

Approaching the Patient with Thoracolumbar Deformity

Innovasis Spine Symposium 2018:

*An Evidence-Based Approach to the Management of Spinal
Disorders*

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Deformity Logic

IF...

- Life (Gravity) α Poor Sag Balance and Pelvic retroversion (Sir Isaac Newton)
 - Poor Sagittal Balance α Pain and Disability (Glassman et al)
 - Pelvic Retroversion α Pain and Disability (Schwab et al)
-

Then...

- Life α Pain
-

Conclusion:

- Enjoy it while you can!!!

2 Main Issues

- Identifying reasonable candidates
- Achieving spinal balance.

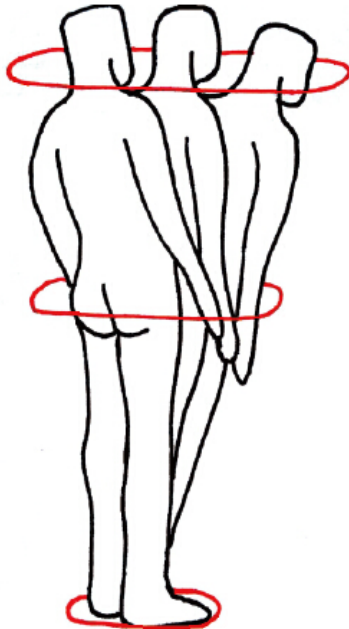


Figure 2 Hen in the center of this "cone of economy" the body may remain in an ergonomically favorable erect position. Larger deviations outside this cone will require external support to be rebalanced.



Patient Selection

- Pain:
 - Location and pattern
 - Back vs Leg
 - If Axial/Back:
 - Flat back?
 - Mechanical and relieved with rest?
 - At apex?
 - If Radicular/Leg:
 - Mono-radicular?
 - Reproduce with side bending?
- Flatback:
 - Muscle fatigue with standing
 - Lower lumbar
 - Complete relief with leaning or sitting
 - More bent over course of the day

Patient Selection

- Demographics
 - Age
 - Physiologic Age
 - > 75
 - Older patients may do better
 - Comorbidities
 - Major Cardiac
 - Prev PE
 - Stroke
 - Dementia
 - Renal
 - Morbid Obesity
 - Immunodeficiency
- Bone Health
 - Osteoporosis: DEXA < -2.5
 - Should check on everyone
 - Pre-op optimization
- Tobacco
- ETOH
- BMI < 40

Patient Selection

- Psychosocial
 - Depression History
 - Employment status
 - Can they return?
 - What's realistic?
 - Marital Status
 - * Family support/engagement (can be a disaster)
- Setting realistic expectations
 - Back pain vs leg pain relief
 - PJK risk
 - 50% complication rate
 - Revision surgery risk
 - Timing on return to work
- Self-reported outcomes
 - ODI, VAS, SRS-22, SF-36, Eq5D

TABLE 1. Factors included in the ASD-FI

Health deficits
Documented by physician
>3 medical problems
Body mass index <18.5 or >30 kg/m ²
Cancer
Cardiac disease
Currently on disability
Depression
Diabetes
Hypertension
Liver disease
Lung disease
Osteoporosis
Peripheral vascular disease
Previous blood clot (deep vein thrombosis/pulmonary embolism/ stroke)
Smoking status
Patient-reported (questionnaire, question no.)
Bladder incontinence
Bowel incontinence
Deteriorating health this yr (SF-36v2, 2)
Difficulty climbing 1 flight of stairs (SF-36v2, 3e)
Difficulty driving a car (LSDI, 3)
Difficulty getting dressed (SF-36v2, 3j; LSDI, 1 & 2)
Difficulty getting in/out of bed (LSDI, 6)
Difficulty sleeping >6 hrs (ODI, 7)
Difficulty walking 100 yards (SF-36v2, 3i)
Difficulty w/ light activity (SF-36v2, 3b)
Feeling downhearted/depressed most of the time (SF-36v2, 9f; SRS-22r, 16)
Feeling tired most of the time (SF-36v2, 9i)
Feeling worn out most of the time (SF-36v2, 9g)
General health: fair/poor (SF-36v2, 1)
Inability to bathe w/o assistance (SF-36v2, 3j; LSDI, 8)
Inability to cheer up often (SF-36v2, 9c; SRS-22r, 7)
Inability to do normal work/schoolwork/housework (ODI, 10; SRS-22r, 9 & 12)
Inability to lift heavy objects (SF-36v2, 3c; ODI, 3)
Inability to travel >1 hr (ODI, 9)
Inability to walk w/o assistive device (ODI, 4)
Leg weakness
Loss of balance
Not in excellent health (SF-36v2, 11d)
Personal care dependency (ODI, 2)
Restricted activity level (SRS-22r, 5)
Restricted social life (ODI, 8; SRS-22r, 14 & 18)

LSDI = Lumbar Stiffness Disability Index; ODI = Oswestry Disability Index;
SF-36v2 = 36-Item Short-Form Health Survey, version 2; SRS-22r = Scoliosis
Research Society-22r questionnaire.

Frailty Index

- 40 variables list:
(score=#items/40)
- Normal: 0-0.3
- Frail: 0.3-0.5
- Severely Frail: > 0.5
- Not practical for routine use

Poor Prognostic Signs*

- Hyphenated names
- More allergies to meds than meds
- Allergy to > 2 opioids
- Work for Soc Sec Admin
- Adults that bring stuffed animals
- Copper-colored hair
- Women with hats
- Ethnic attire of different ethnicity
- Sunglasses indoors
- Fibromyalgia
- Hair stylists
- Flight attendants
- Injuries caused by video games
- “horse people”
- “really high pain tolerance”
- Pain >> 10

*MedStar Union Memorial Residents and Staff: 2008-present

Physical Exam

Coronal Deformity

- Is it flexible?
 - Side bending
- Passively correctible?
 - Hands on Apex
- Where is it?

Sagittal Deformity

- Is it fixed?
 - AS
 - Previous surgery
 - Over bolster xray
- Compensated
 - pelvic retroversion?
 - Knees and Hips Flexed?
 - Scapula extended?
- Hip and Knee contracture
- Location? (upper thoracic, mid or lower thoracic, lumbar)



C7 Plumb: + 14cm. Not extending through lumbar spine!!

Physical Exam

- Neuro Exam
 - Should correlate with Plain films/MRI/CT

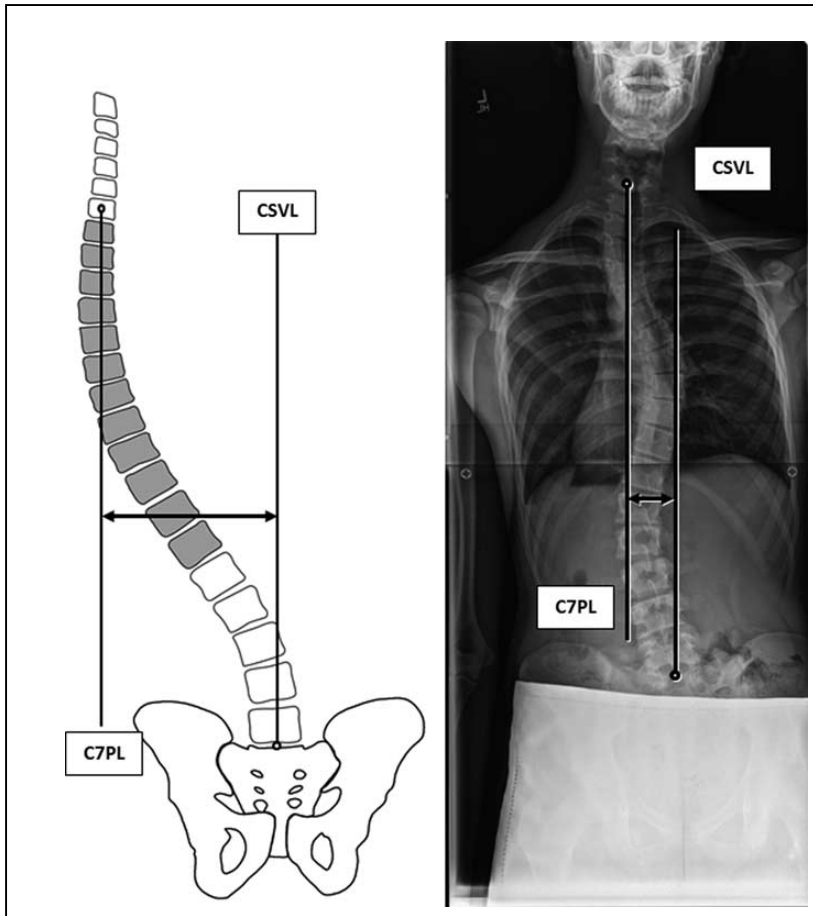


Radiographic Evaluation



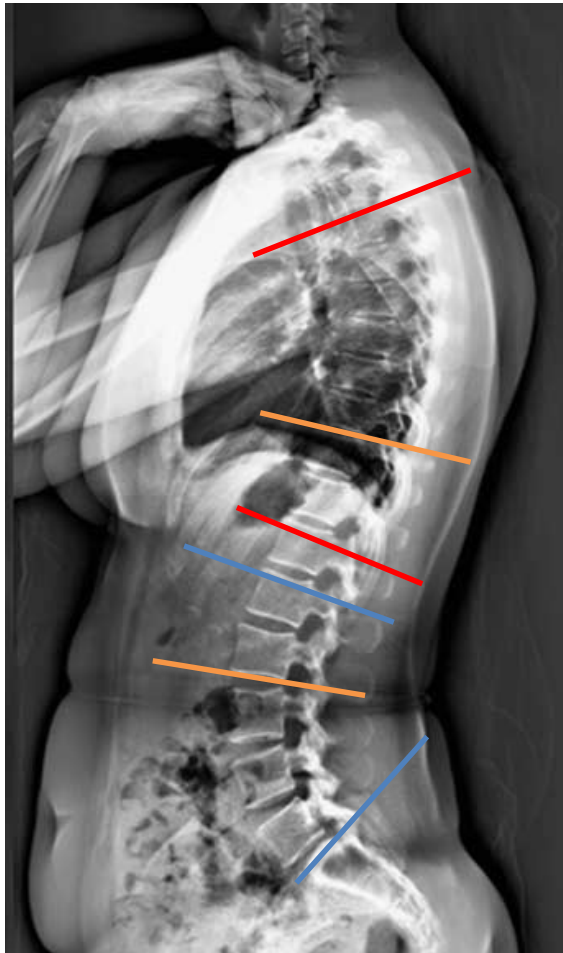
- PA and lateral full cassette radiograph
- Knees and hips fully extended
- No external support
- Arms folded and hands fisted over clavicle

Frontal Plane Analysis



- Cobb of all curves
 - T, T/L, L, and L/S fractional
- Lateral listhesis
- Coronal Alignment (C7 plumb to CSVL) (<4cm)

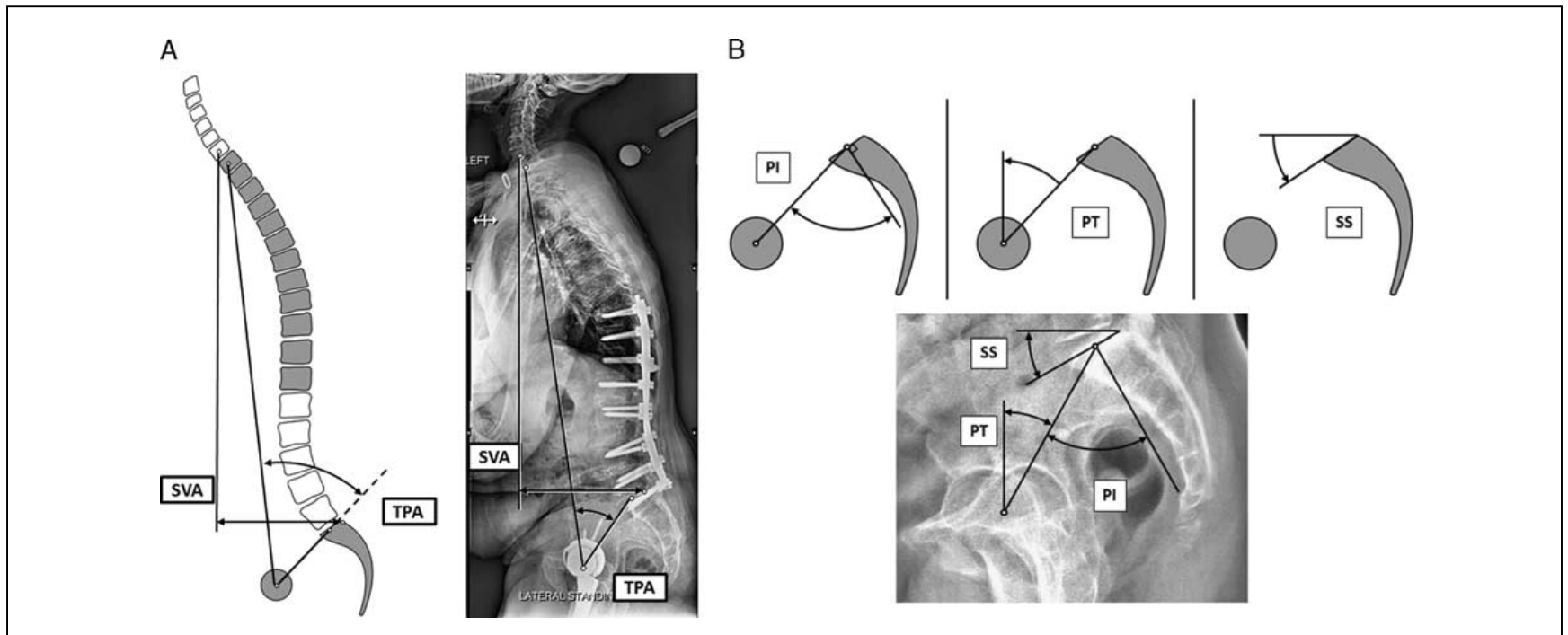
Sagittal Plane Analysis



- Regional
 - TK (T4-T12)
 - TLK (T10-L2)
 - LL (L1-S1)

Sagittal Plane Analysis

- Global: SVA (normal < 4cm) and TPA (<10)
- Spinopelvic: PT (nl < 20) PI-LL (<10)



SRS-Schwab: Recognition of Importance of Sagittal plane (no coronal modifier!)

4 Coronal Curves Type

T Thoracic only

with lumbar curve $< 30^\circ$

L TL / Lumbar only

with thoracic curve $< 30^\circ$

D Double Curve

with at least one T and one TL/L,
both $> 30^\circ$

N No Coronal Curve

All coronal curves $< 30^\circ$

3 Sagittal Modifiers

PI minus LL

0 : within 10°

+ : moderate $10-20^\circ$

++ : marked $> 20^\circ$

Global alignment

0 : SVA $< 4\text{cm}$

+ : SVA 4 to 9.5cm

++ : SVA $> 9.5\text{cm}$

Pelvic Tilt

0 : PT $< 20^\circ$

+ : PT $20-30^\circ$

++ : PT $> 30^\circ$

Be watchful for non-structural scoliosis
(neither AIS of adulthood or degen de novo)



Preventing PJK: Guidelines for UIV selection^{1,2}

- Stable vertebra
- Neutrally rotated vertebra
- Horizontal vertebra and disc above
- Above apex of kyphosis
- Achieve sagittal balance
- No listhesis above
- Check proximal disc, facet, and ligaments
- Consider UIV angle
- Consider distance between UIV and SVA
- Educate patient, PT, nurses
- PRAY!



(1) Shufflebarger et al Spine 31(19) 2006

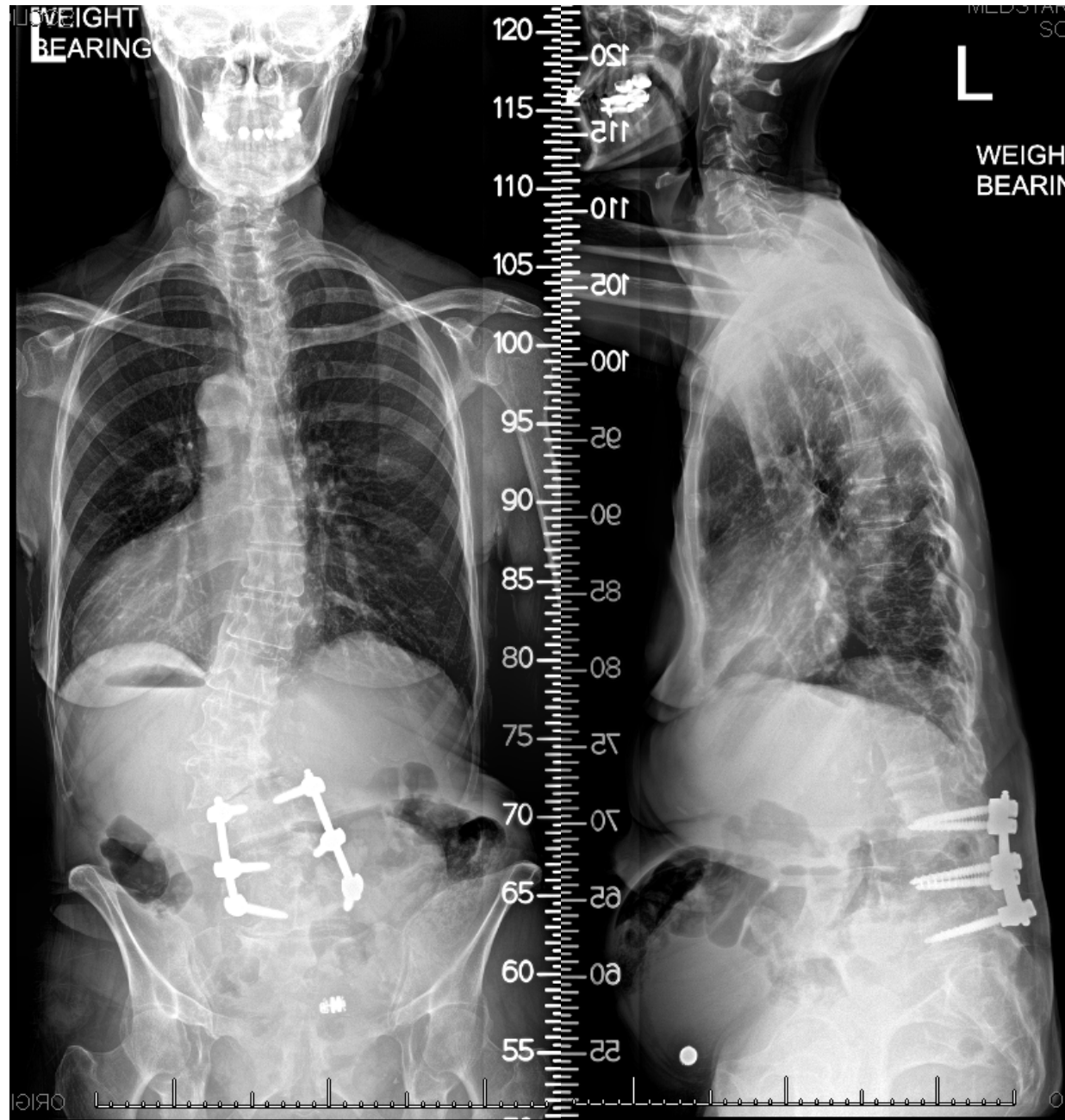
(2) Bridwell et KH J. Neurosurg Spine 1 2004

Temper Correction with Age

<35	17.7	26.2	9.49	11.1	-11.3	29.2	-29.1	4.4
35-44	8.8	40.7	11.77	15.5	-6.2	21.9	-4.0	10.0
45-54	19.9	51.2	15.43	18.9	-1.7	16.4	16.5	14.5
55-64	28.0	60.5	20.87	22.1	3.3	11.1	37.0	18.8
65-74	19.5	69.7	24.62	25.2	7.5	6.1	55.6	22.8
≥74	6.2	79.6	32.54	28.8	13.7	0.2	79.9	27.8

Case

- 71 yo female
- PMHx
 - Anemia
 - HTN
 - TIA
 - Fibromyalgia
 - Prev L3-5
 - No Tob
 - No ETOH
 - BMI: 16
- Exam
 - Pos Sag Balance
 - NI Neuro



Case

Coronal Plane

- C7-CVDL: 3.7cm
- Cobb: T12-L2 = 42 deg
- R Fx'l: L3-S1 = 19 deg
- Listhesis: 1.8 cm
- L2 trapped

SRS-Schwab

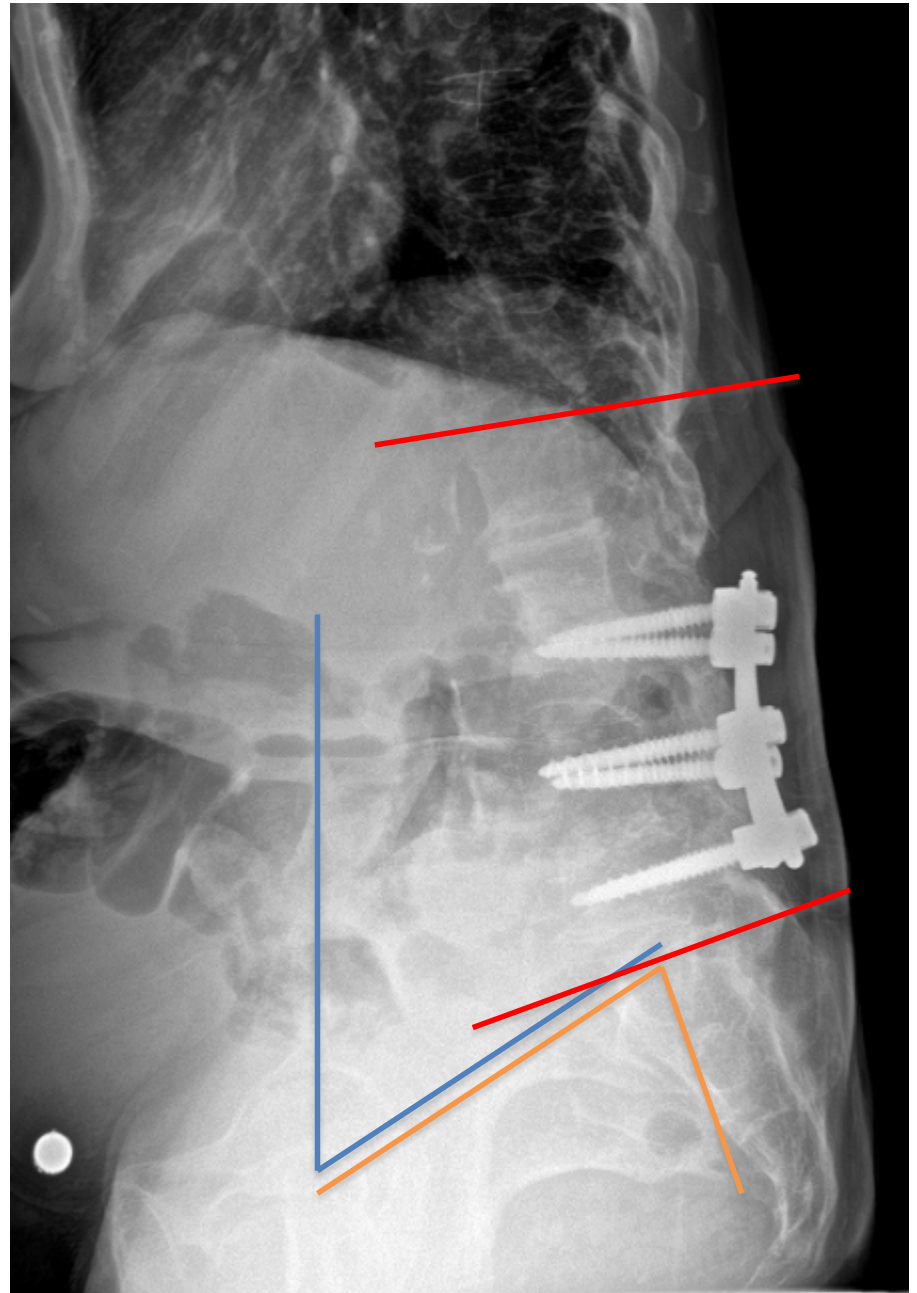
“L”



Case

Sagittal Plane

- Regional
 - TK: 20 deg
- Global: ++
 - SVA: + 14cm (>9.5)
 - TPA: 59 deg (severe > 20)
- Spinopelvic:
 - PT: 53 deg (++) (>30)
 - LL: 11 deg
 - PI: 73 deg
 - PI-LL: 62 deg (++) (>20)



SRS-Schwab: L, ++, ++, ++



Age-Dependent Needs

- PI-LL: 62 deg
 - Goal < 10
 - Need 52 deg
- TPA: 59 deg
 - Goal < 28
 - Need: 31 deg
- SVA: +14cm
 - Goal < 8 cm
 - Need 6 cm (@2mm/deg)
 - Need 30 deg

Estimated Needs: 40 deg Lordosis

Plan

Back-Front-Back

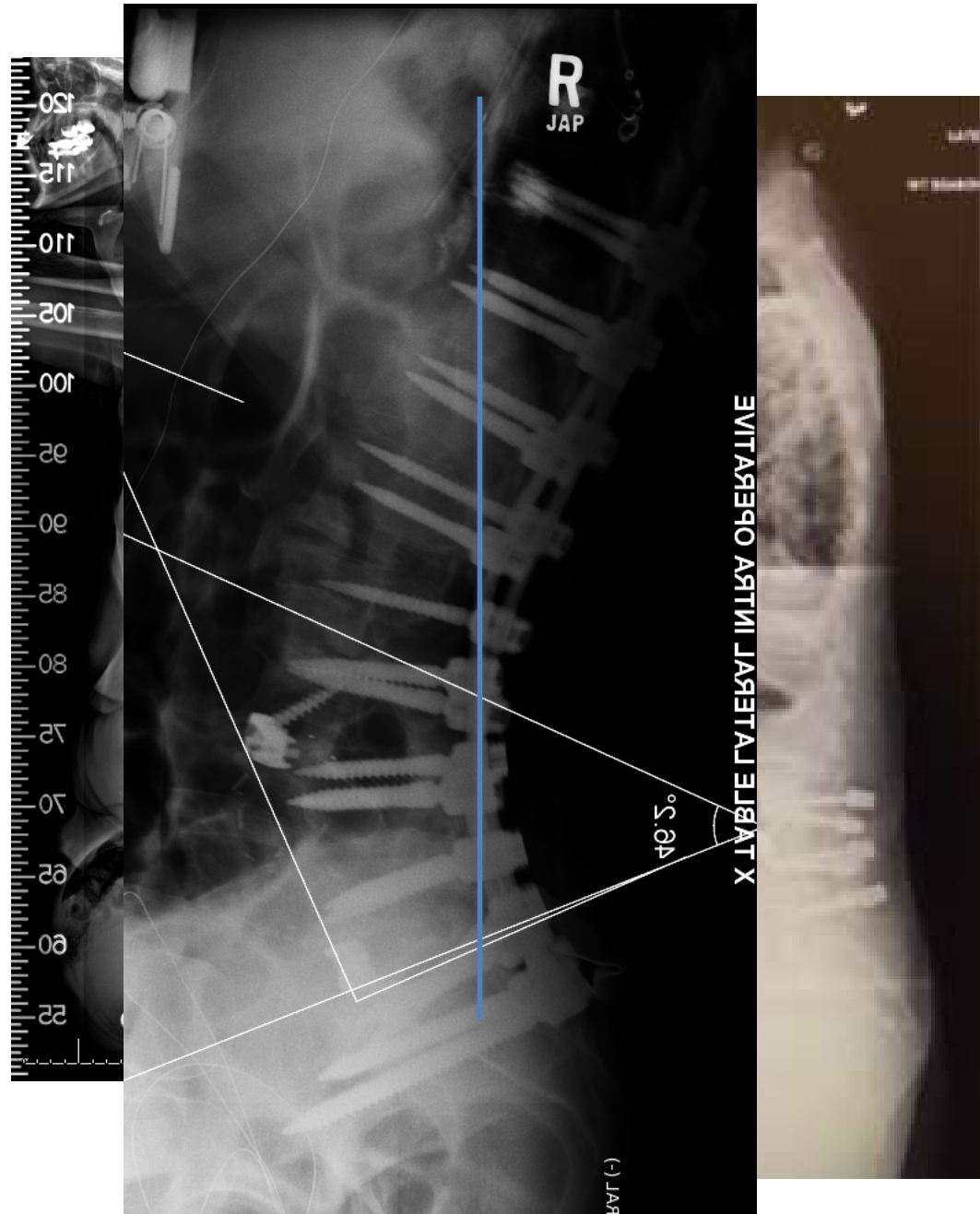
Stage I:

- Removal and Osteotomy L3/4, L5/S1
- Hyperlordotic ALIF: L3/4, L5/S1

Standing Assessment

Stage II:

- Ponte T10-L2
- PSF/Inst T10-Pelvis
- Cement Aug



Results

3 month f-u

Sagittal

SVA: 0 cm (14)

LL: 62 (11)

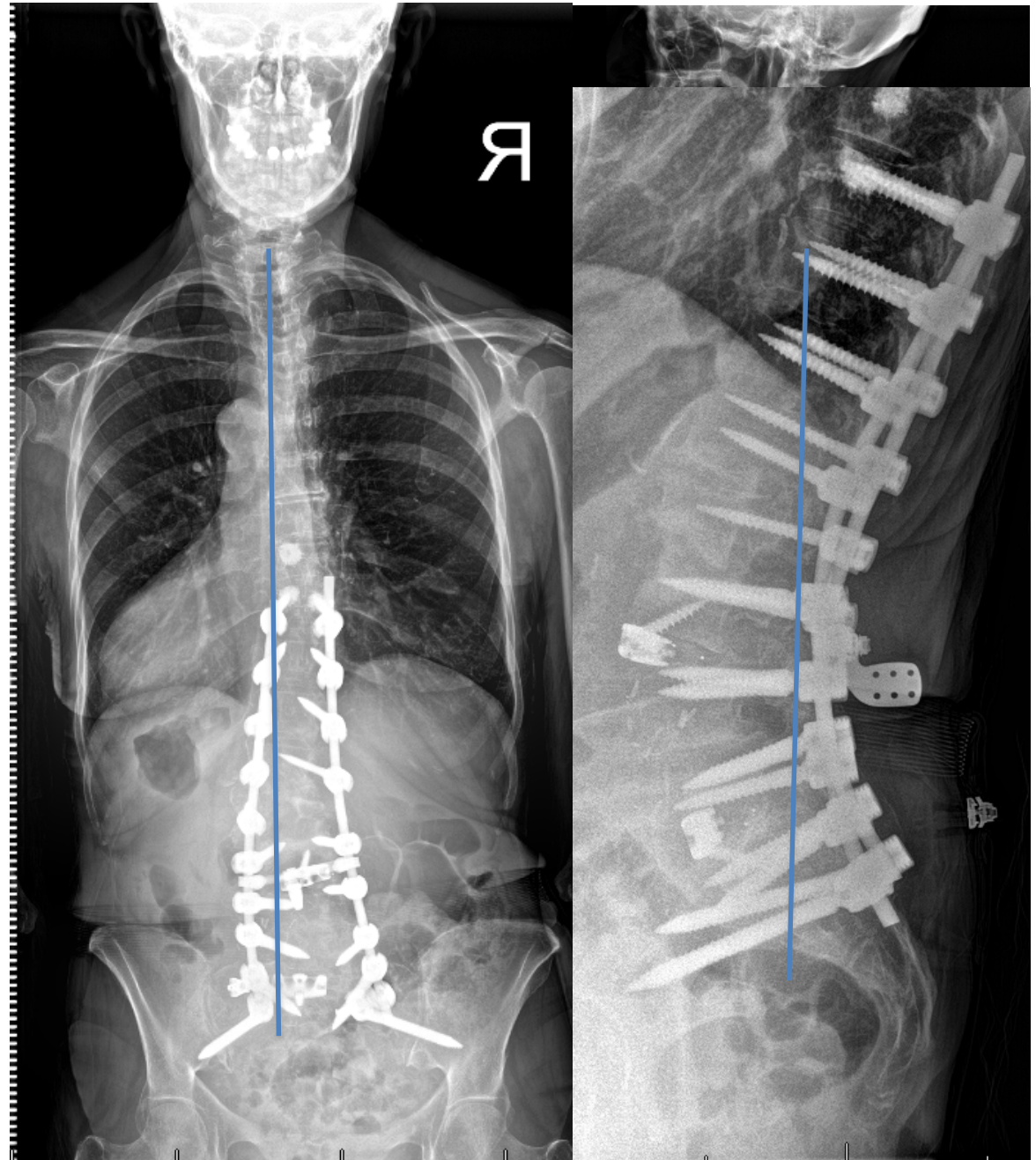
PI-LL= 9 (62)

TPA= 35 (59)

PT= 42 (53)

Coronal

C7-CVDL= 2cm



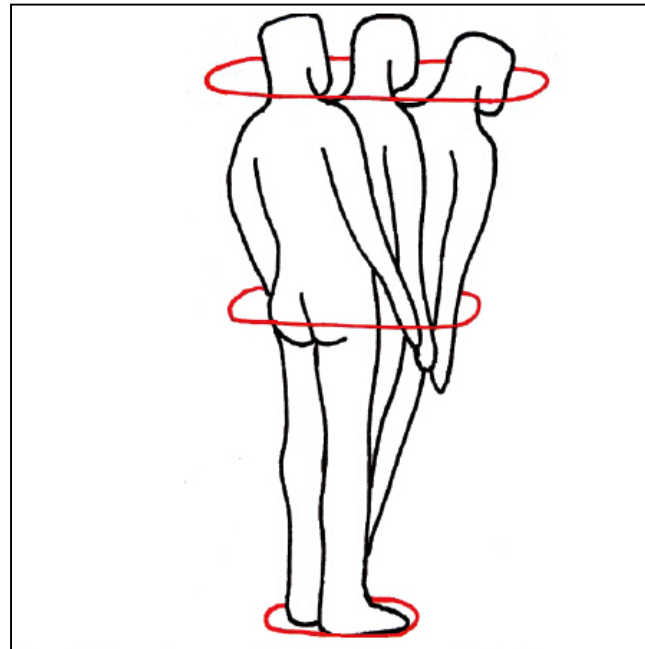
Summary

Patient Selection

- Honest Assessment
- Back Pain vs Leg Pain
 - What will likely get better
 - Residual disability?
- Major Red Flags
 - Frail

Restoring the Cone of Economy

- Age-dependent
- Protect the Junction



THANKS!



THANKS!

