Surgery for Scoliosis and Spinal Deformity

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Scoliosis

Classification

- Structural
  - Idiopathic
  - Congenital
  - Neuromuscular
  - Degenerative
  - Others
- Non-structural

Ascending scoliosis

Descending scoliosis

Adolescent idiopathic scoliosis

Curve Type

Type	Proximal Thoracic	Main Thoracic	Thoracolumbar / Lumbar	Curve Type
1	Non-Structural	Structural (Major*)	Non-Structural	Main Thoracic (MT)
2	Structural	Structural (Major*)	Non-Structural	Double Thoracic (DT)
3	Non-Structural	Structural (Major*)	Structural	Double Major (DM)
4	Structural	Structural (Major*)	Structural	Triple Major (TM)
5	Non-Structural	Non-Structural	Structural (Major*)	Thoracolumbar / Lumbar (TL/L)
6	Non-Structural	Structural	Structural (Major*)	Thoracolumbar / Lumbar - Main Thoracic (TL/L - MT)

*Major = Largest Cobb Measurement, always structural
Minor = all other curves with structural criteria applied

STRUCTURAL CRITERIA
(Minor Curves)

Proximal Thoracic: - Side Bending Cobb ≥ 25°
- T2 - T5 Kyphosis ≥ +20°

Main Thoracic: - Side Bending Cobb ≥ 25°
- T10 - L2 Kyphosis ≥ +20°

Thoracolumbar / Lumbar: - Side Bending Cobb ≥ 25°
- T10 - L2 Kyphosis ≥ +20°

LOCATION OF APEX
(SRS definition)

CURVE	APEX
THORACIC	T2 - T11-12 DISC
THORACOLUMBAR	T12 - L1
LUMBAR	L1-2 DISC - L4

Modifiers

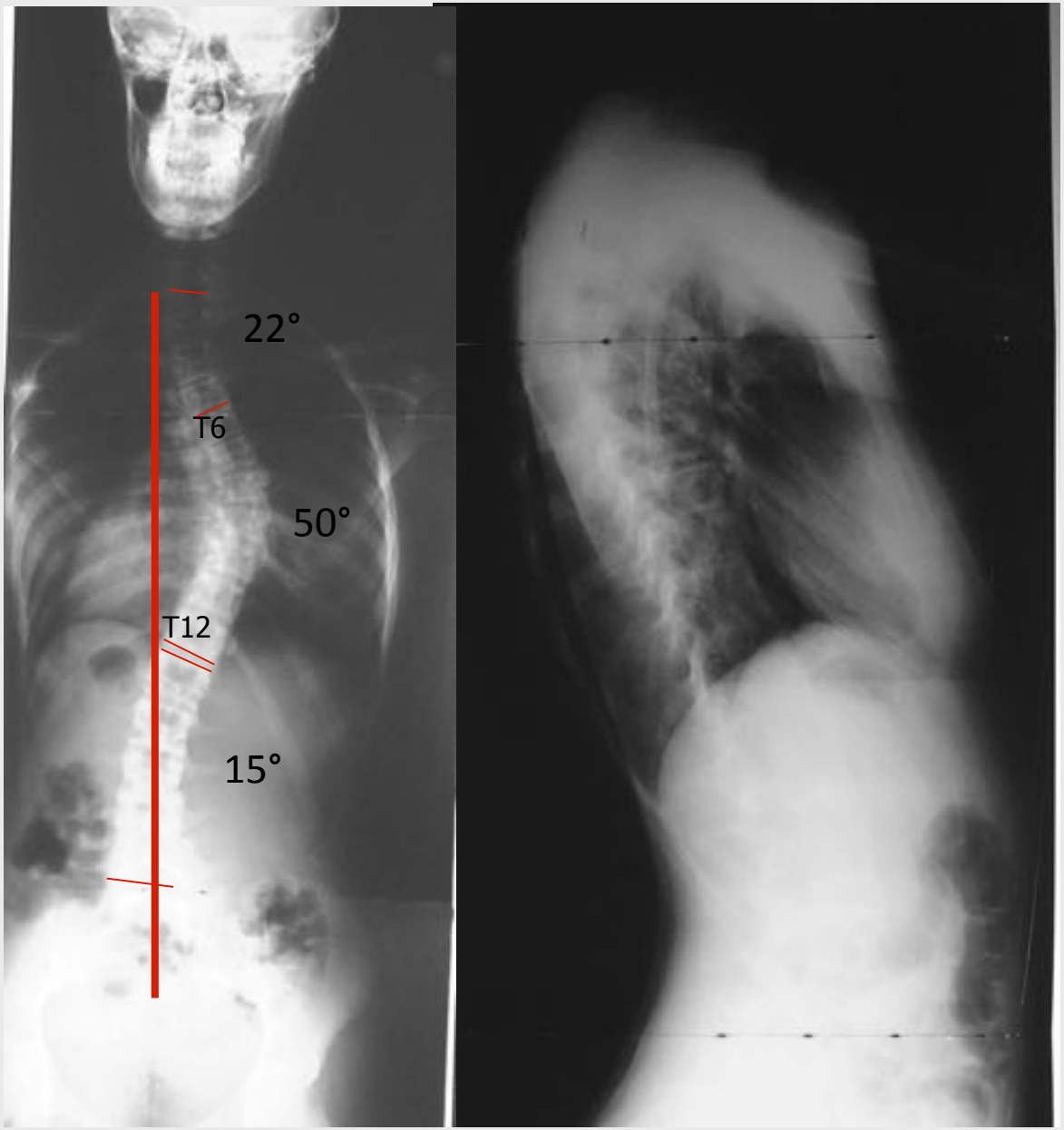
Lumbar Spine Modifier	CSVL to Lumbar Apex
A	CSVL Between Pedicles
B	CSVL Touches Apical Body(ies)
C	CSVL Completely Medial

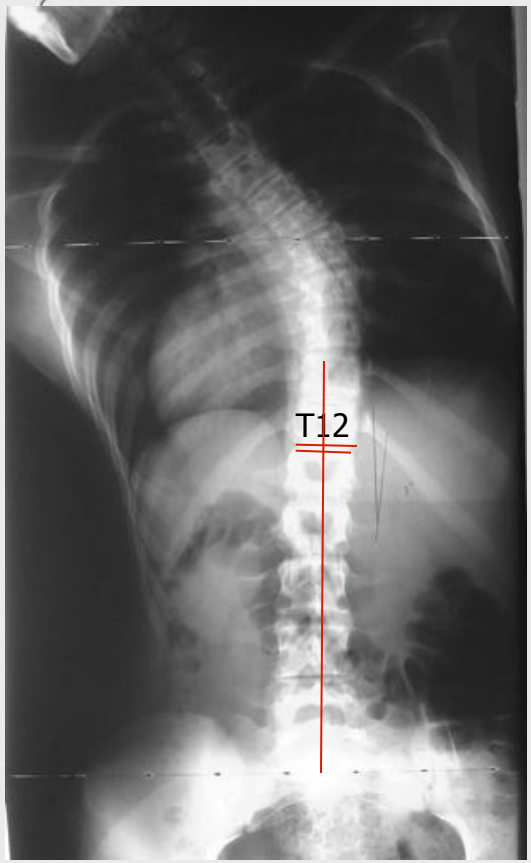
Thoracic Sagittal Profile T5 - T12		
-	(Hypo)	< 10°
N	(Normal)	10°- 40°
+	(Hyper)	> 40°

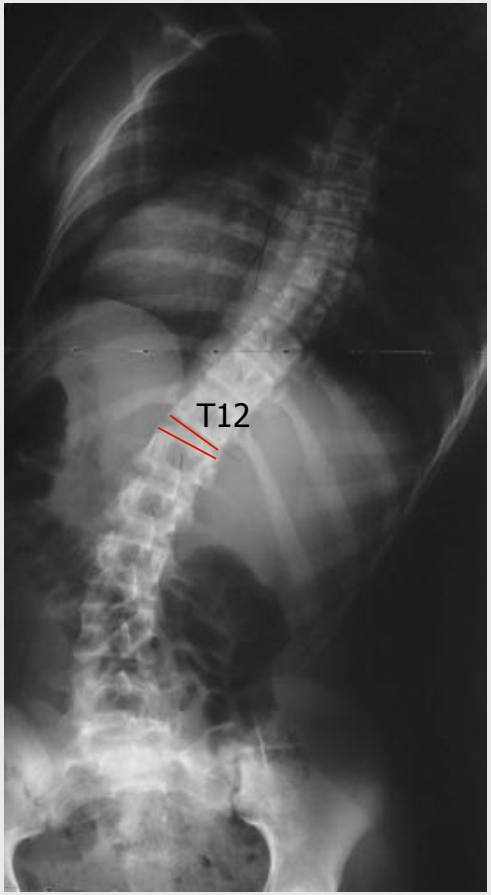
Curve Type (1-6) + Lumbar Spine Modifier (A, B, or C) + Thoracic Sagittal Modifier (-, N, or +)

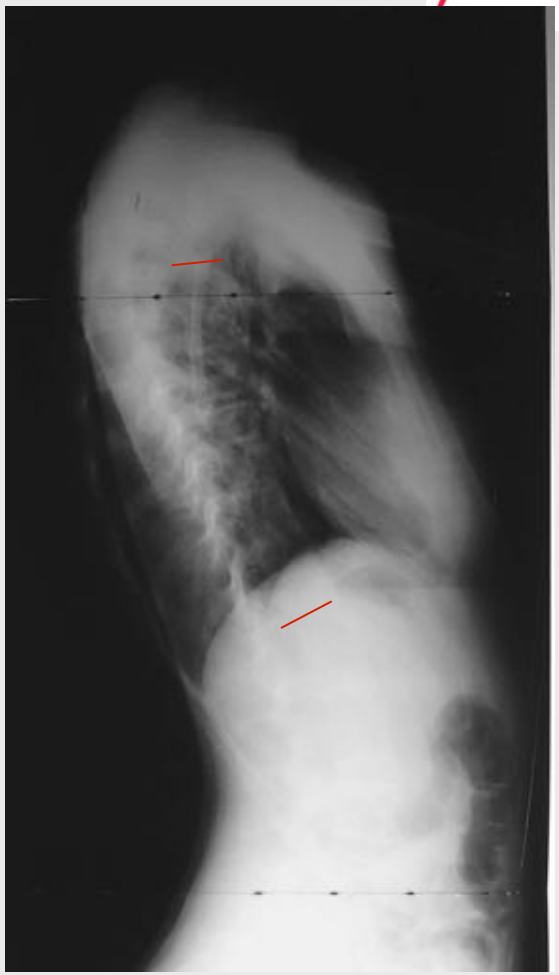
Classification (e.g. 1B+):_____

Lenke classification in surgical planning in AIS


22°
T6
50°
T12
15°


T12


T12



Indications for surgical treatment

Who to treat

- General approach
  - Immature patients
    - >25 degrees observation
    - 25-40 degrees brace or observation
    - <40 degrees surgery
  - Mature patients
    - >50 degrees observation
    - <50 degrees surgery

Preoperative assessment

- Physical examination
  - Always see the physical deformity
  - Rule out easily recognizable syndromes
  - Assess balance and shoulder level
  - Assess leg length discrepancy
- Neurological examination
  - Long tract signs
  - Abdominal reflexes

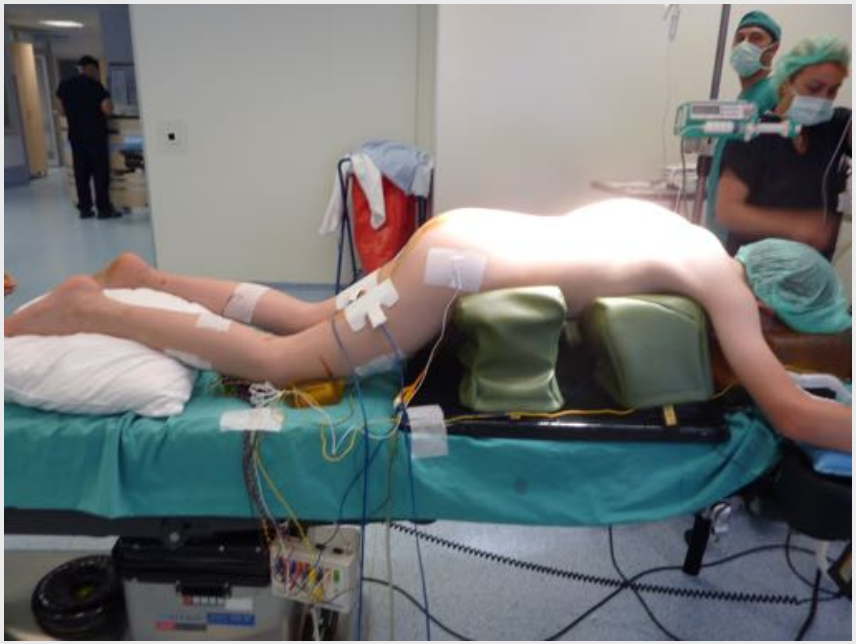
- Appropriate imaging
  - **<u>Standing AP and lateral long cassette X-rays</u>**
  - *Supine bending X-rays*
  - *Traction / TUGA*
  - **MRI ?**

15 y boy, 6 mos hx

- Discuss expectations with patient AND family
  - 1st priority safety
  - 2nd priority a balanced trunk
  - 3rd priority correction

Proper patient positioning

Positioning and TcMEP

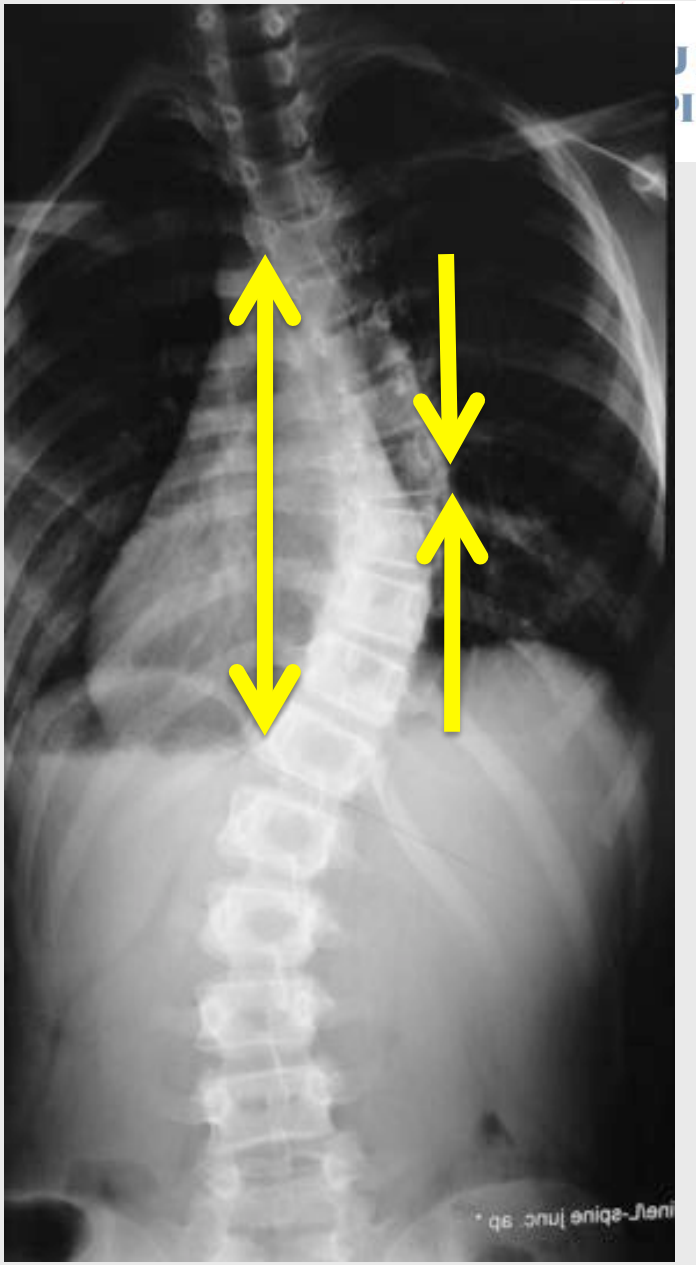


Spinal cord monitorization

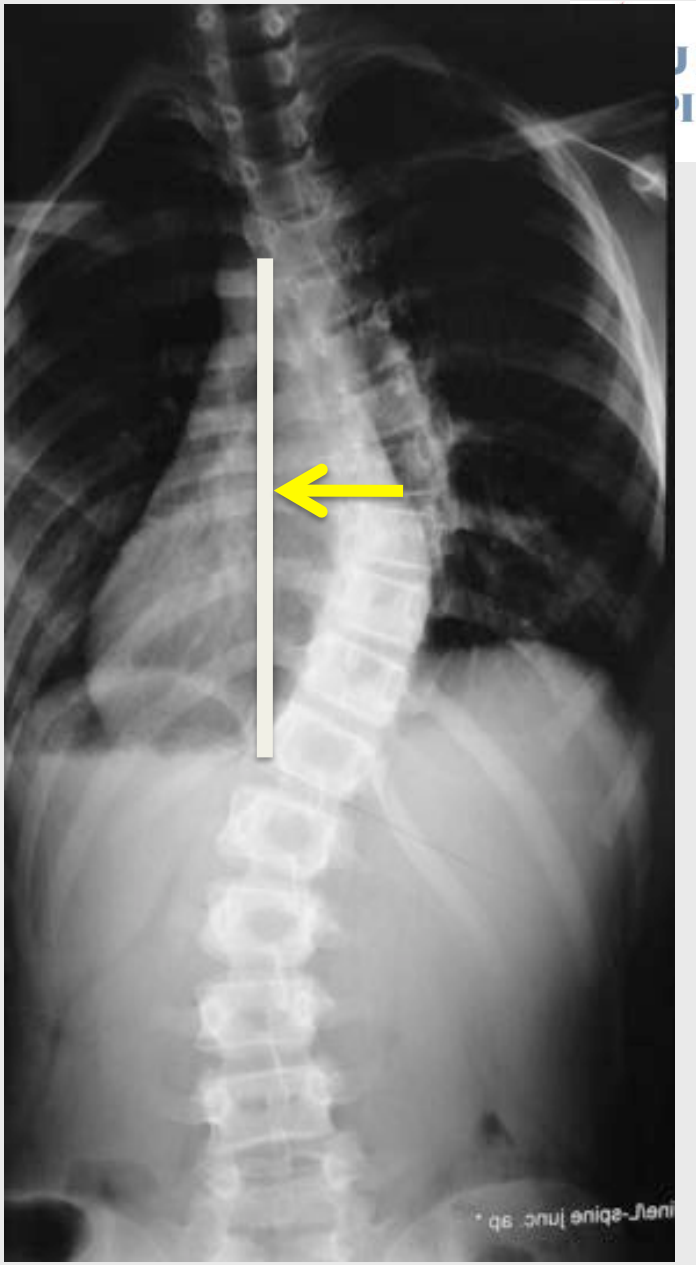
- Essential in deformity surgery
- How?
  - Tc MEP
  - SSEP
- Why?
  - High risk surgery
  - Class A evidence on the importance of relevant IOM changes

Correction techniques

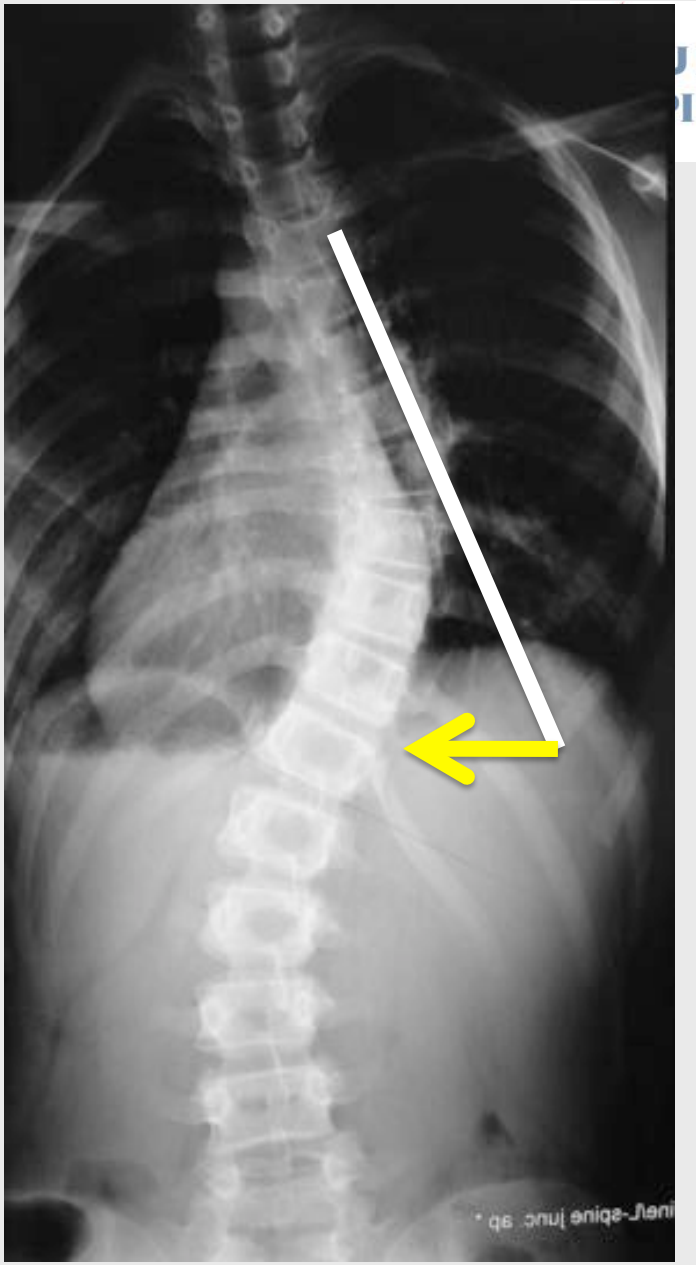
- Harrington forces



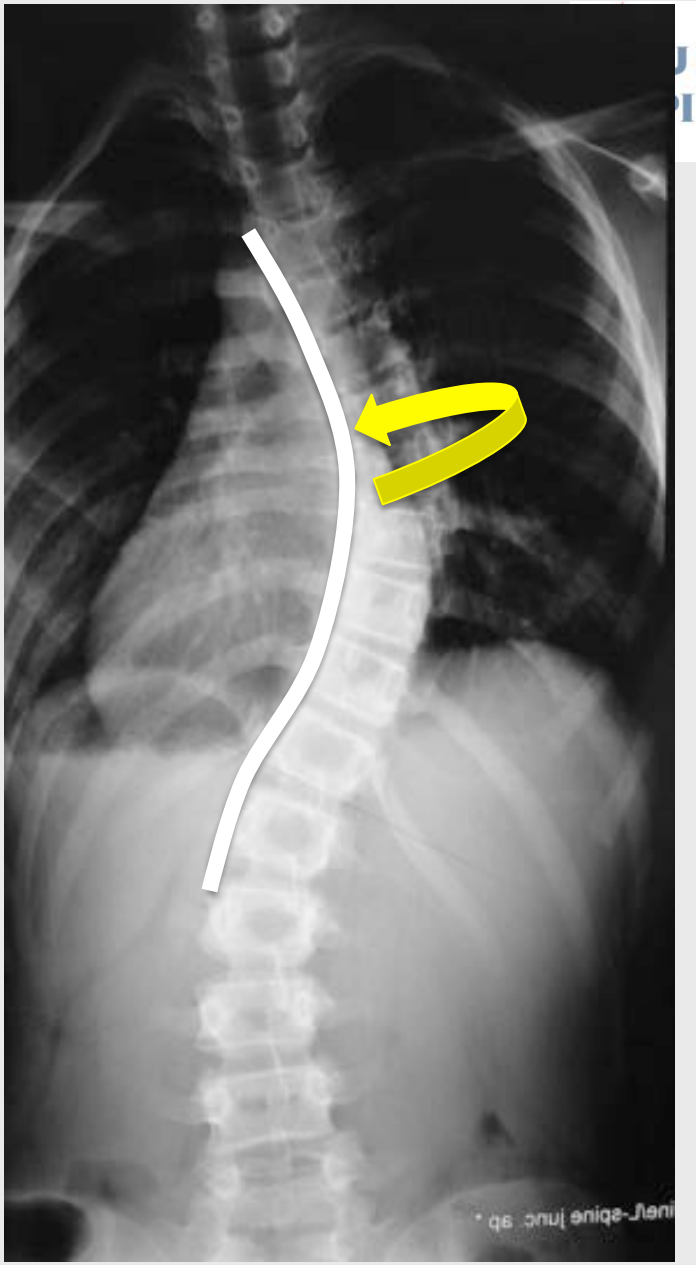
- Harrington forces
- Translation



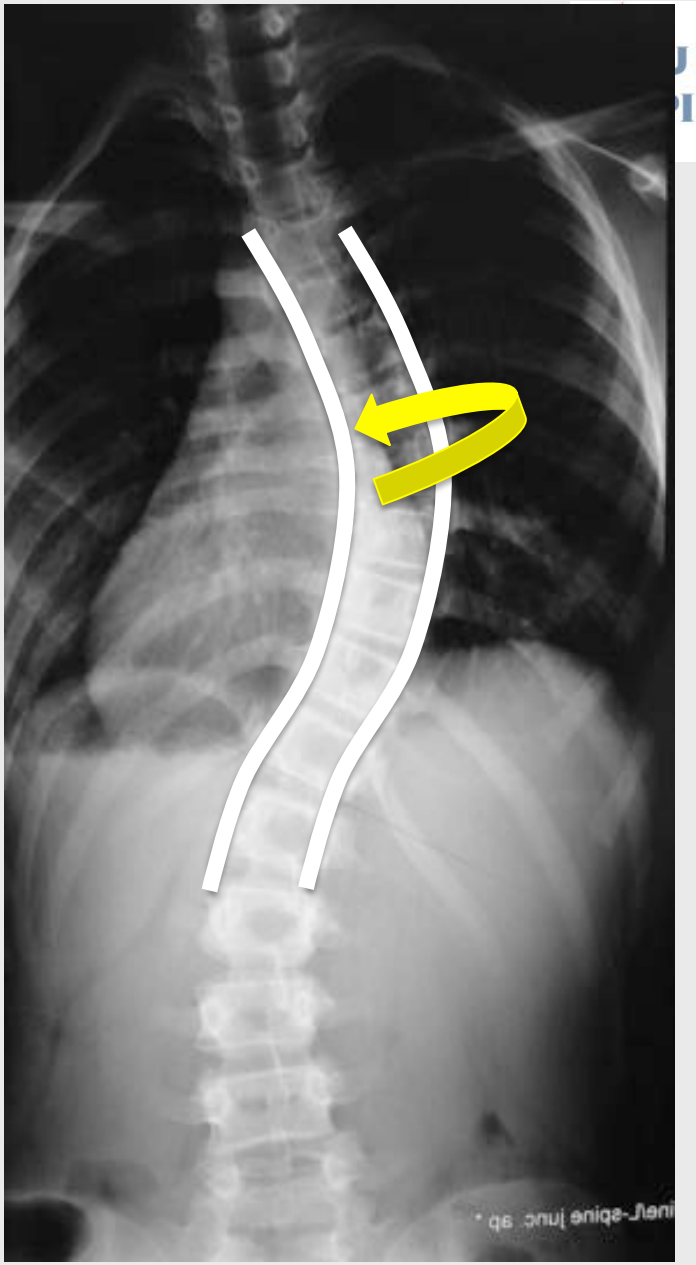
- Harrington forces
- Translation
- <u>Cantilever correction</u>



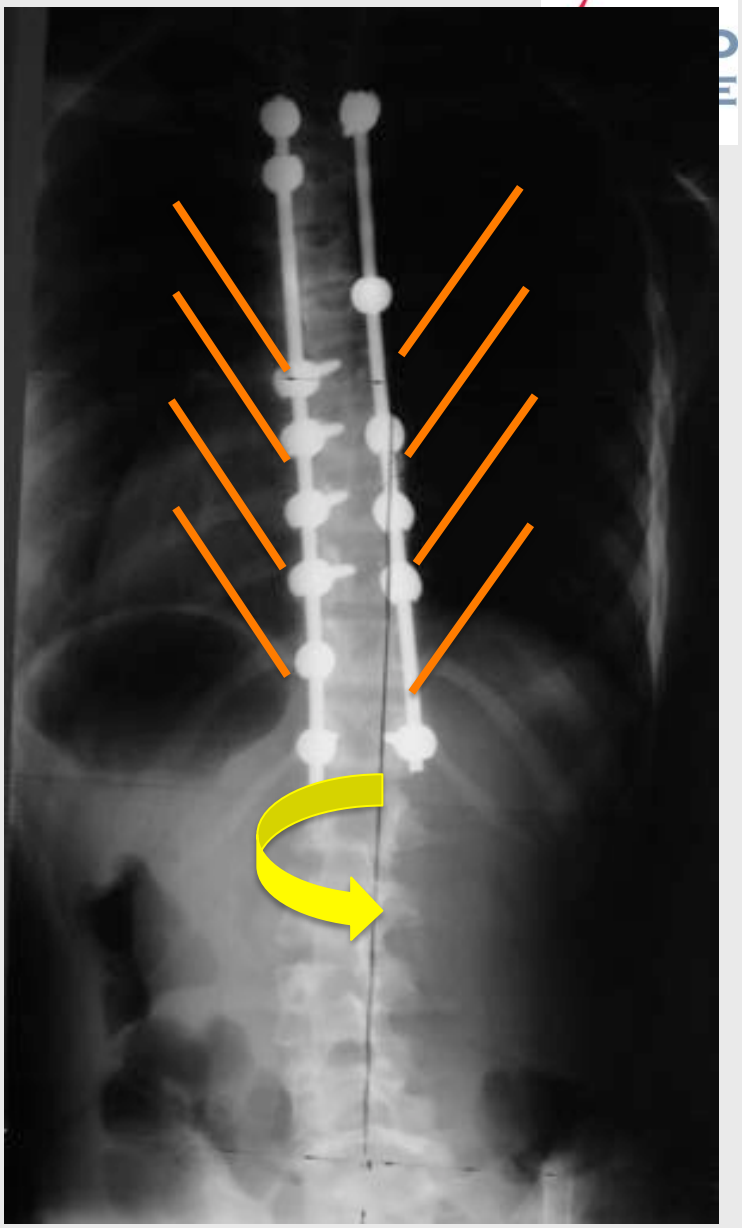
- Harrington forces
- Translation
- Cantilever bending
- Rod rotation
  - Concave rod



- Harrington forces
- Translation
- Cantilever bending
- Rod rotation
  - Concave rod
  - Double rod



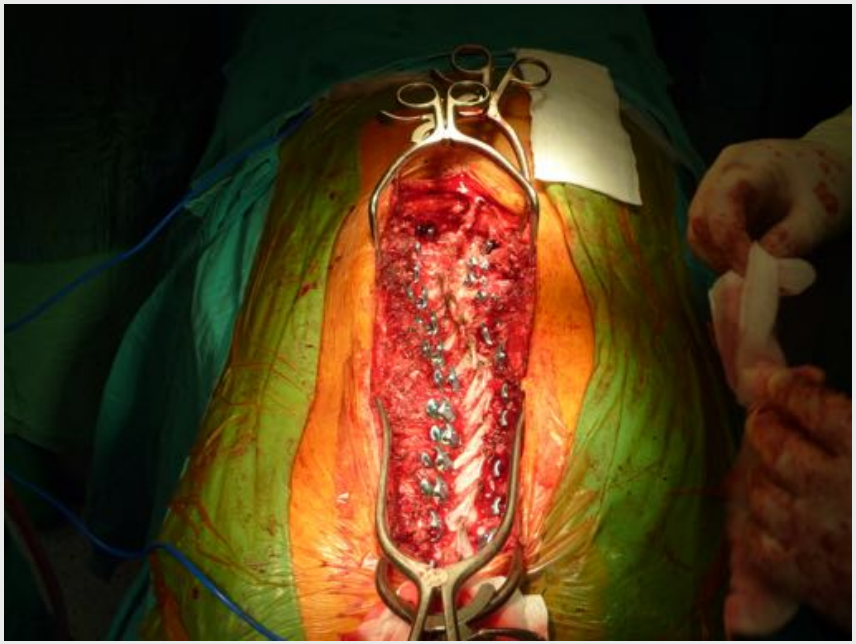
- Harrington forces
- Translation
- Cantilever bending
- Rod rotation
  - Concave rod
  - Double rod
- <u>Direct vertebral derotation</u>



The technique I use

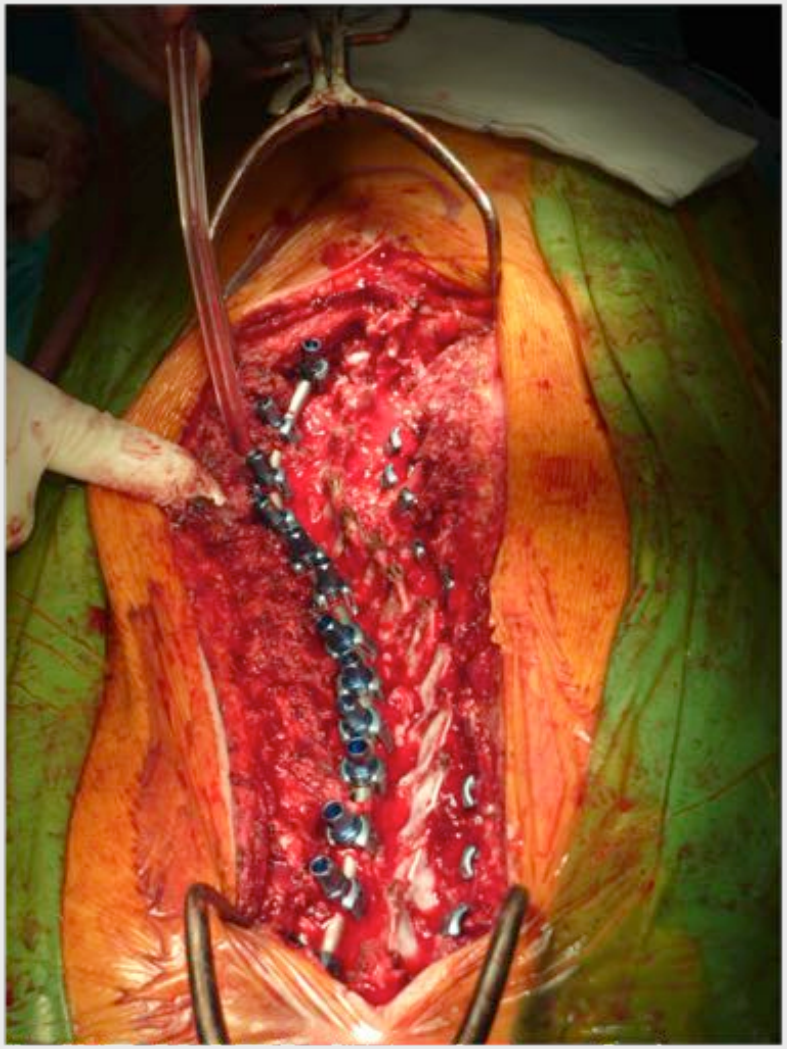
15 y boy, 6 mos hx

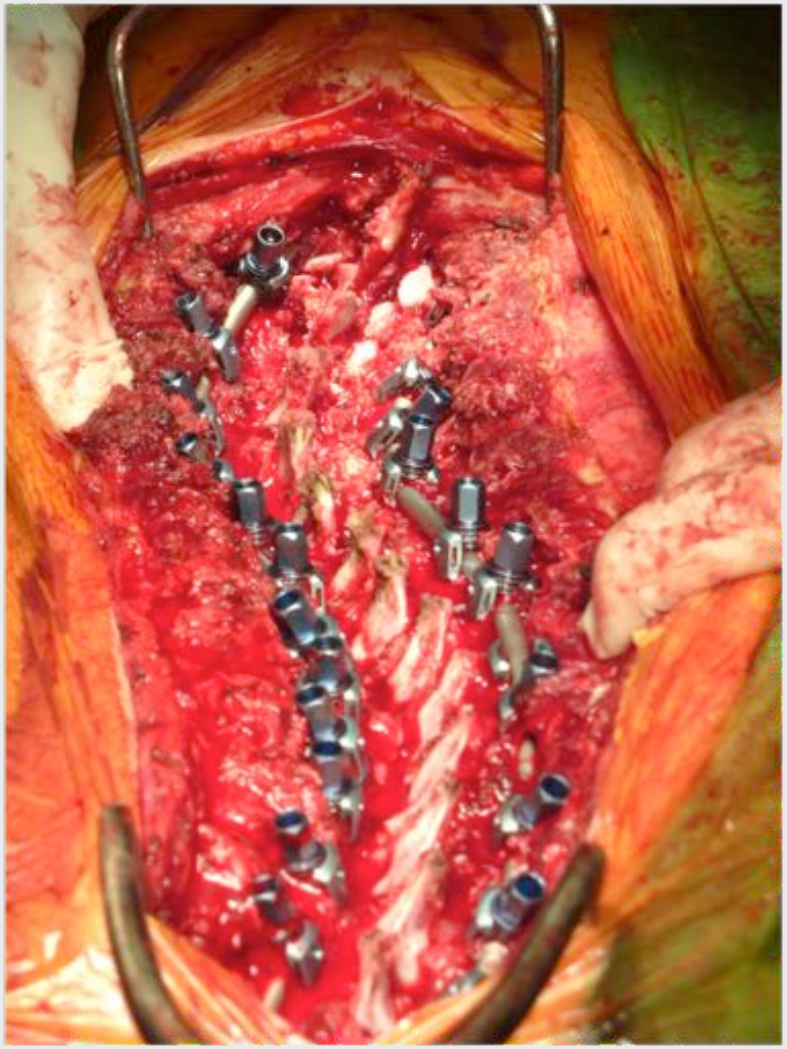
Exposure, screw placement



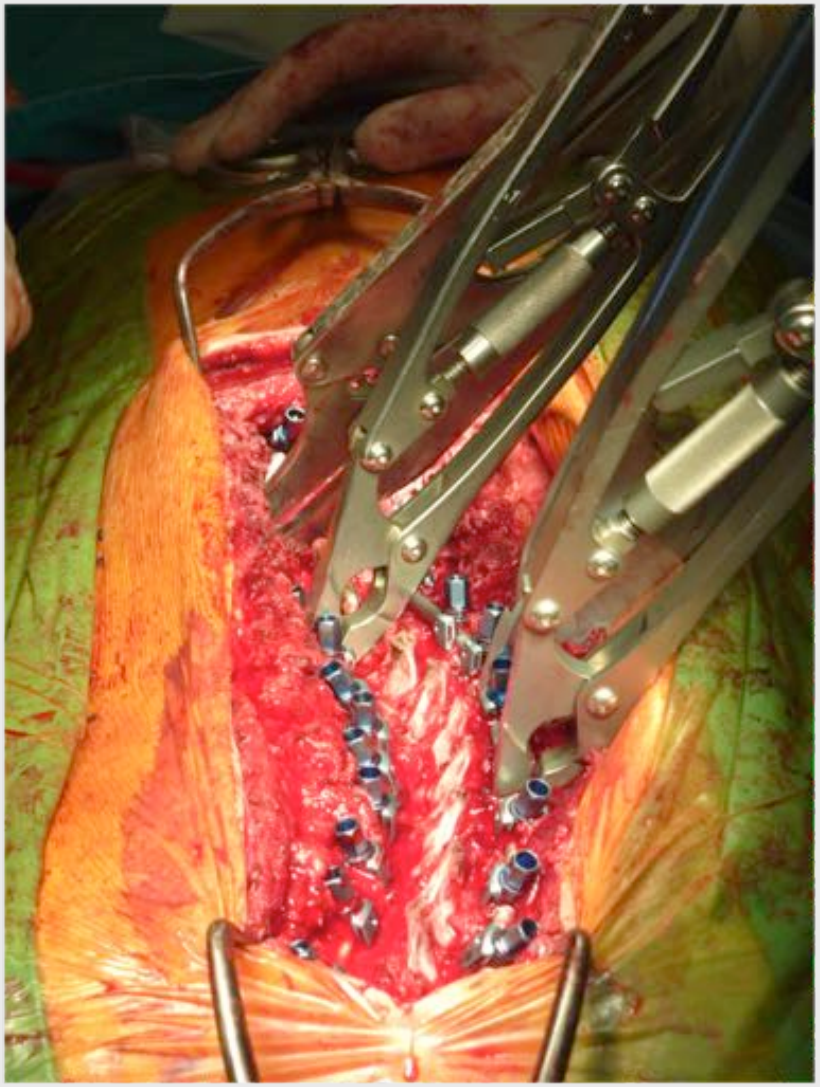
C-arm, check screws

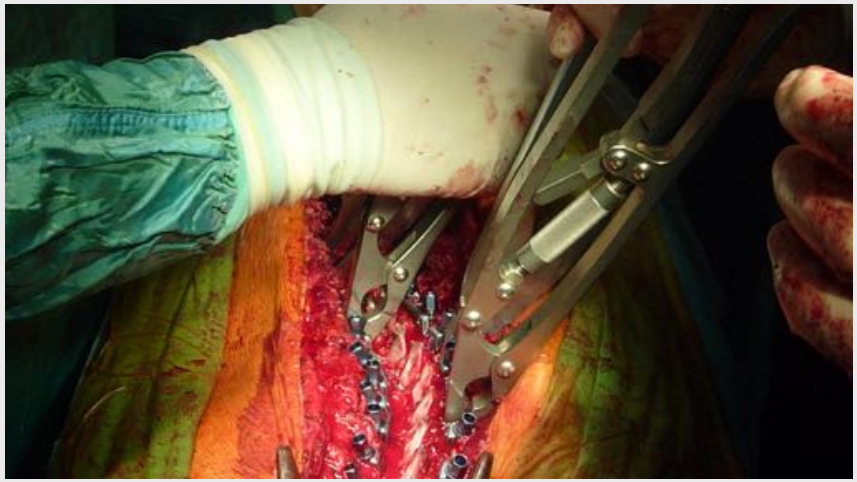
Bend and insert both rods



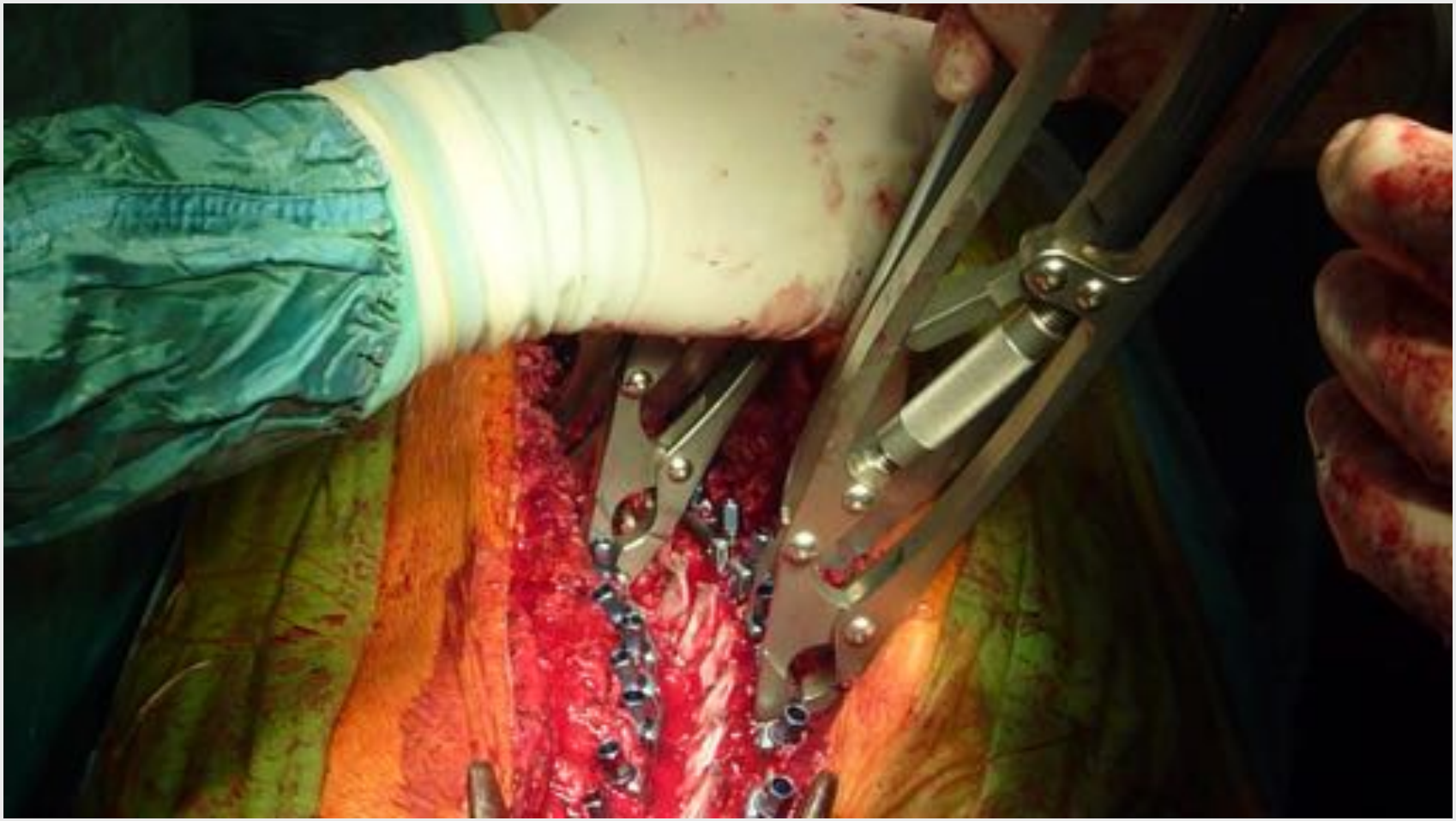


Double rod rotation



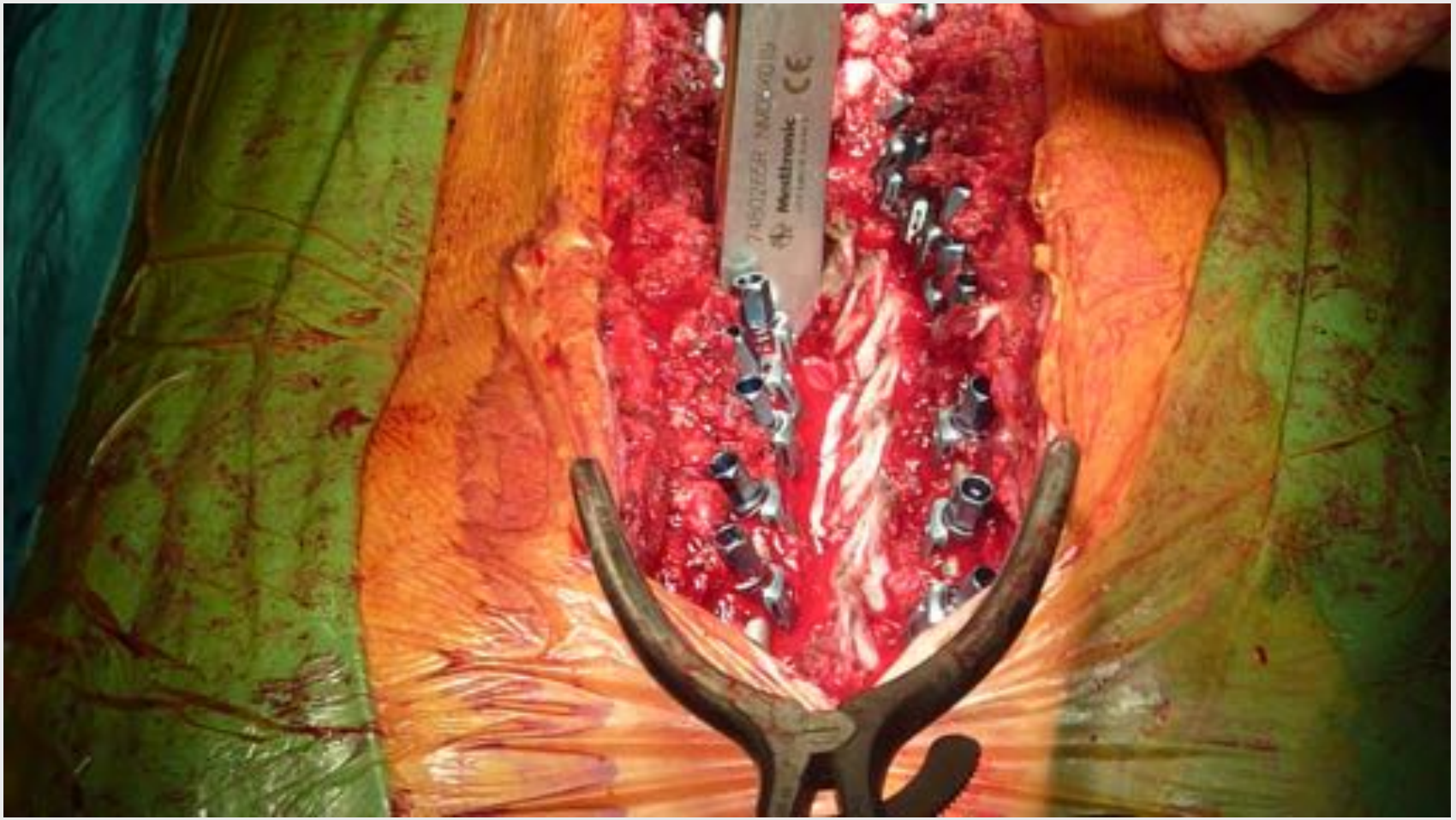


Rod rotation

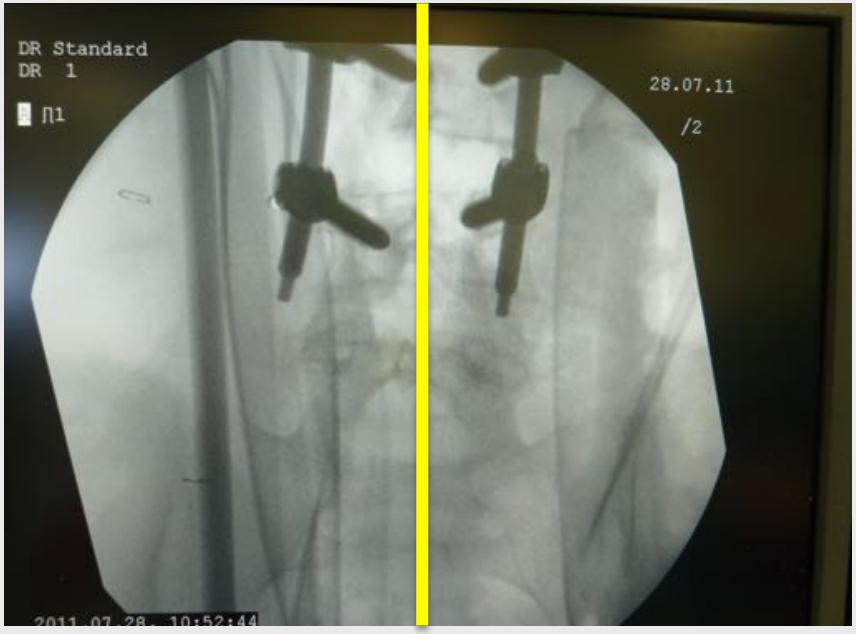


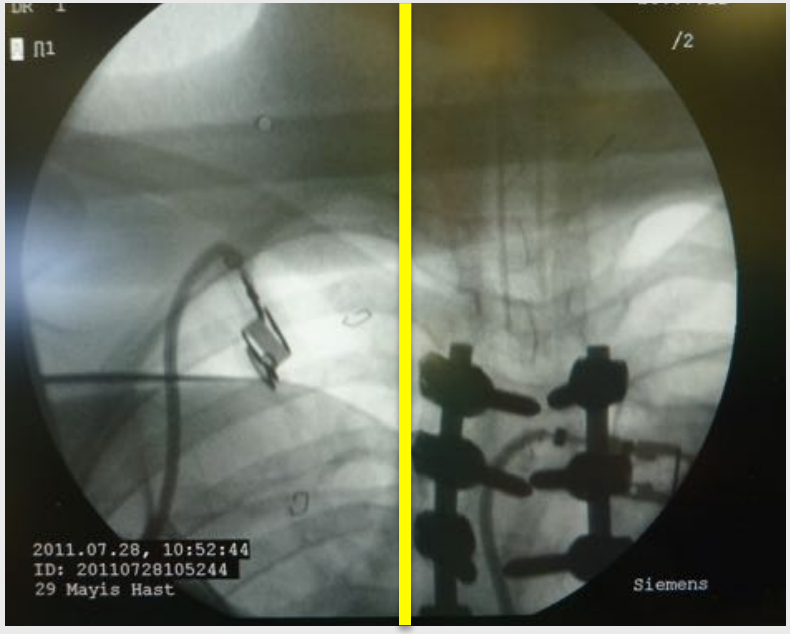
Rib hump reduction

Coronal correction

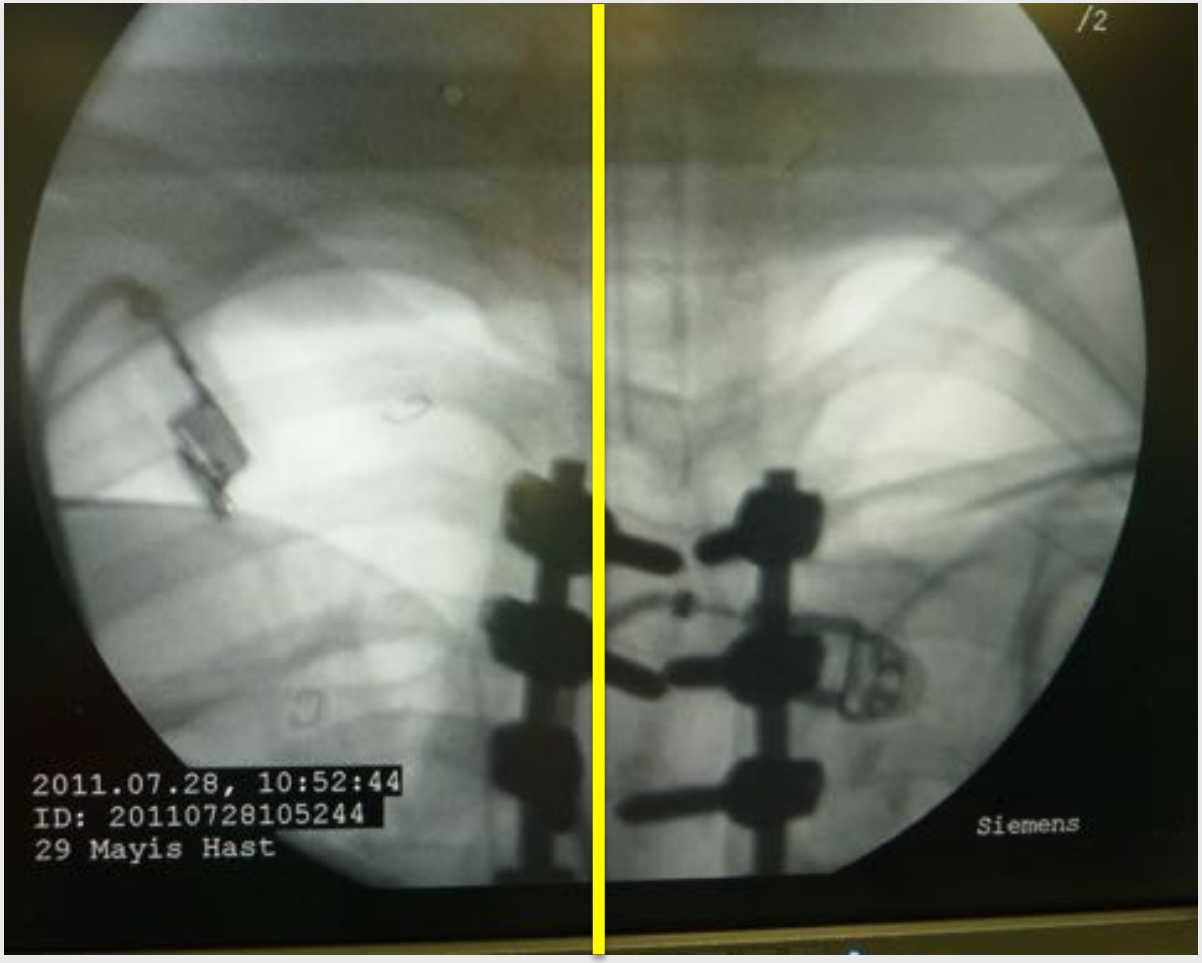


Check for balance





Adjustment



Final

Early post-op

@ 2 years

Identify relevant complications

- Complications due to poor positioning
  - Pressure sores
  - Blindness
  - Nerve injury
    - Femoral nerve
    - Brachial plexus
- Neurological complications
- Wound complications
  - Infection
  - Dehiscence

- Mechanical complications
  - Rod breakage
  - Screw loosening
- Balance problems
  - Inappropriate fusion levels
  - Over/under correction
  - Disease progression
- Pseudoarthrosis
- Proximal/distal junctional kyphosis

Summary AIS

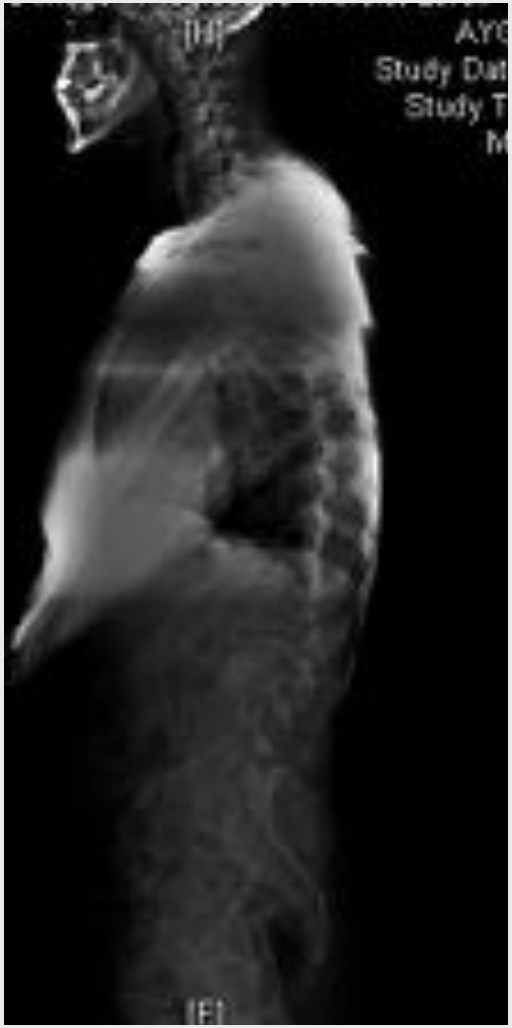
- Classification is fairly easy and effective in decision making
- Success depends on appropriate analysis of the patient and proper communications
- Proper patient positioning and monitorization is essential
- More than one way to correct any deformity
- Understanding and identification of possible complications is the most efficient way to avoid them

Adult deformity

Why different ?

- A very heterogeneous population
  - Age
  - Etiology
  - Location
- Needs and problems very different than pediatric deformity
  - Cosmesis less important
  - Function more important

38 y ♂ manual worker



72 y ♀ can only walk 50 m

Results

Coefficients of correlation between radiologic parameters and quality of life

	Coronal Cobb	Thoracic kyphosis	Lumbar lordosis	Lordosis Gap	SVA	T1SPI	PT
SRS22 SubTotal	n. s.	n. s.	-0.246 p= 0.003	-0.289 p= 0.001	-0.305 p= 0.000	-0.273 p= 0.002	-0.261 p= 0.003
SRS22 Pain	n. s.	n. s.	-0.320 p= 0.000	-0.336 p= 0.000	-0.329 p= 0.000	-0.294 p= 0.001	-0.286 p= 0.001
SRS22 Function	n. s.	n. s.	-0.373 p= 0.000	-0.402 p= 0.000	-0.363 p= 0.000	-0.358 p= 0.000	-0.353 p= 0.000
ODI	n. s.	n. s.	0.195 p= 0.019	0.252 p= 0.005	0.293 p= 0.001	0.207 p= 0.020	0.232 p= 0.009

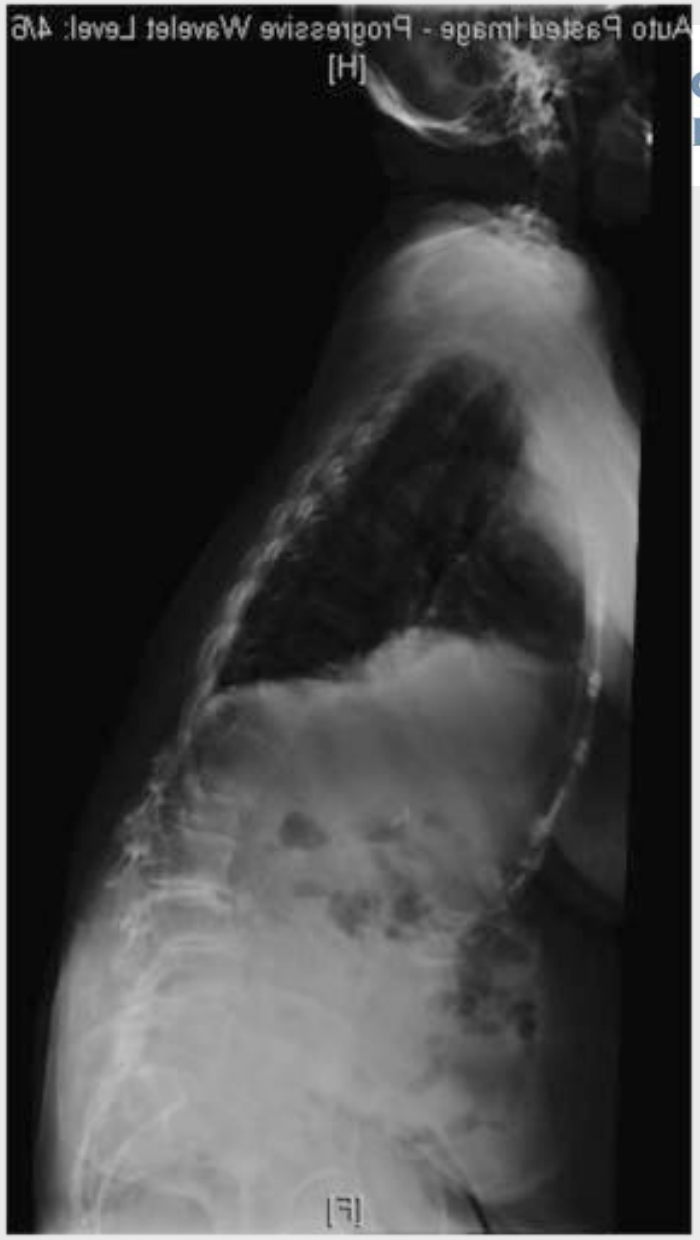
No change in HRQoL

67 y

Early post-op

2 years

78 y



Early post-op

1 year

61 y

Post-op

1
year

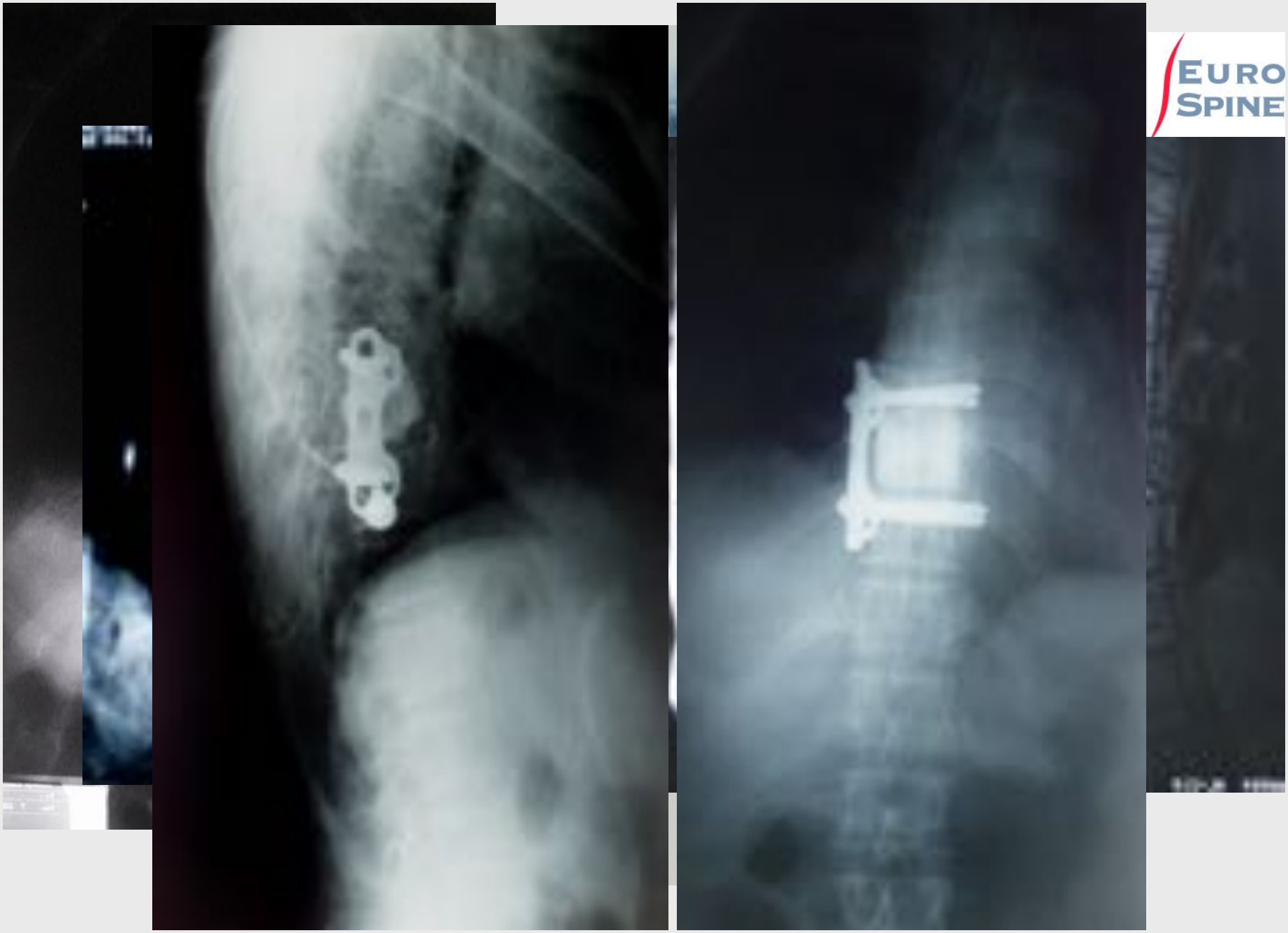
Summary Adult Deformity

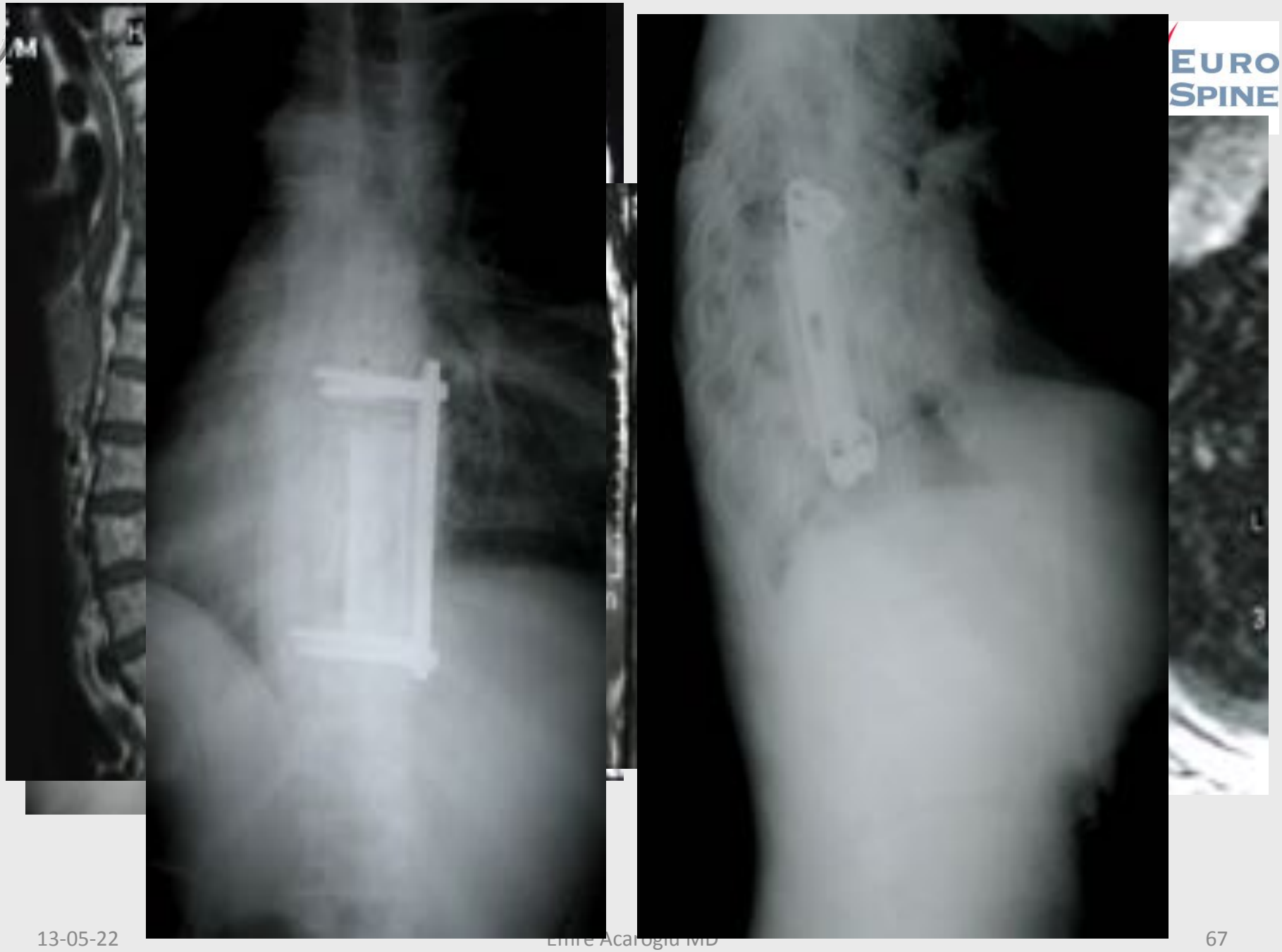
- Adult spinal deformity
  - Is not similar to pediatric deformity
    - Different problem
    - Different needs
  - Restoration of function is the ultimate goal
    - Function is dependent on the sagittal balance
  - Restoration of sagittal balance takes
    - Longer instrumentation and fusion
    - Often w/ spinal osteotomies

TB Spondylitis

Surgery for Tb Spondylitis

- Generally considered as an adjuvant to effective chemotherapy
- Indications
  - Neurologic involvement
  - Deformity / impending deformity
  - Presence of large abscess / necrotic tissue





Summary

- Deformity surgery is one of the last frontiers in Spine Surgery
- Success depends on:
  - Good patient selection
  - Good pre-op evaluation and planning
  - Having adequate resources (mandatory)
  - Knowing the spectrum of possibilities
  - Being aware of your abilities (and shortcomings)
  - LEAST on the type of instrumentation