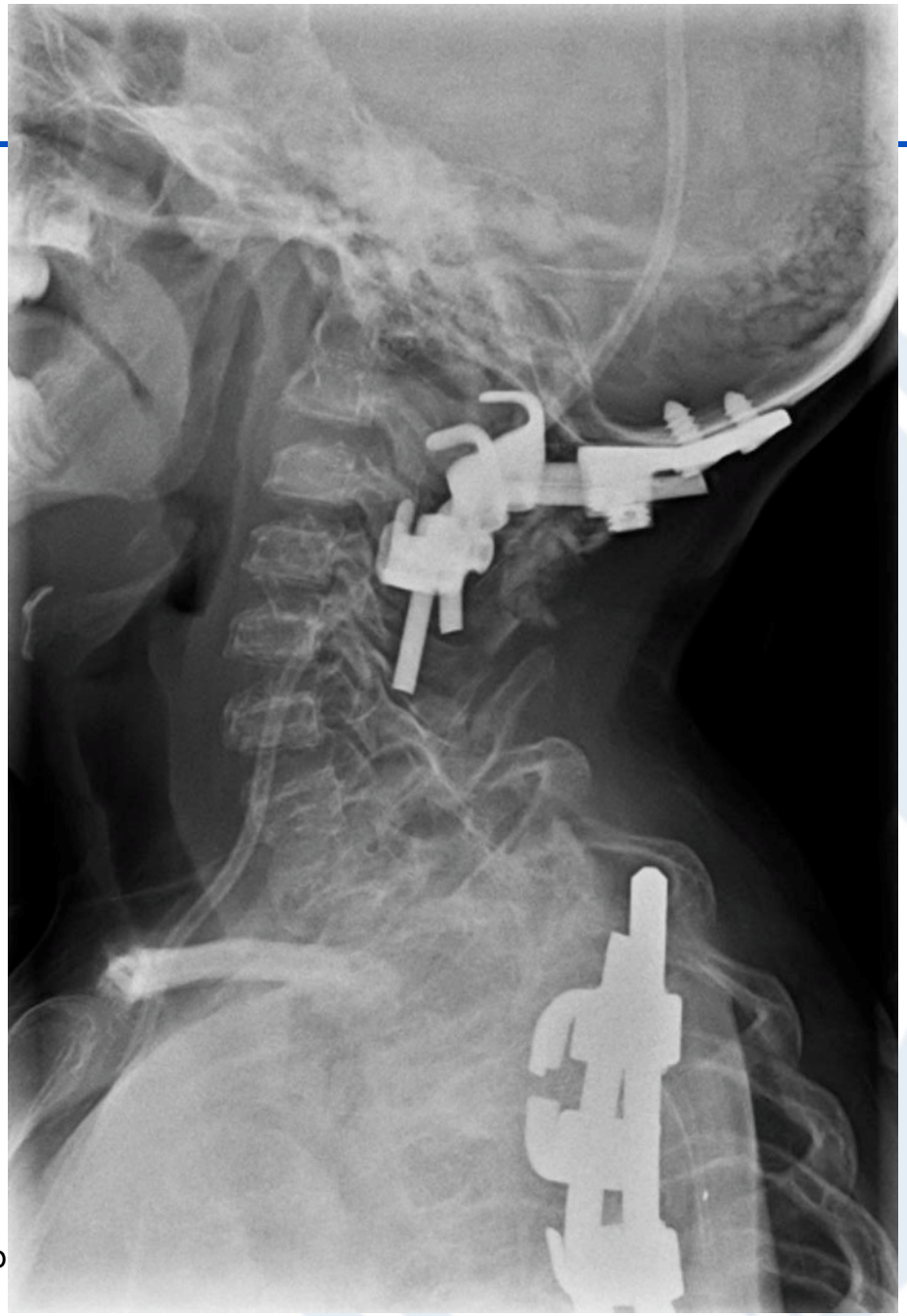
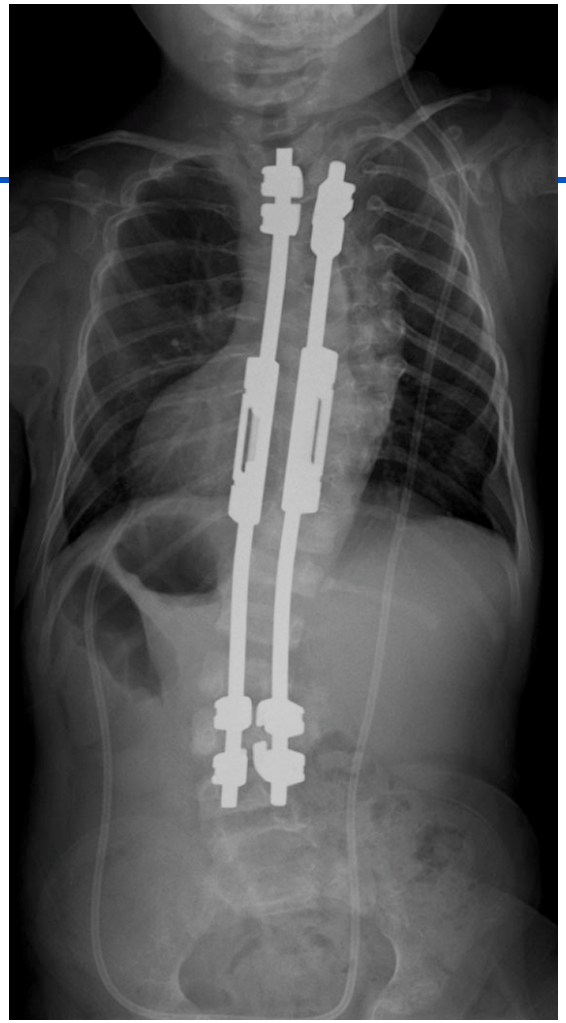
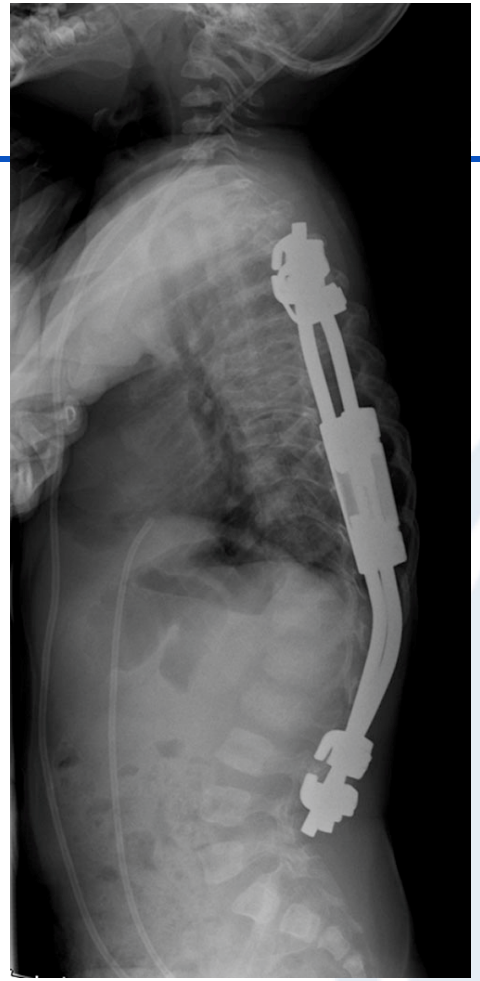
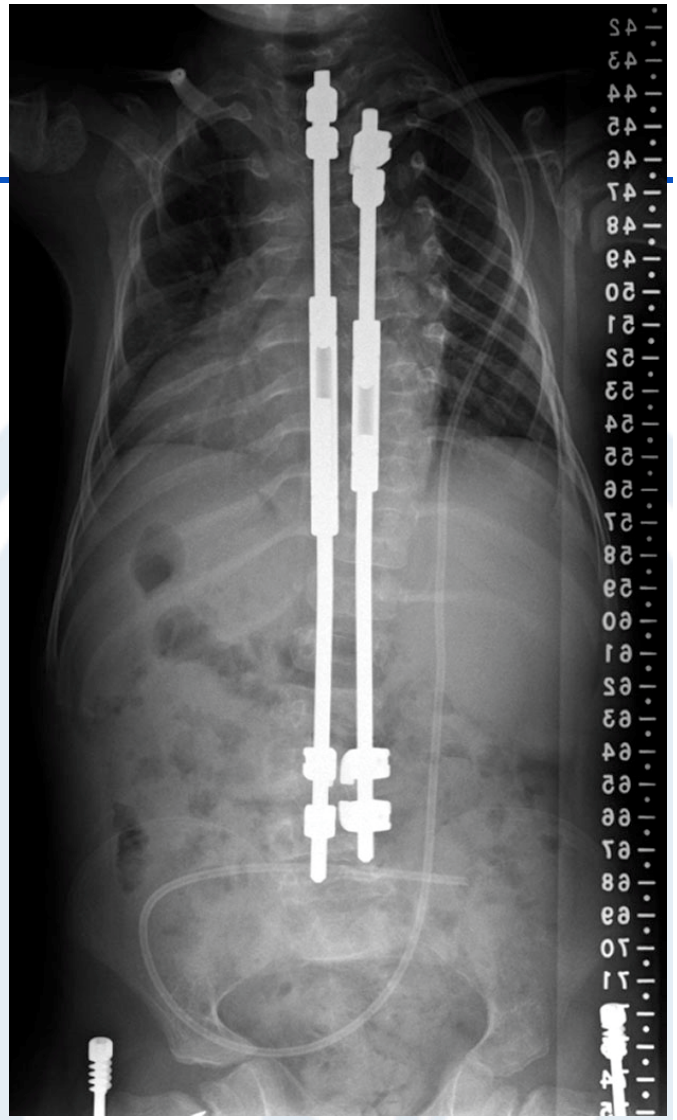
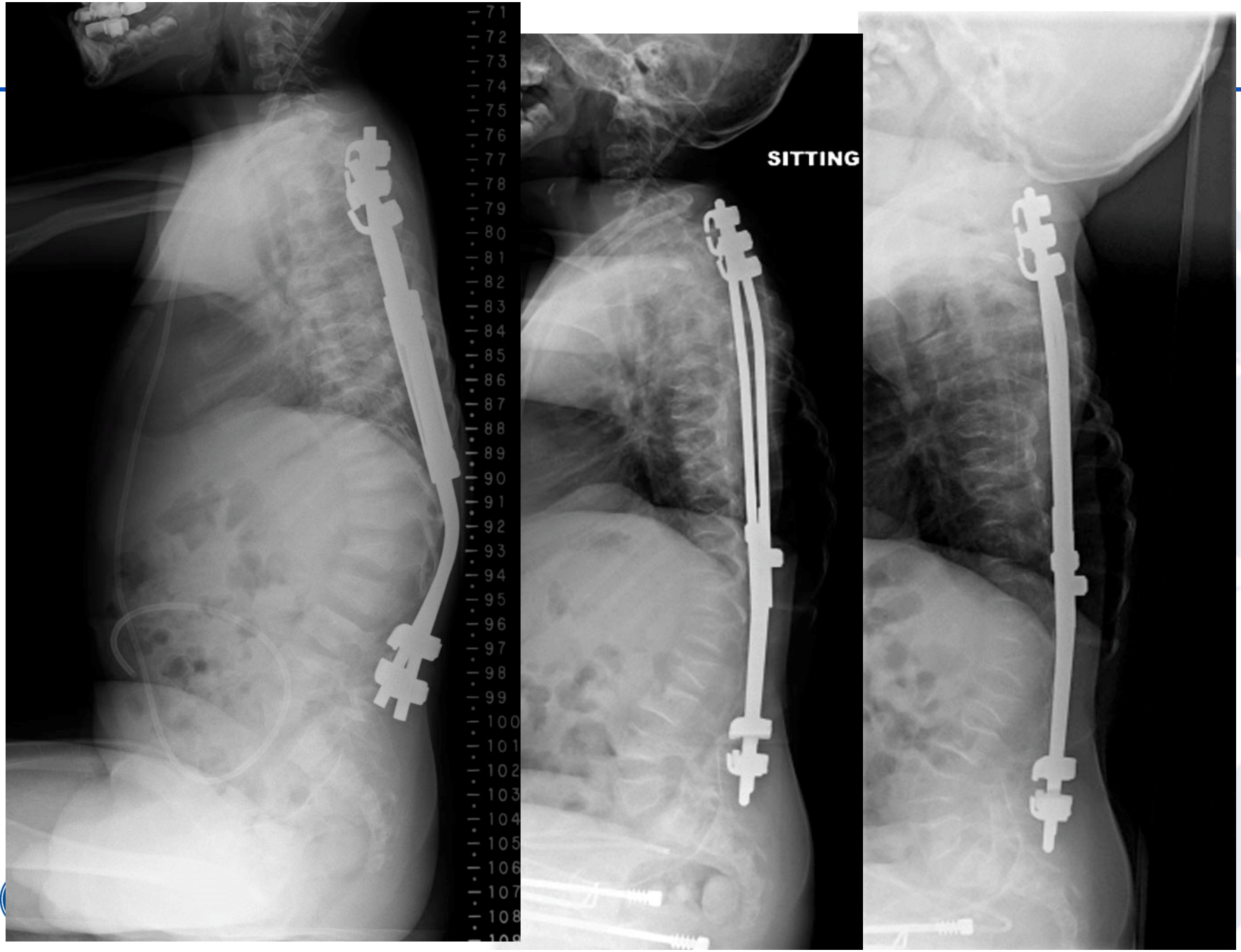




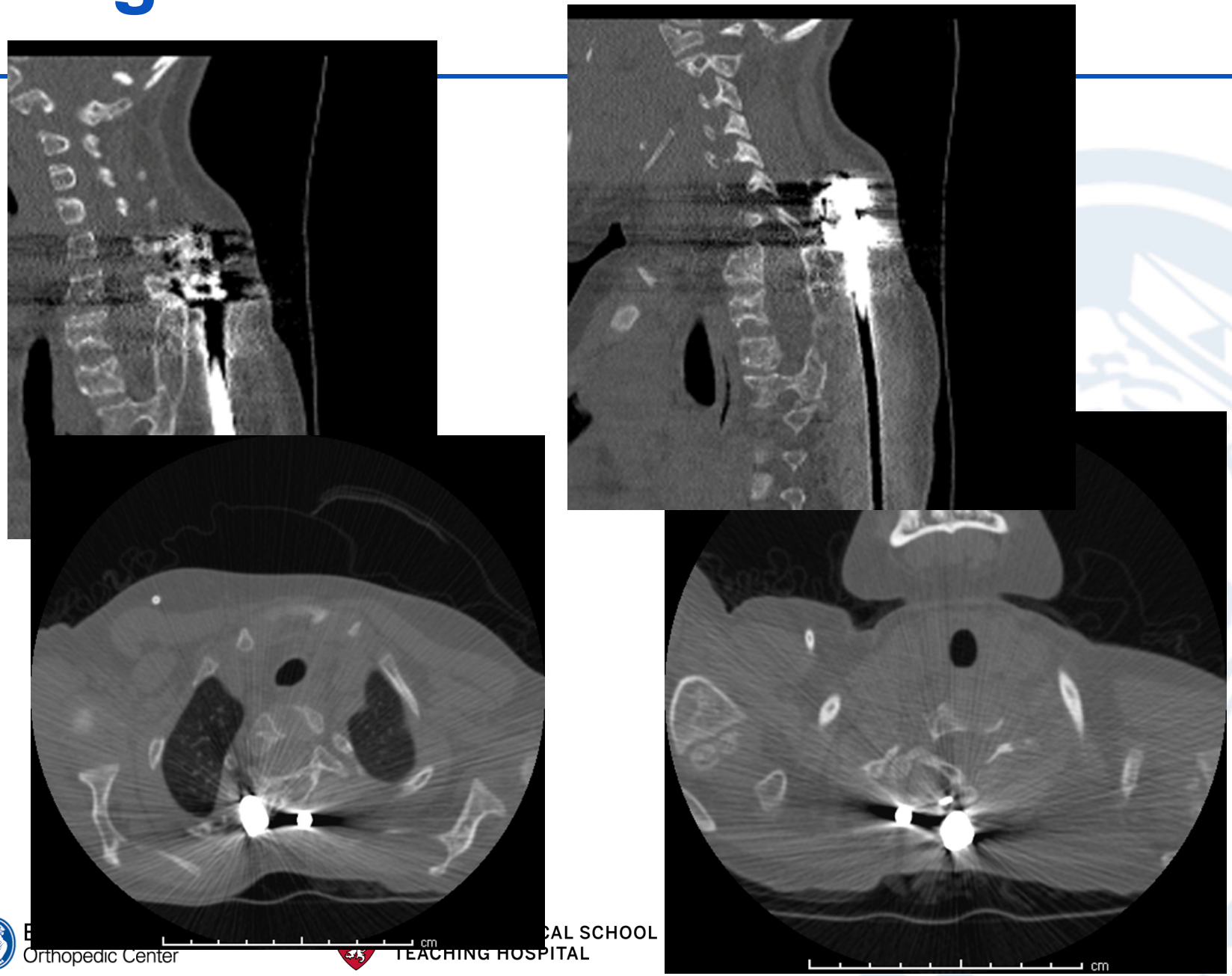


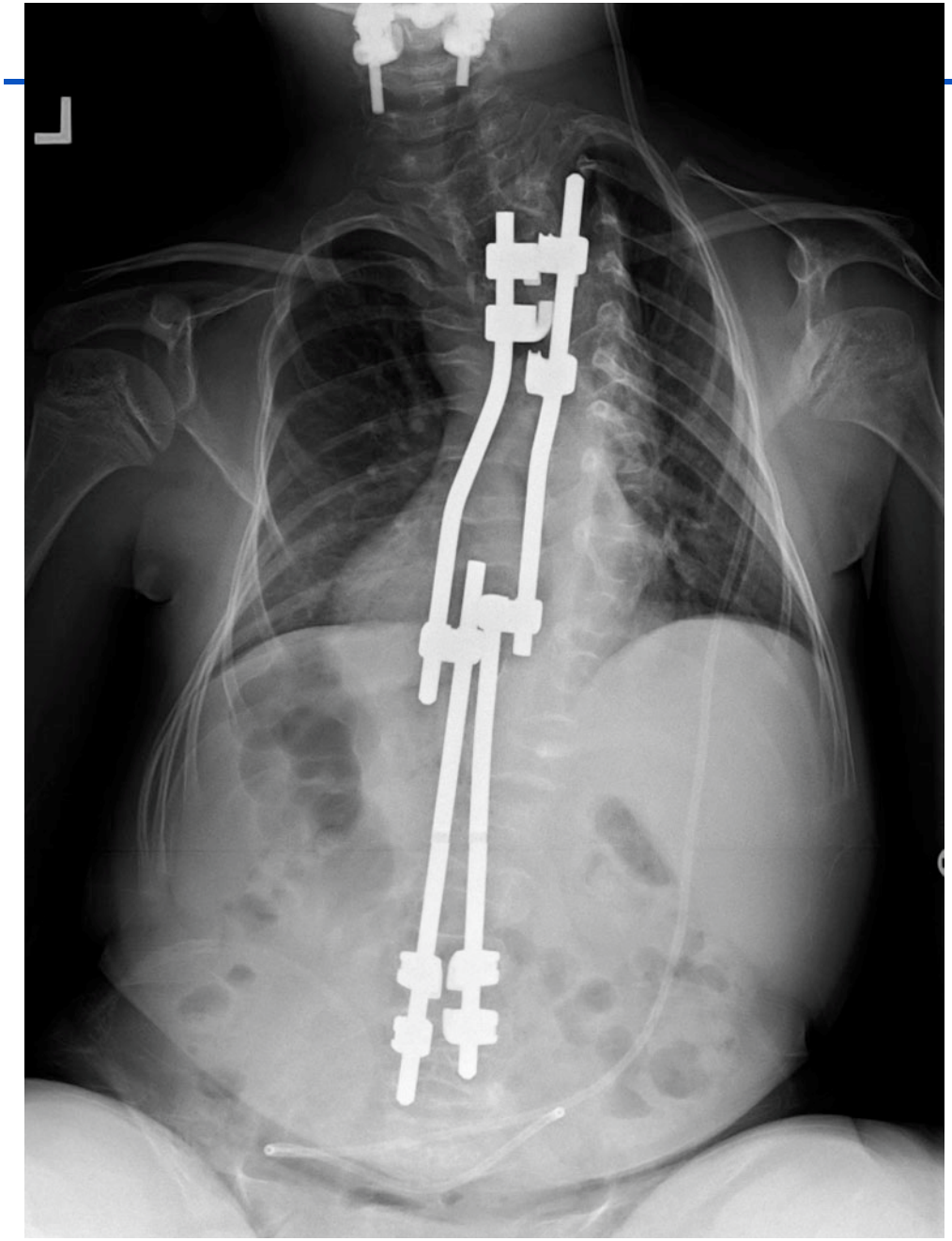


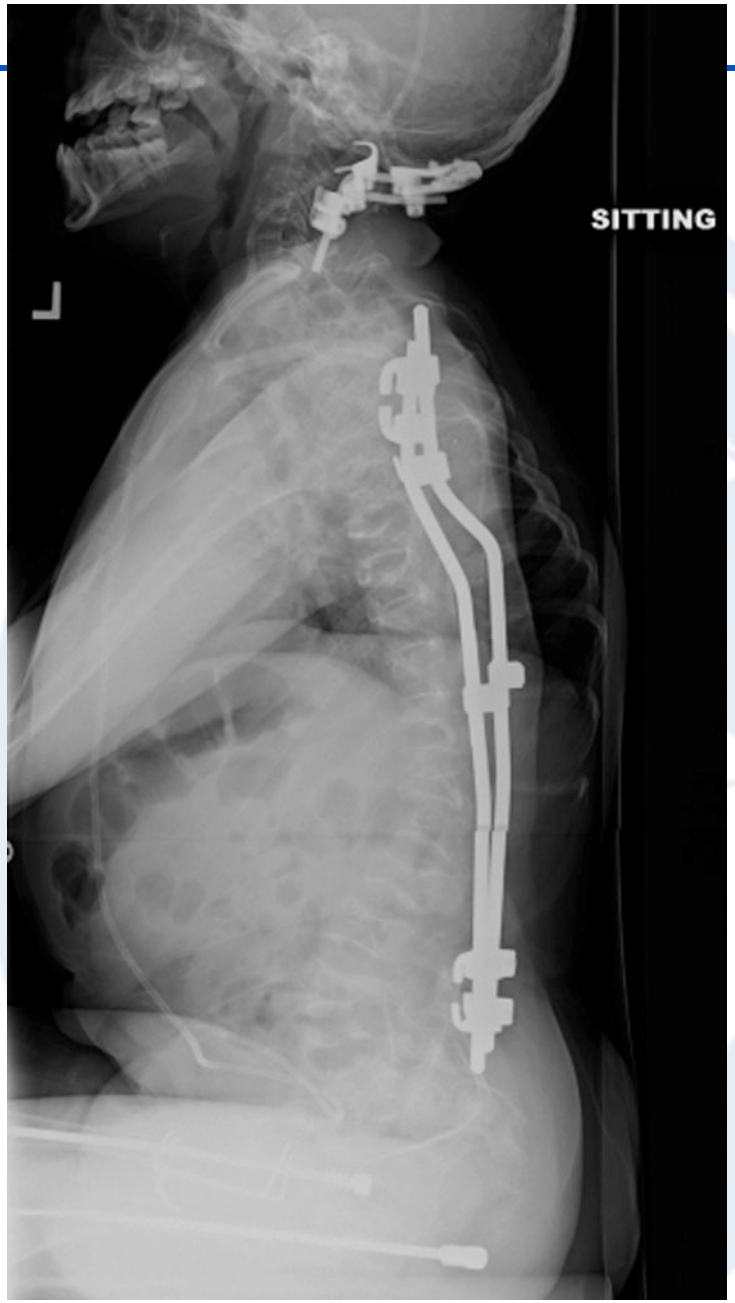



SITTING

Migration



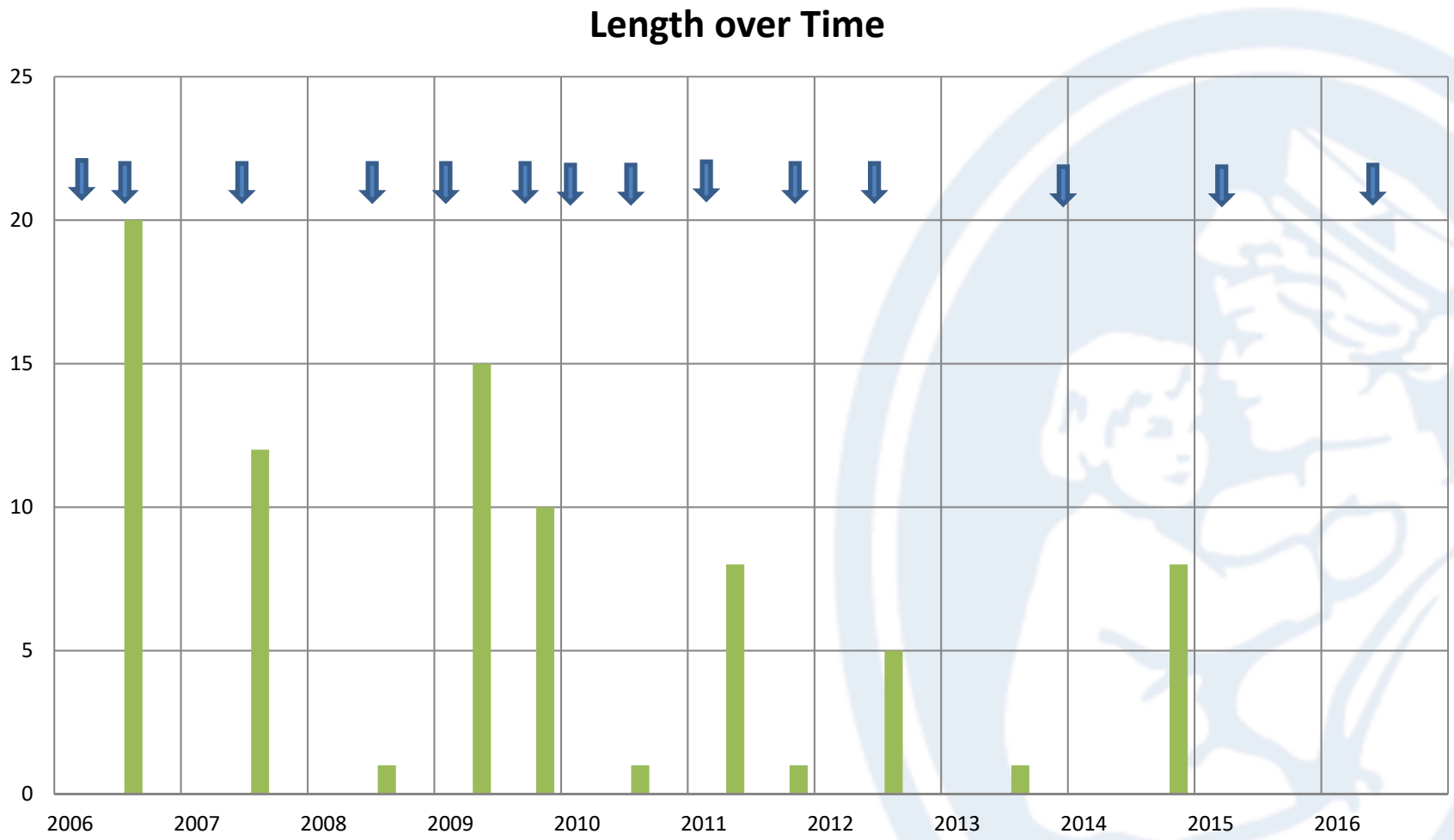



SITTING

M.S.: Osteogenesis Imperfecta

- **Age: 4.4 yrs……14 yrs.**
- **Index surgery……2**
- **Lengthenings……13**
  - Combined with Occ.-Cerv decompression/fusion..2
  - Exchanges……2
- **Unplanned……0**

T1-S1 Length Gain



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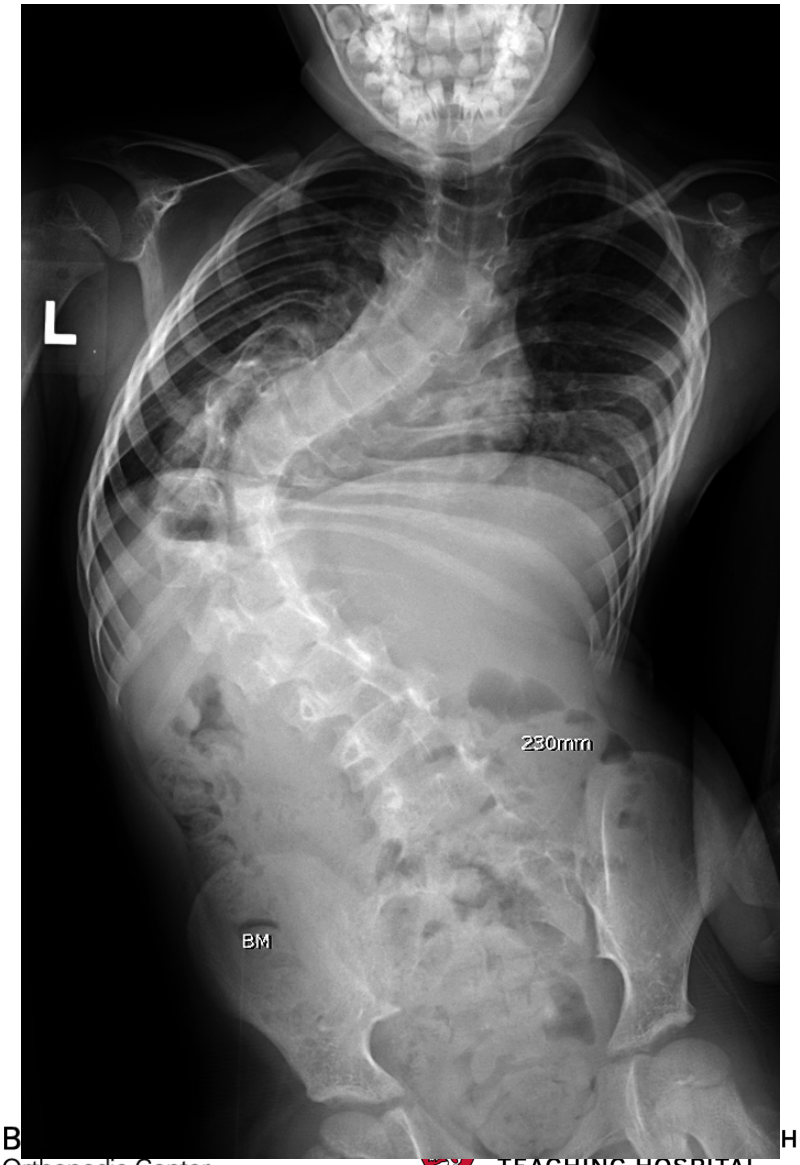
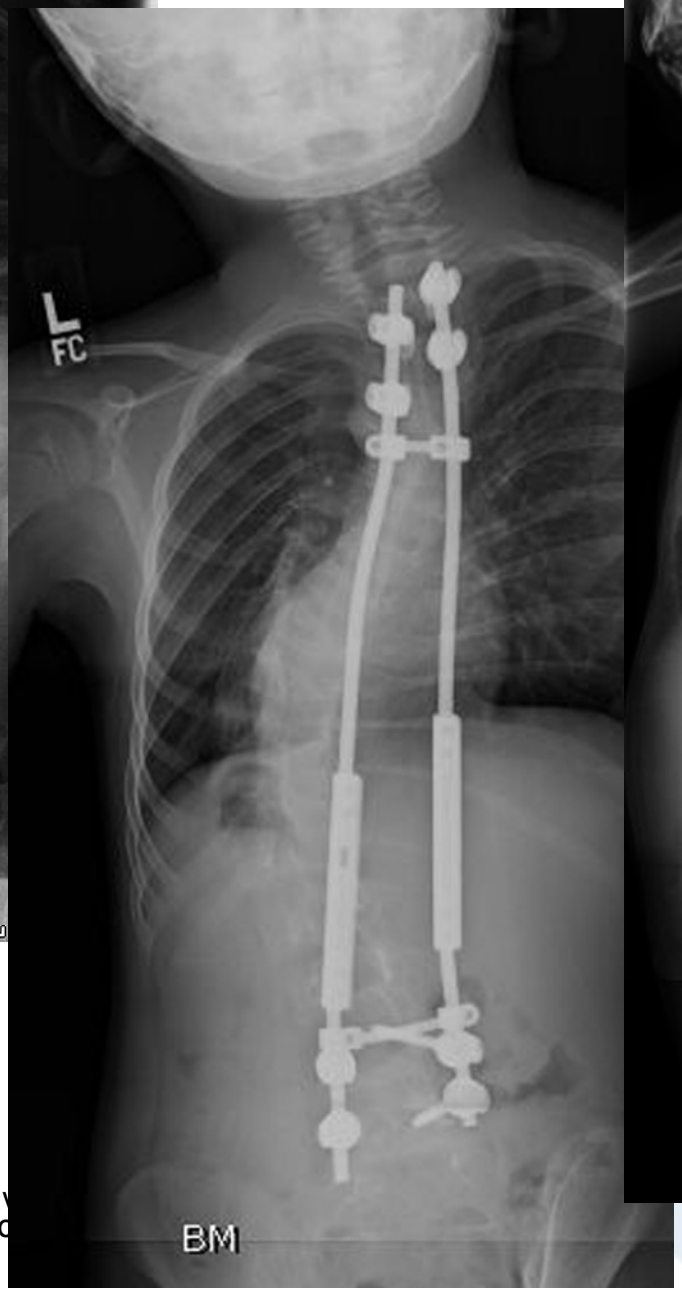
Length Gain/Deformity Correction

	Initial	Best	Final
T1-12 (mm)	122		201
T1-S1 (mm)	188		280
Scoliosis (Cobb°)	75/62	28/16	50/25

Osteogenesis Imperfecta





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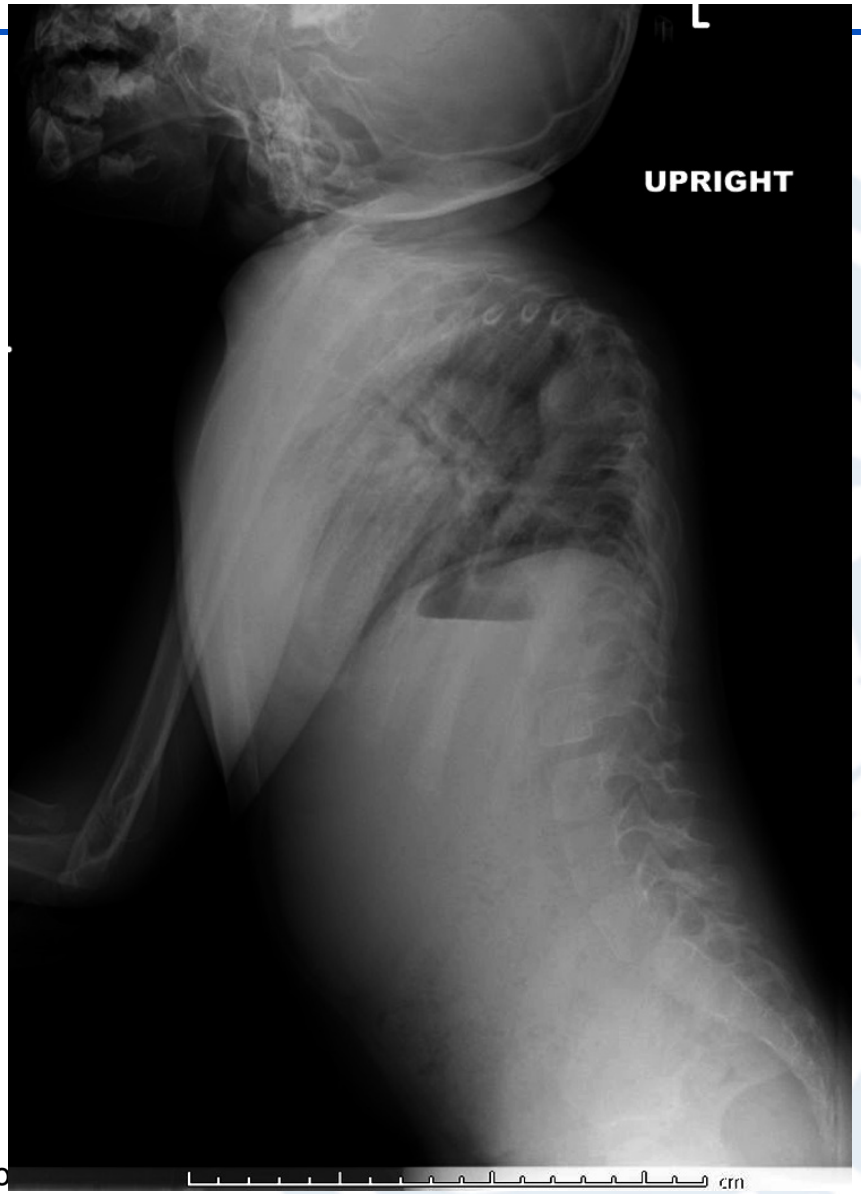
HARV
TEAC

Prader-Willi

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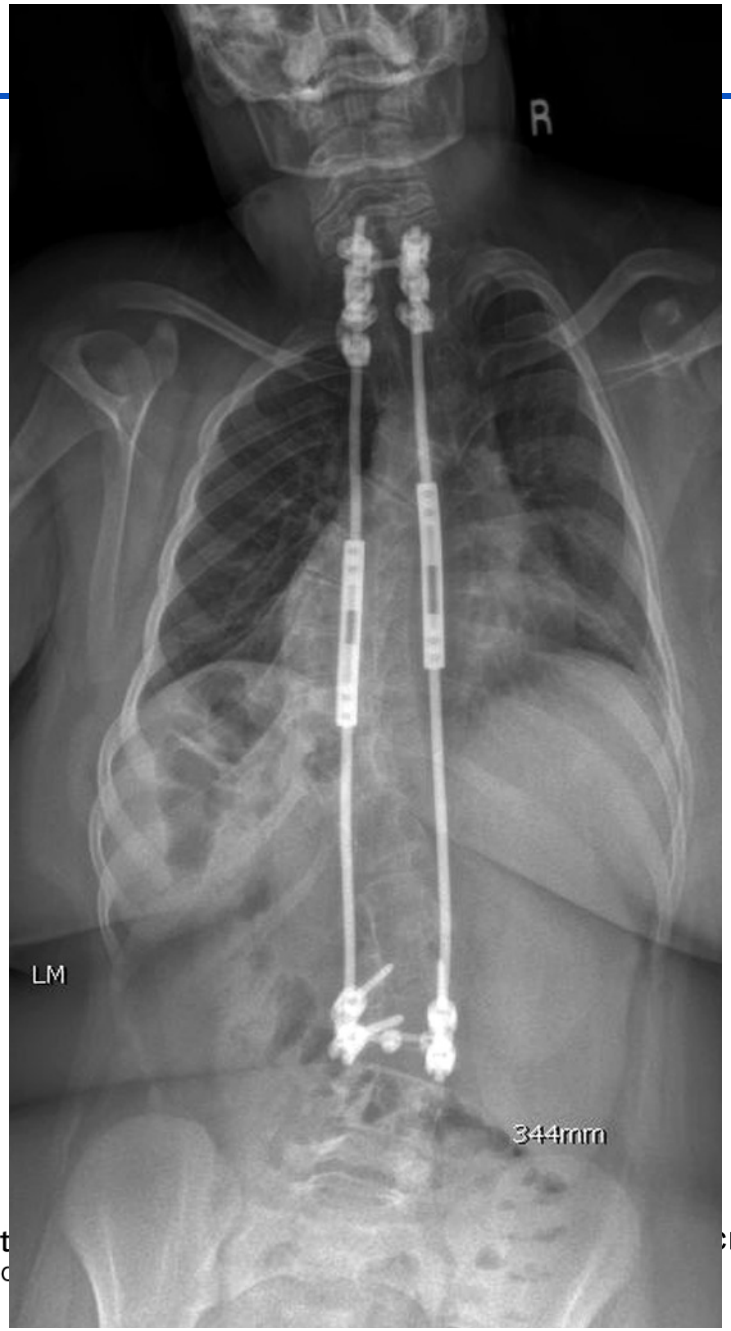
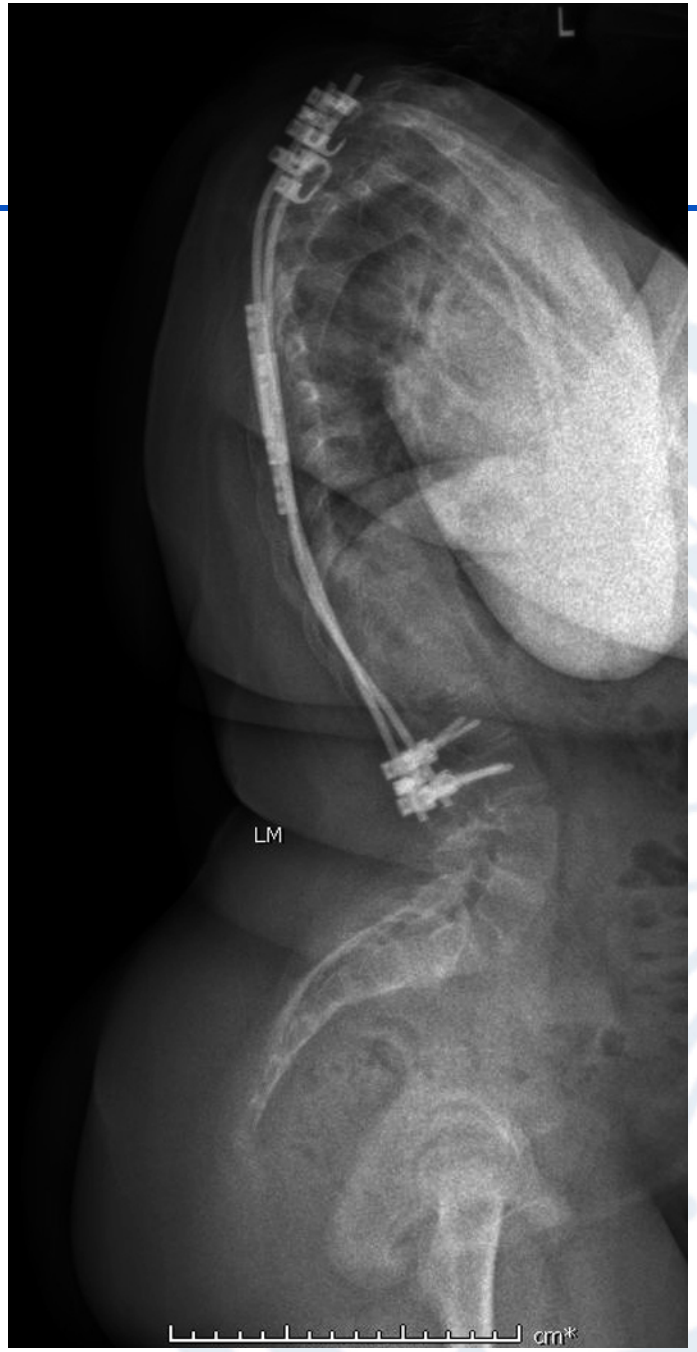
LM


R
LM
344mm


L
LM
cm

L.M.: Prader-Willi

- **Age: 4 +5……..13+6**

- **Surgeries:**
  - Initial: ……..3 (anchors/halo/GR insertion)
  - Lengthenings: ……18 (6 exchanges- **1 unplanned**)

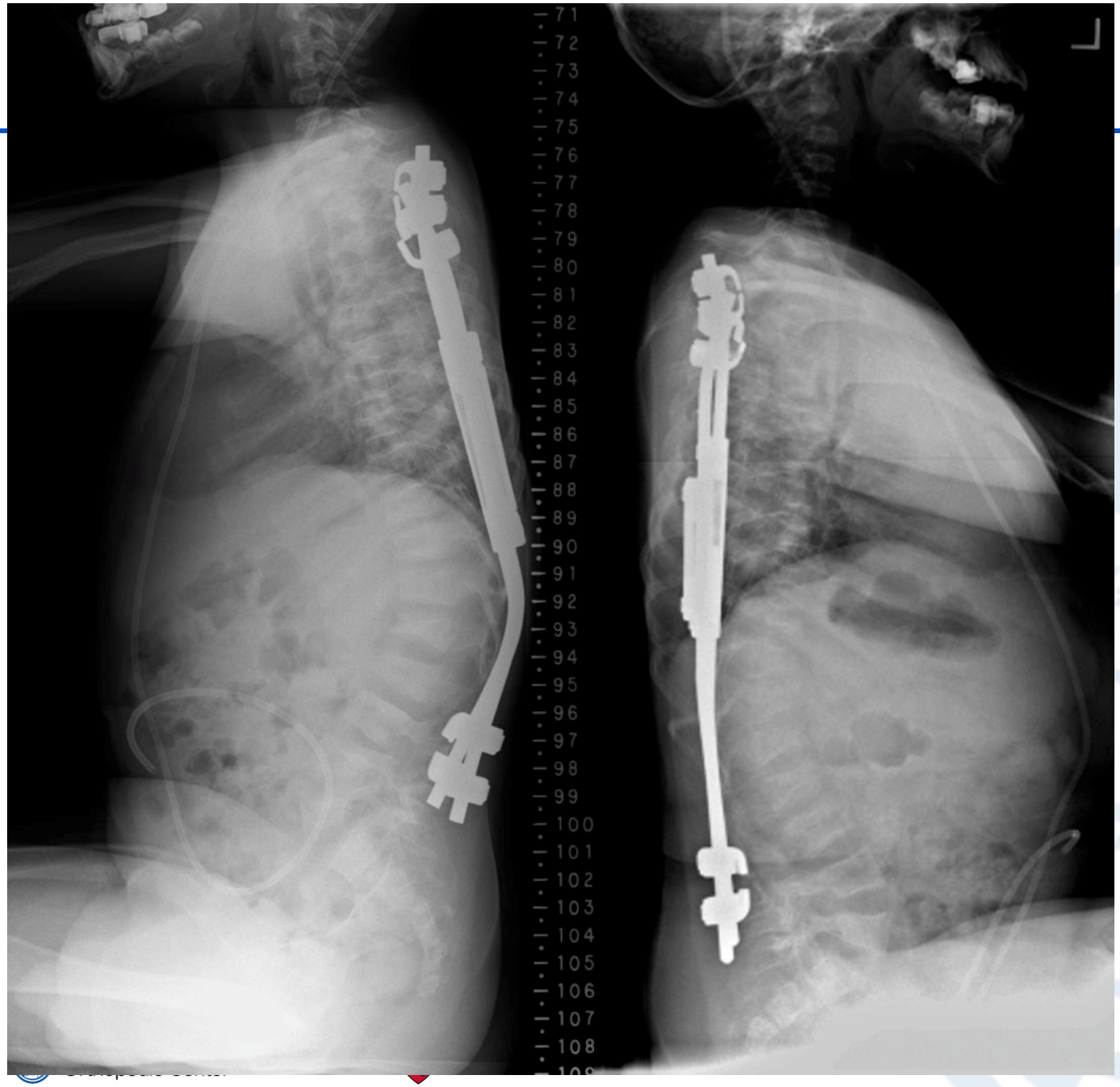
L.M.: Prader-Willi

	Initial	Best	Final
Scoliosis	104°	48°	50°
Thoracic Kyphosis	80°	57°	58°
T1-12 (mm)	112		218 (106)
T1-S1 (mm)	196		342 (146)

Conclusions

The surgical technique of staged initial growth rod lengthening seems to lead to the establishment of strong instrumentation anchor sites. In our experience use of this technique has prevented anchor site failures in children predisposed to that complication (poor bone quality, hyperkyphosis).

Thank you



Establish solid anchor points

- **Where bone deficient**
  - Poor bone quality- metabolic disease, O.I.

- **Where stresses greater**
  - hyperkyphosis

Staged Index Surgery in Growth Rod Instrumentation

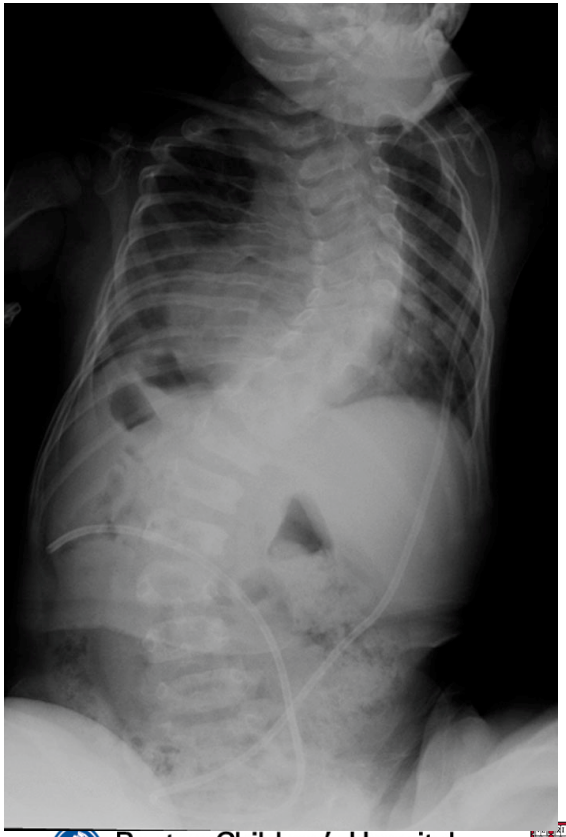
- **Stage 1:The placement of the anchors alone without connection of the distraction instrumentation**

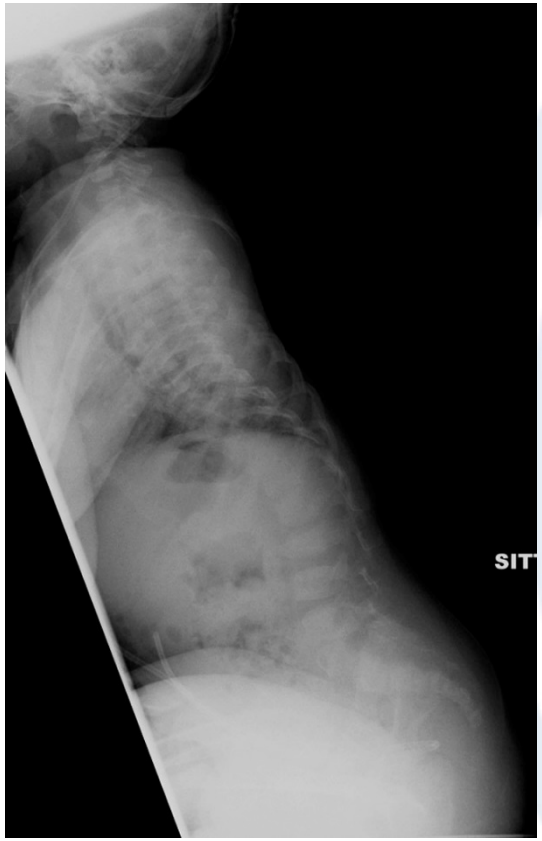
- **Allow adequate time for fusion at the anchor sites**

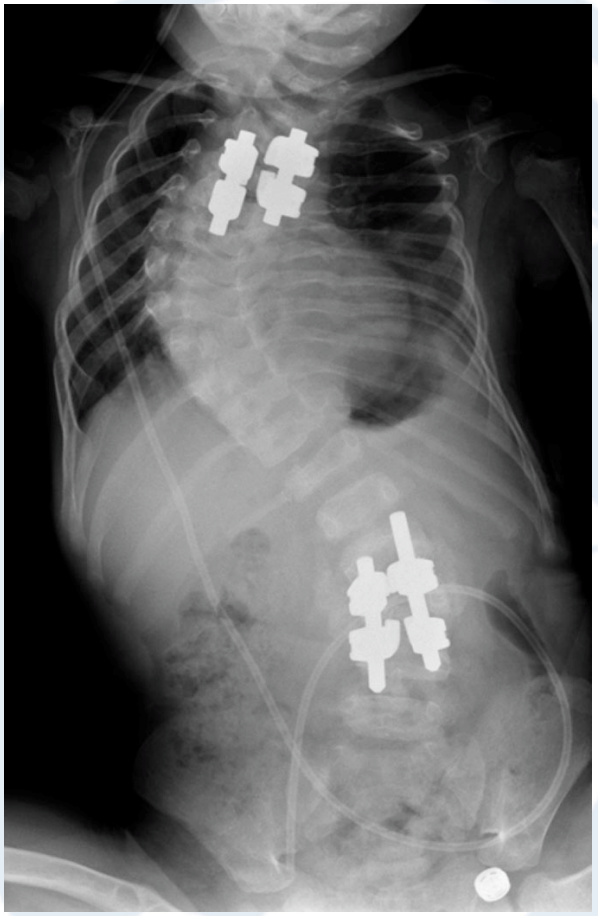
  ?? Pre-stage 2 traction

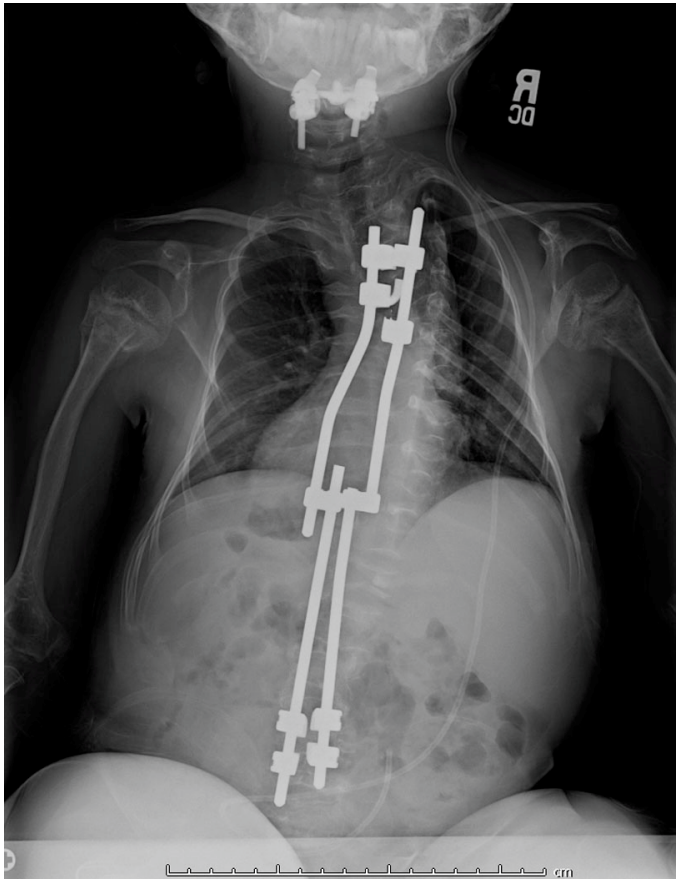
- **Stage 2: Removal of the short segment rods and placement of the distraction instrumentation; distraction**

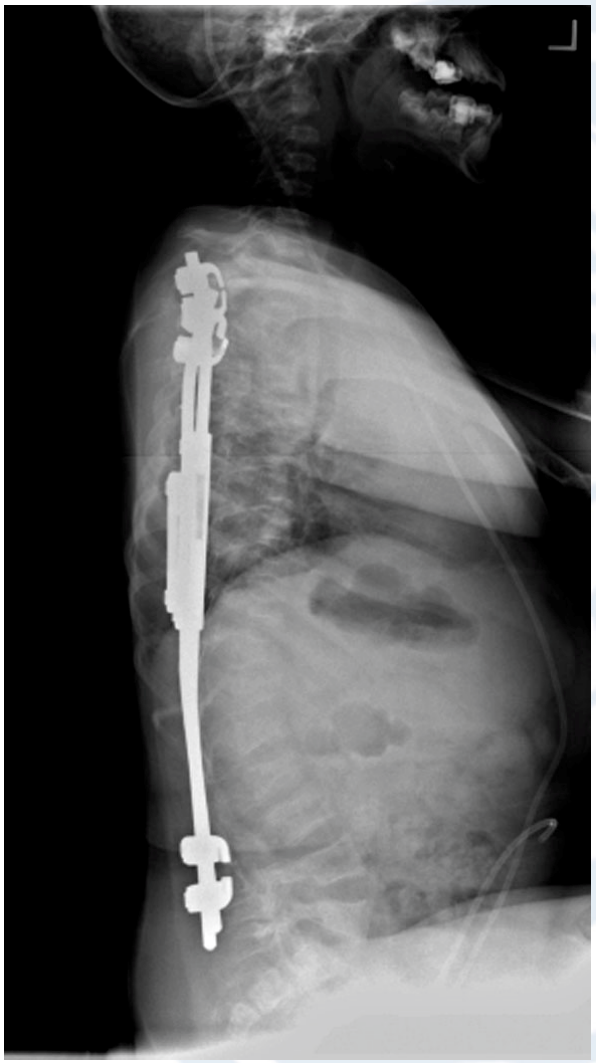
MS –O.I











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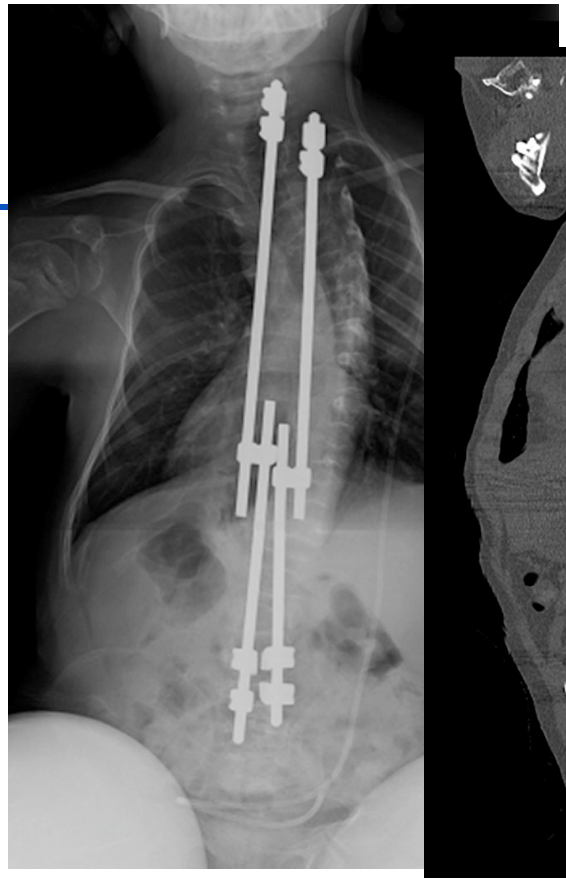

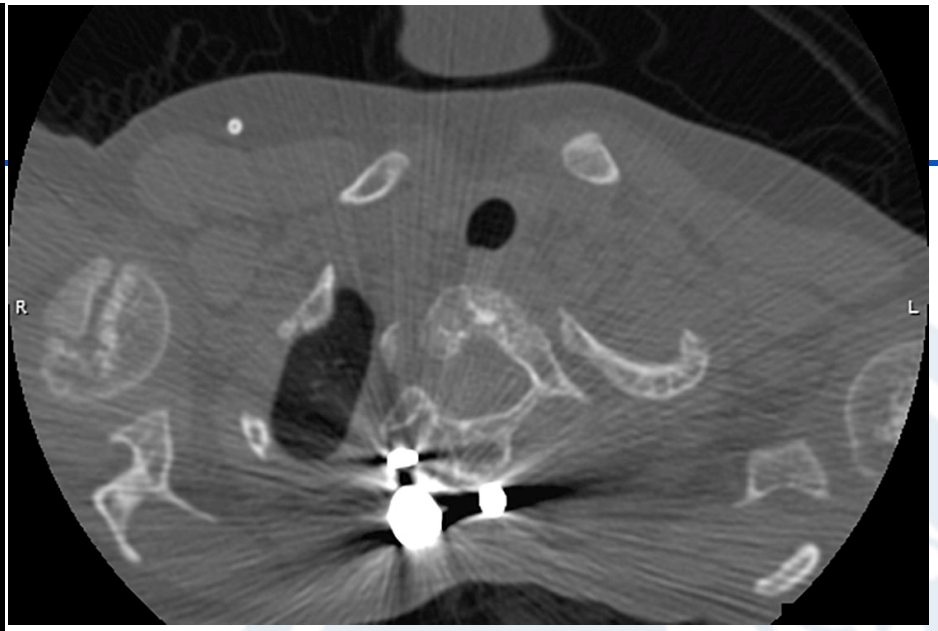
R
L

Surgeries

- **Index……2**
- **Lengthenings……13**
  - Combined with Occipital-C2 fusion..2
  - Exchange……2
- **Unplanned……0**

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