

## LESSONS LEARNED FROM ADULTS WITH EOS: WHAT CAN EOS SURGEONS DO BETTER?

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## DISCLOSURES

Last 36 months

**Royalties:** Medtronic (substantial), Quality Medical Publishing (minor).

**Consulting:**

**Grants:** Axial Biotech, DePuy-Synthes Spine.

**Board:** Scoliosis Research Society.

**Philanthropic/Society Research Funding:** Fox Family (Prospective Pediatric Spinal Deformity study); AOSpine & SRS (Scoli-Risk 1 study).

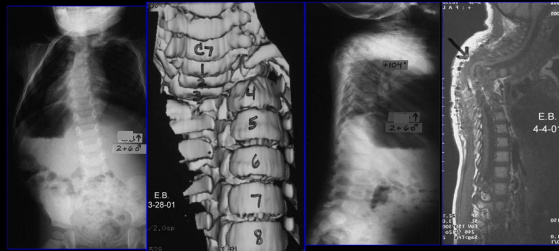
**Fellowship Funding:** AOSpine North America (funds/fellow year).

**Speakers' Bureau:** DePuy-Synthes Spine, K2M (monies donated to private foundation)

**Travel/Accommodations:** AMCICO, AOSpine, BroadWater, COA, DePuy-Synthes, Dubai Spine Society, Medtronic, SOSORT, SRS, SSF, The Spinal Research Foundation.

**Editorial:** Associate Editorial Board of Spine, Editorial Board of the Journal of Spinal Disorders & Techniques and Scoliosis, Professional Advisory Board of Backtalk and the Scoliosis Association, Associate Board of the Journal of Neurosurgery: Spine, The Spine Journal, Associate Editor for iscoliosis.com and spineuniverse.com, Deputy Editor of Spine Deformity.

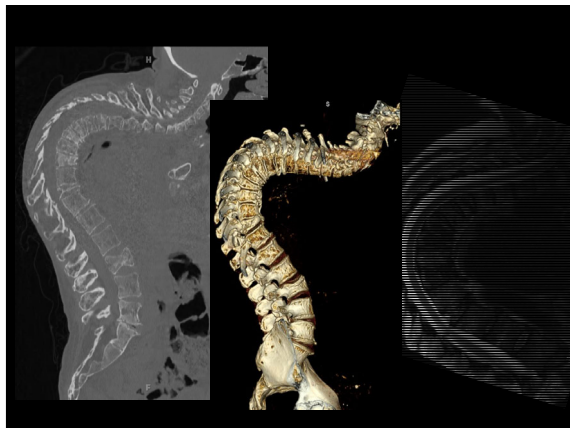
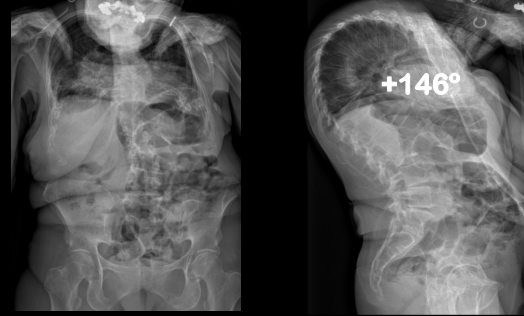
## CDS: AGE 2 + 6



3/5 STRENGTH, CAN STAND BUT  
CANNOT WALK!

## SEVERE THORACIC KYPHOSIS DUE TO MULTIPLE MYELOMA

62 Y/O

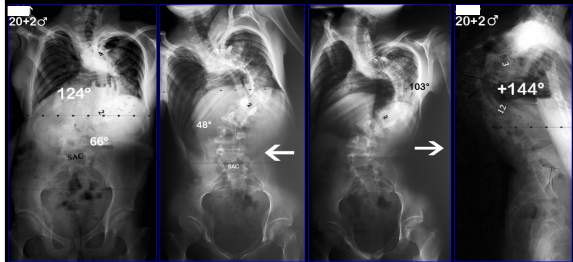


CHRONIC O2 NEEDED x 3  
YRS/NOT A BMT CANDIDATE!

## TOPICS COVERED

- In-Situ Fusions
- Angular Deformity
- Deformity-Induced Myelopathy
- Global Sagittal Alignment
- When to Consider Getting Additional Advice

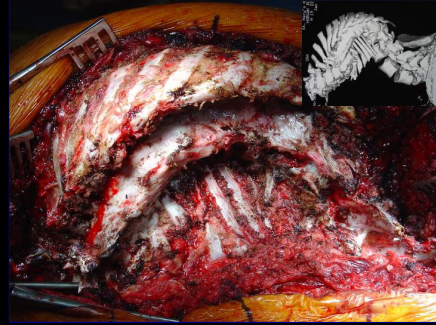
## IIS S/P T4-T12 IN-SITU PSF AGE 7



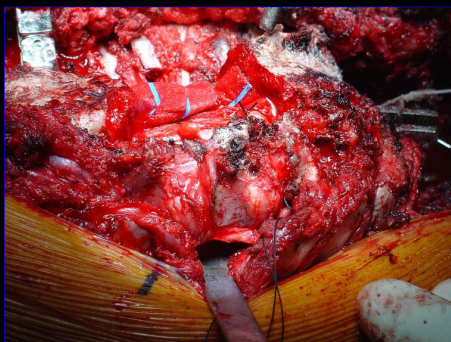
## CLINICAL PHOTOS



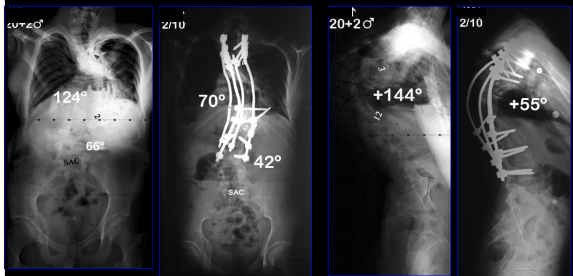
## SEVERE CRANKSHAFT



## CONVEX DISC/BODY EXCISION



## REV PSF T2-L4/2 LEVEL VCR



4 YEARS POSTOP

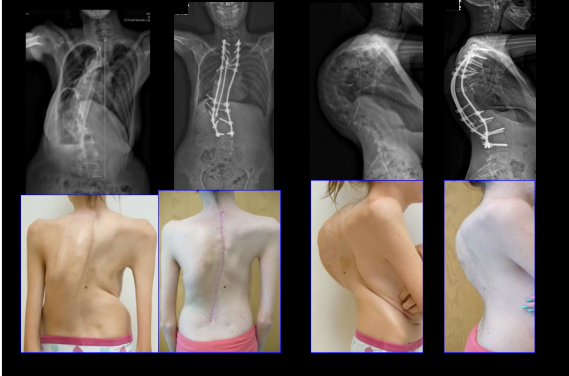
**PRE AND POSTOP CLINICAL PHOTOS**



**JUVENILE ONSET KYPHOSCOLIOSIS /CRANKSHAFT**



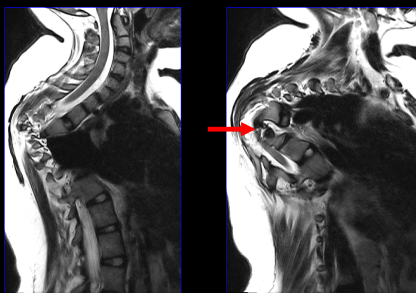
**PSF T1-L4/T9 VCR**



**CONG KYPHOSCOLIOSIS/MYELOPATHY**



**SC ATTENUATED**

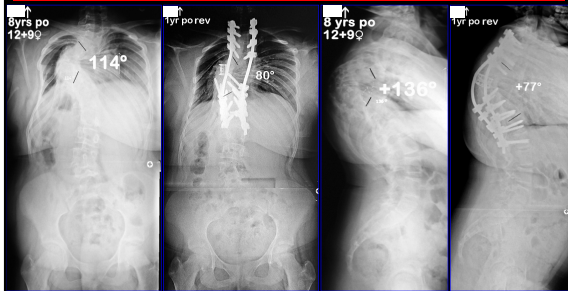


**GRADE 3+ STRENGTH LE/MYELOPATHY**

**CONG KS - S/P ASF/PSF**



# PSF/SC DECOMP/VCR



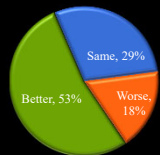
No SCM/Ant Cord Syndrome/Intact Sensation

# 6 MONTHS POSTOP!



## Post Multilevel VCR for Severe Deformity with Myelopathy (n=28)\*

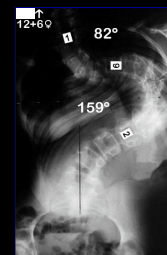
- Pre-existing Myelopathy thought to indicate higher risk of operative/postoperative neurological morbidity
- No existing reports of neurological outcomes or neuromonitoring reliability in this pt. population
- **28 pts.** Treated by a single surgeon between 2002-2014
- Retrospective analysis of neurological outcome frequencies and factors associated with outcome
- **Neurological Outcomes** graded as:
  - Improved, Unchanged, Worsened



\*DORWARD, LENKE ET AL  
IMAST 2013

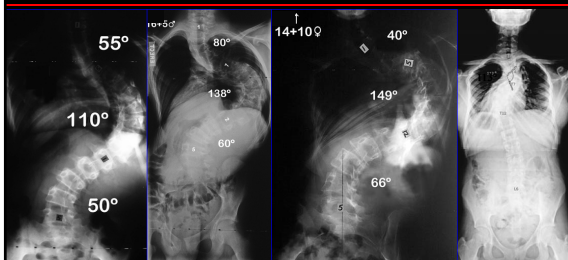
## “ANGULARITY”

- **DAR=Deformity Angular Ratio:**



DAR:  $159/8=19.9$

## DAR: DEFORMITY ANGULAR RATIO



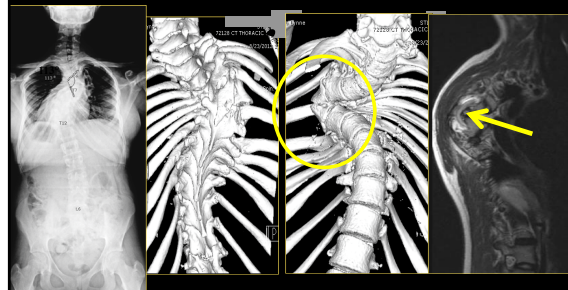
110/8=13.8

138/7=19.7

149/7=21.3

113/3=37.7

## NF DYSPLASTIC KYPHOSCOLIOSIS!






DAR = 37.7!

# CONCLUSION




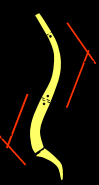
- **Deformity Angular Ratio (DAR)**  
Quantifies the Angularity of Spinal Deformities and is Useful to Predict Risk of Neurologic Complications during **Post VCR** Surgery
- Patients With:
  - **Coronal DAR  $\geq 10$**   $\rightarrow$  Inc. SCM Alerts
  - **Sagittal DAR  $\geq 15$  Or Total DAR  $\geq 25$**   $\rightarrow$  Inc. SCM Alerts & New Neuro Deficits

## 3 Most Highly Correlated Parameters!!!




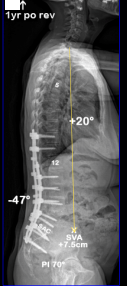
①		<b>PI minus LL</b>	}	Among all Coronal and Sagittal Parameters
②		<b>SVA</b>		
③		<b>Pelvic Tilt</b>		

Operative and Non-Operative Patients pre and post-op

## ALIGNMENT OBJECTIVES





			
<b>&lt;5 cm</b>	<b>&lt;0°</b>	<b>&lt;25°</b>	<b>LL=PI +/- 9°</b>




## L4 PSO/PSF T10-SAC/ILIUM

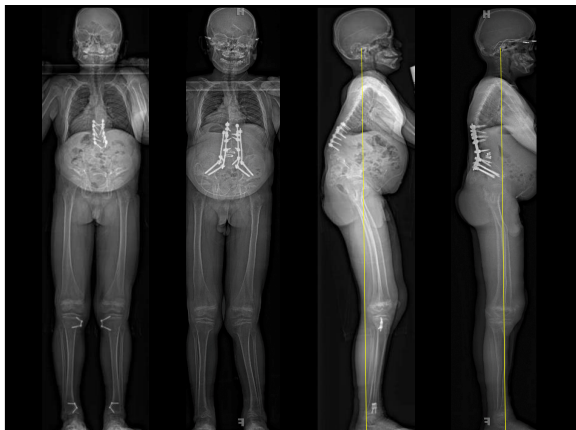
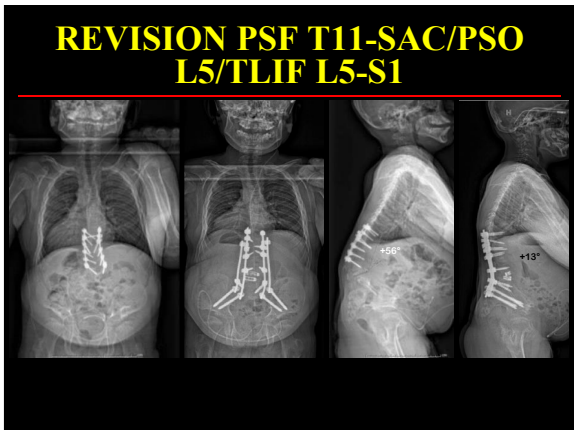
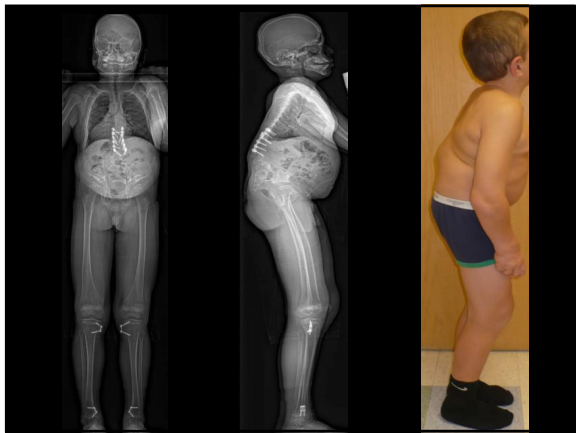
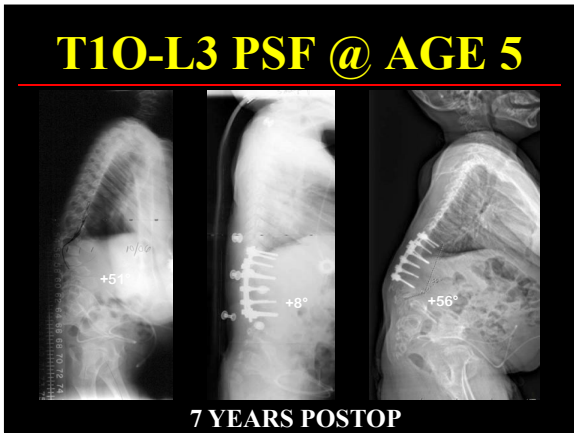
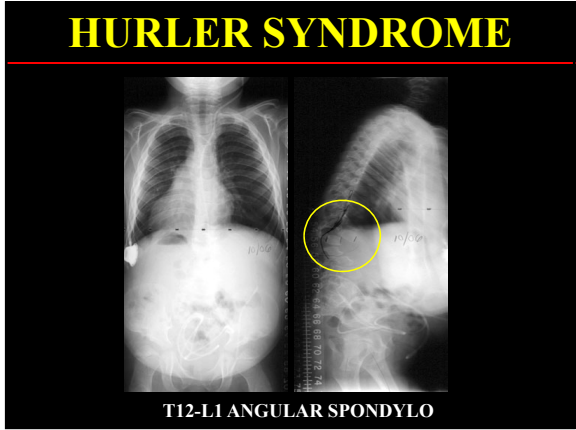
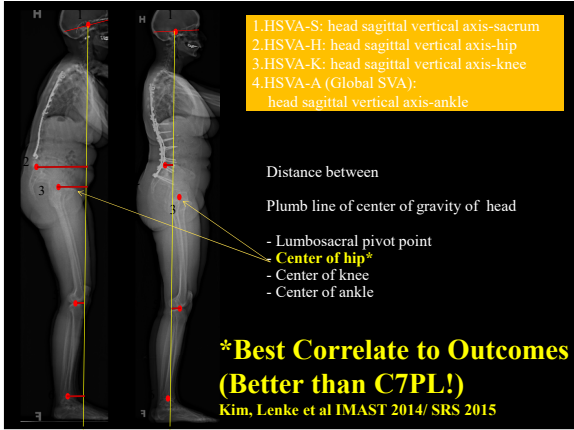
			
CVA +1cm		SVA +18.6cm	PI 70°
17°		-16°	+20°

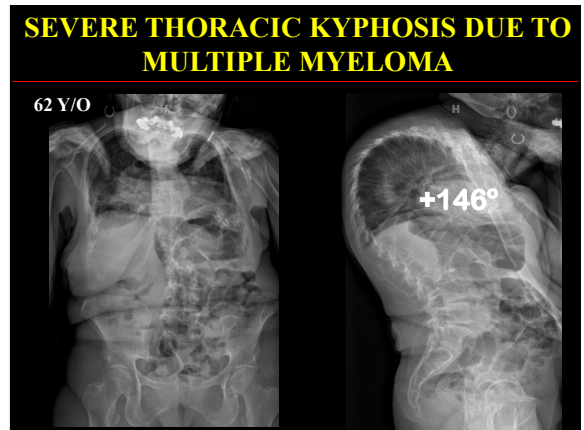
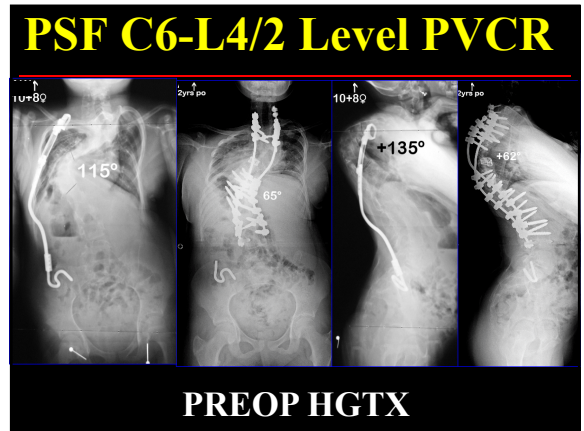
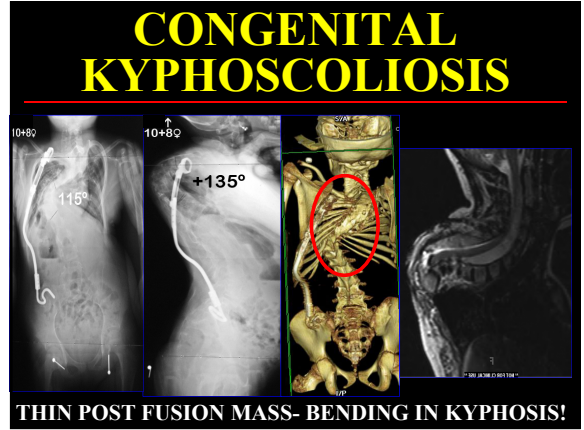
**L3/4 TLIF/4-ROD TECHNIQUE**

## AGE 73 – SPINAL/PELVIC/LE REALIGNMENT!

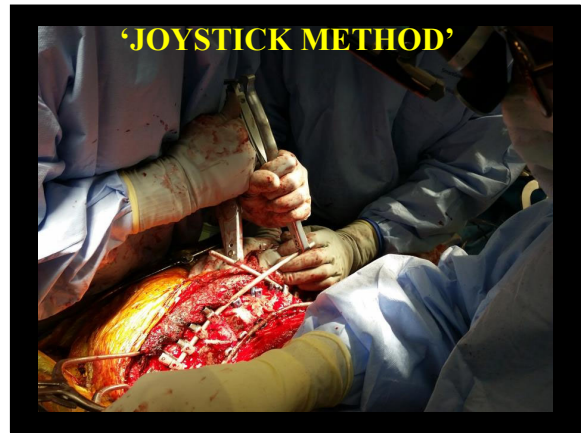
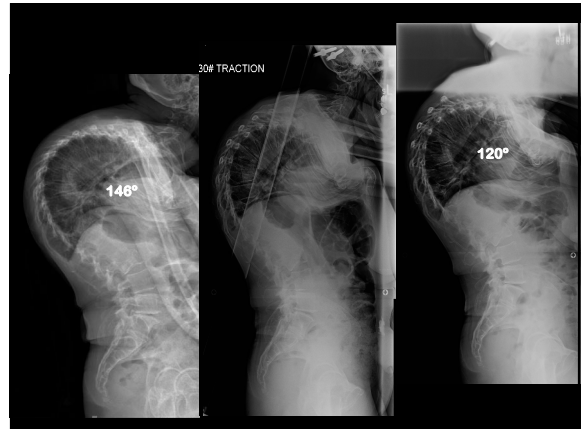
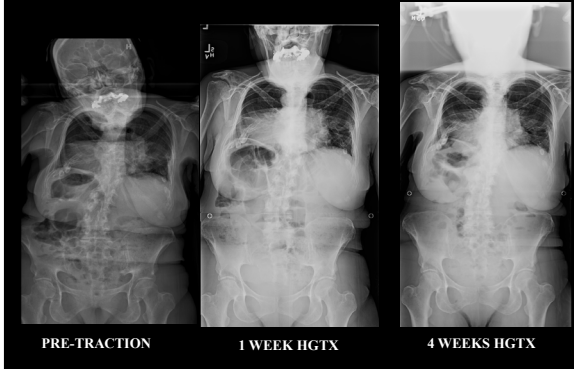
			
<b>GLOBAL BODY ALIGNMENT!</b>			

		
		Preop ODI: 62
		Postop ODI: 12

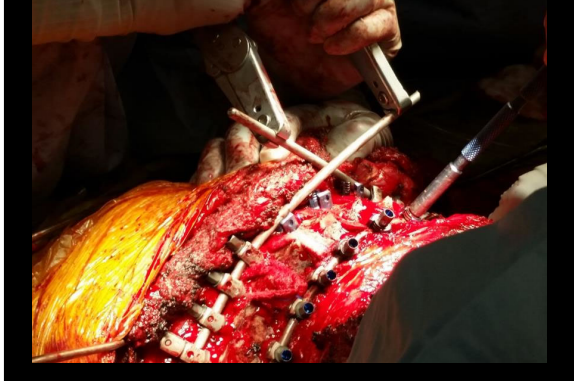




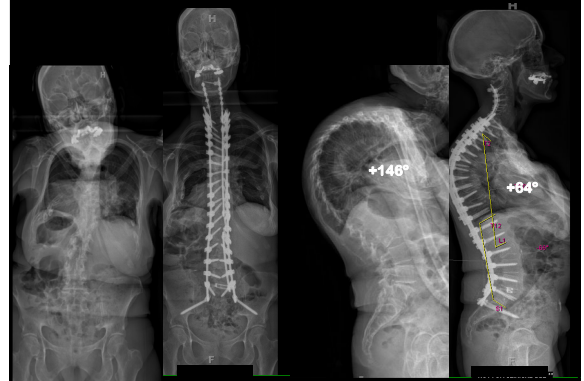
**HALO GRAVITY TRACTION X 4 WKS**



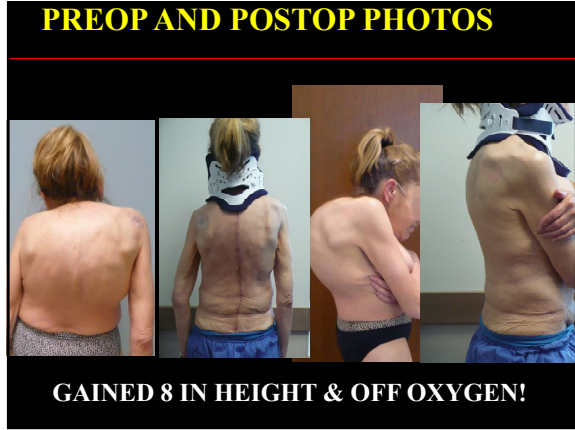
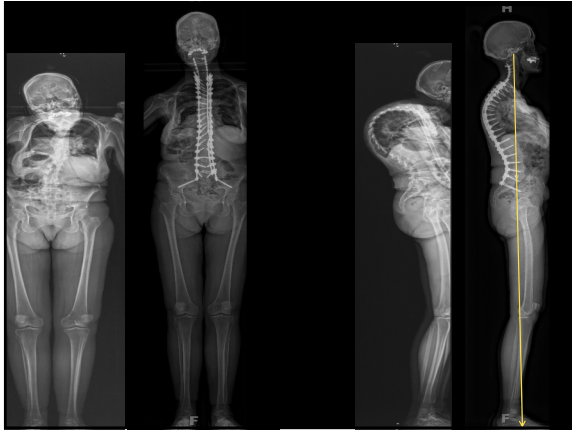
**'SEQUENTIAL ROD REPLACEMENT'**



**PSF C2-SACRUM/PCO'S/L5-S1 TLIF**







**CONCLUSIONS**

- In-Situ Fusions- **NO!**
- Angular Deformity- **AVOID!**
- Deformity-Induced Myelopathy- **RISKY!**
- Global Sagittal Alignment- **IMPORTANT!**
- When to Consider Getting Additional Advice **WISE!**

**THANK YOU!**

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