CONS-MIS DEFORMITY

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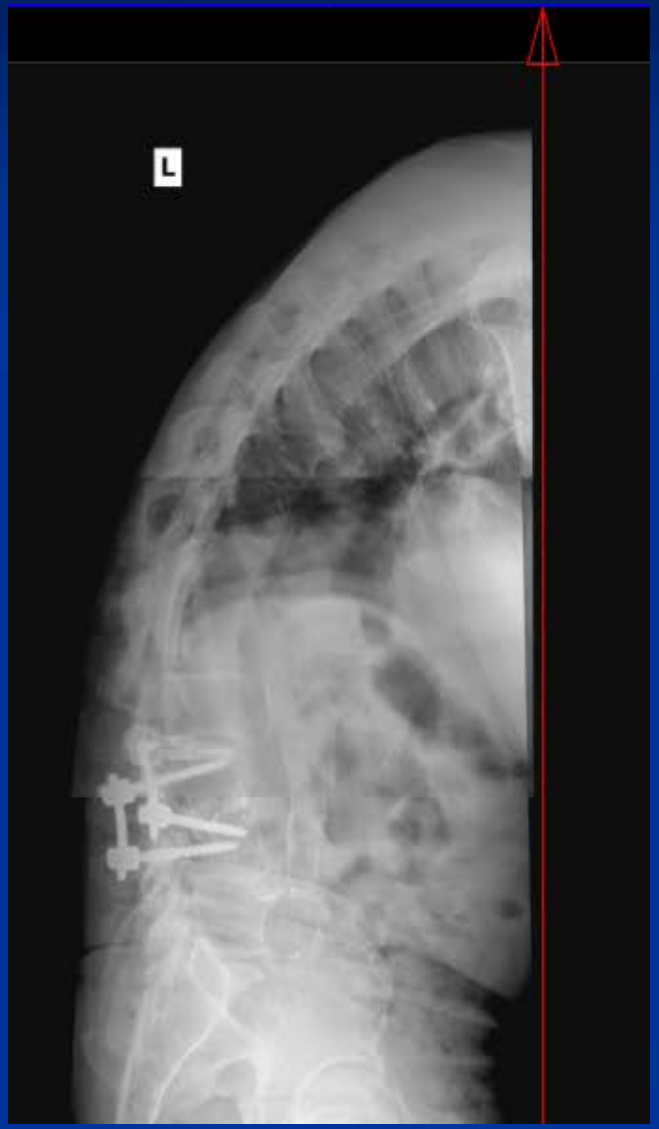
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Goals of Surgery Remain the Same

- Indications Same (fix every curve w pain)
- Principles remain same
  - Levels, iliac fixation, fusion techniques
- Now we need to measure differences
  - Outcomes (clinical, fusion, alignment)
  - Complications
  - Recovery
  - Cost
  - Radiation exposure (physician, staff, patient)
  - Time (length, staged, etc)

The recent popularity of direct lateral fusions have increased the incidence of fusion to L5

- Need to establish principles for determining fusion to L5 vs S1. Cannot allow limitations of a new procedure dictate these principles

Deformity Surgery : Sagittal Alignment and Radiculopathy

- Radiculopathy often due to fractional curve at L5/S1 segment resulting in foraminal stenosis
- Correction of large sagittal deformities lead to higher rates of junctional deformity

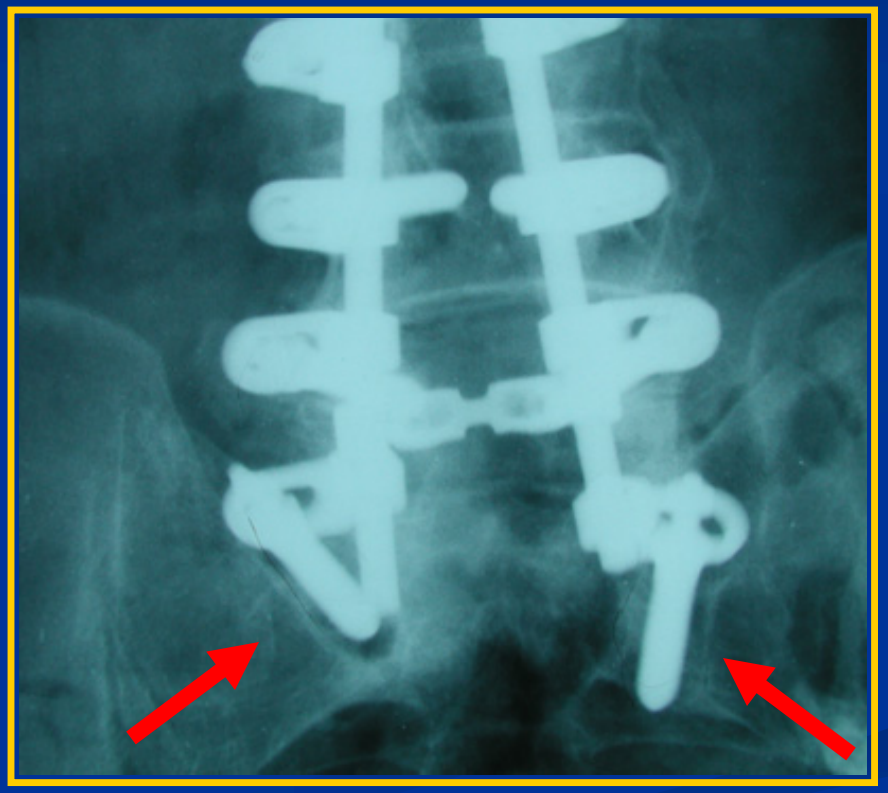
Must Carefully Eval LS Junction

- Must evaluate levels below
  - Disc degeneration (MRI, Ferguson view, foraminal stenosis at L5/S1)
  - Facet Arthrosis (CT scan)
  - Stenosis (MRI, CT Myelogram)
  - Instability (Flex/Ext films) – rotatory subluxation, spondylolisthesis
  - Overall alignment, long standing scoliosis films, what is patients' coronal and sagittal balance?

LONG FUSIONS TO THE SACRUM CHALLENGING

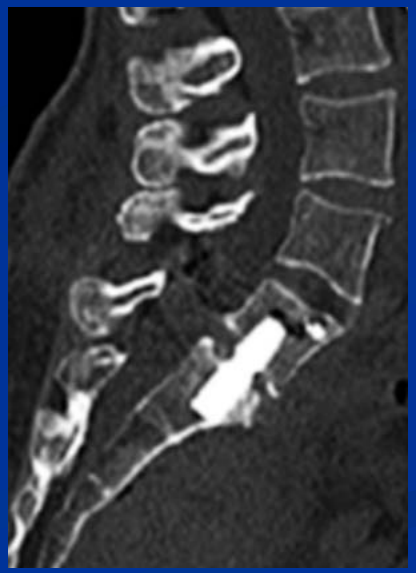
- High Complication Rate

- Pseudarthrosis
- Inadequate correction
- Instrumentation Failure
- Sacral fractures



MIS : L5/S1 fusion is possible

- Additional stage OLIF/ALIF (most cases)
- TLIF (smaller footprint, less correction, higher pseudorates)
- Trans 1 screw
- Iliac fixation (possible)



Sagittal Restoration of Lumbar Lordosis

- Pre-op planning: Able to dial in lumbar lordosis to match pelvic incidence, using varying degree implants
- 2/3 of lumbar lordosis is typically located from L4-S1, with maximal lordosis at L5/S1. So it makes sense to obtain maximal correction at these two levels thus arguing against DLIF for scoliosis correction followed by TLIF at L5/S1
- New larger foot prints decrease the incidence of subsidence in large corrections

Practical considerations of hyperlordic cages

- Preop CT scans are important to assess for fused facet joints which will limit correction
- A thorough discectomy with release of Anterior annulus, bridging osteophytes, and partial anterolateral annulus while preserving endplates is essential
- Release of posterior annulus and sometimes PLL, allows for lengthing of posterior graft height
- This is important, hyperlordotic cages shorten the posterior column and a thorough foraminotomy is critical. A longer posterior wall of the cage will help indirectly open the foramen
- Finally, a buttress scew is important to avoid extrusion of the graft

Coronal correction via ALIF

- Structural cages most commonly used at L4/L5 and L5/S1 for fractional scoliosis curve and "level out the take off from the pelvis"
- Often, if significant coronal deformity or scoliosis exist, release of upper lumbar levels and packing with bonegraft allows for coronal balancing posteriorly
- Cages placed in middle of primary curve can lead to a fixed coronal deformity
- Larger footprints prevent subsidence, and improves coronal correction

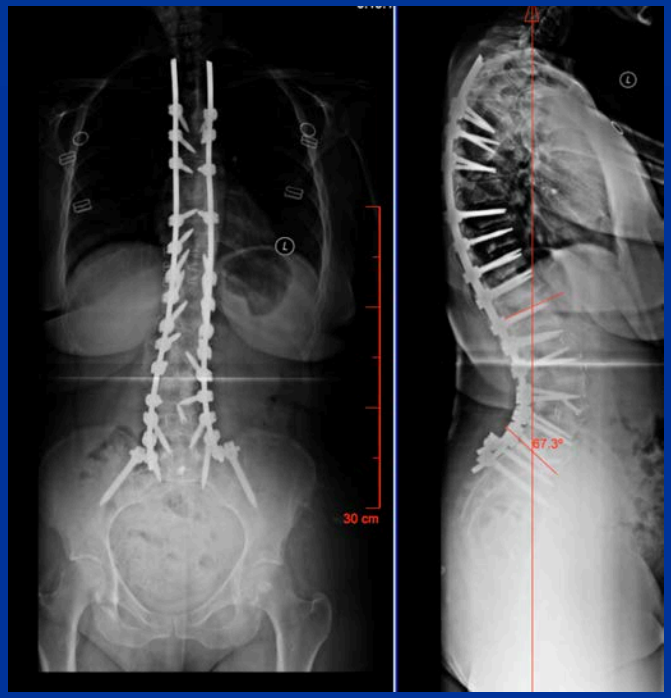
ALIF ideal approach for deformity as well as decompression

Case example : Coronal and Sagittal

- Combined anterior /posterior approach
  - 122 mm/161 mm
  - Sagittal correction
  - Solid fusion
  - Coronal balance
    - Cages at L4/L5, L5/S1
    - Morsalized bone above

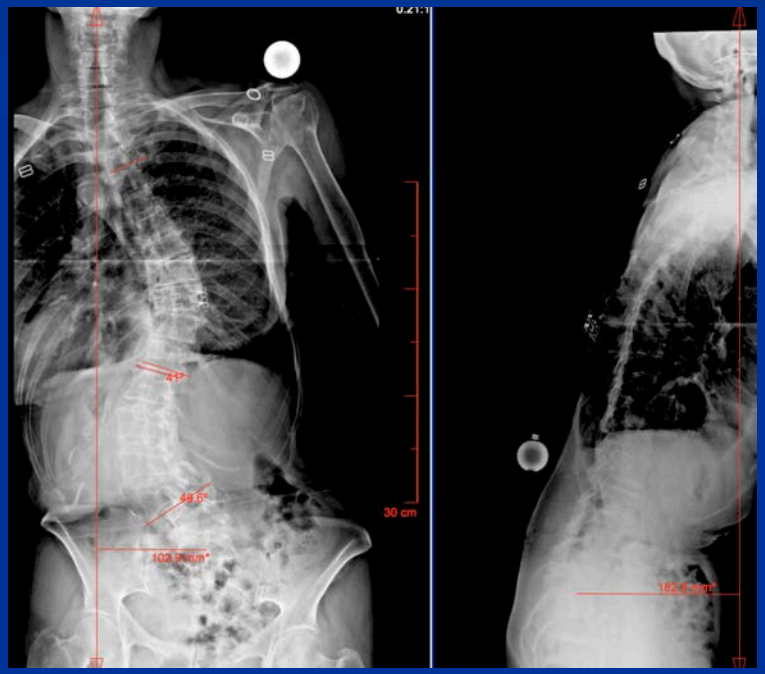
- Placing cages at upper lumbar levels, inhibit posterior coronal correction.
- Prefer anterior release with morsalized bone

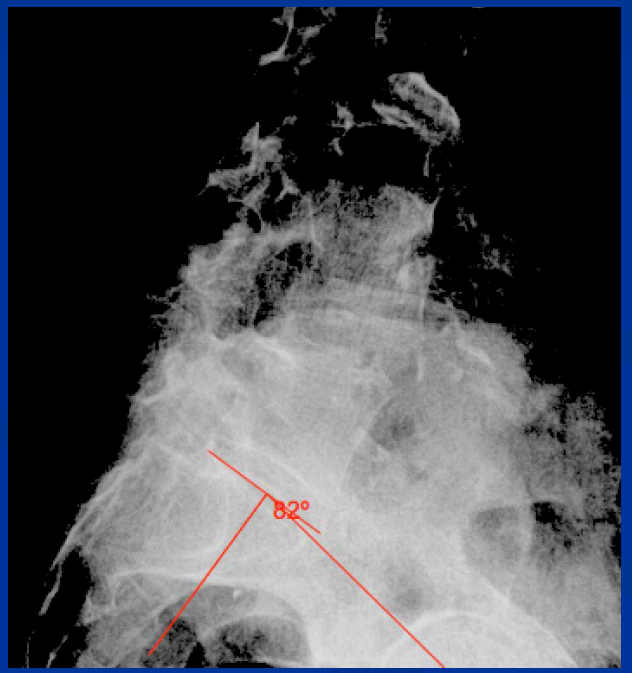
Goal is coronal and sagittal balance



- Posterior : need to perform aggressive release to mobilize spine and correct deformity. Intra-op 36 inch films necessary to confirm coronal balance

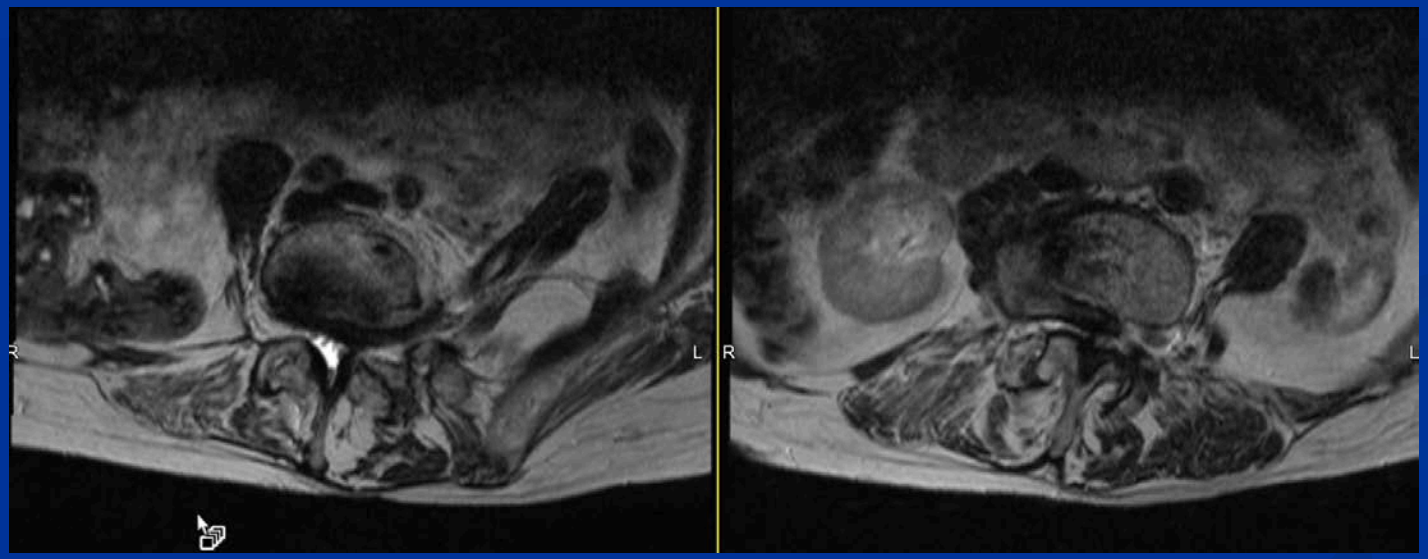
75 yo female with difficulty walking, bilateral leg pain

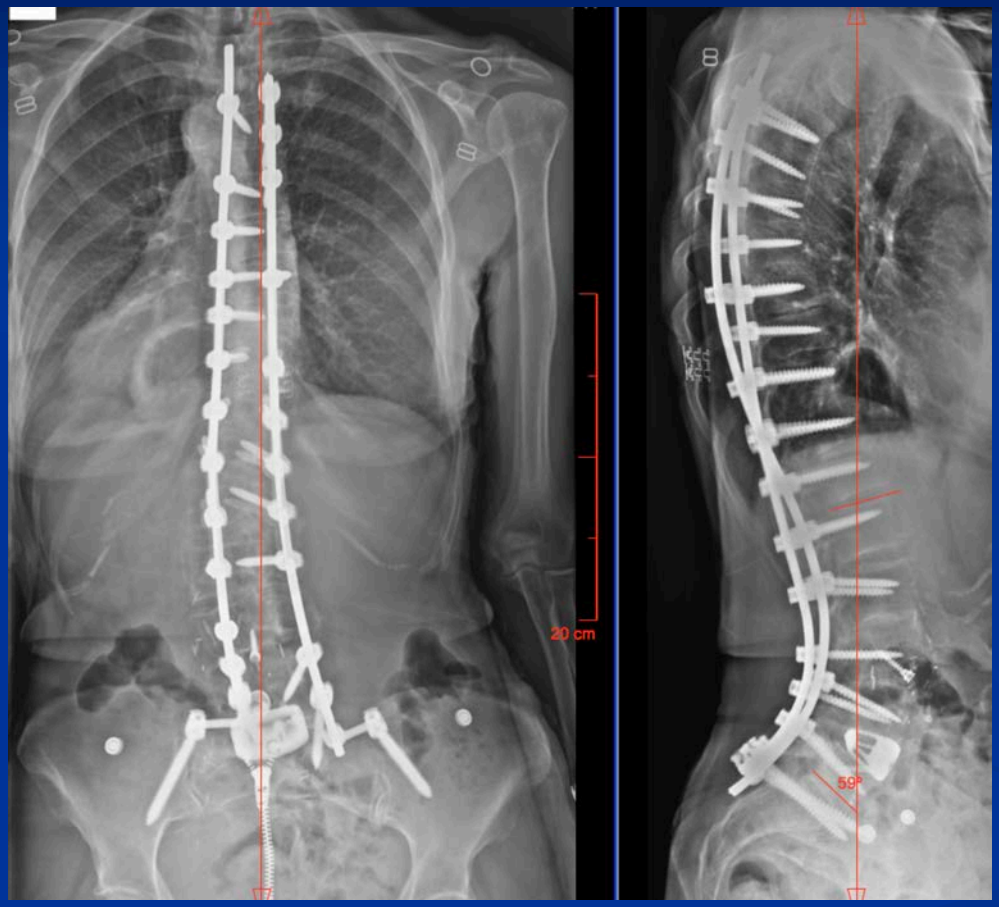




CT scan allows eval of lateral bridging osteophytes at upper levels and need for release

Cages at L4/L5 and L5/S1 to level take off of spine from pelvis and correct fractional curve, use wide foot print and appropriate lordosis

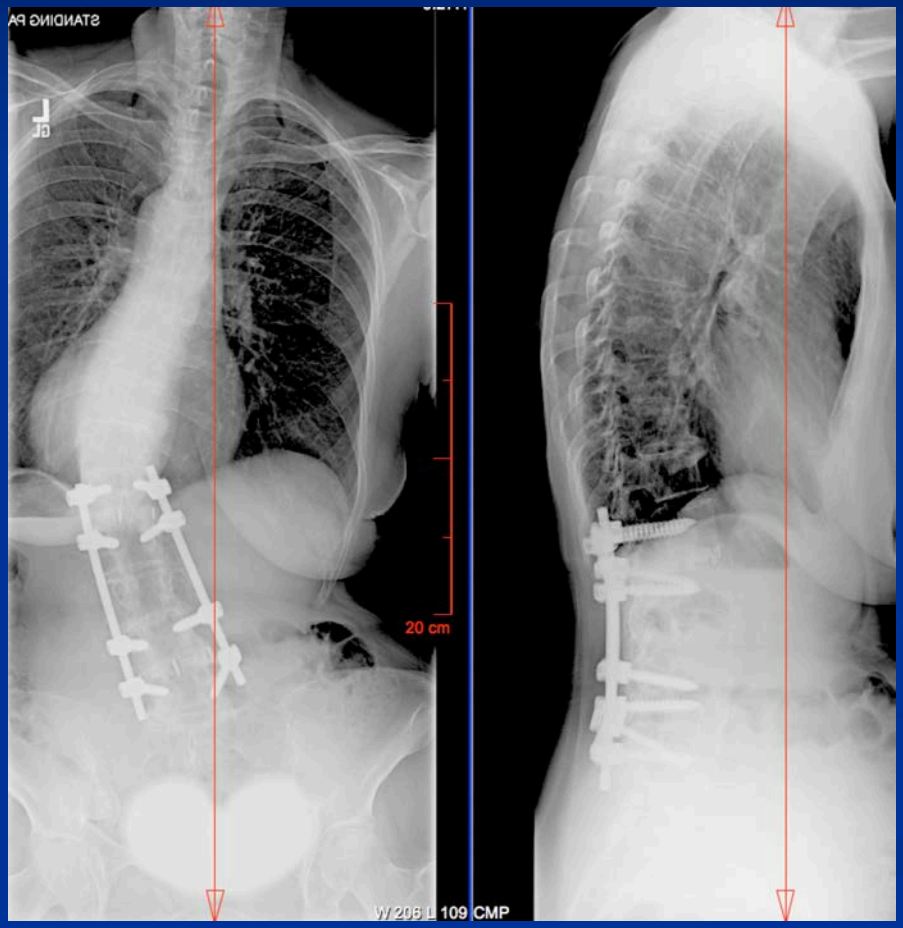

R
L
R
L

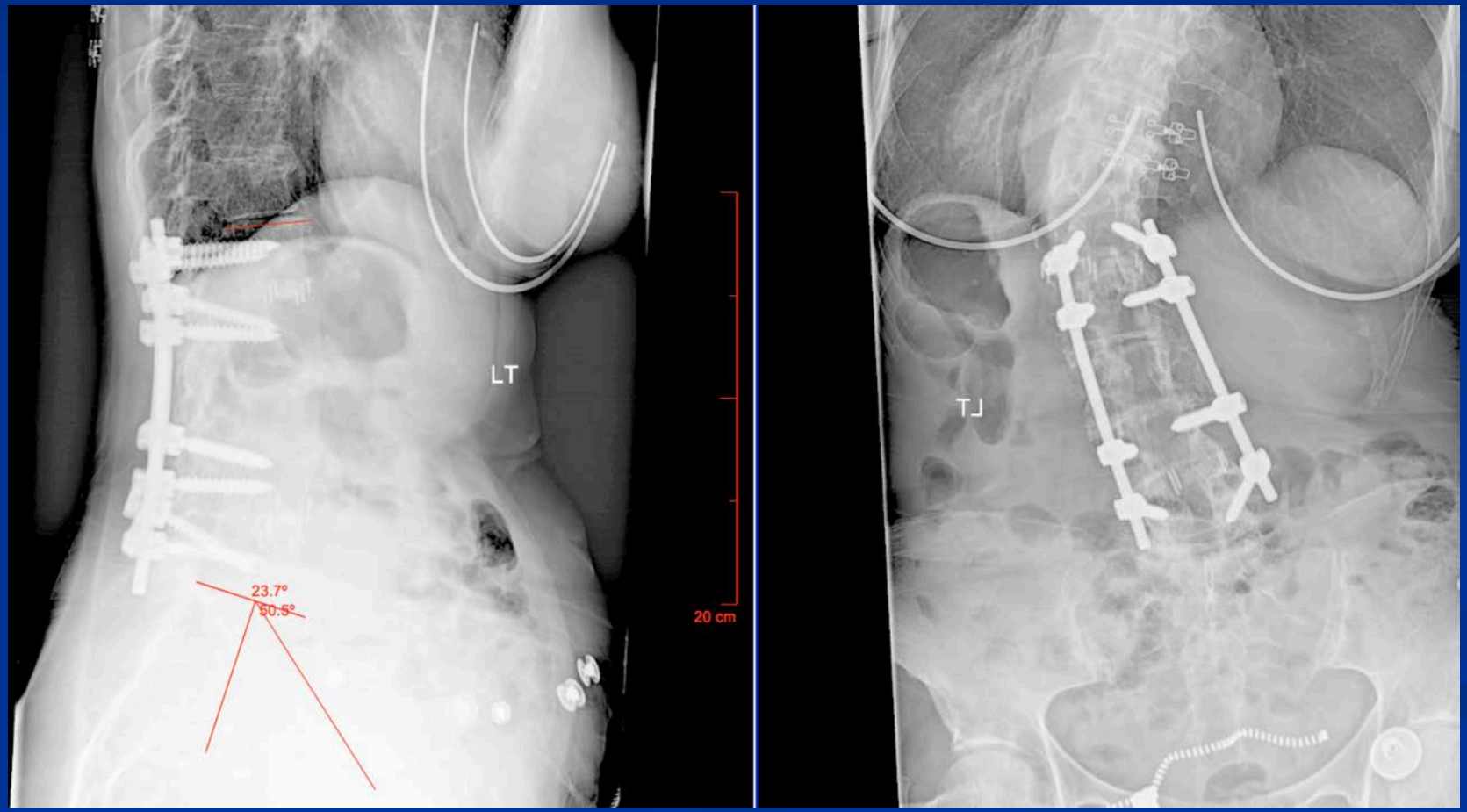

20 cm
59°

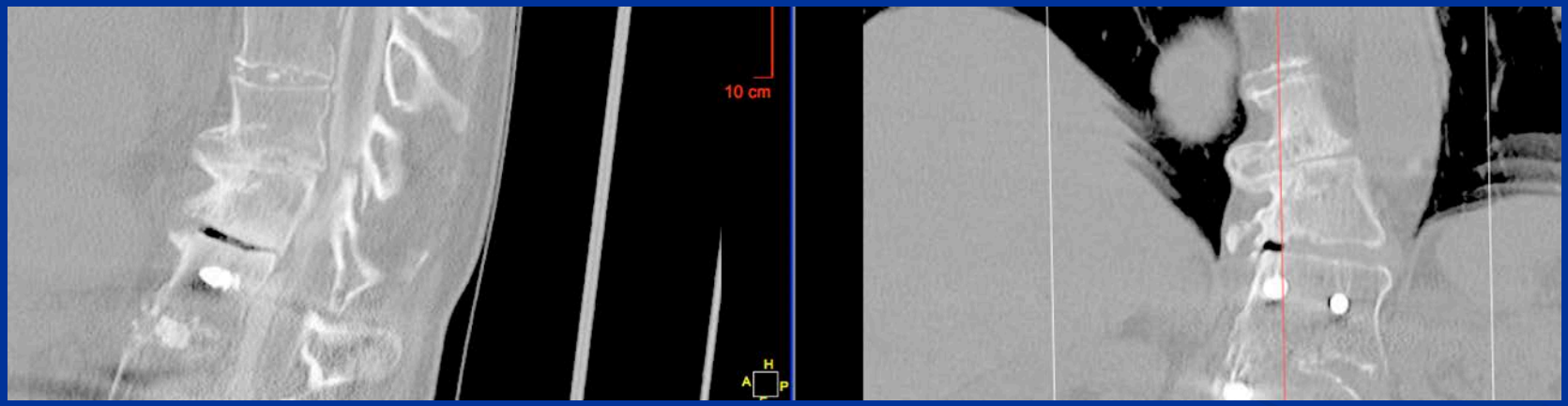
Procedures should not dictate principles

- 80 year old female
- s/p lateral/posterior L1-L5 fusion
- Progressive right leg pain, inability to stand / walk
- Vertical sacrum, PI 50 degrees, LL 24 degrees

Sagittal / coronal imbalance




LT
23.7°
50.5°
20 cm
TJ

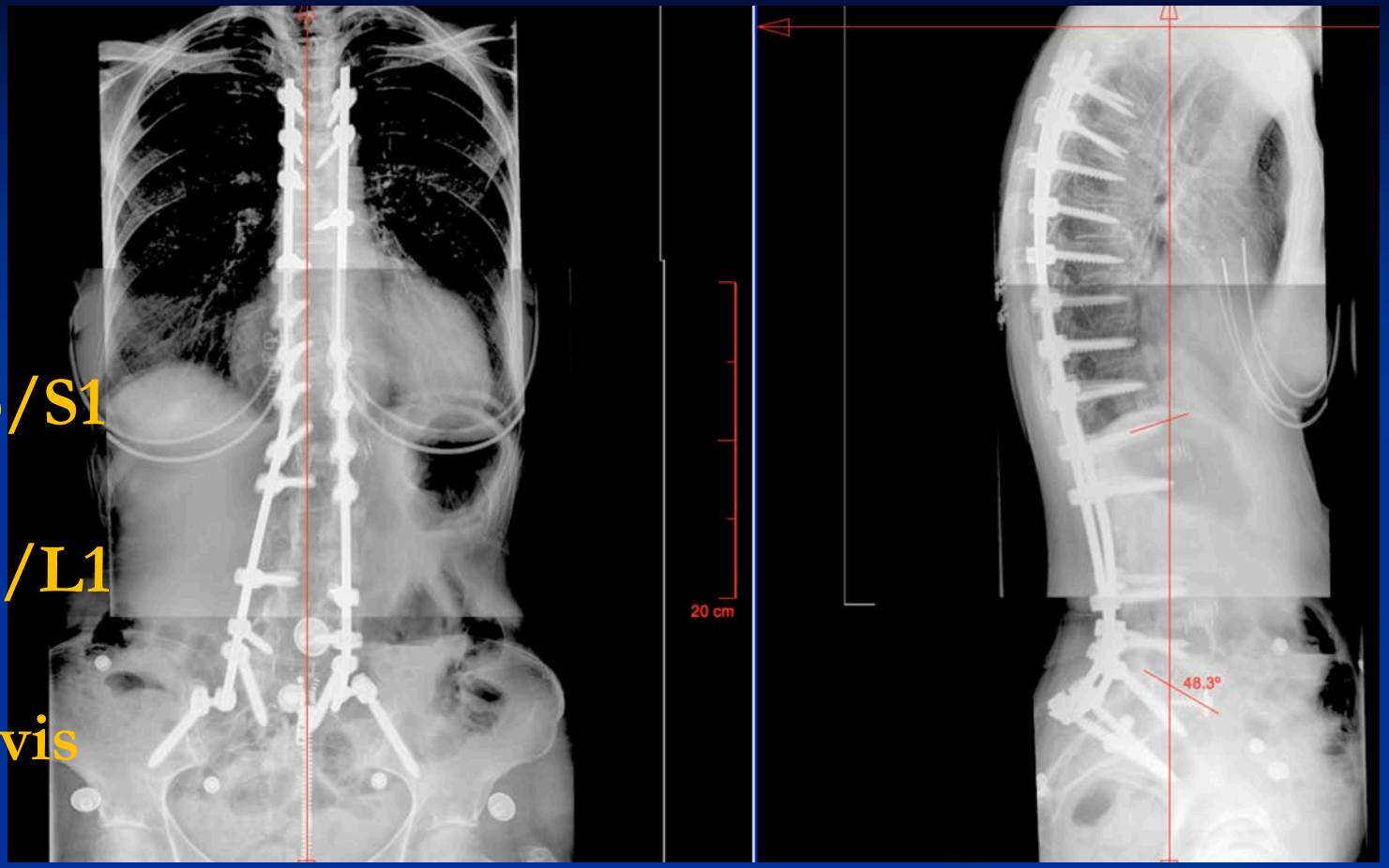

10 cm
H
A
P

- Treatment options
  - Decompression
  - Posterior
  - Lateral
  - Anterior
  - levels

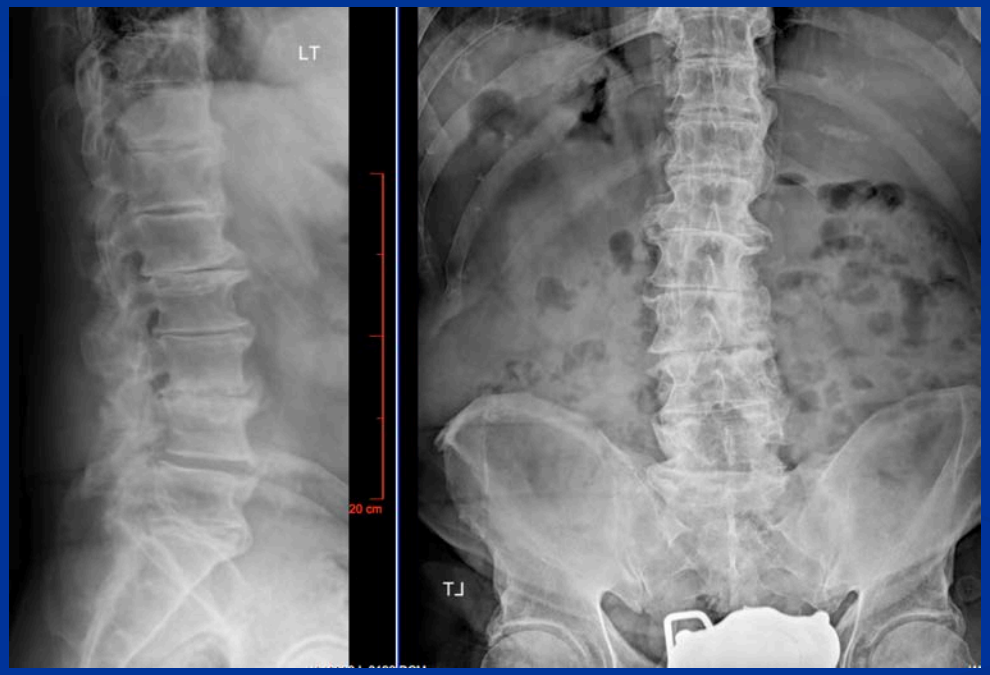
Anterior L5/S1

Lateral T12/L1

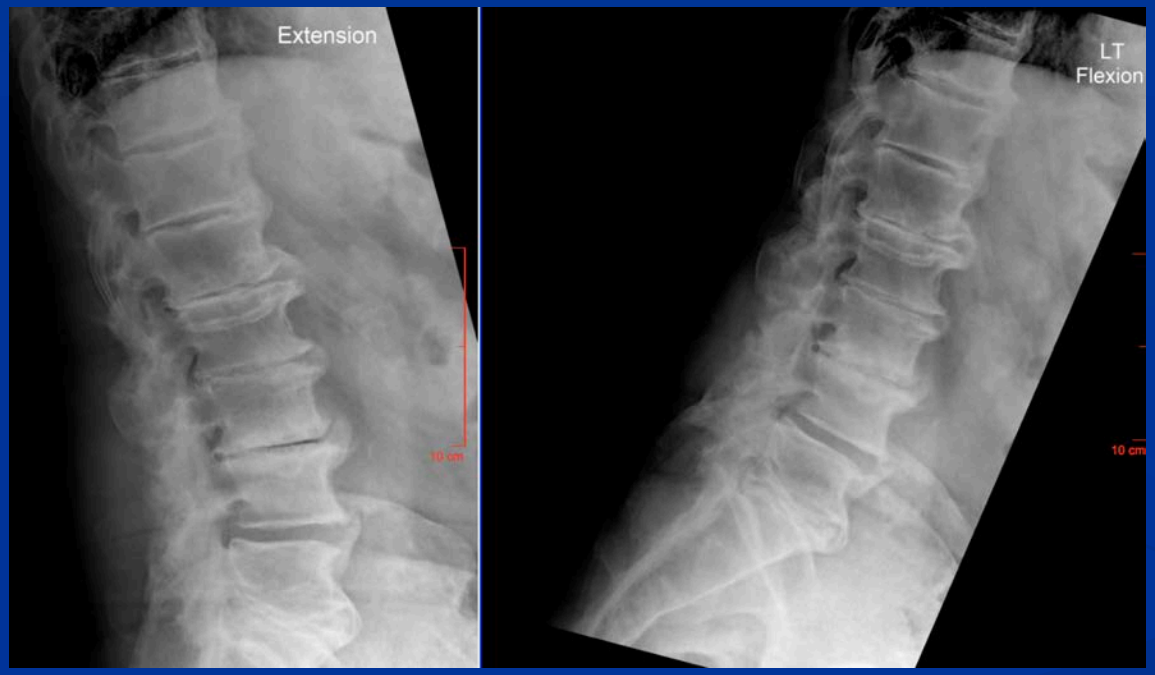
PSF T5-pelvis

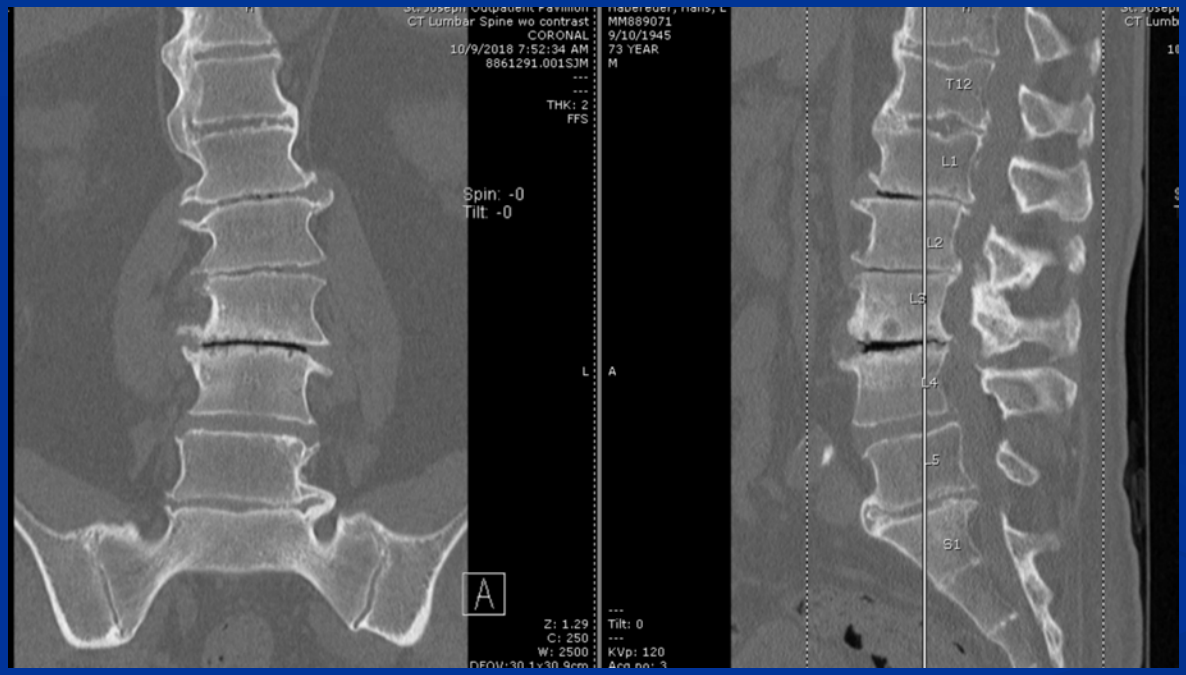


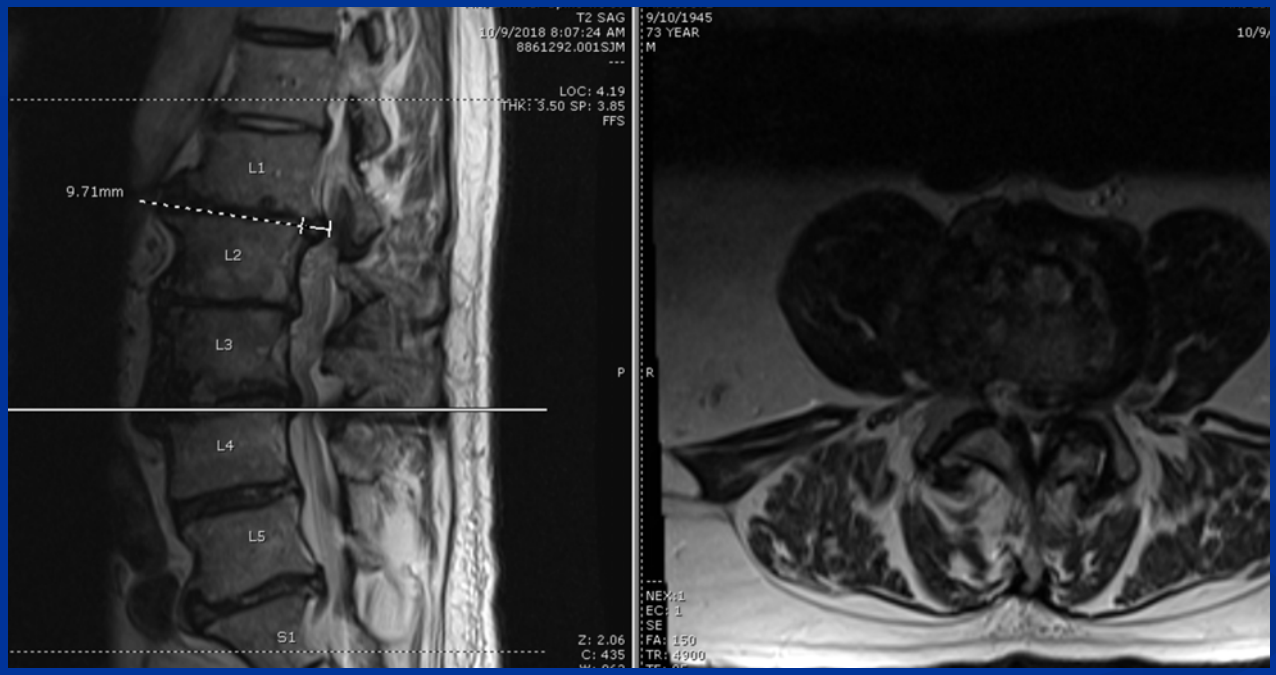
73 yo male difficulty walking

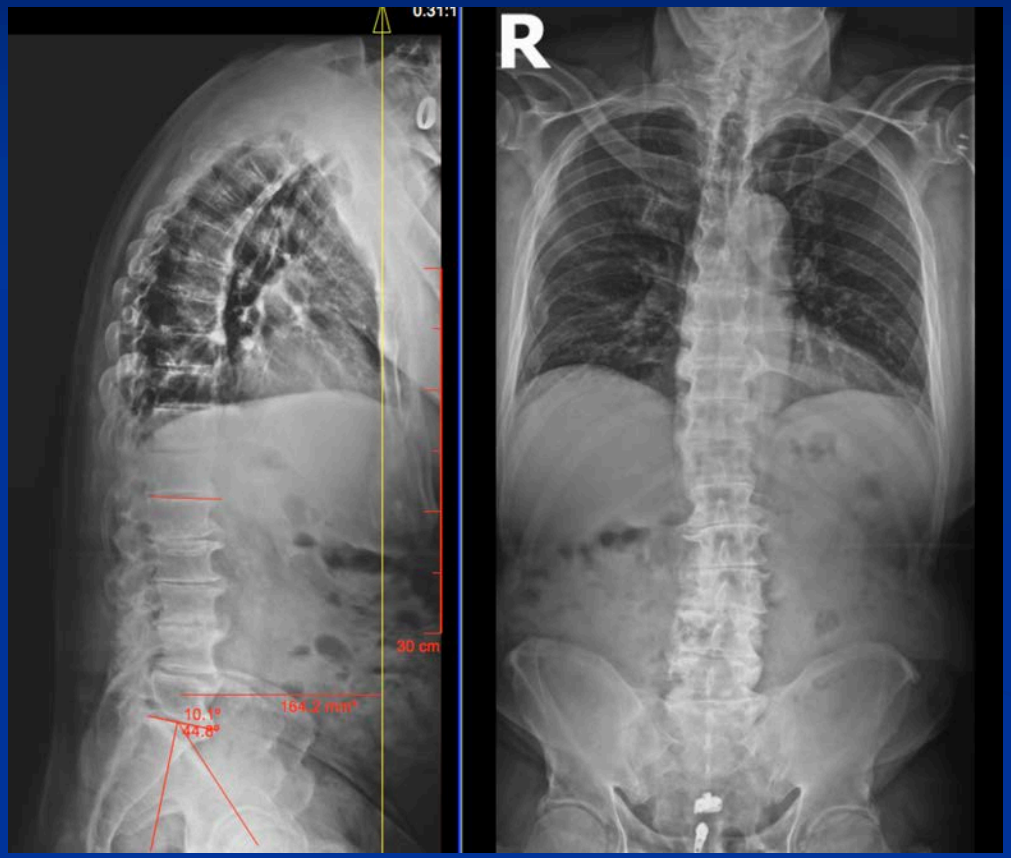


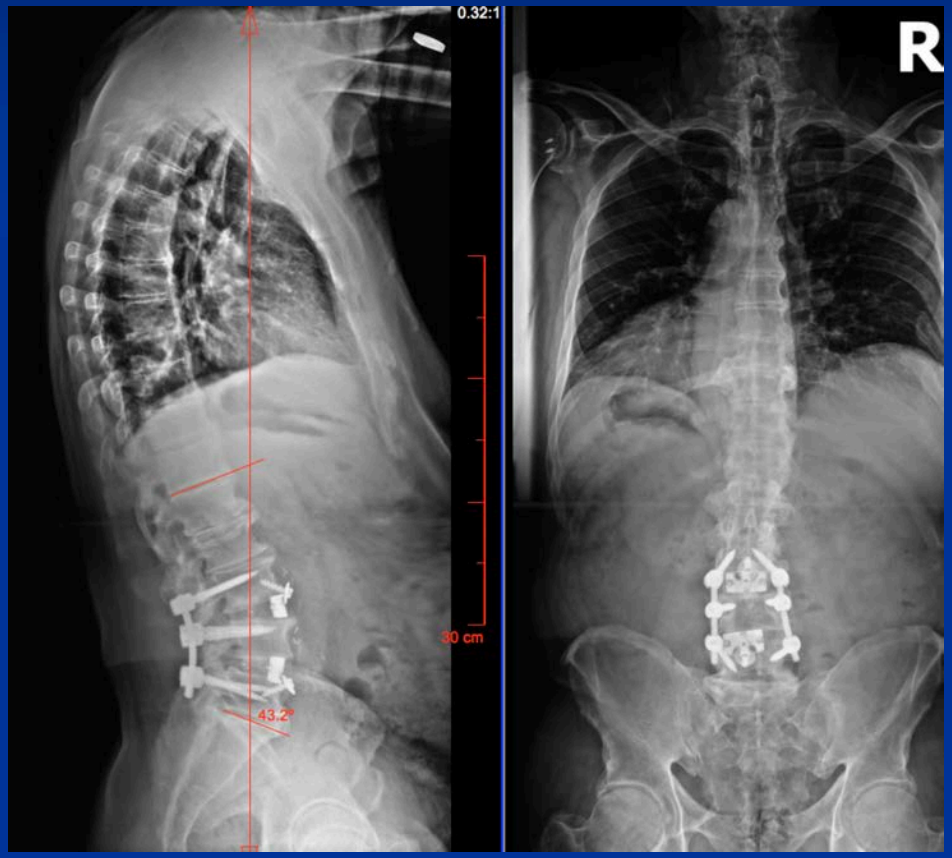
Spondy L4/L5

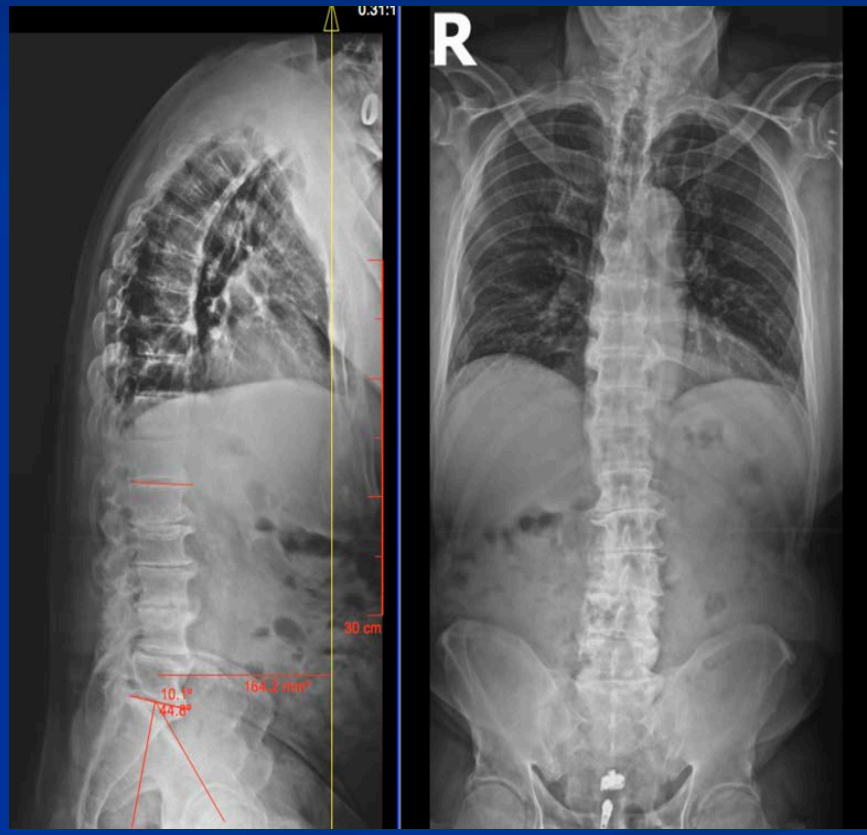



CT Lumbar Spine wo contrast
CORONAL
10/9/2018 7:52:34 AM
8861291.001SJM
THK: 2
FFS
MM889071
9/10/1945
73 YEAR
M
Spin: -0
Tilt: -0
L
A
Z: 1.29
C: 250
W: 2500
Tilt: 0
KVp: 120
T12
L1
L2
L3
L4
L5
S1


T2 SAG
10/9/2018 8:07:24 AM
8861292.001SJM
LOC: 4.19
THK: 3.50 SP: 3.85
FFS
9/10/1945
73 YEAR
M
L1
9.71mm
L2
L3
L4
L5
S1
P
R
NEX:1
EC: 1
SE
FA: 150
TR: 4900
Z: 2.06
C: 435


R
30 cm
10.1°
44.8°
164.2 mm²


0.32:1
R
30 cm
43.2°


0.31:1
R
30 cm