
PRINCIPLES OF ADULT SPINE DEFORMITY

Indications and Goals of Surgery

MICHAEL O. LAGRONE M.D., P.A. ORTHOPEDIC SURGERY
Adult & Pediatric Spine Surgery, Scoliosis, Pediatrics Orthopedics

SPINAL DEFORMITY IN THE ADULT

- Increasingly common disorder
 - Significant and measurable impact on HRQL
 - Surgical treatment still complex with significant risk of complications
-



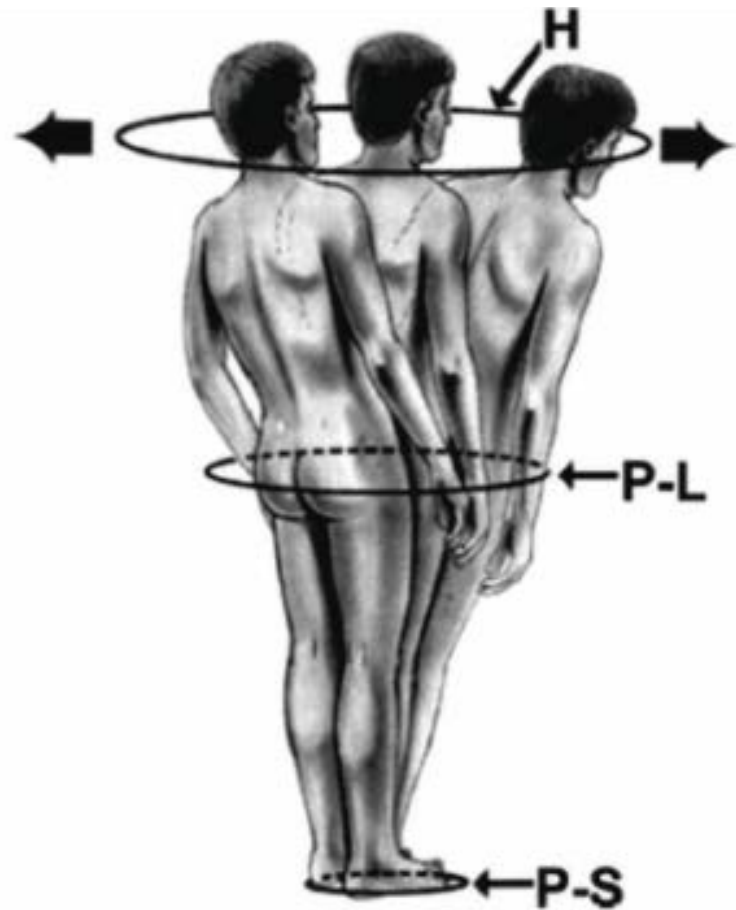
ASD – DEFINITION

- Malalignment of the spine
 - Segmental
 - Regional
 - Global
-



SPINAL ALIGNMENT

- Critical for maintenance of upright posture
- Stability of the axial skeleton
- Minimal muscular energy expenditure



ASD

- Scoliosis
 - Sagittal malalignment
 - Kyphosis
 - Spondylolisthesis
 - Axial plane deformity
-



SCOLIOSIS

- Sequelae of childhood deformity
 - De novo (degenerative)
-



ASD– OTHER CAUSES

- Trauma
 - Tumor
 - Infection
 - Inflammatory conditions
 - Post-surgical (Iatrogenic)
-



POST-SURGICAL (IATROGENIC) ASD

- Destabilization
- Malalignment



ASD – PREVALENCE

- As high as 32% in general population
 - Up to 68% in people over age 65
 - With U.S. population growth--the number of older adults with ASD is estimated to be more than 60 million by 2050
-

ASD--Economics

- Aging population
 - More co-morbidities
 - Increasing number of people with ASD

 - Growing strain on health care resources
 - Important to develop evidence-based approaches
 - If we don't, policy makers and 3rd party payors will
-

ASD—Indications for surgery

- Should we treat ASD surgically?
-

Impact of ASD

- Measurable effect on physical and mental health
 - Back pain, neurologic symptoms, difficulty standing upright, and functional limitations
 - Marked disability when compared to the general U.S. population
 - Impact worsens with age
-

Operative treatment of ASD

- Improved function and health status and reduced pain

Furthermore....

- Elderly gain a disproportionately greater improvement in disability and pain despite a higher complication rate
-

Indications for Surgery in ASD

- Not as clear cut as for AIS
 - Typically related to curve magnitude and/or progression in AIS
 - Adults more often seek care for for pain and disability due to **degenerative disease** and **malalignment**
 - Curve magnitude may not be the major issue in ASD
-

ASD vs AIS

- Co-morbidities
 - Bone quality
 - Stiffness
 - Sagittal malalignment
 - Need for neurologic decompression
 - Frequently require fusion to sacrum
-



Surgical Treatment of ASD

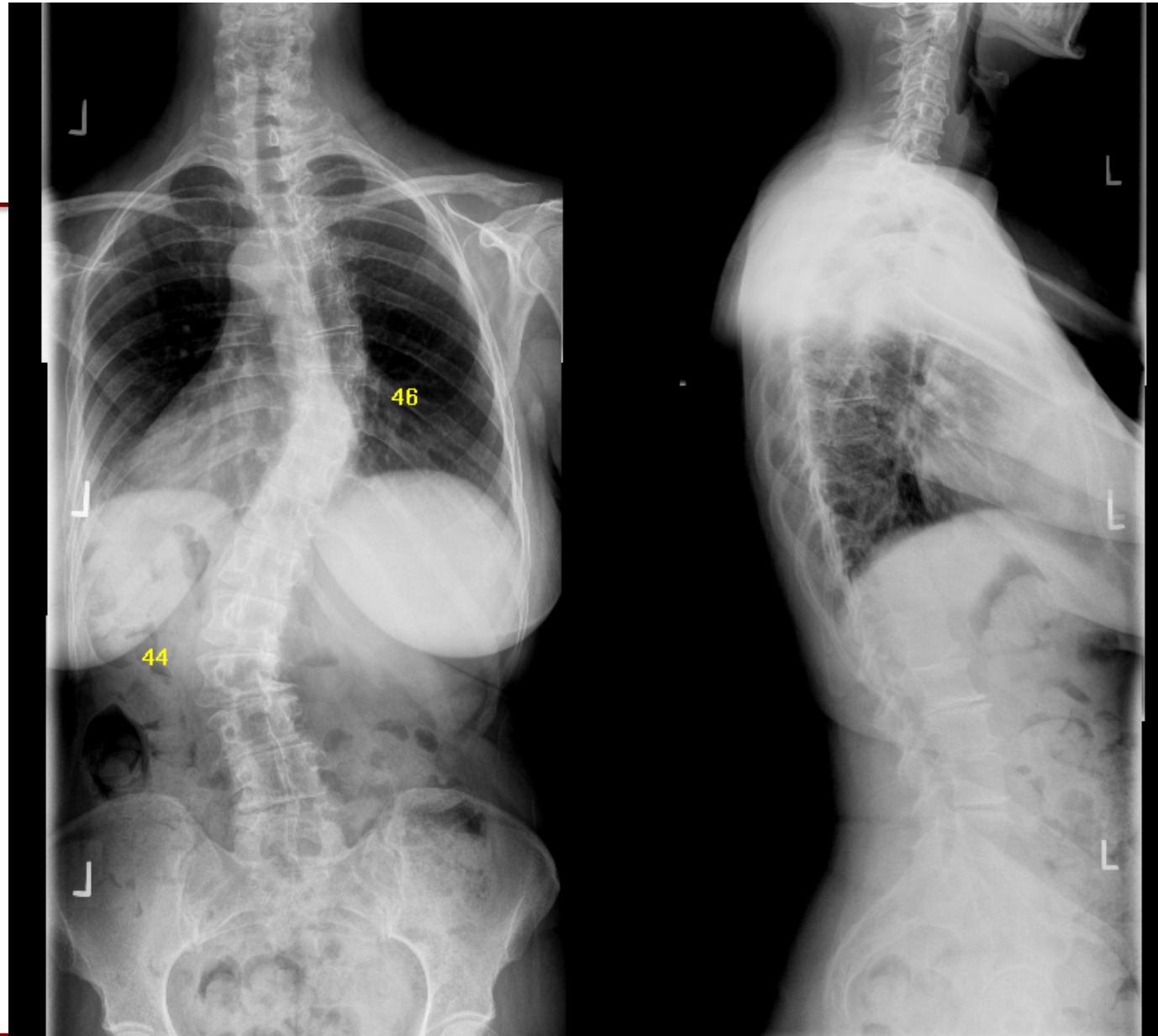
- Wide variability in the indications, surgical techniques and post-op care
 - Difficult to develop **Appropriate Use Criteria** and still be responsive to these variables (Berven)
-

A.H. 56 yo F physician

AIS as a child

Progressive painful
scoliosis

Healthy, exercises
regularly, nonsmoker,
No narcotics



A.H.

5 yr post-op

No surgical complications

Minimal pain



J.P. 70 yo F

Severe back and LE pain

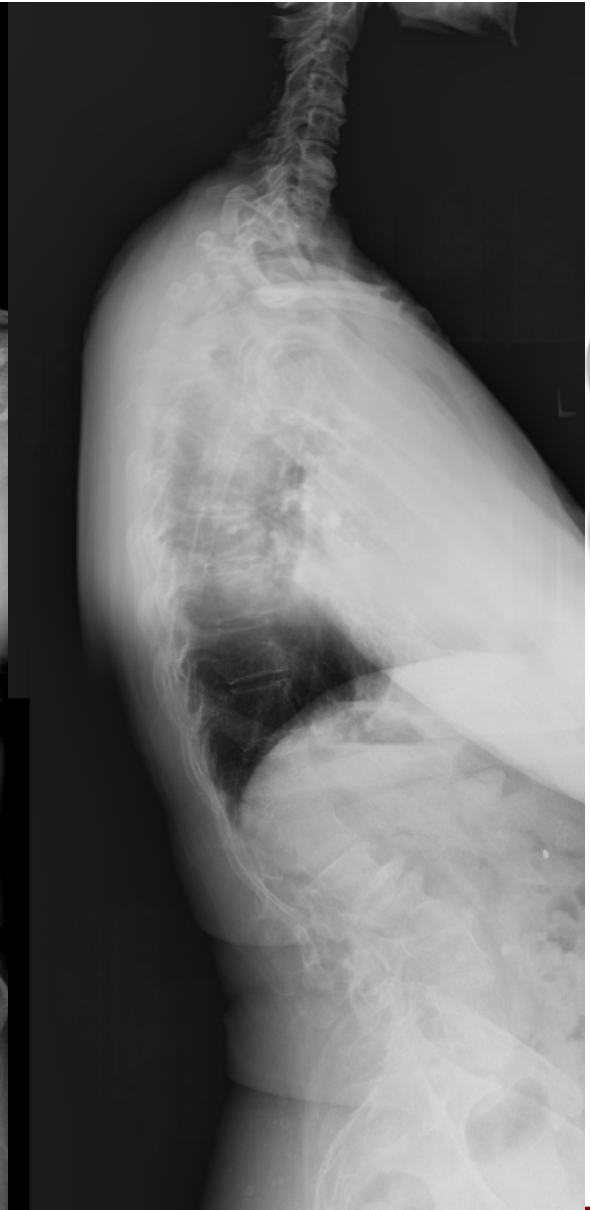
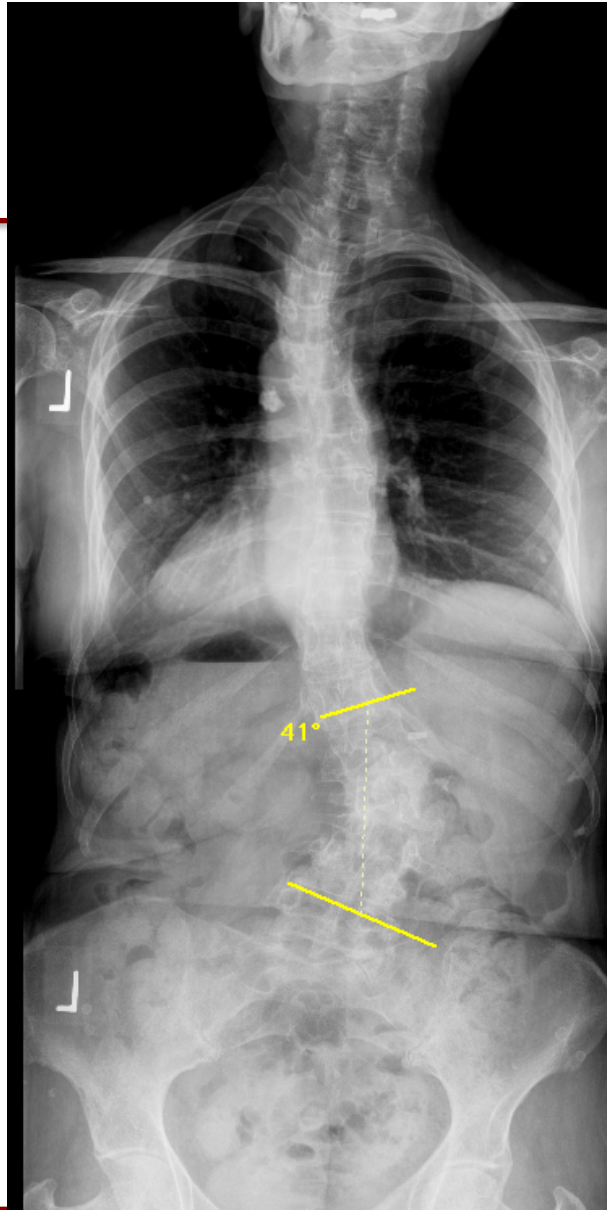
Progressive curve

Lumbar stenosis

Osteopenia, HTN,

Deconditioned

Narcotic use



J.P.

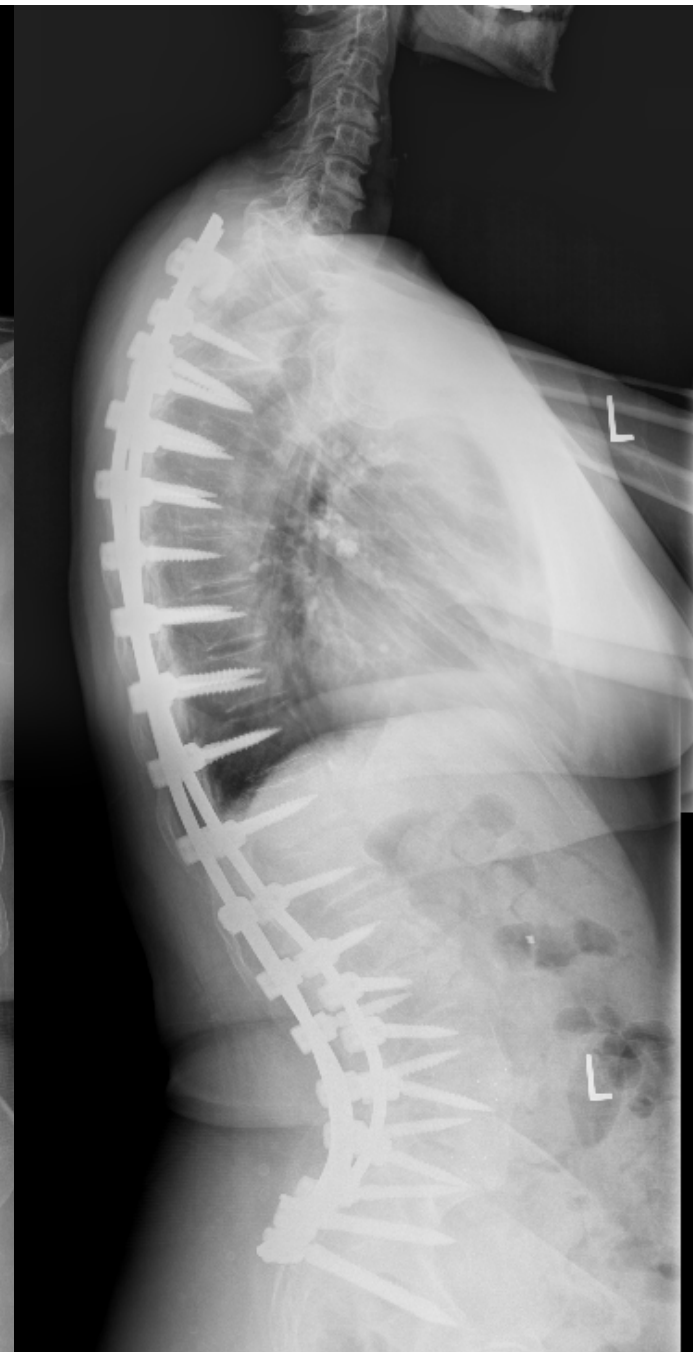
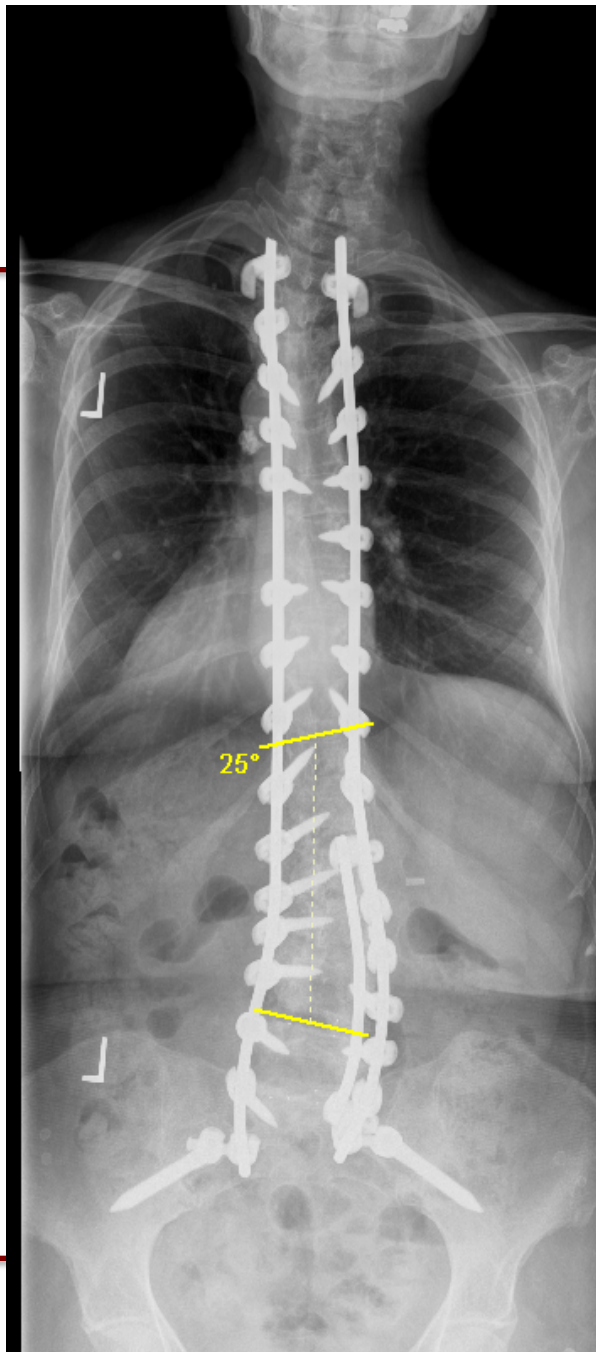
- Different risk profile than A.H.
 - Goal is to optimize patient
 - Placed on a 1 year course of Forteo, daily walking, and weaned from narcotics
-

JP

1 year PO

Mod LBP

No LE sx



Principle

Surgical **indications** and **goals** may not be the same for all patients with ASD



Surgical Indications

- Vary depending on:
 - Risk stratification
 - Patient expectations and desires
 - Shared decision making
-

V.B. 63 yo F

Back and LE
pain

No relief
with PT and
injections



V.B.

3 years PO T4-S1 fusion,
Lam/TLIF L4-5 and L5-S1,
Bilateral iliac screws

C/O of some upper
thoracic pain

No LE sx

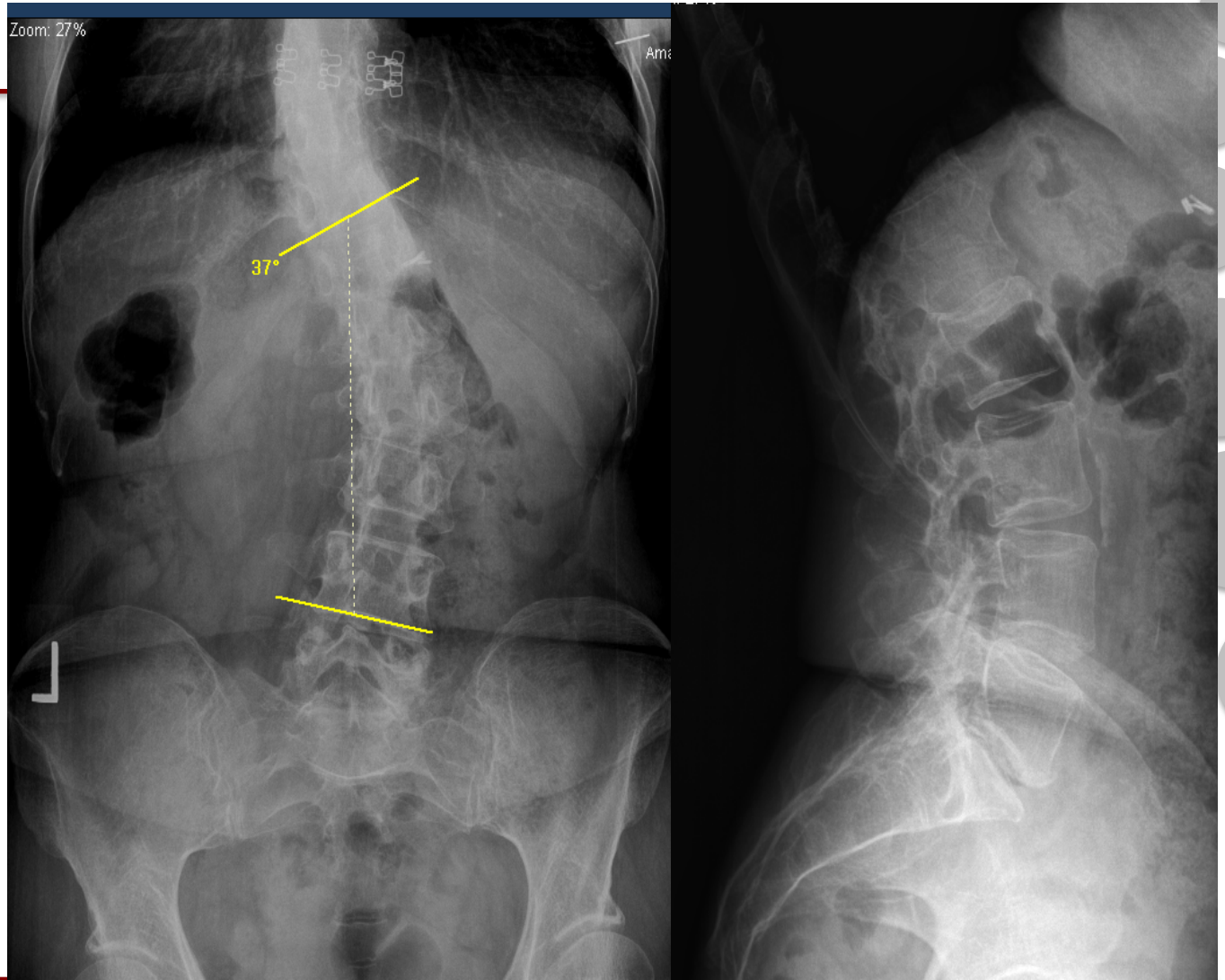
Very happy
Working as a teacher



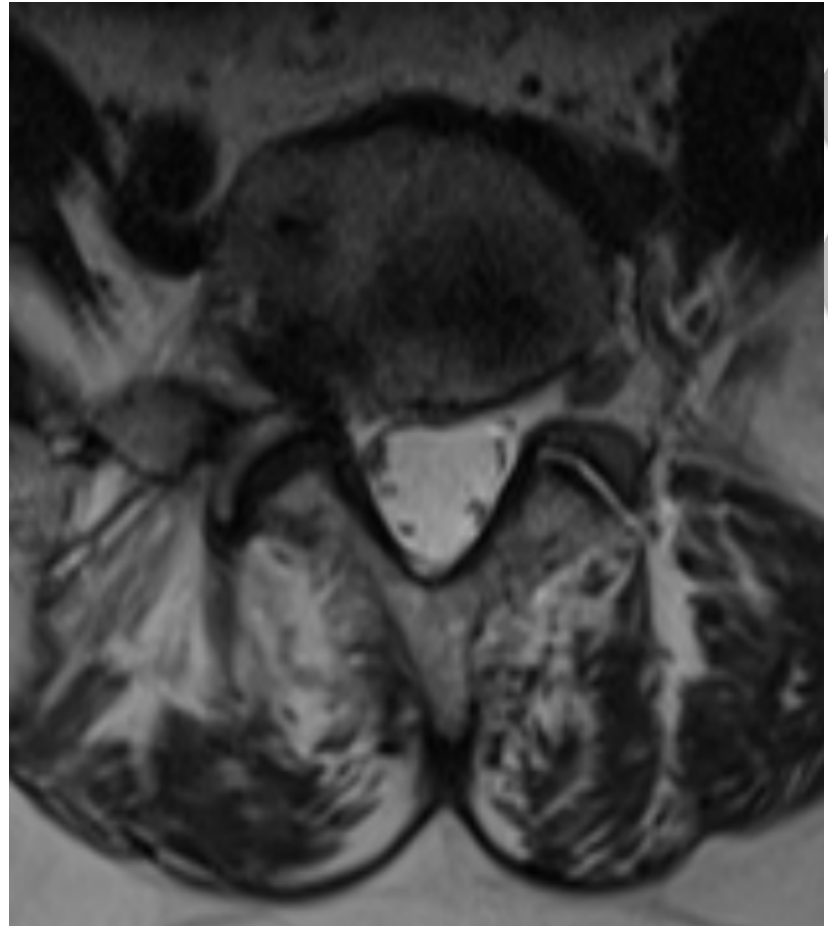
S.B. 65 yo F

RLE pain

Mild LBP



S.B.

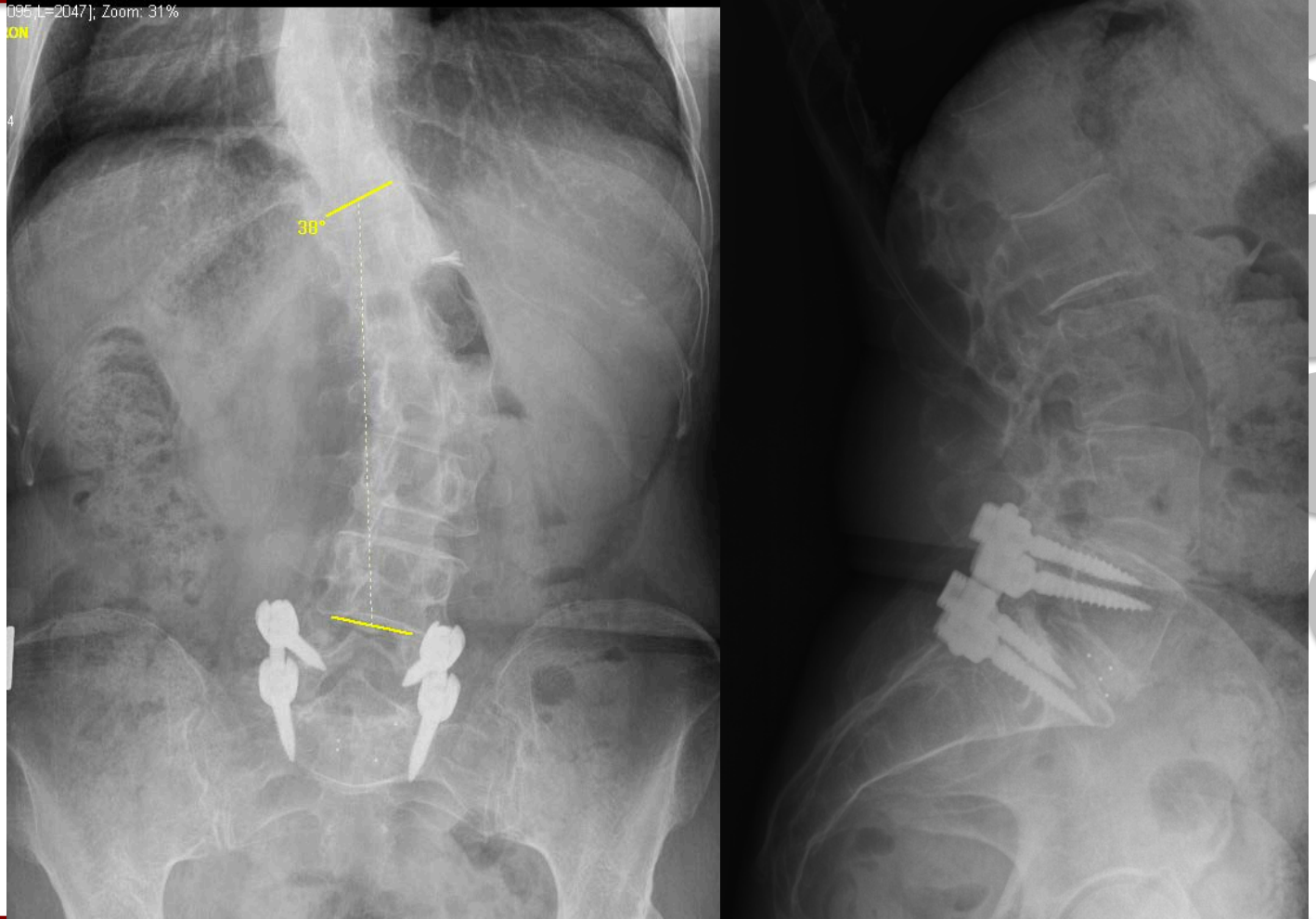


S.B.

1.5 years PO
TLIF/PSF

No LE pain

No back pain



Non-surgical Treatment of ASD

- Physical Therapy
 - Chiropractic
 - Accupuncture
 - Medication
 - Injections
 - Bracing
-



Non-surgical Treatment of ASD

- No evidence for improvement in HRQL
 - Accounts for the largest component of increased costs over past decade
 - We all still do it
 - Need evidence-based pathways
-

Indications for Surgery in ASD

Thoracic Curves

- Few adults seek surgical treatment for isolated thoracic scoliosis
 - Young adults with significant curves
 - Concern for self-image
-

Thoracic Scoliosis

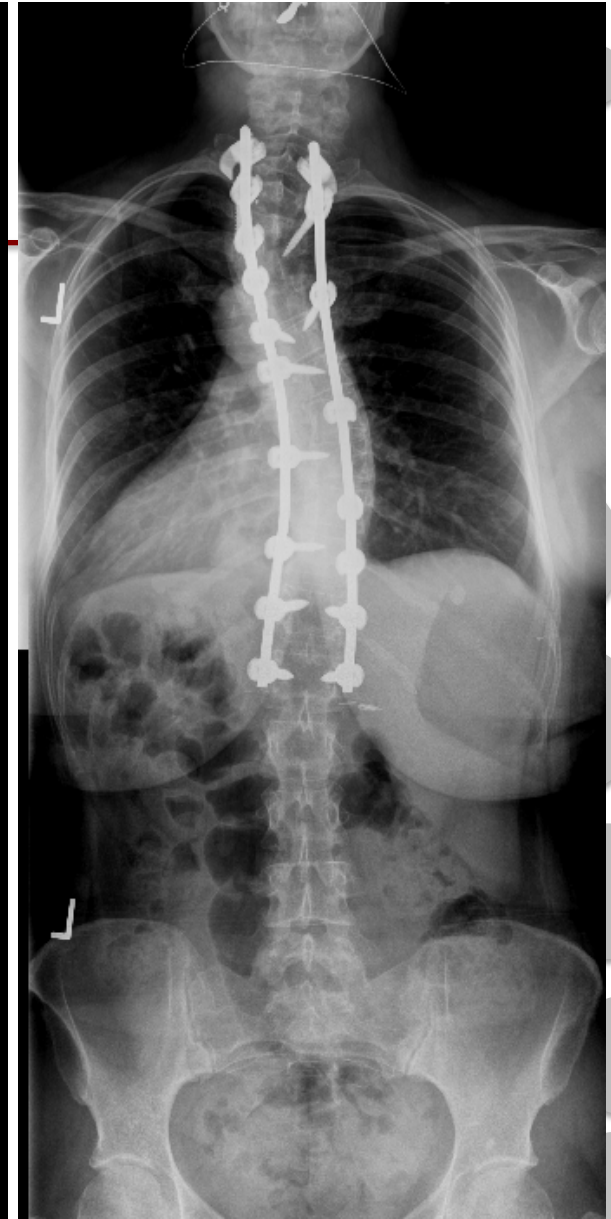
- Thoracic curves > 50 degrees tend to progress
 - Can consider surgery depending on symptoms and concern for deformity
 - If symptoms are manageable, observe for progression
 - Selective thoracic fusion can be considered
 - Younger patients
 - No significant lumbar pathology
-

W. McG 47 y.o. F

Progressive
thoracic curve

Thoracic back pain

No LBP



Lumbar/Thoracolumbar Curves

- Majority of ASD patients seeking care
 - Degree of curvature not as important
 - **Surgery indicated** for:
 - Progressive curves
 - Severe back and/or LE symptoms unresponsive to non-operative care
 - Neurologic involvement
 - Symptomatic sagittal malalignment
-

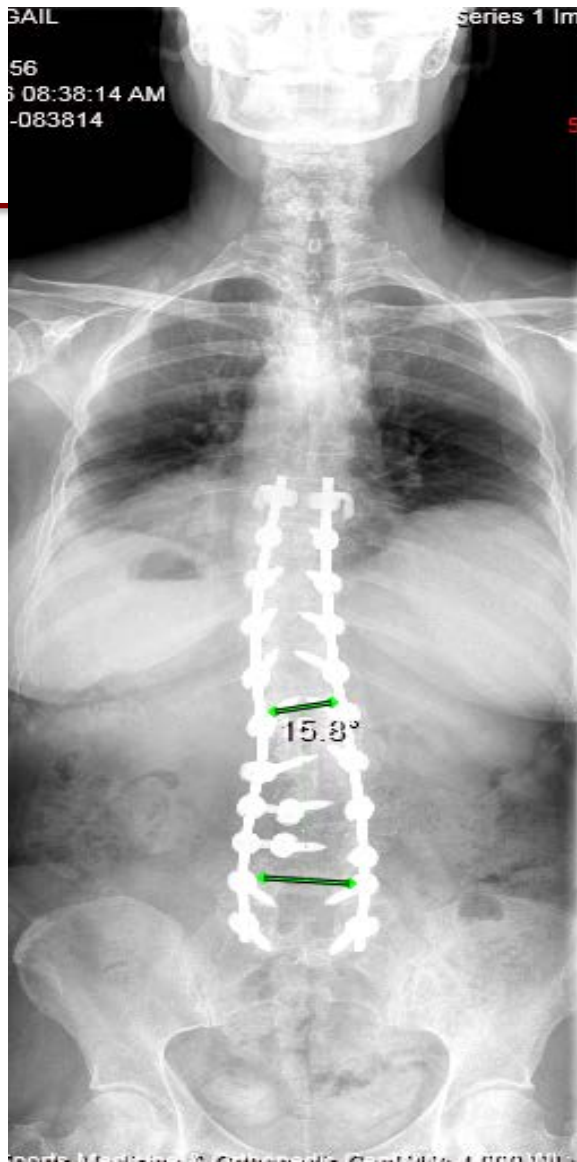
G.A. 58 yo F LBP, Bil LE sx

3 prior lumbar surgeries, L5-S1 fusion

MRI: severe stenosis L4-5

Tx: PT, ESIs, meds





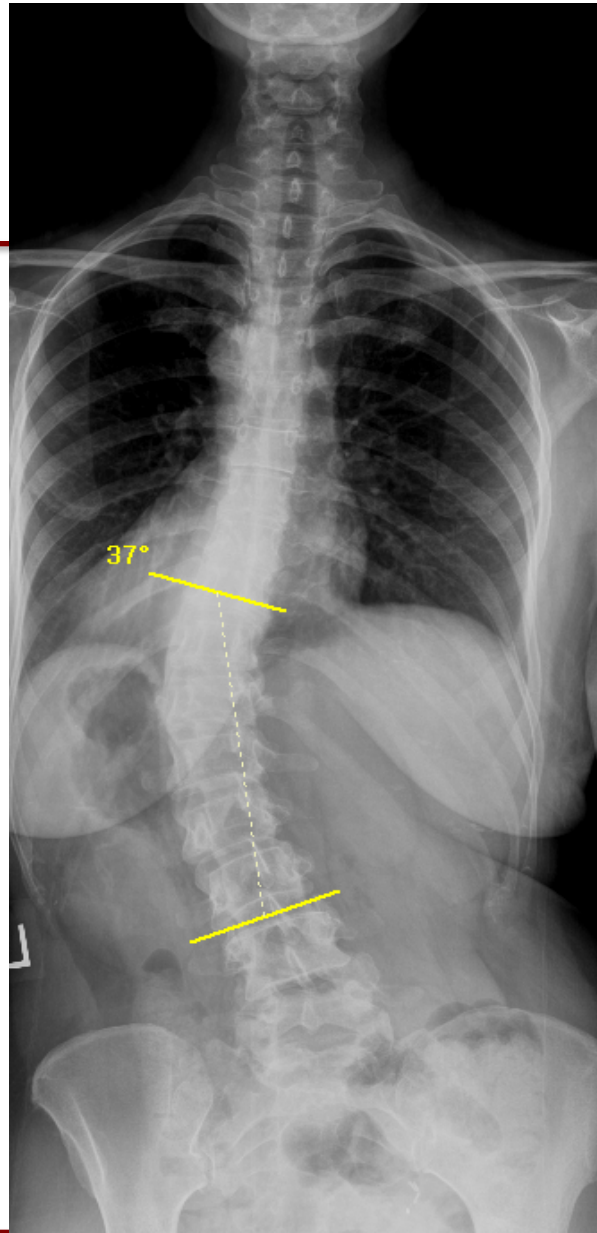
G.A.
2 Year post-op:
Lam/TLIF L3-4,
L4-5
PSF/Instr T8-S1
(Prior fusion L5-
S1)

No LE Sxs
Mild-Mod LBP
Off Narcotics

K.A. 47 y.o. F

Progressive curve

LBP, LLE pain



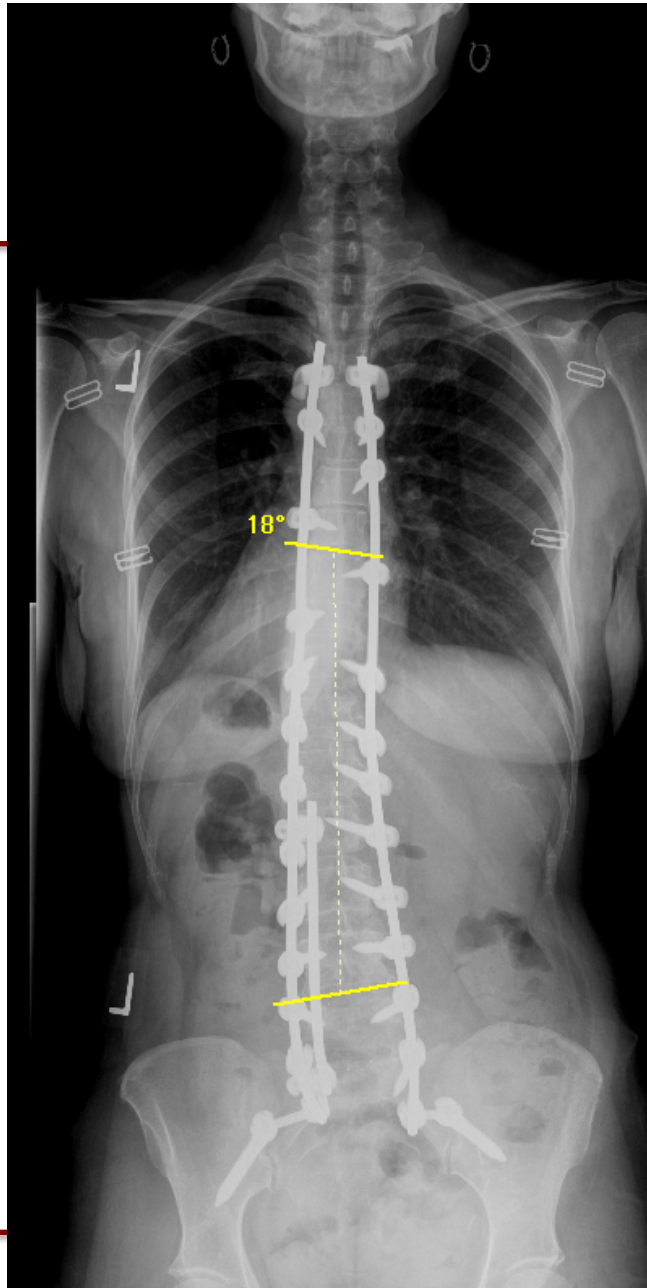
K.A.

1 Year PO

Mod
interscapular pain

Mild LBP

No LE sxS



Fusion to the Sacrum

- Most adults with symptomatic Lumbar and T/L curves have L/S pathology
 - May be avoided in selected younger patients with “healthy” L4-5 and L5-S1 segments
 - High risk of distal junctional pathology if fused to L-5
-

Goals of Surgical Treatment in ASD

- Reduction of Pain and disability
 - Safety
 - Cost effectiveness
-



Reduction of Pain and Disability

- Restore alignment
 - Decompress neural elements as needed
 - Maintain alignment
 - Stable fixation
 - Solid fusion
 - Avoid junctional pathology
-



Alignment

- Direct correlation between radiographic parameters and self-reported pain and disability
 - Sagittal alignment by far the most important
 - Overall alignment should be harmonious with:
 - Lumbar lordosis proportional to Pelvic incidence
 - Thoracic kyphosis proportional to lumbar lordosis
 - Global alignment (SVA, TPA)
-

Patient Safety

- Intertwined with every aspect of ASD surgery
 - Patient selection
 - Preoperative optimization
 - Surgical planning
 - Surgical technique and skills
 - Post-operative care
 - Management of complications
-

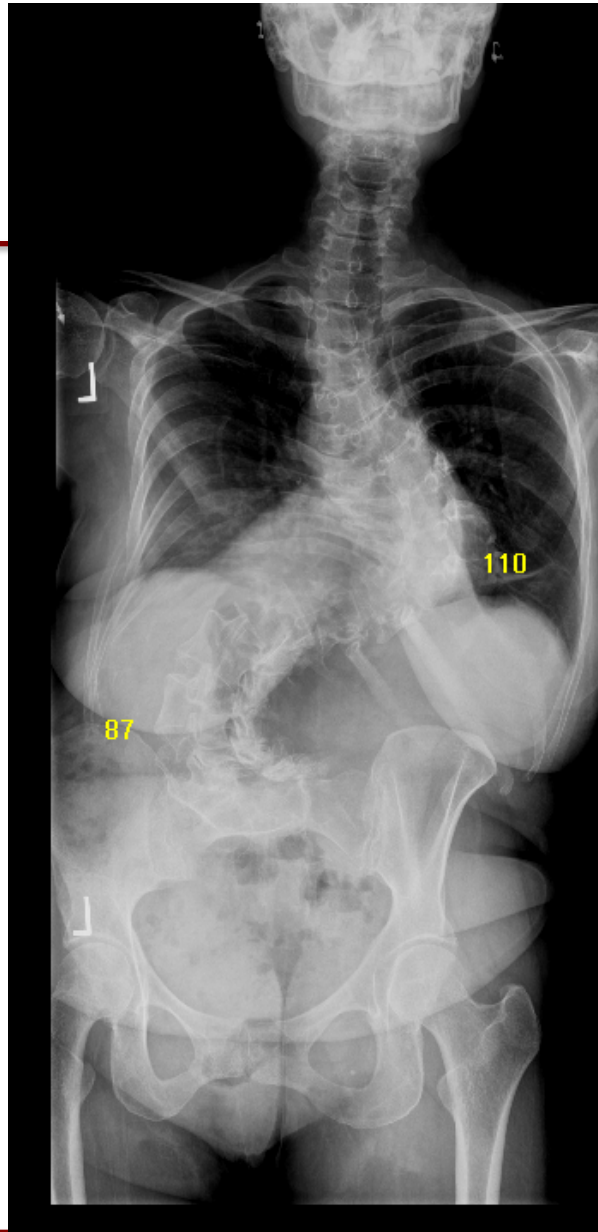
G.L. 50 yo Female

Scoliosis since
childhood

No prior treatment

LBP, Rt lower rib pain

Occasional SOB



G.L.

2 years post op

PSF T2-S1

No osteotomies

Trunk lengthened 6.5 cm



Cost Effectiveness

- Wide disparity in the cost of surgical treatment of ASD (location, surgeon preferences)
 - How can we help control costs?
 - Proper patient selection and optimization
 - Prudent use of implants, biologics, etc.
 - Avoid complications (especially unplanned return to OR)
-

Conclusion

- ASD has a significant impact on HRQL
 - Prevalence of ASD will continue to increase
 - Surgical treatment of ASD improves HRQL
 - Wide variability in surgical indications
 - Direct correlation between radiographic parameters and self-reported pain and disability (sagittal alignment most important)
 - Current economics are not sustainable
-

THANK YOU!

