

# “When and How To Include the Pelvis in Growth Friendly Implants”

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Endowed Chair of Pediatric  
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Southern California



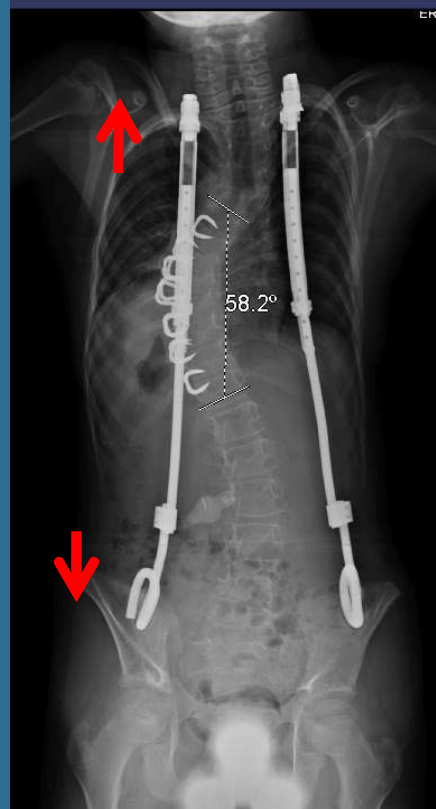
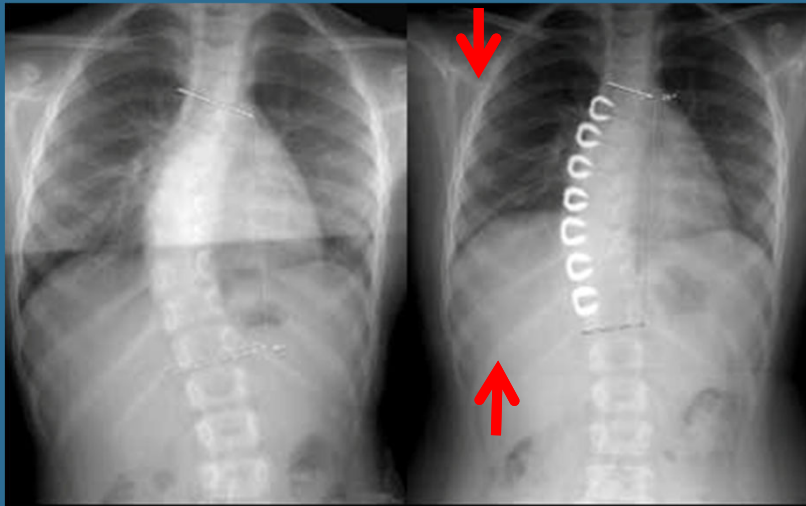
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## Golden Rule:

# ONLY include the pelvis when you plan on fusing to the pelvis

- Damages facet joints
- I have never seen a patient successfully fused shorter than growth friendly implants

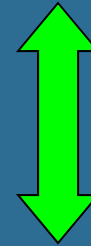
# ONLY include the pelvis when you plan on fusing to the pelvis



# Growth Friendly Implant Classification

## 1. Distraction based

- Growing Rods
- VEPTR
- Magec



## 2. Guided Growth

- Luque-Trolley
- Shilla



## ~~3. Compression Based~~

- ~~● Tether~~
- ~~● Staple~~

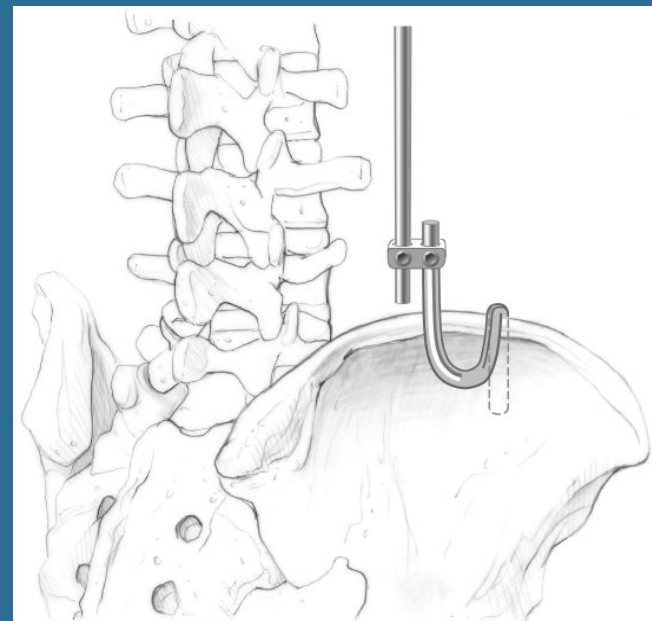
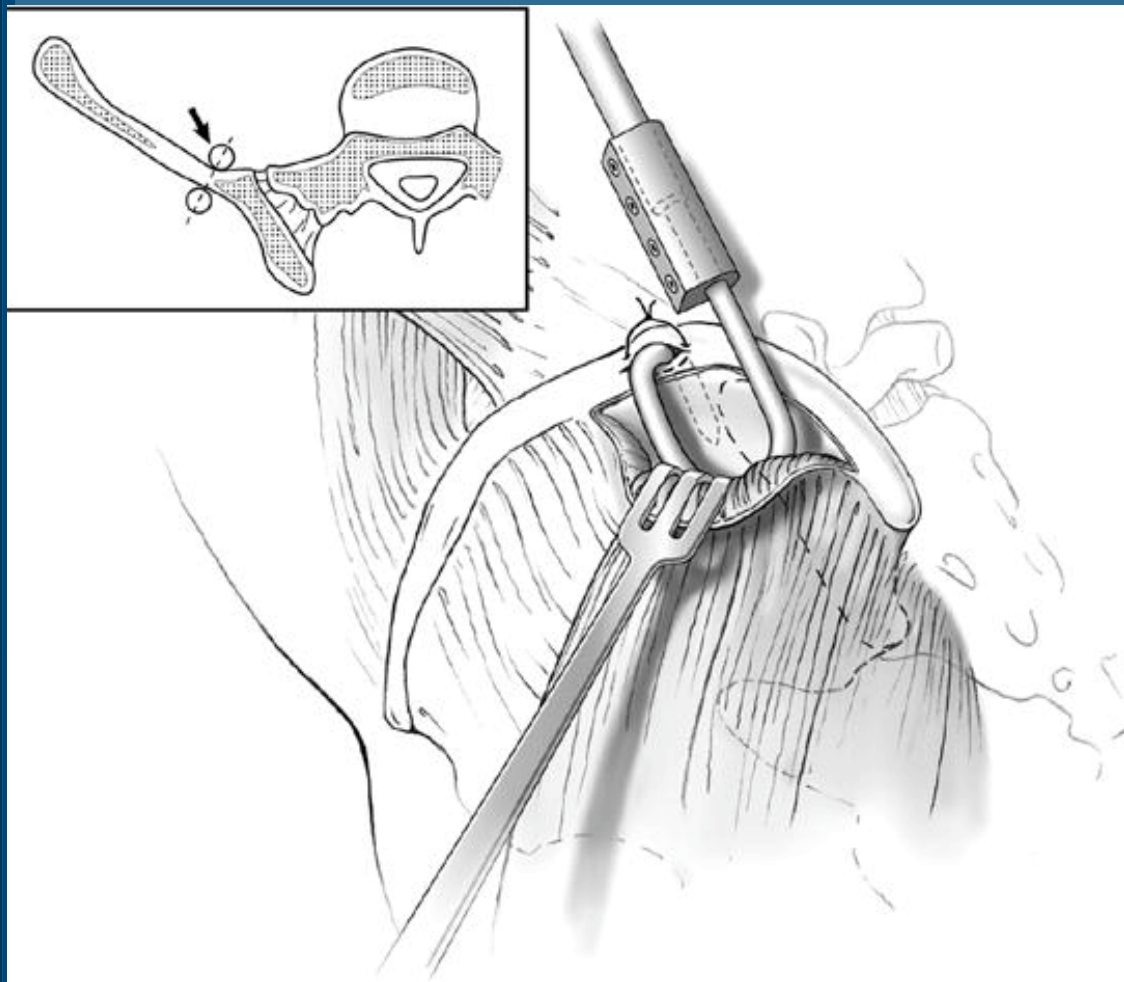


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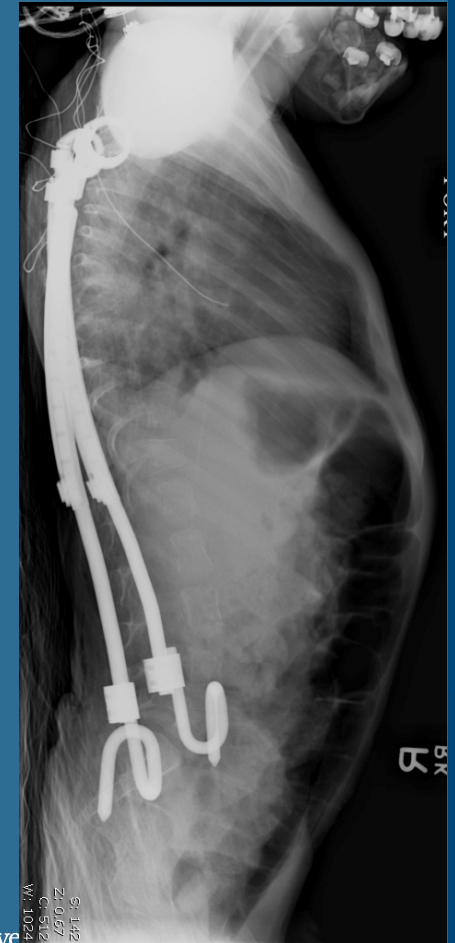
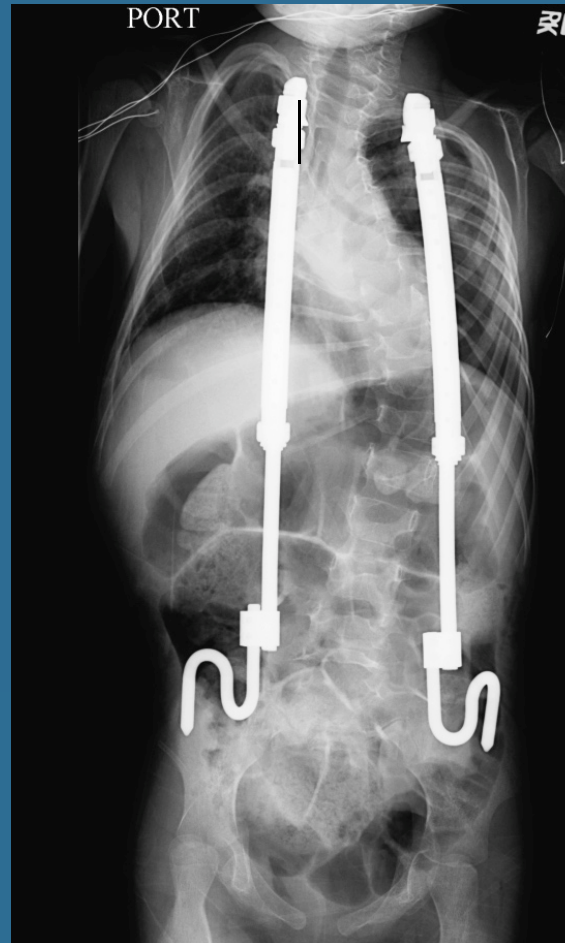
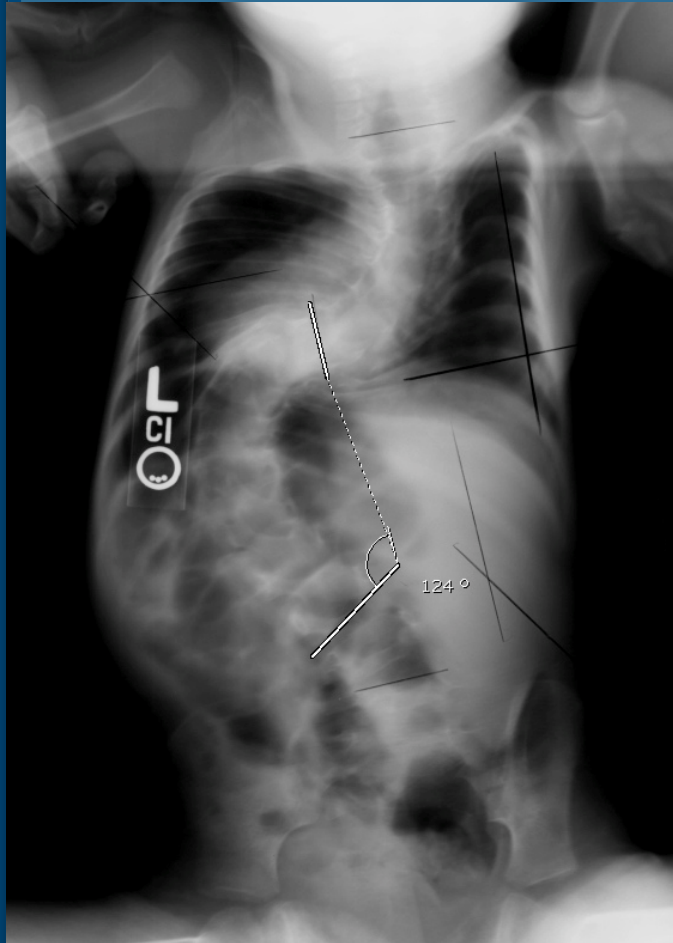
# S hook



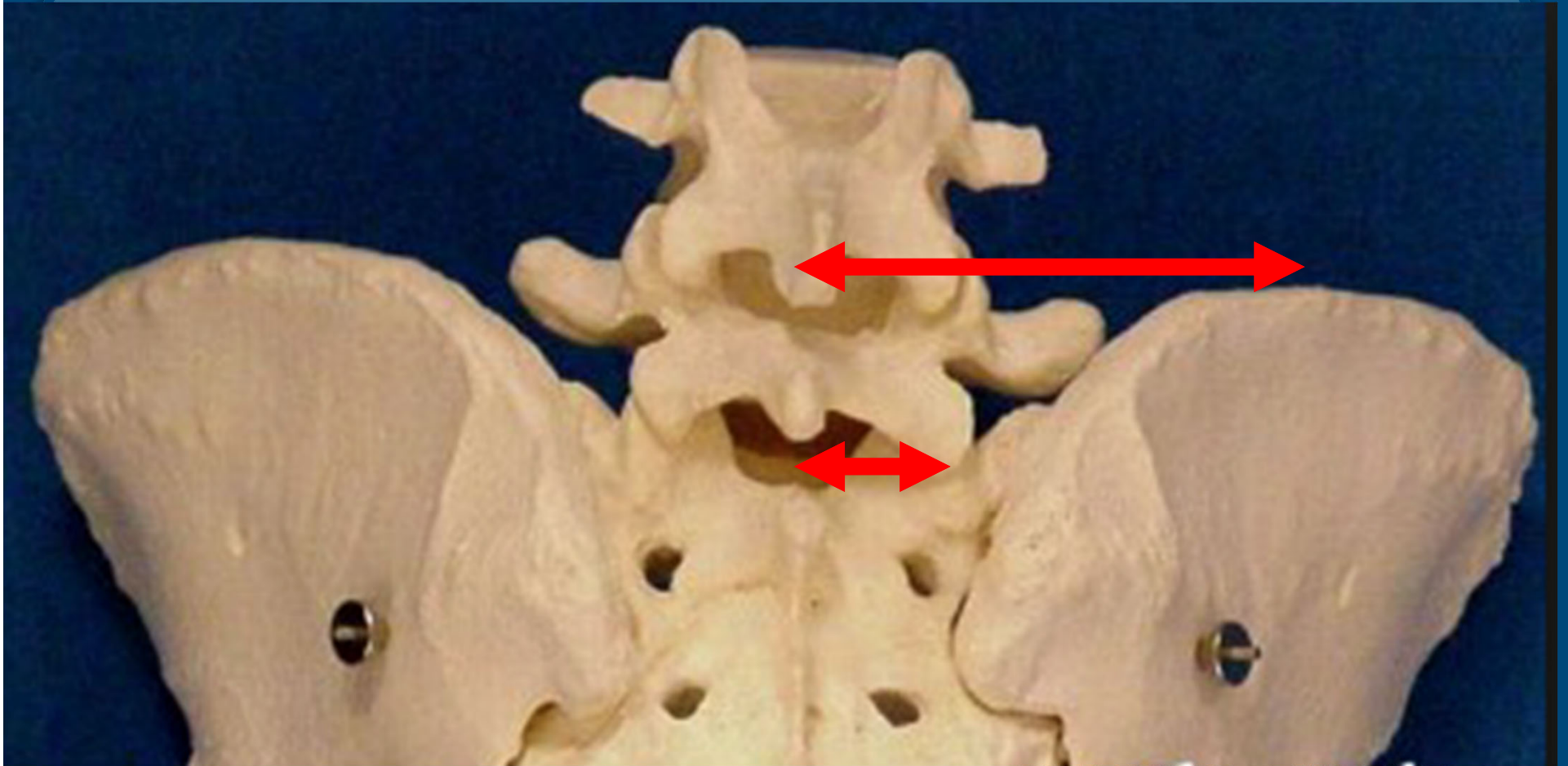
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# Dual VEPTR - Portable Traction

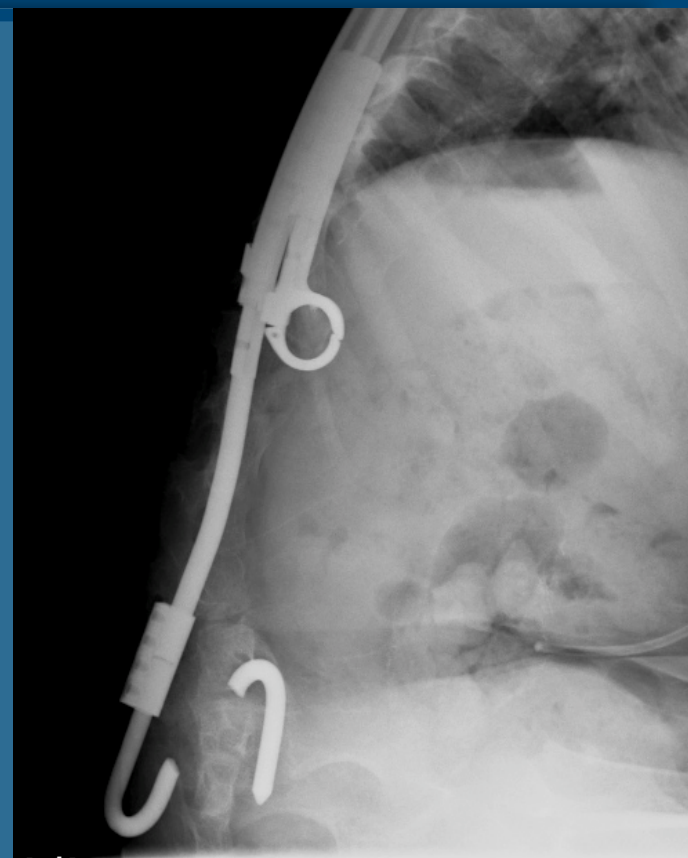


## Positive: Improved moment arm - pelvic obliquity





# Migration



# Fracture



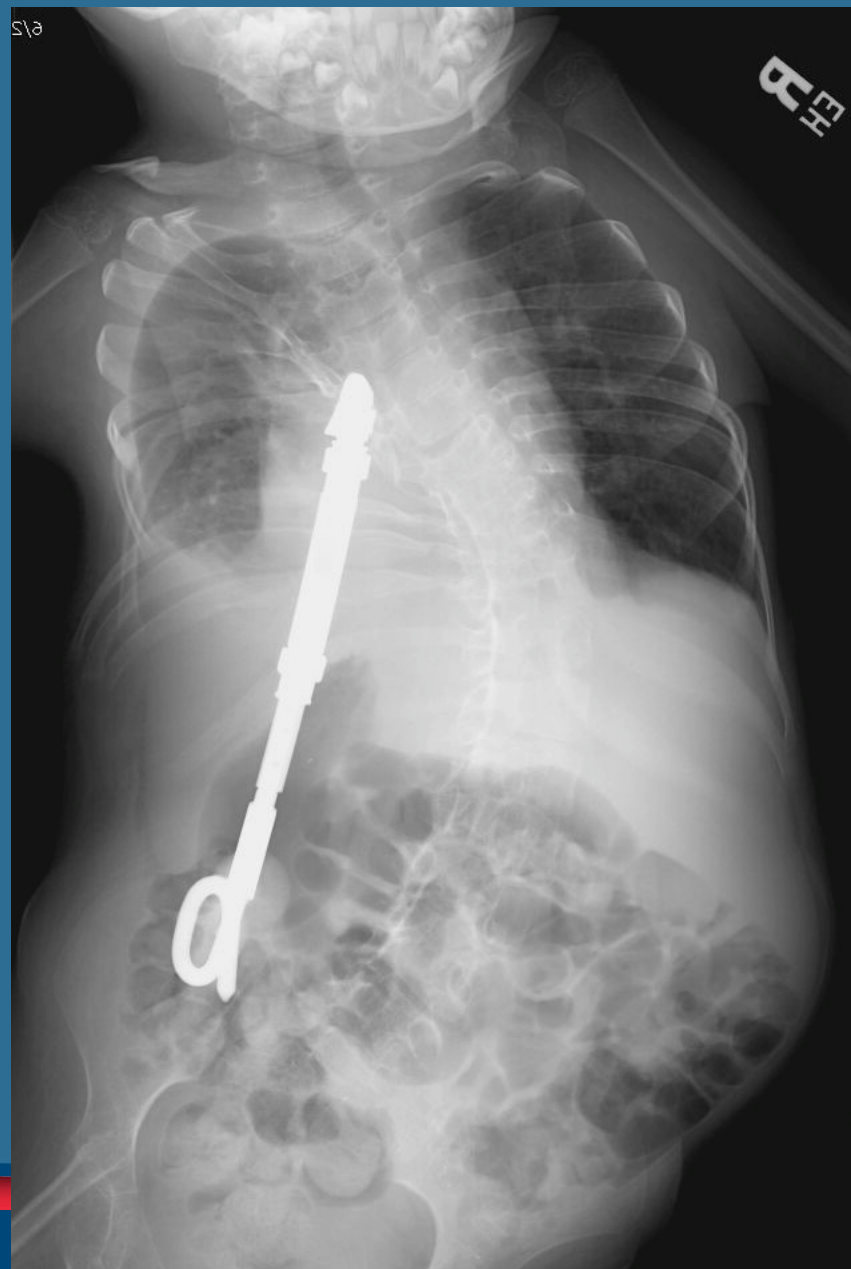
# 6yo arthrogryposis



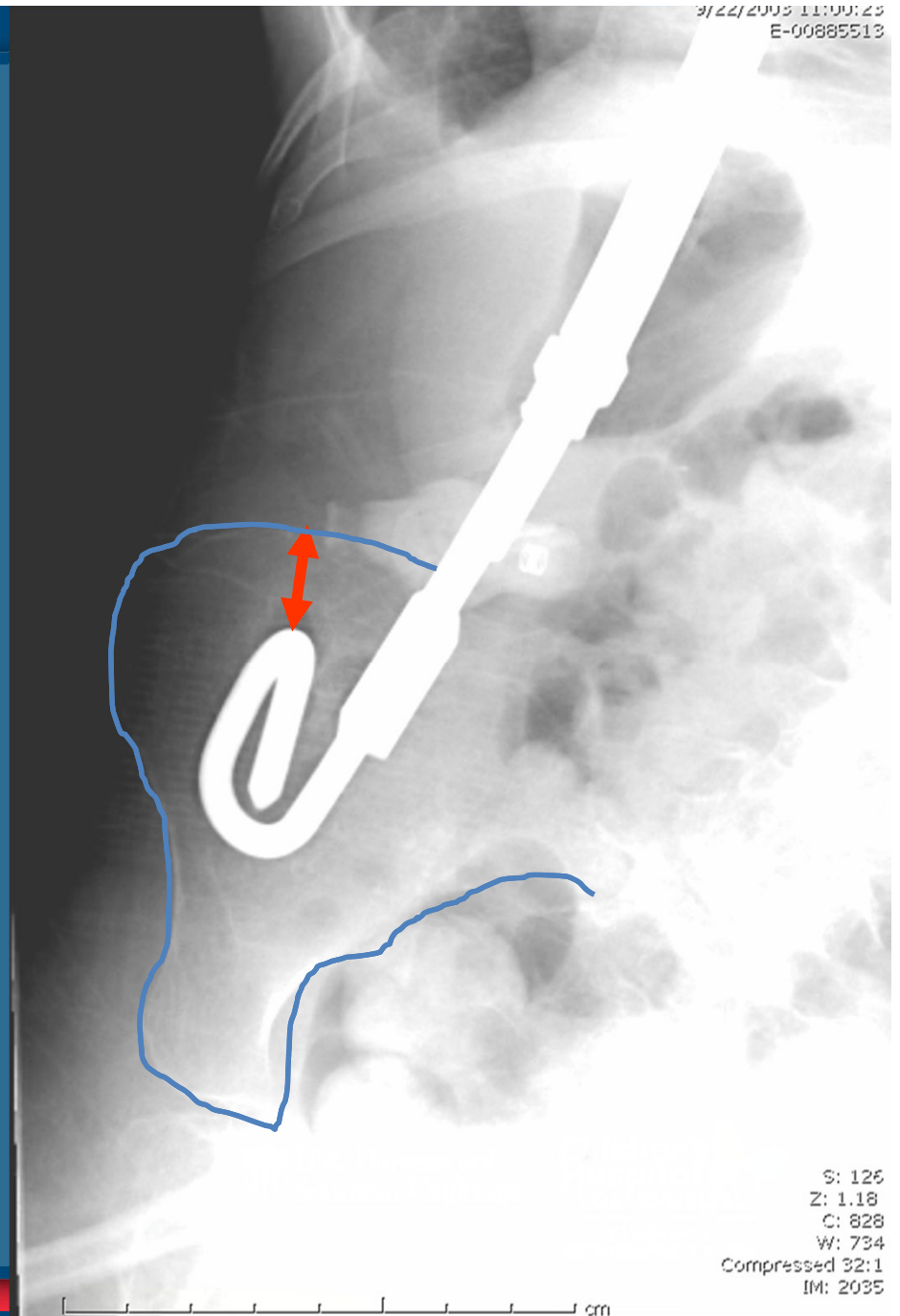
# Pre



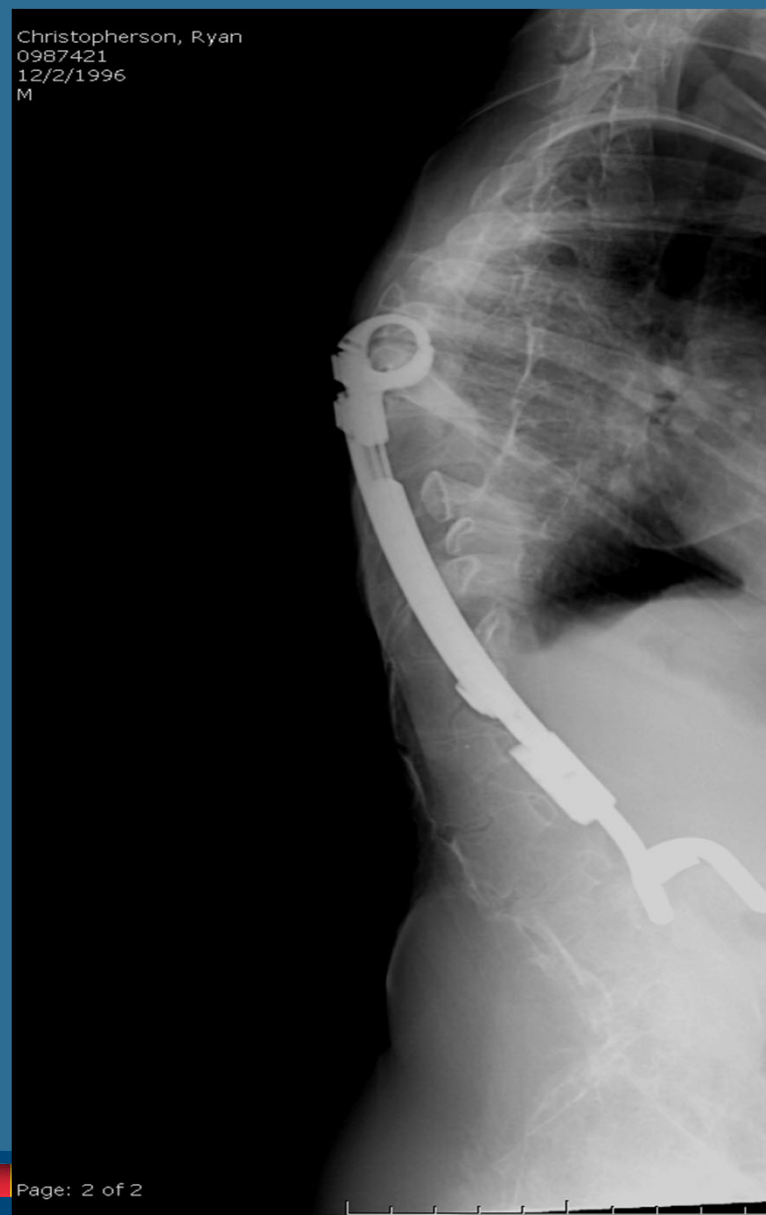
# Post



# Migration + Pain

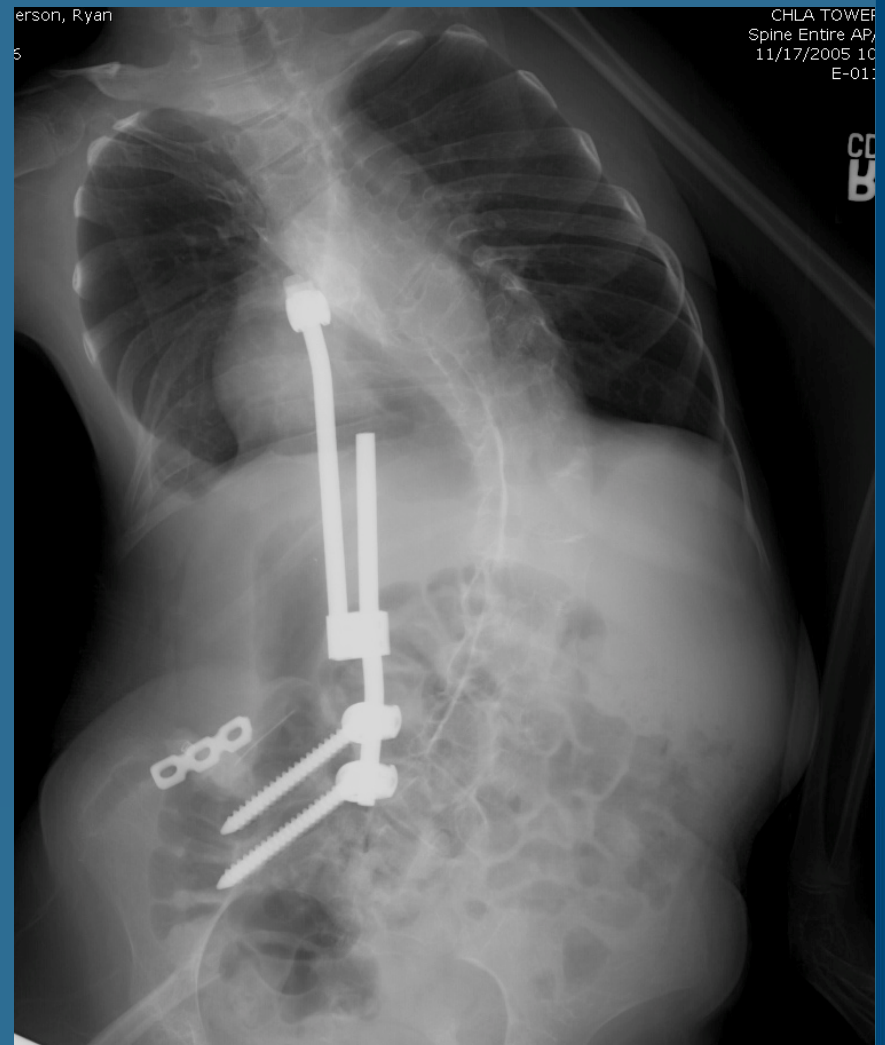
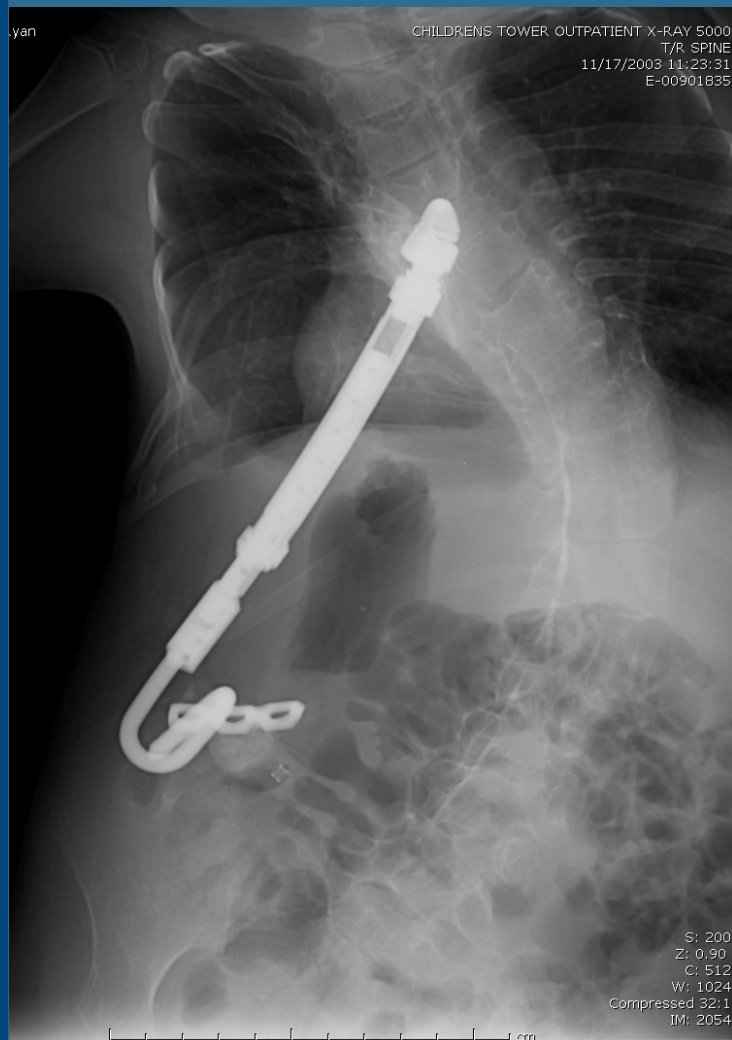


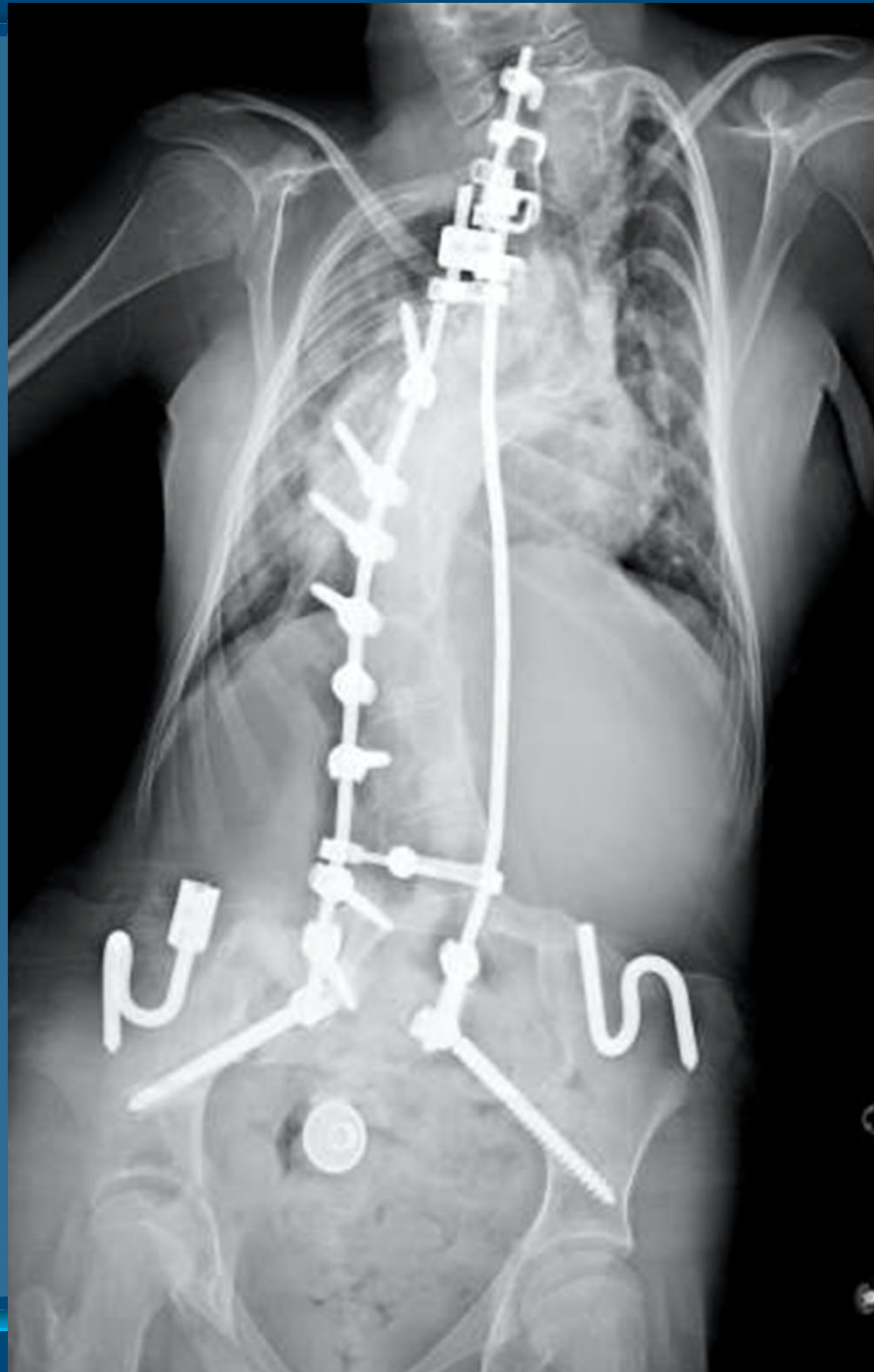
# Revision - recon plate over iliac crest





## Revision #2 Iliac Screws

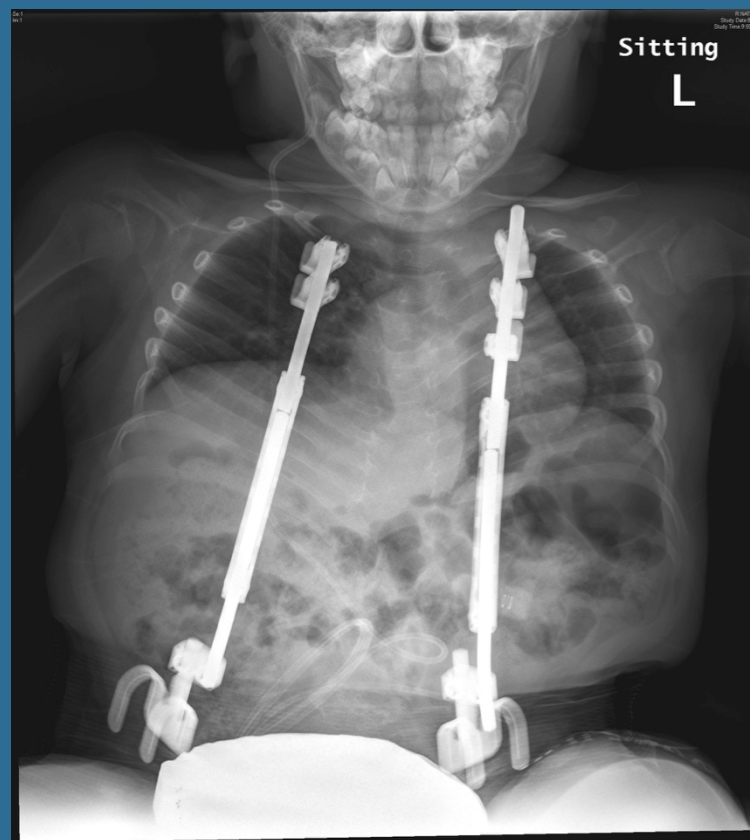
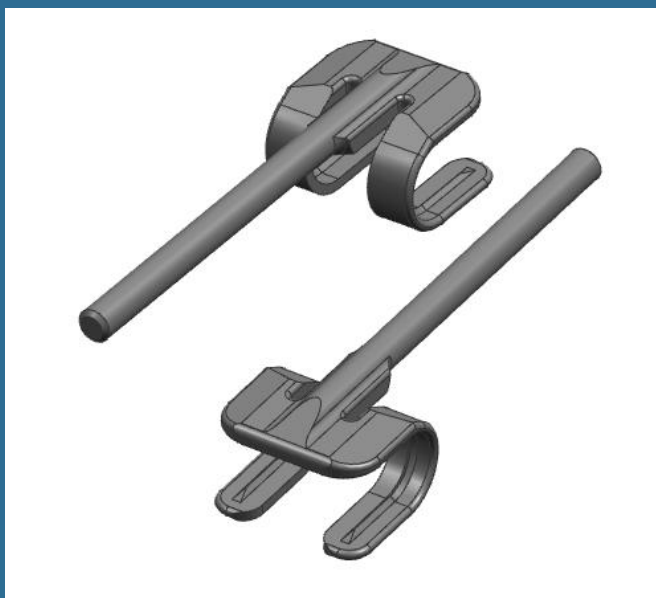




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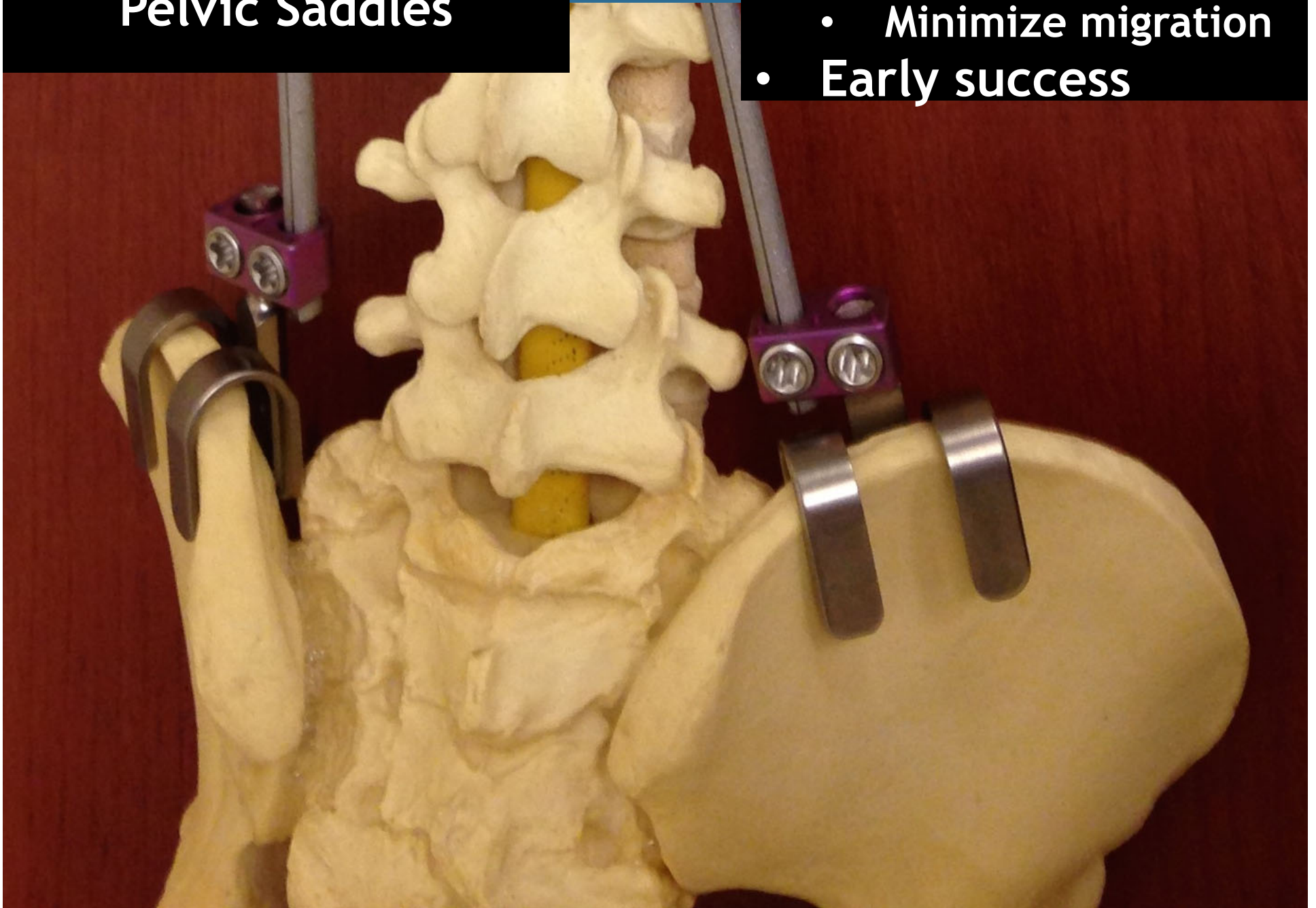
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# Pelvic Saddles in Growing Rods



## Pelvic Saddles

- Large surface area
  - Minimize migration
- Early success





# **“S” hooks Vs. Screws**

## **E-poster: ICEOS 2016**

### **Pelvic obliquity correction in distraction based growing spine constructs**

Mathew Schur BA<sup>1</sup>, Lindsay M Andras MD<sup>1</sup>, Nicholas R Gonsalves MD<sup>1</sup>, Paul D Sponseller MD MBA<sup>2</sup>, John B Emans MD<sup>3</sup>, Michael G Vitale MD MPH<sup>4</sup>, David L Skaggs MD MMM<sup>1</sup>, Growing Spine Study Group, Children's Spine Study Group

1.Children's Orthopaedic Center, Children's Hospital Los Angeles; 2.Department of Orthopaedic Surgery, Johns Hopkins Children's Hospital, Johns Hopkins University; 3.Department of Orthopaedic Surgery, Boston Children's Hospital, Harvard Medical School; 4. Department of Orthopaedic Surgery , New York-Presbyterian Morgan Stanley Children's Hospital, Columbia University Medical Center



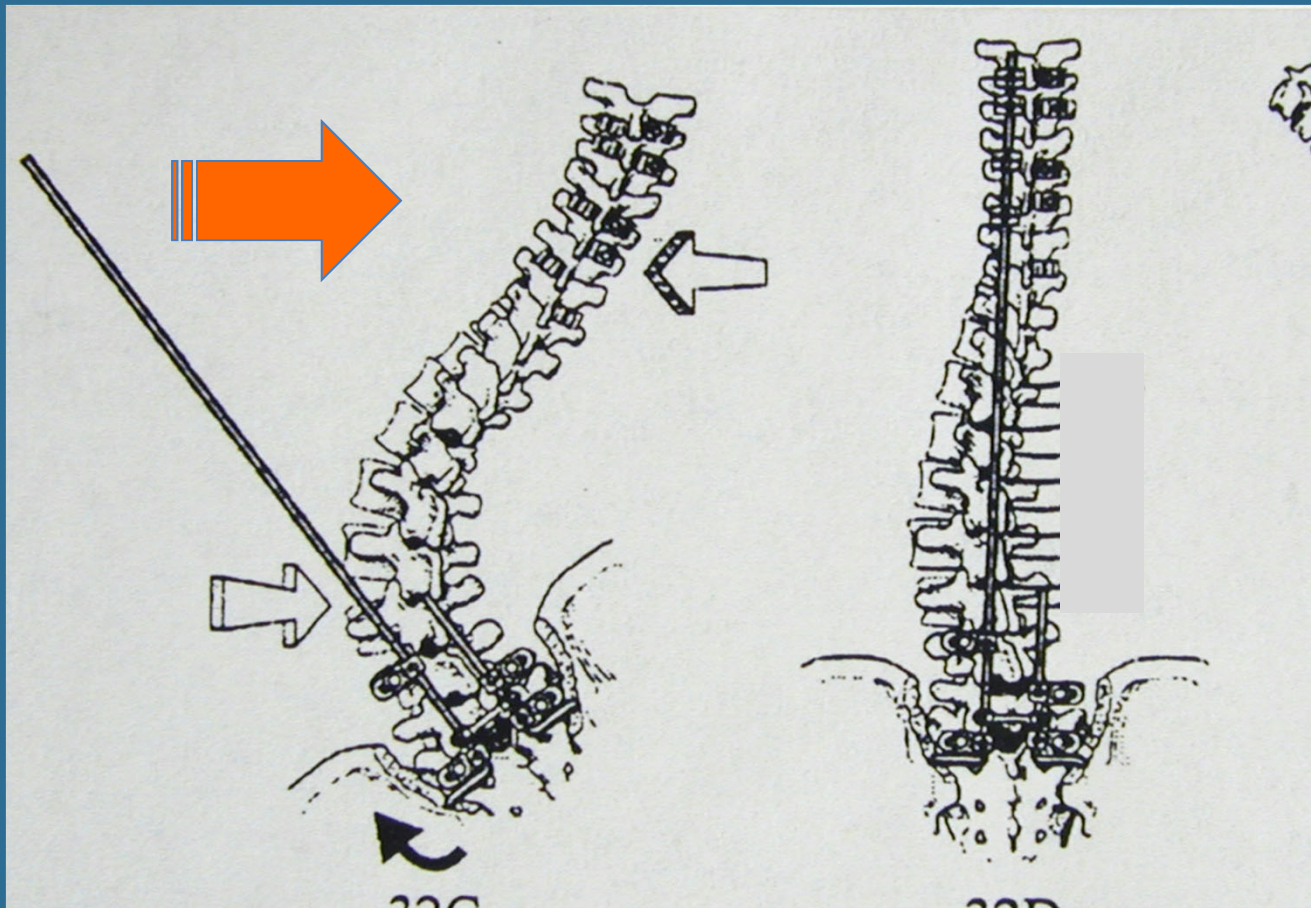
# Screws Vs. “S” hooks

- Better Pelvic Obliquity Correction  
Screws (74%) > Hooks (57%)  $p=0.04$
- Less Complications?  
Screws (15%)  $\sim$  < Hooks (26%)  $p=0.2$
- 113pts “S” hooks vs. 41 pts screws (29 Iliac, 12 SAI)

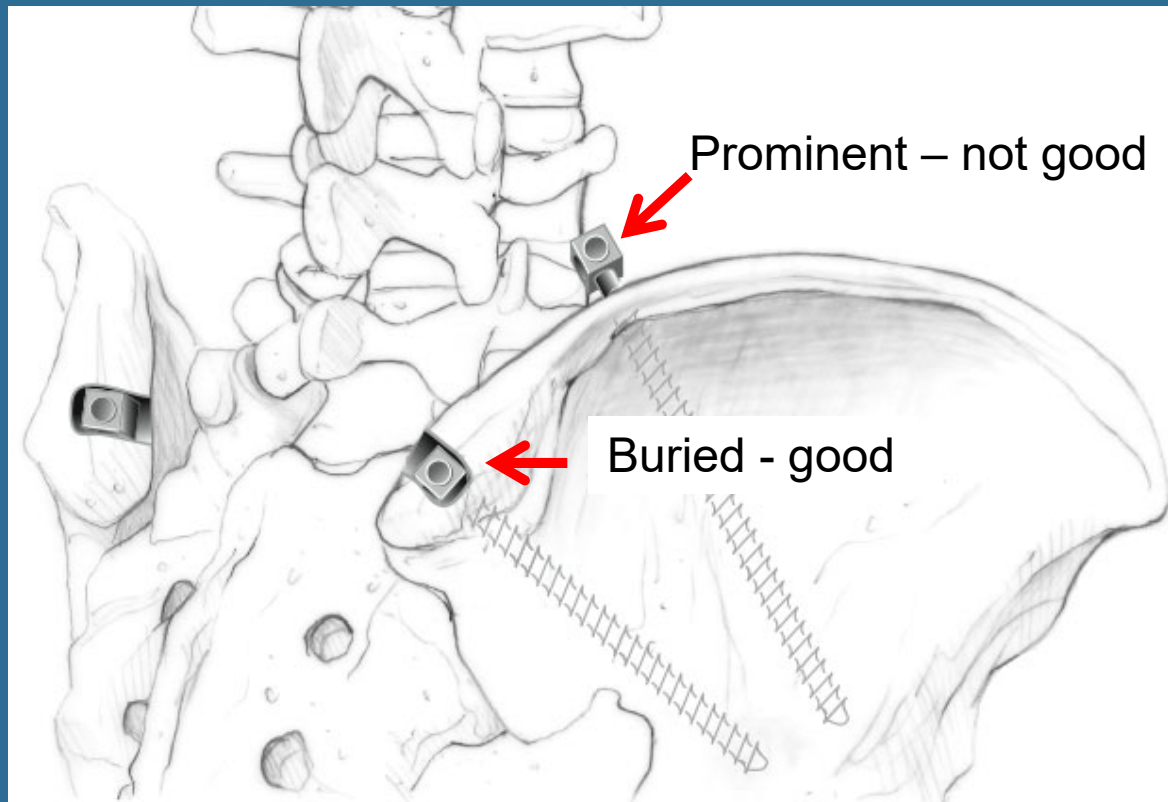
Schur, Andras, ICEOS 2016



## Pelvic Obliquity Correction-Cantilever



# Traditional Iliac Screws

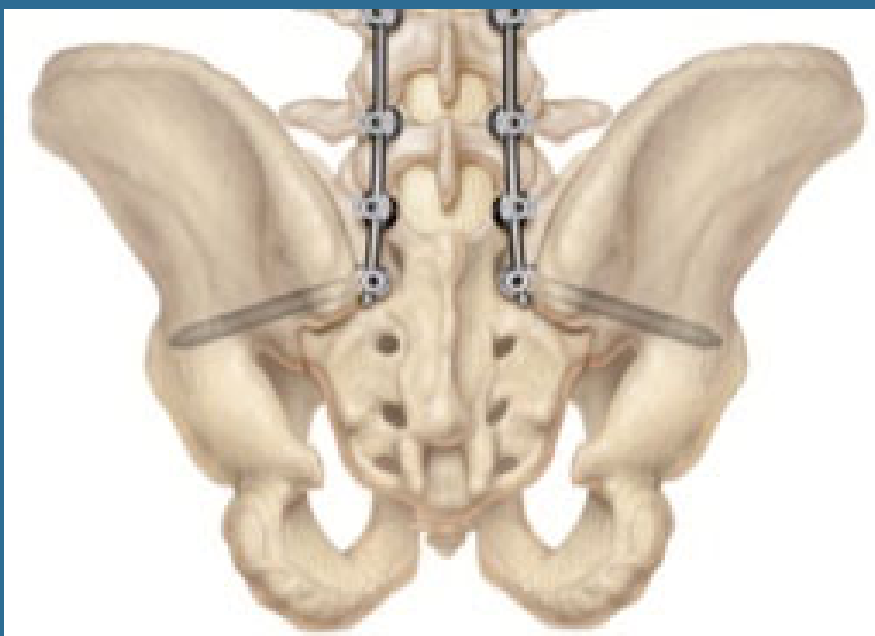




# Pelvic Fixation of Growing Rods

## Comparison of Constructs

Paul D. Sponseller, MD,\* Justin S. Yang, BS,\* George H. Thompson, MD,†  
Richard E. McCarthy, MD,‡ John B. Emans, MD,§ David L. Skaggs, MD,¶  
Marc A. Asher, MD,|| Muharrem Yazici, MD,\*\* Connie Poe-Kochert, CRNP,†  
Pat Kostial, RN, BSN,†† and Behrooz A. Akbarnia, MD††



Dual rods best for correction  
of Pelvic Obliquity

Pelvic fixation better correction  
than sacral fixation

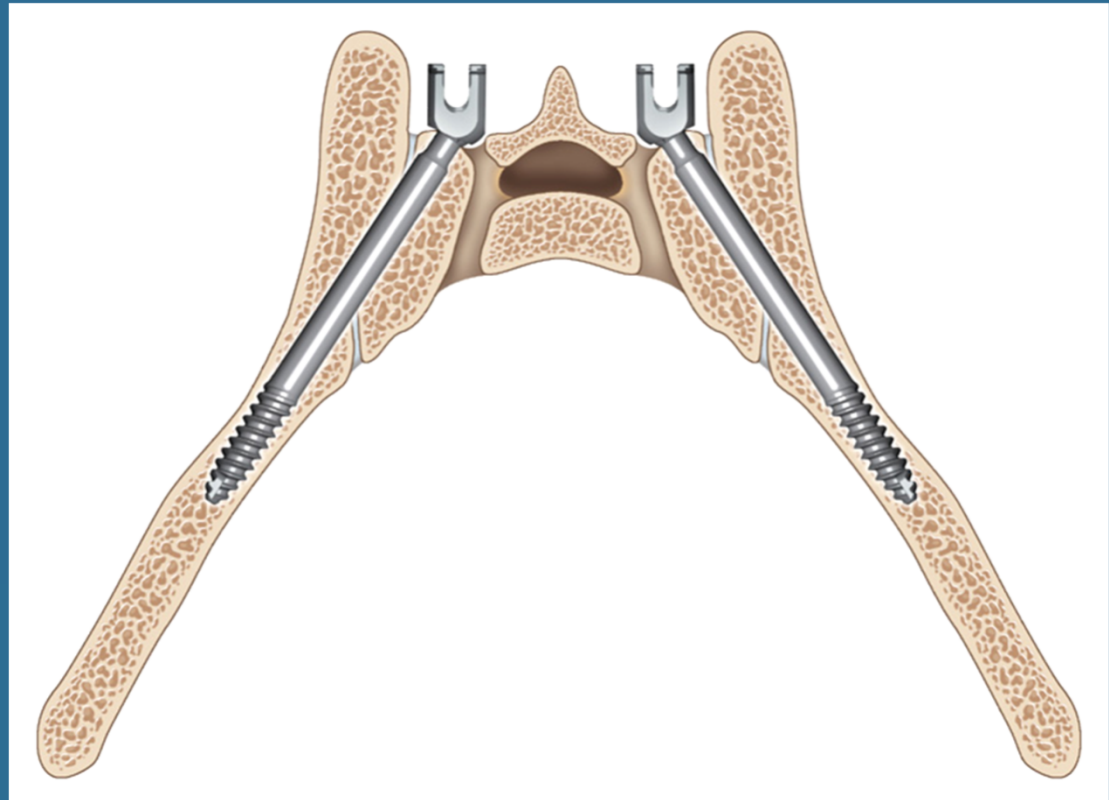
Spine 2009

# Outcomes of Pelvic Fixation in Growing Rod Constructs: An Analysis of Patients With a Minimum of 4 Years of Follow-up

Jaysson T. Brooks, MD<sup>a</sup>, Amit Jain, MD<sup>a</sup>, Francisco Sanchez-Perez-Grueso, MD<sup>b</sup>,  
David L. Skaggs, MD<sup>c</sup>, George H. Thompson, MD<sup>d</sup>, Behrooz A. Akbarnia, MD<sup>e,f</sup>,  
Paul D. Sponseller, MD<sup>a,\*</sup>, Growing Spine Study Group

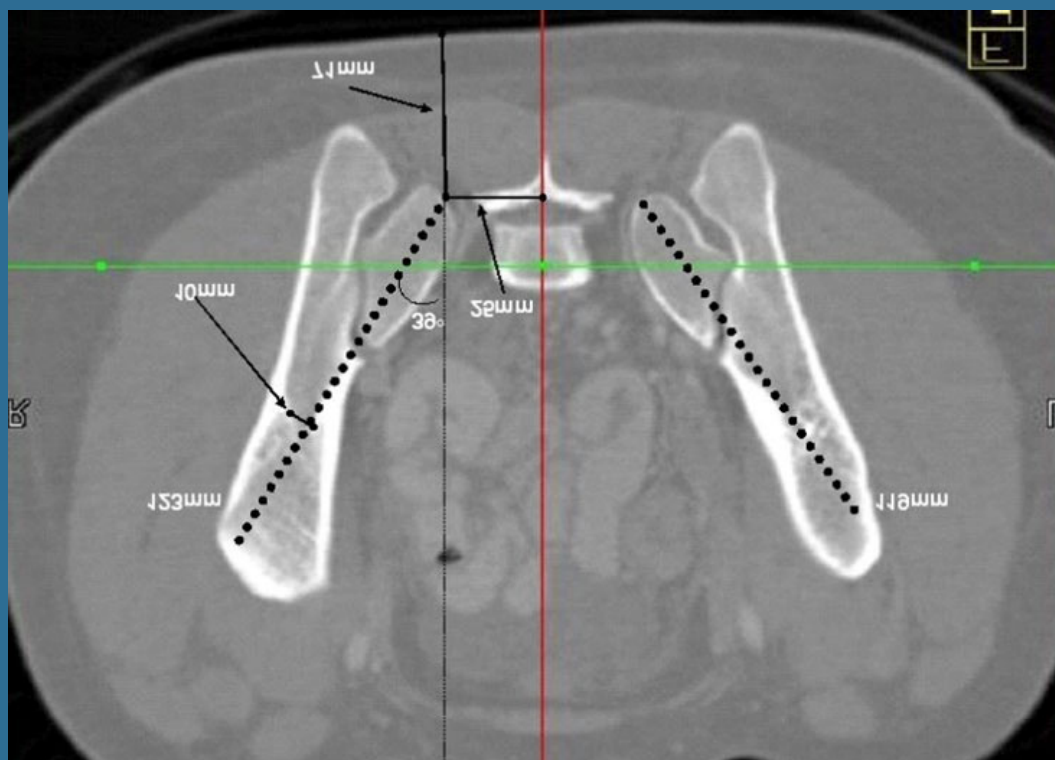
- Iliac screws infection rate 60% VS. SAI 7% ( $p=0.002$ )

Spinal Deformity, 2016



## Fusions

- **SAI Screws Fail 75% less than Iliac Screws** ( $p= 0.031$ )
- Less revisions for Prominence

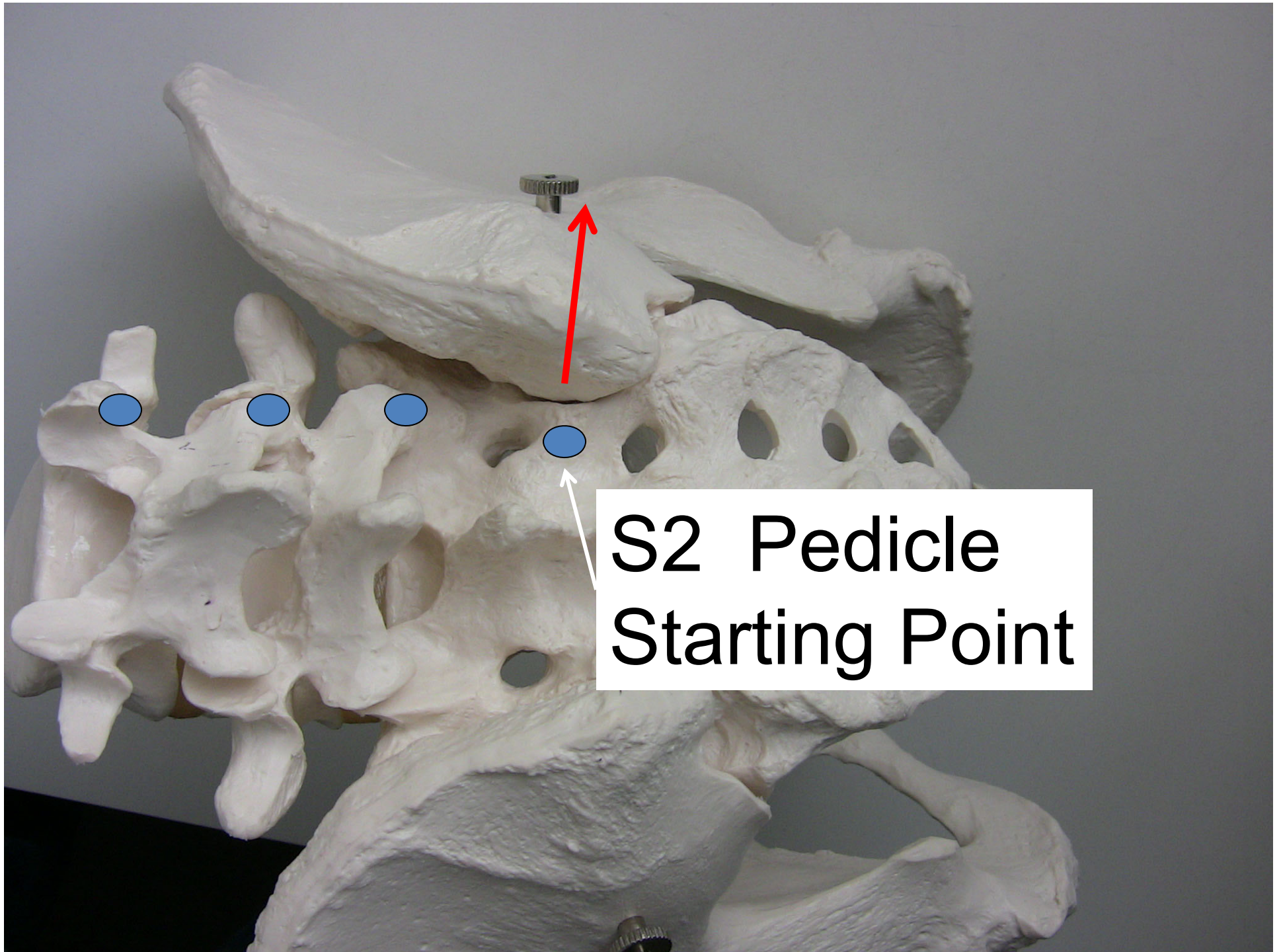


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SRS, 2015

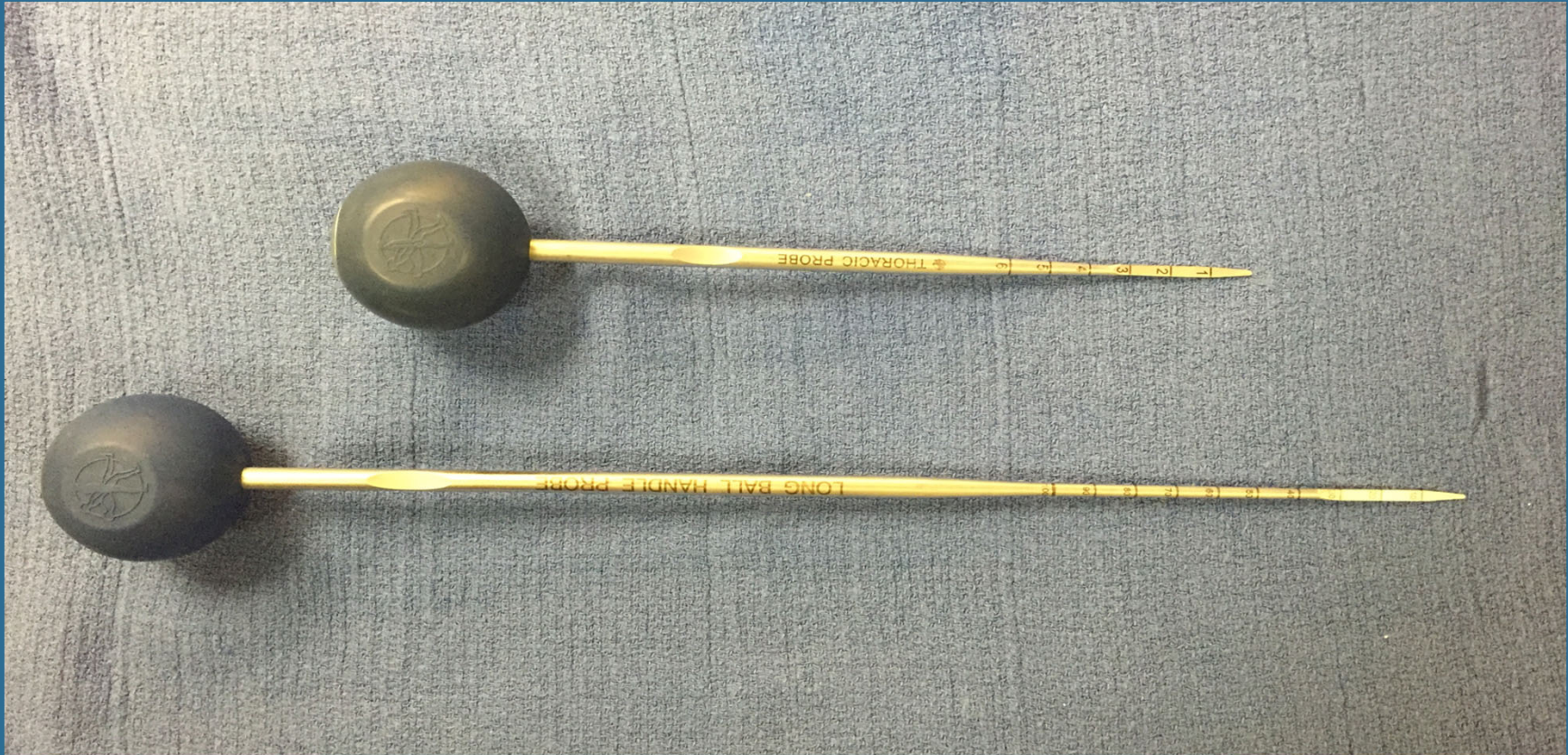




**S2 Pedicle  
Starting Point**



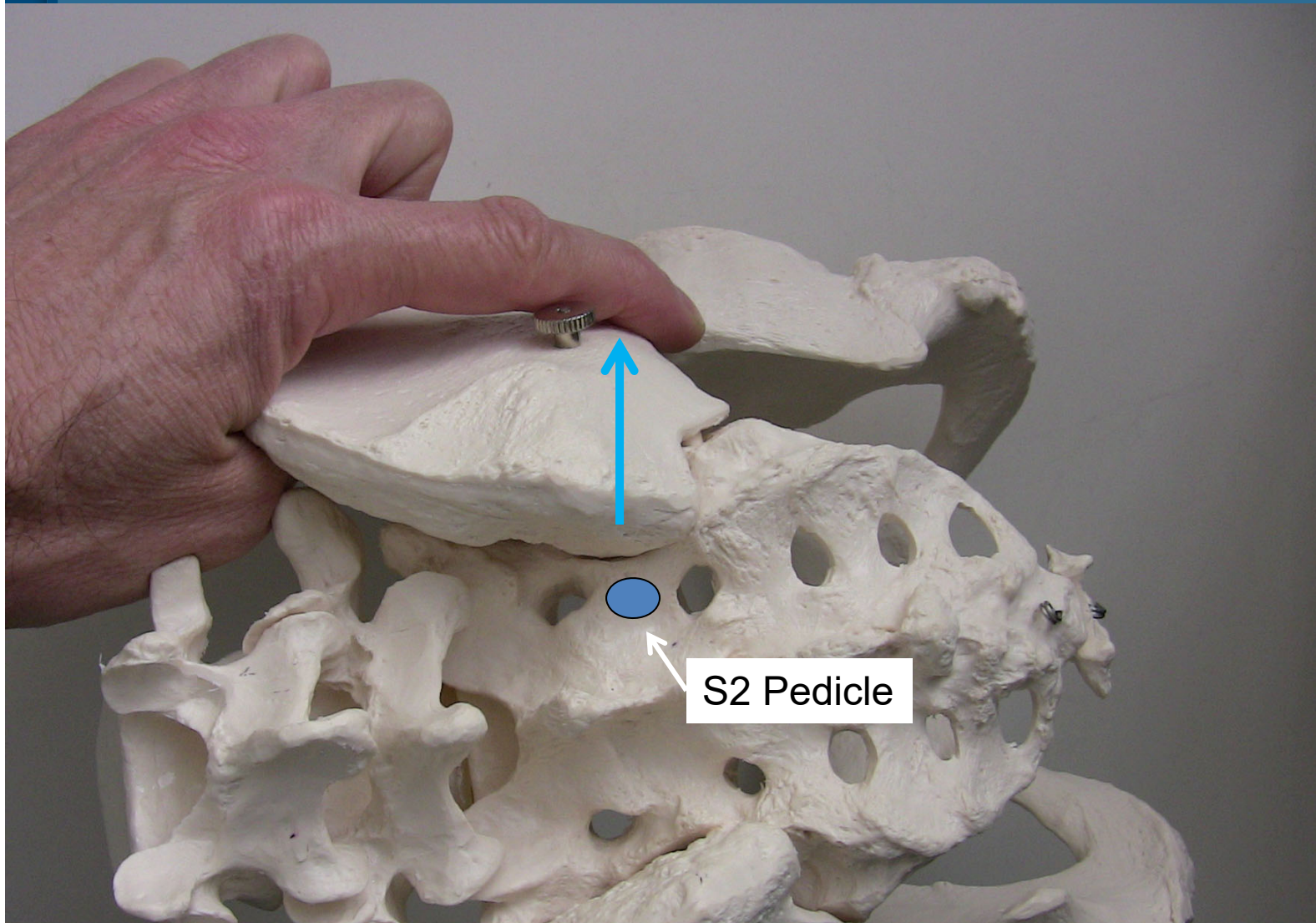
# Double Length Lenke



Cannulated Screws may be helpful

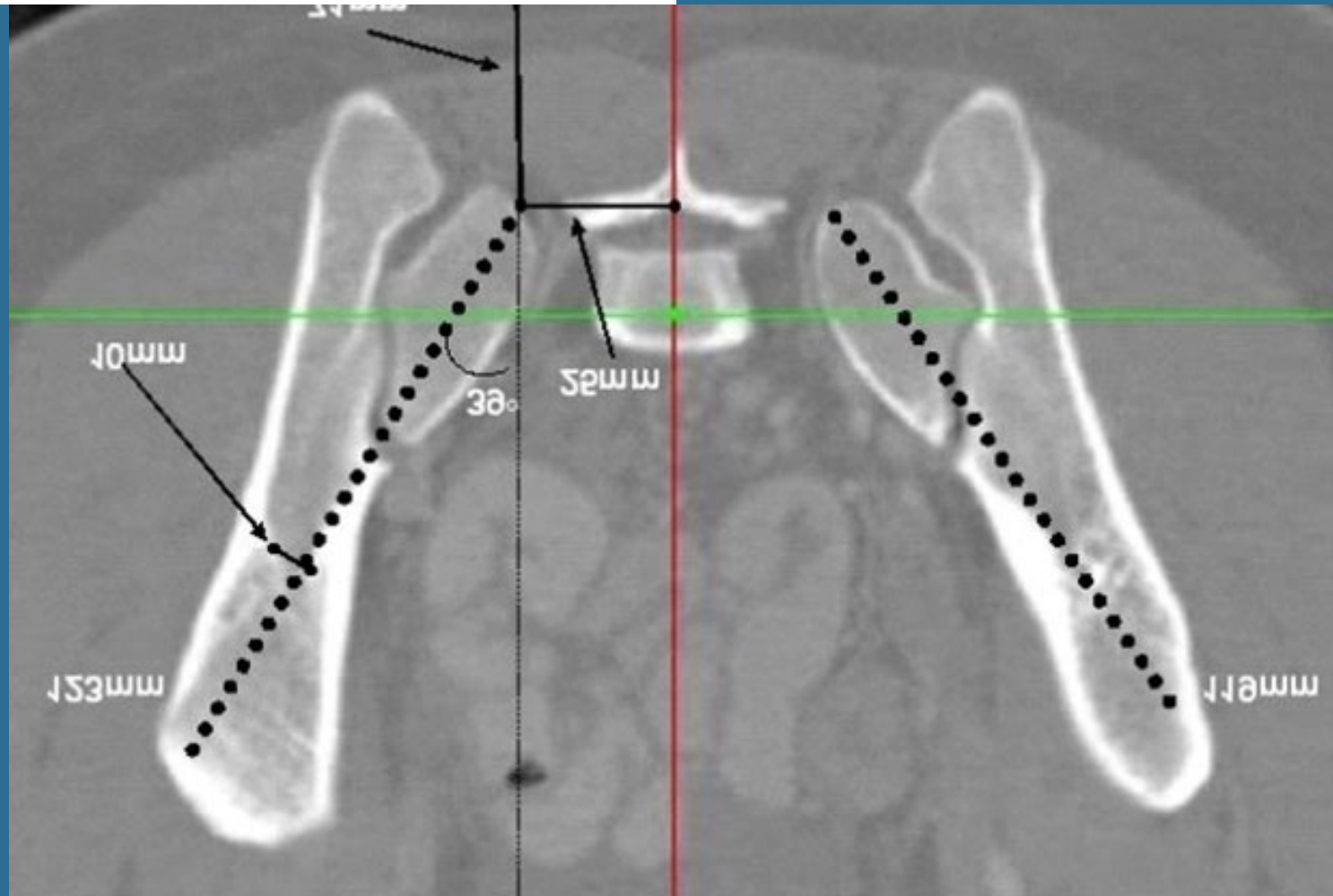


## Option: Feel Sciatic Notch - 3 cm incision



1. Burr Cortex
2. At 20mm expect resistance of SI joint
3. Beware of lateral drift

**In Fusions**  
**Min Diameter- 8.5 mm**

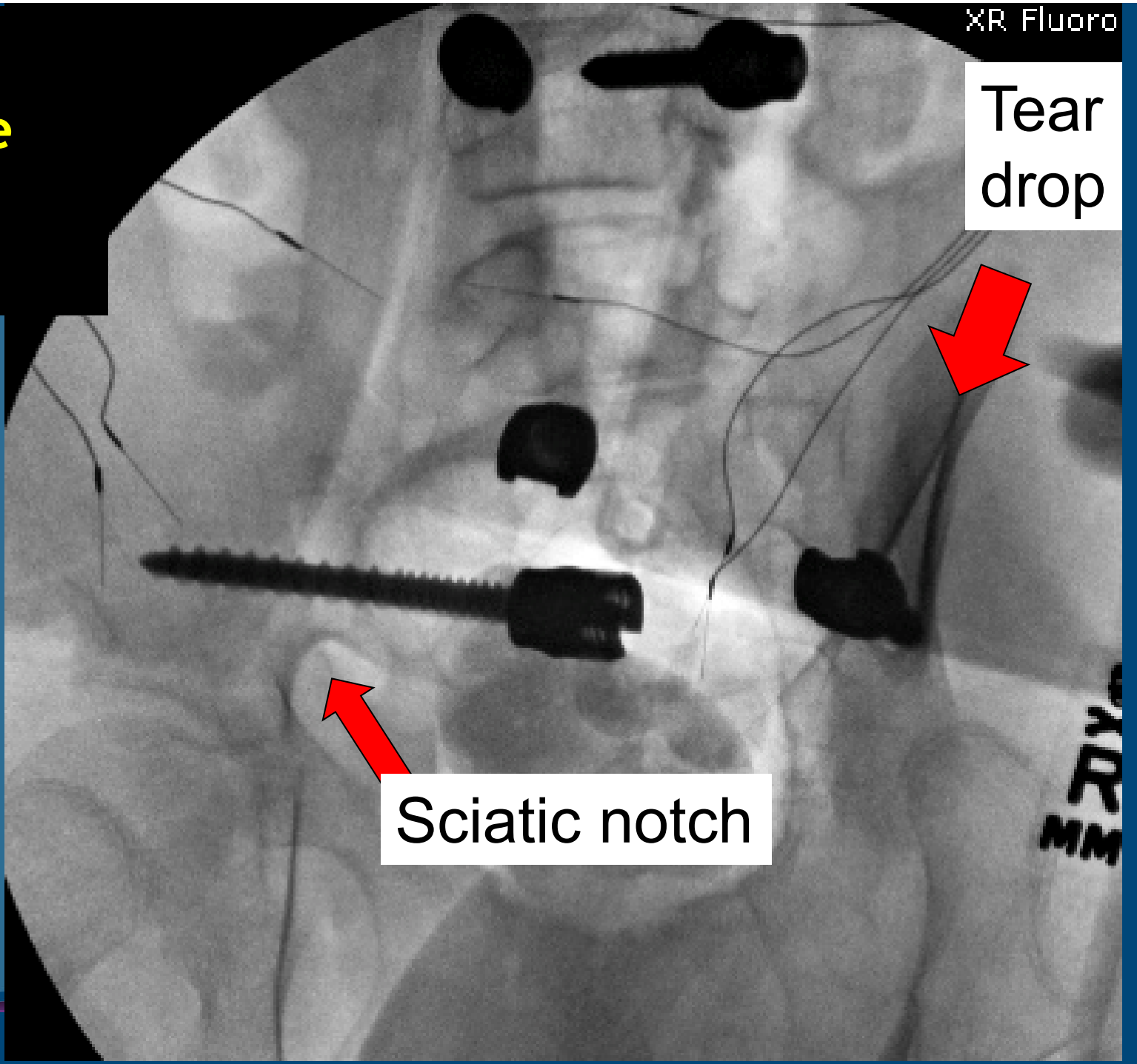


**Oblique  
Fluoro**

XR Fluoro

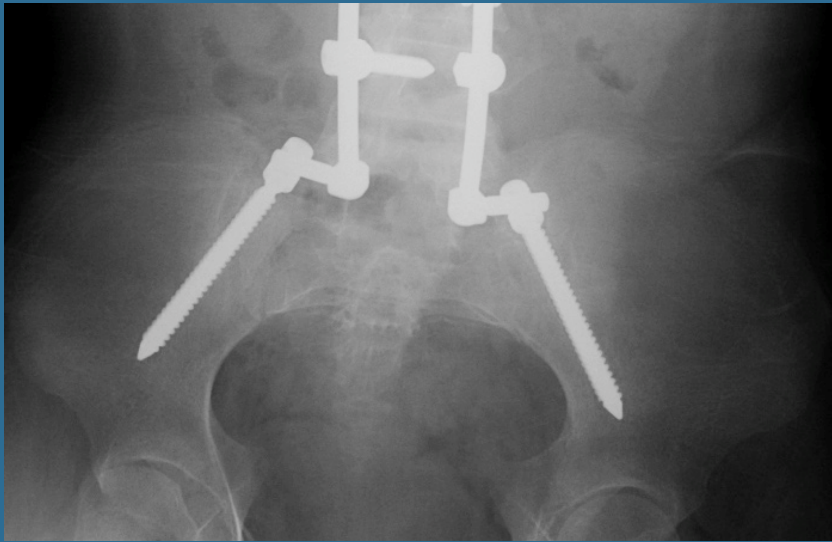
Tear  
drop

Sciatic notch

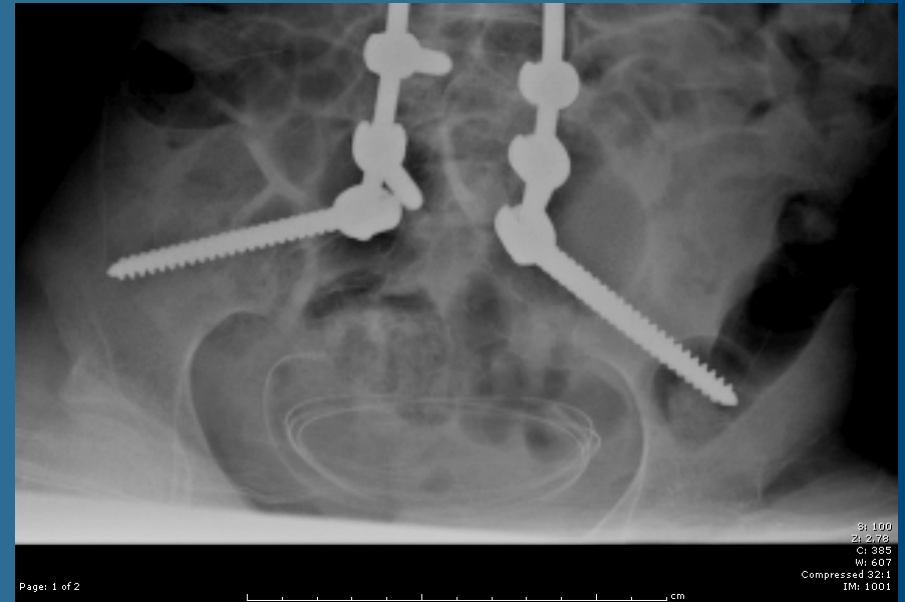




## Standard Iliac Screws Off-set Need Connectors



## SAI Screws line up



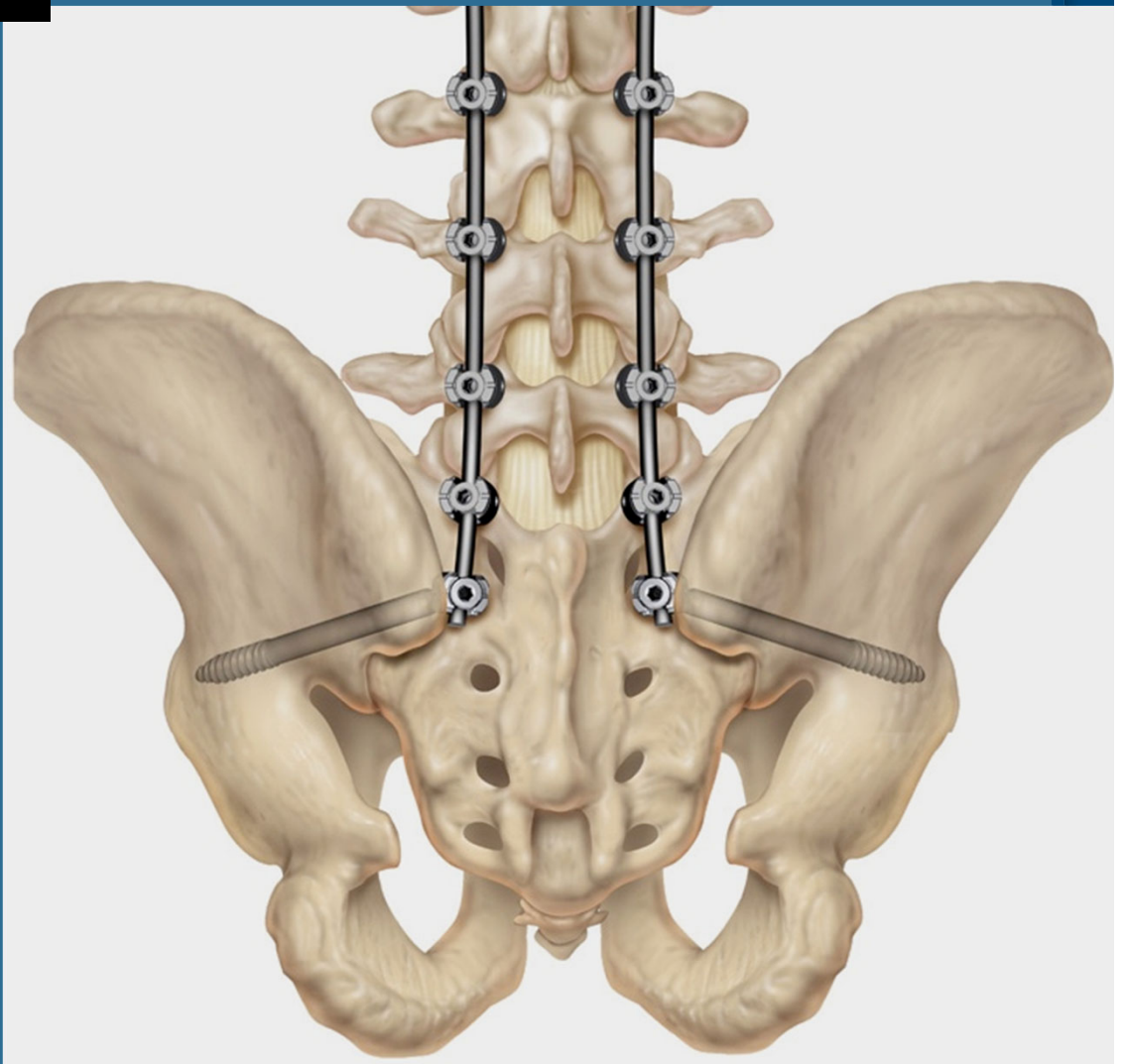
# SAI Screws

## Negative

- Learning curve

## Positives

- Low Profile - less revisions
- No connectors
- Less Failures
- Less infection (GR)

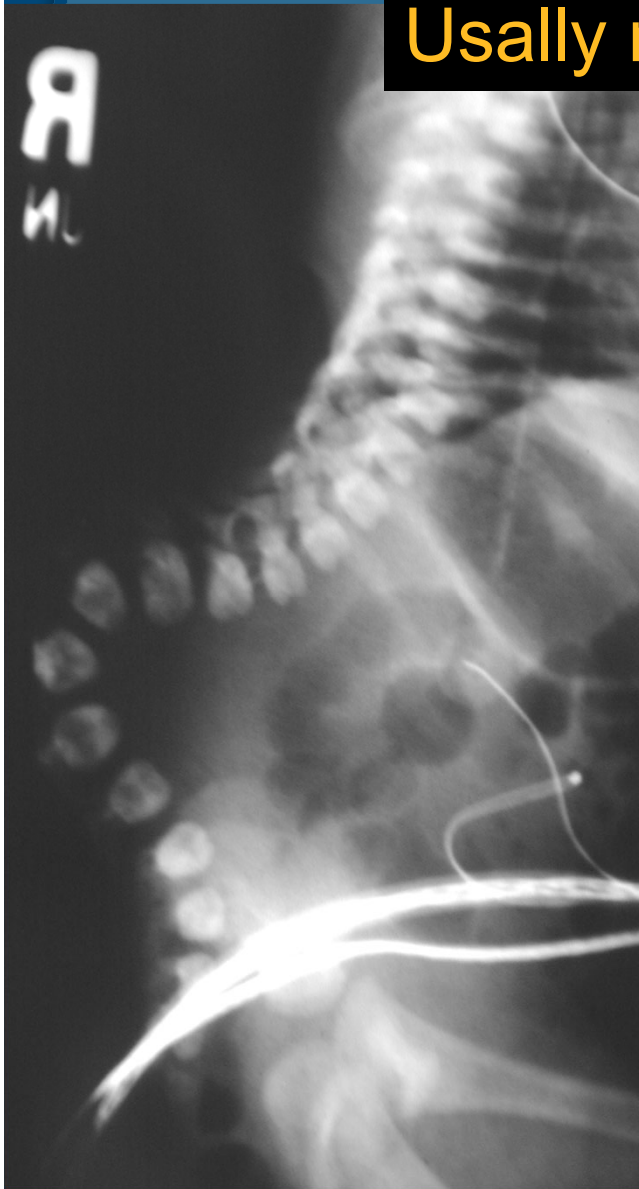


# Shilla





# Kyphectomy – Soft Tissue Usually neurologically compromised



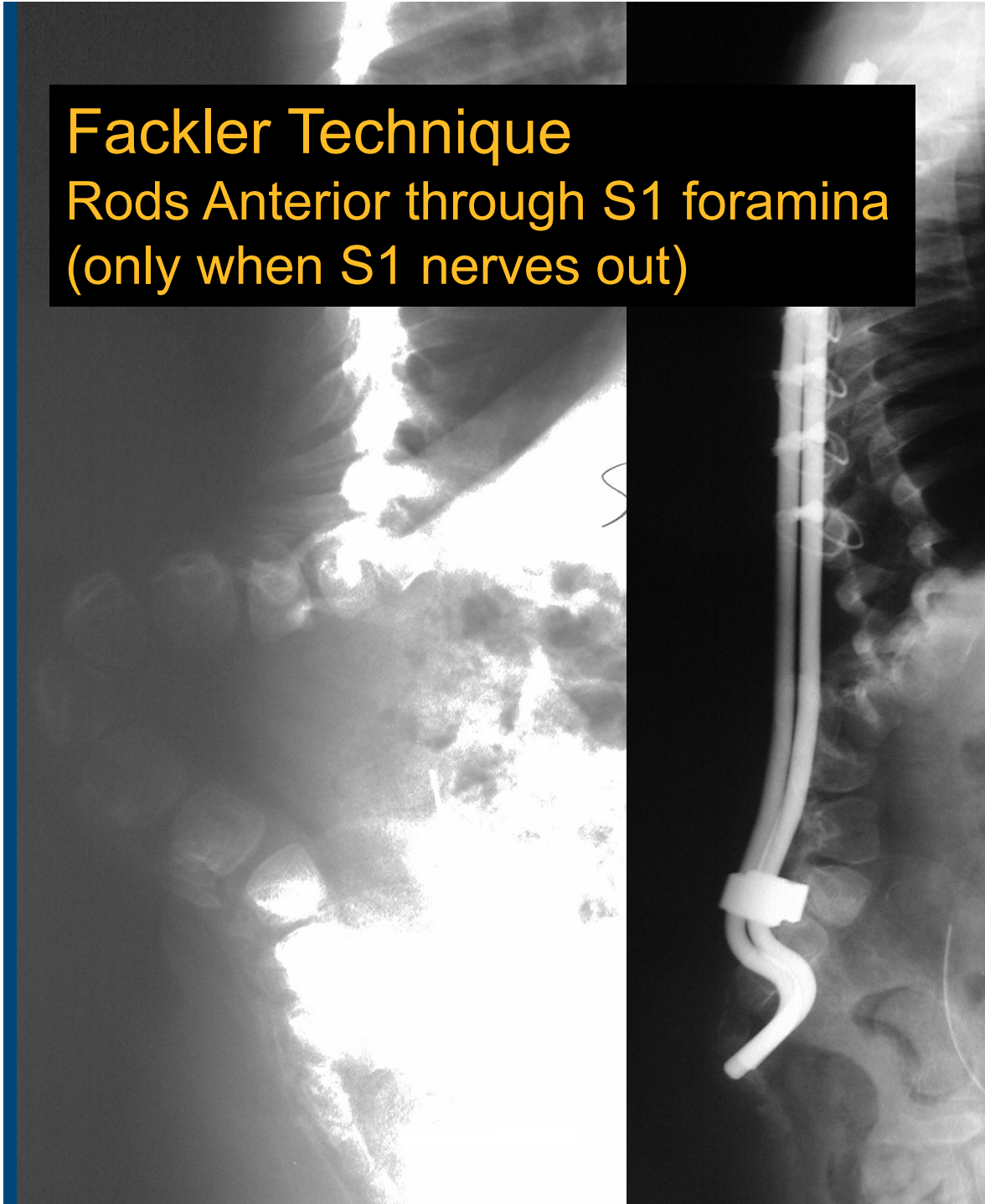
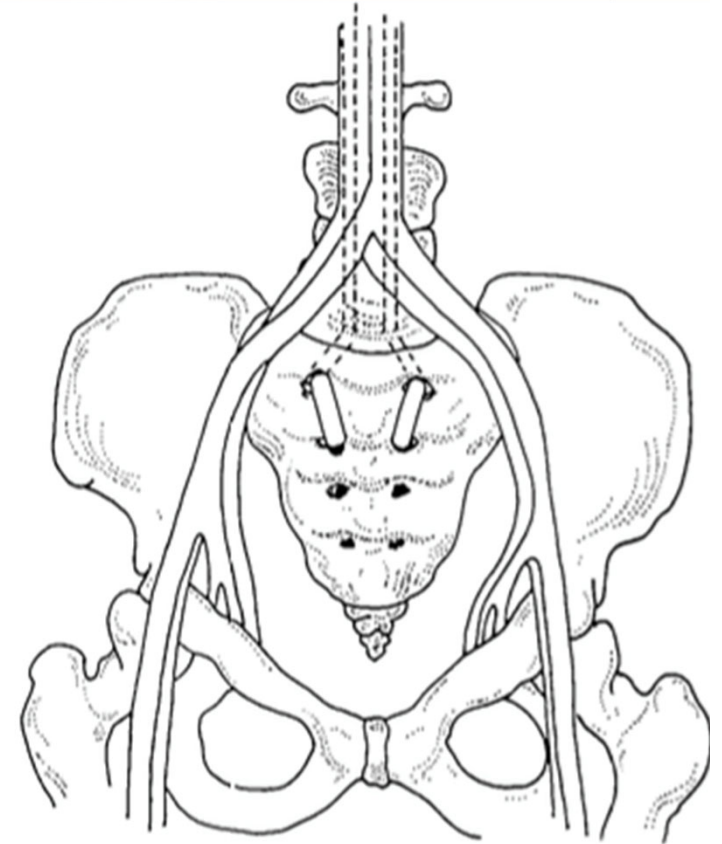
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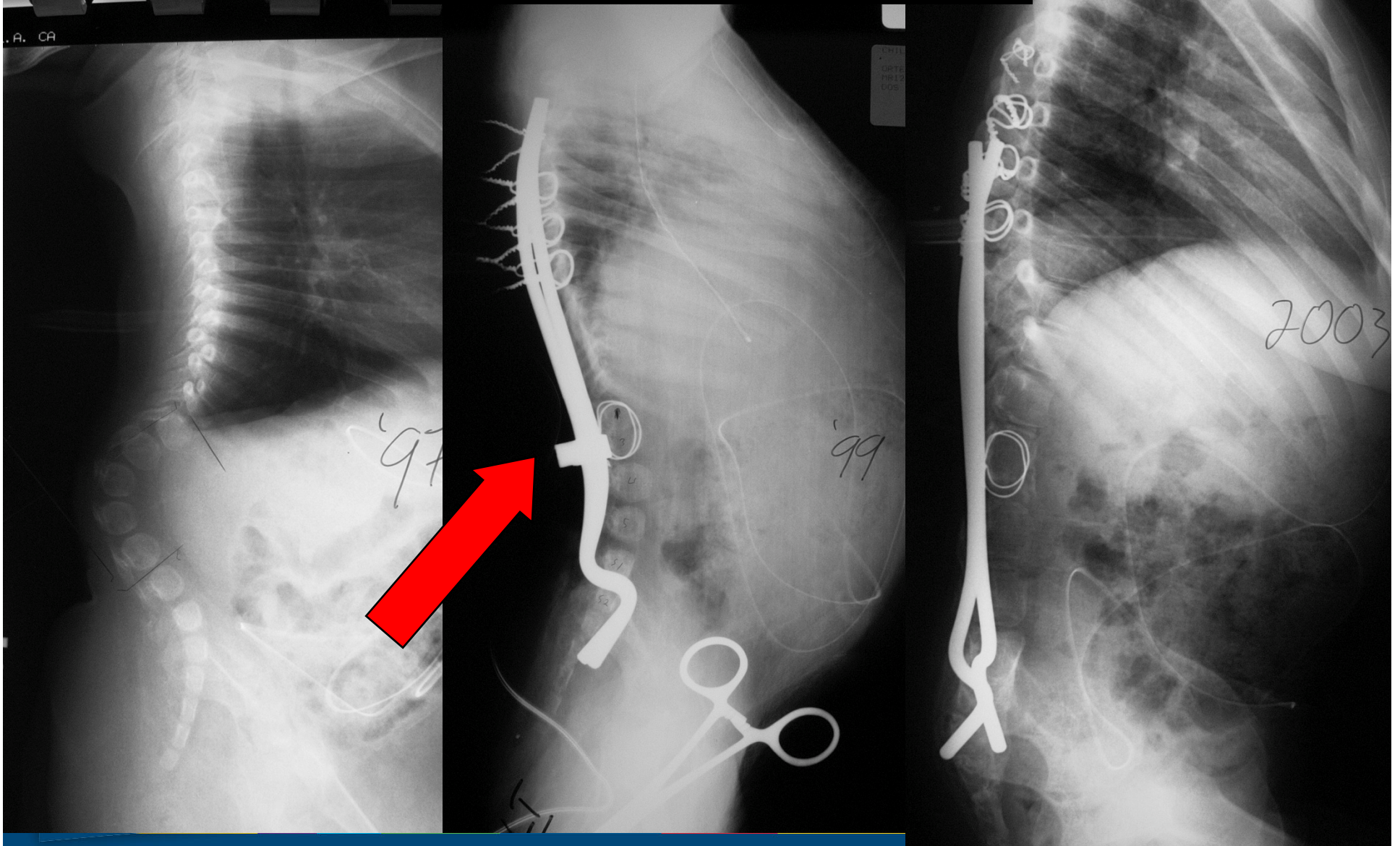


# Fackler Technique

Rods Anterior through S1 foramina  
(only when S1 nerves out)



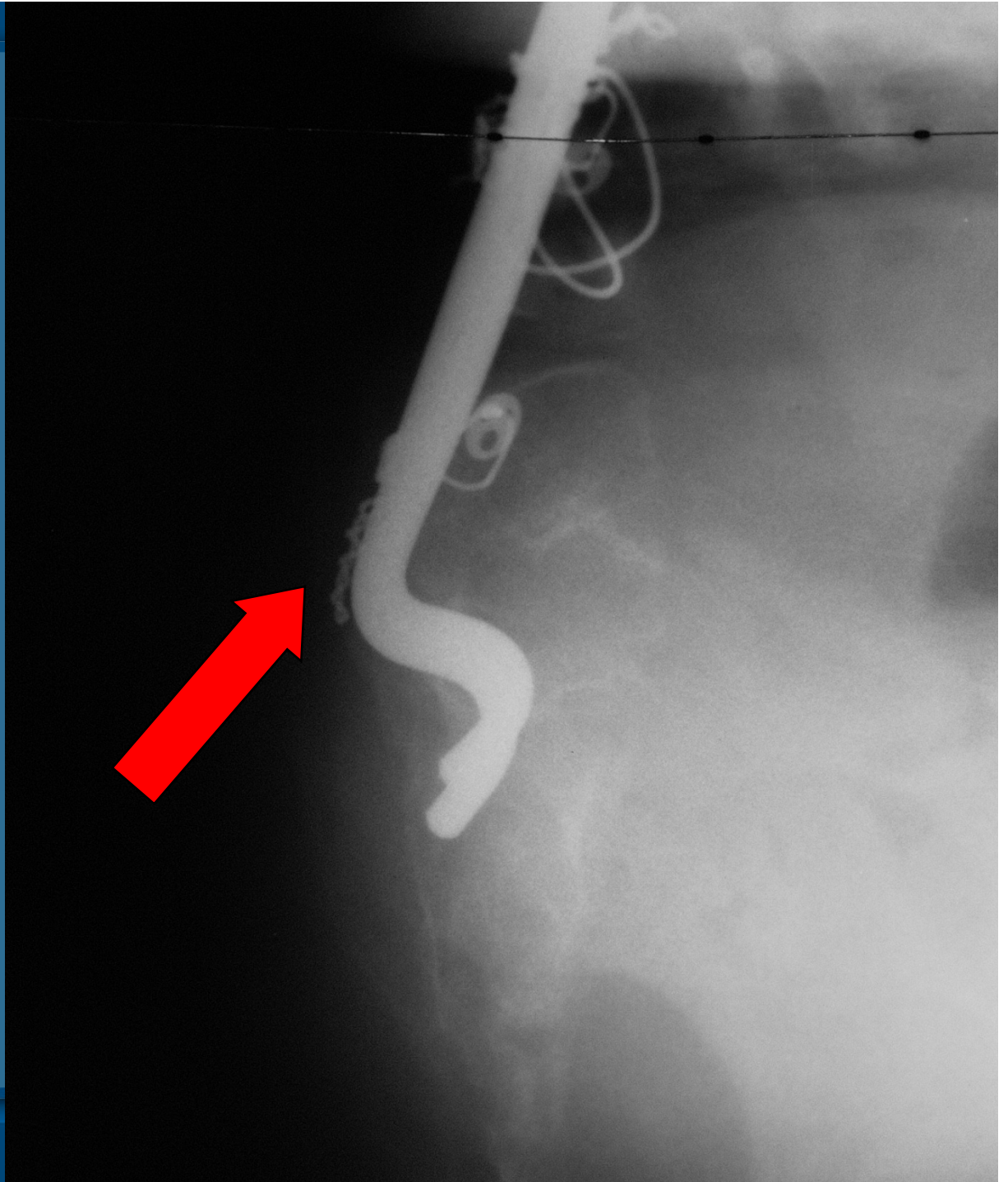
Not rotationally stable  
Cross connectors help





# Posterior Migration

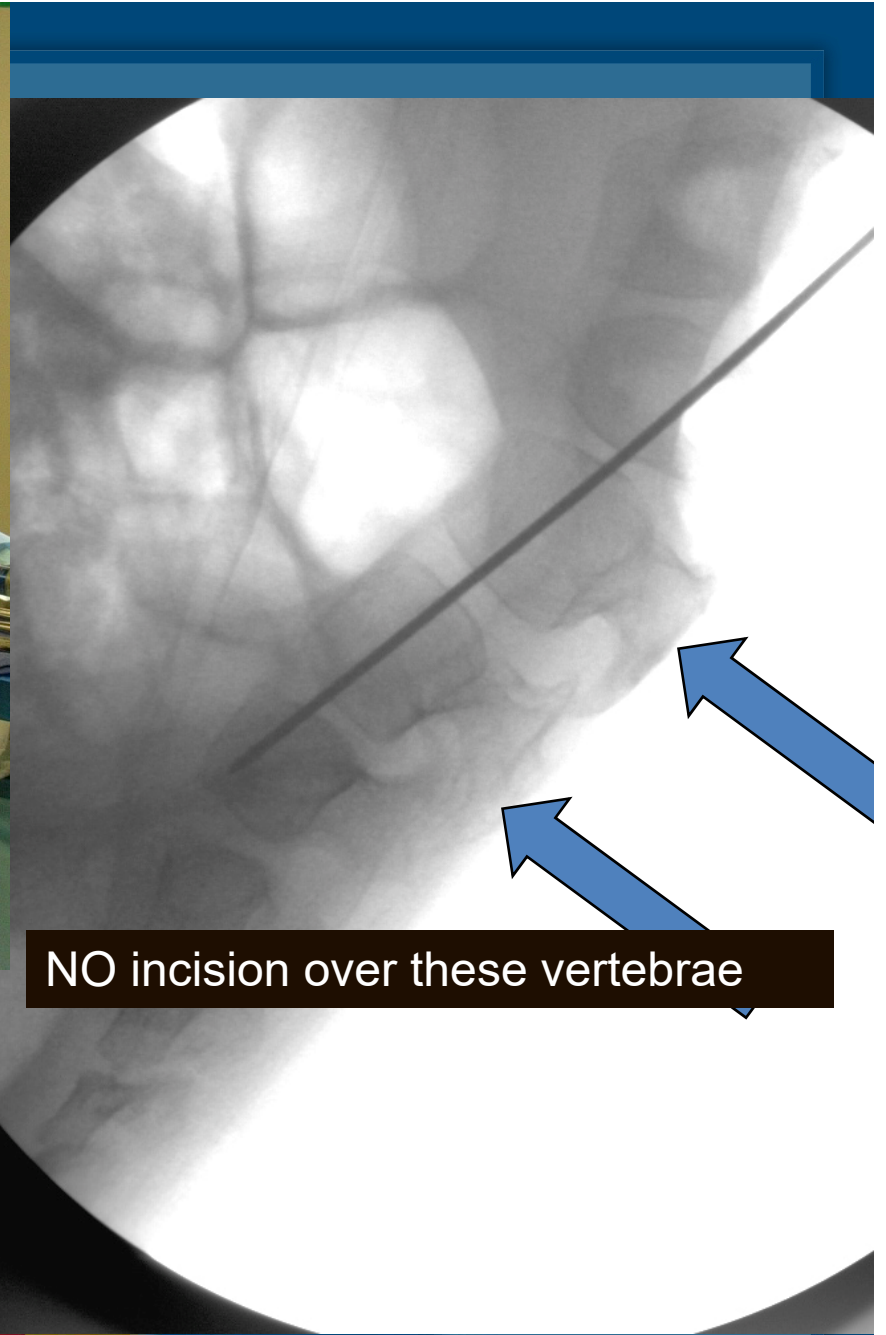
- Thin skin



# Ultra Low Profile Rods





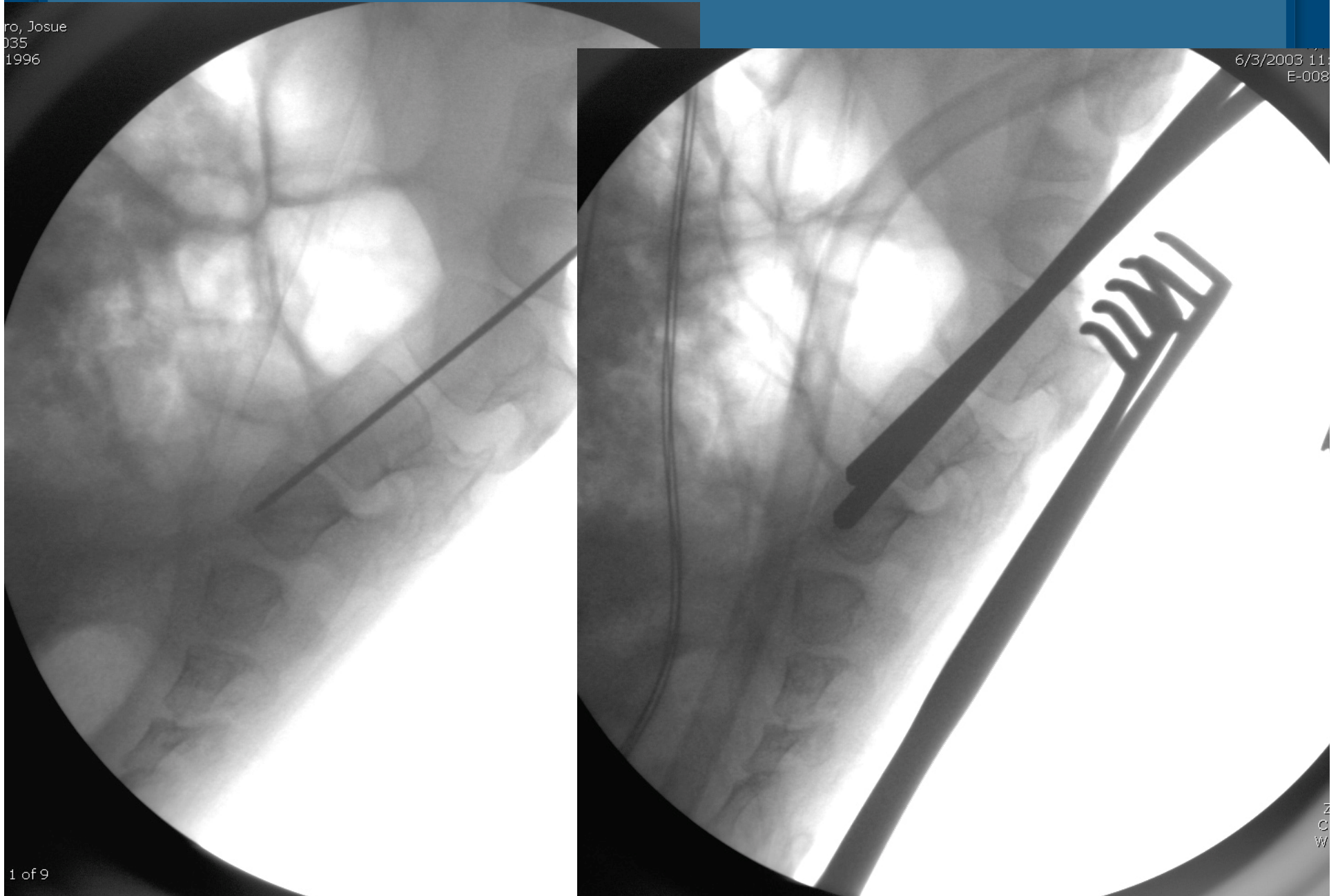


NO incision over these vertebrae

Wire for 7.3 cannulated screw, then drill bit, then hammer in rods – they fit very tightly

ro, Josue  
035  
1996

6/3/2003 11:  
E-008

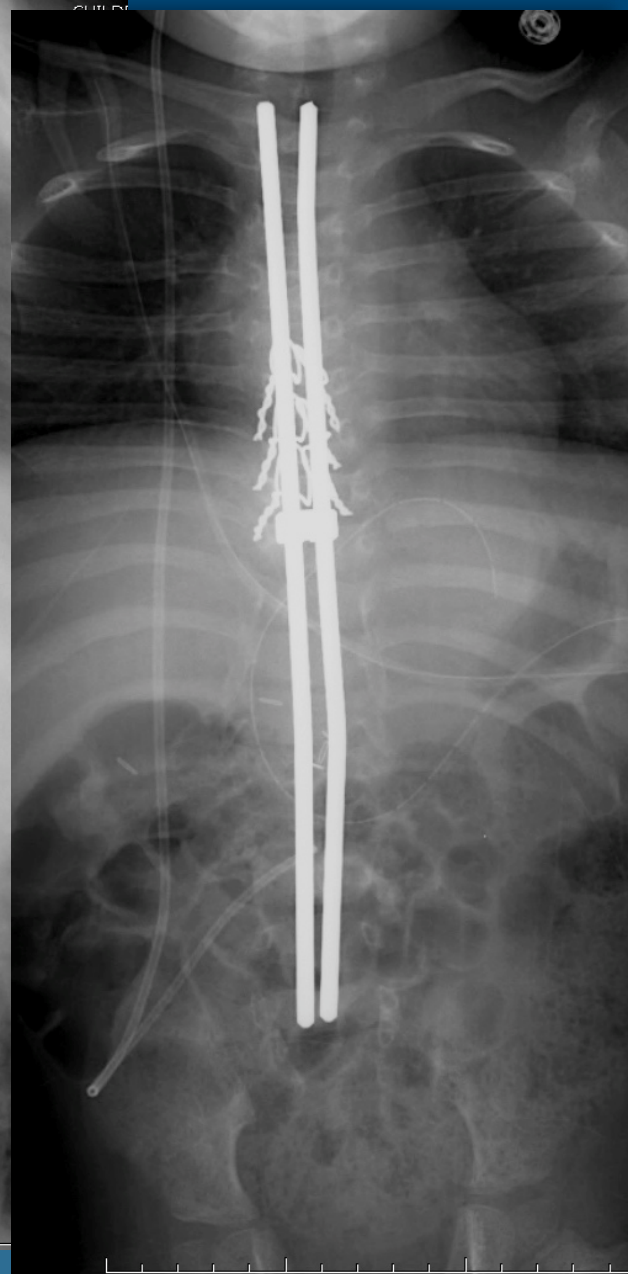
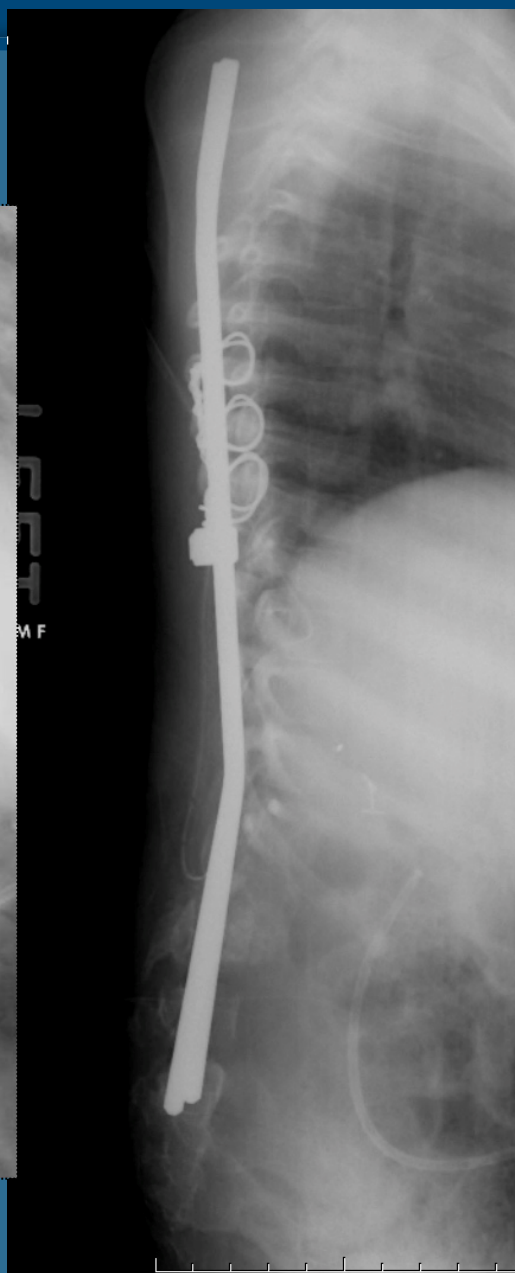
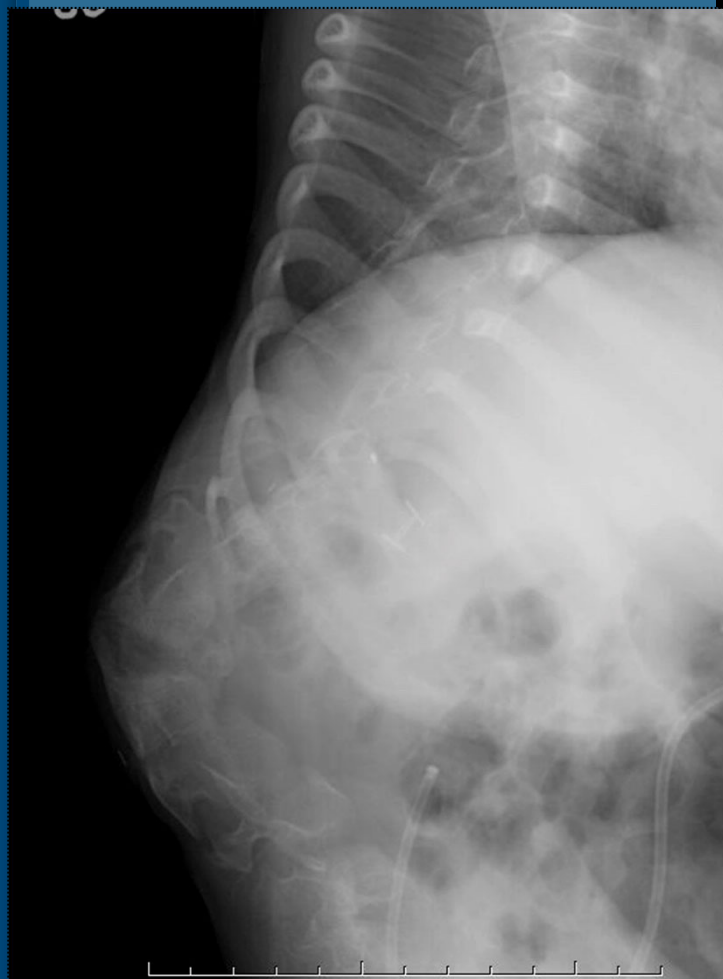


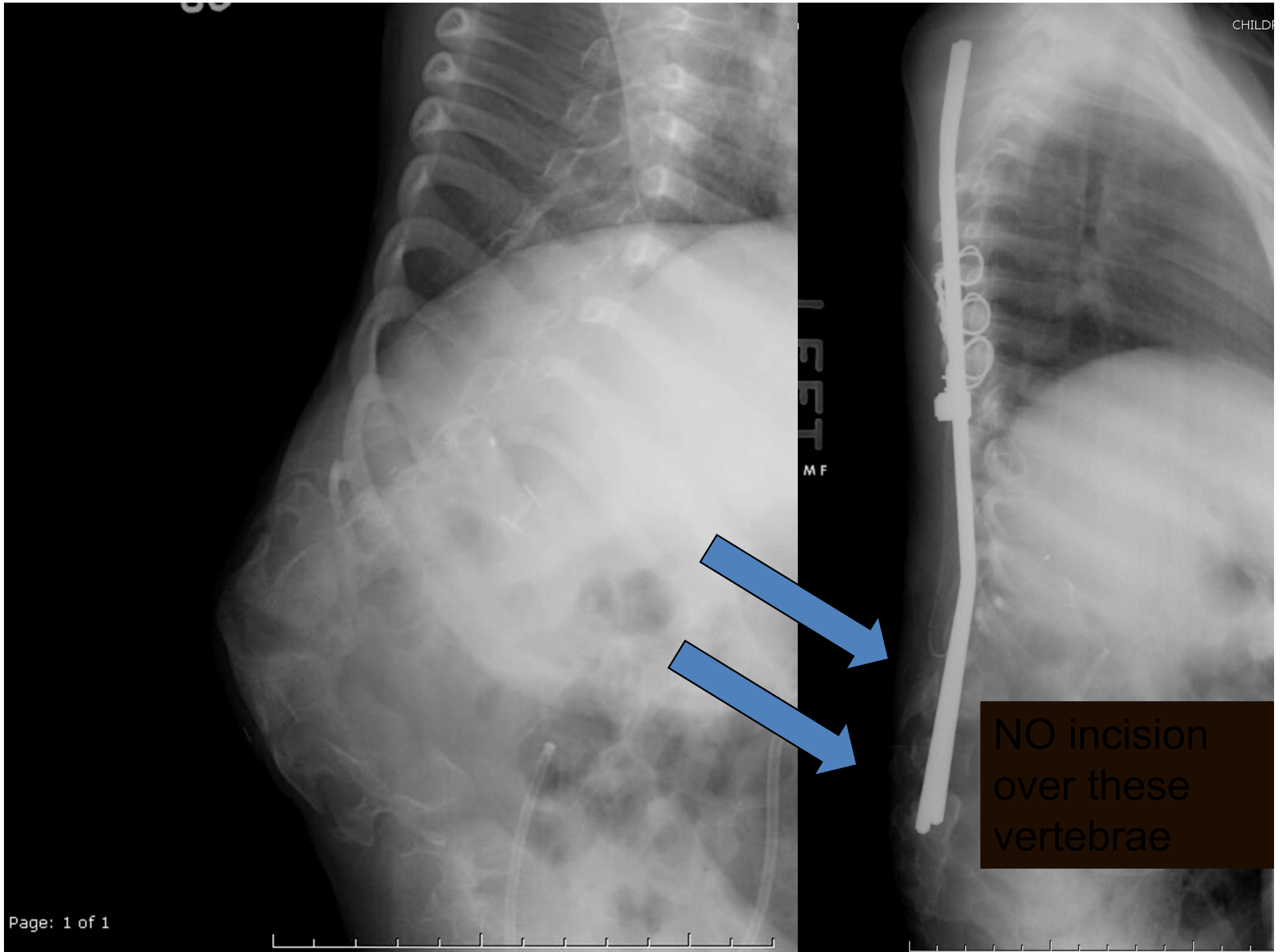


NO incision over distal vertebrae









Poop out  
of Wound





Thank You

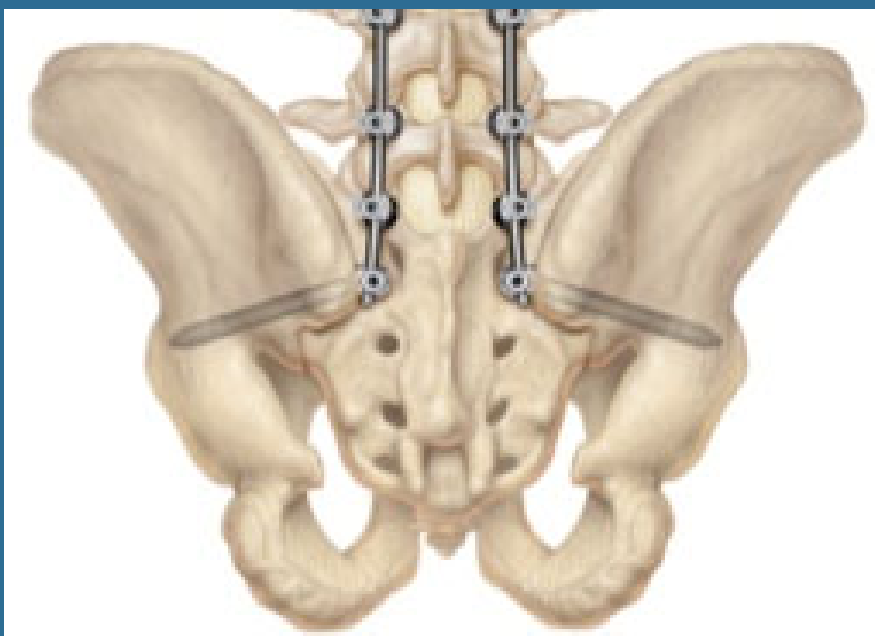


# Pelvic Fixation of Growing Rods

Spine 2009

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Dual rods best for correction  
Iliac screws may break more

??prominence??

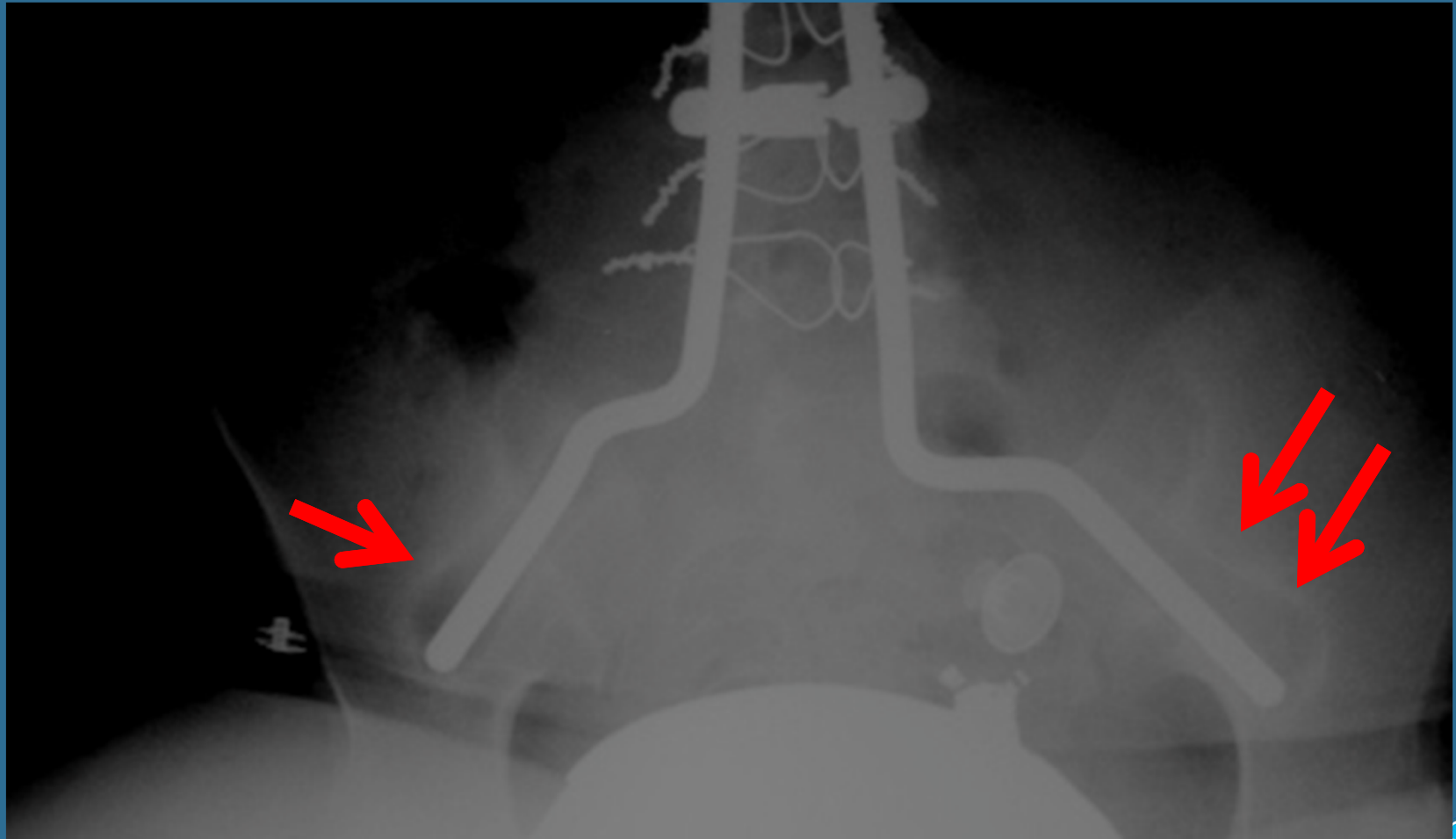


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# Galveston abandoned in adults: pain

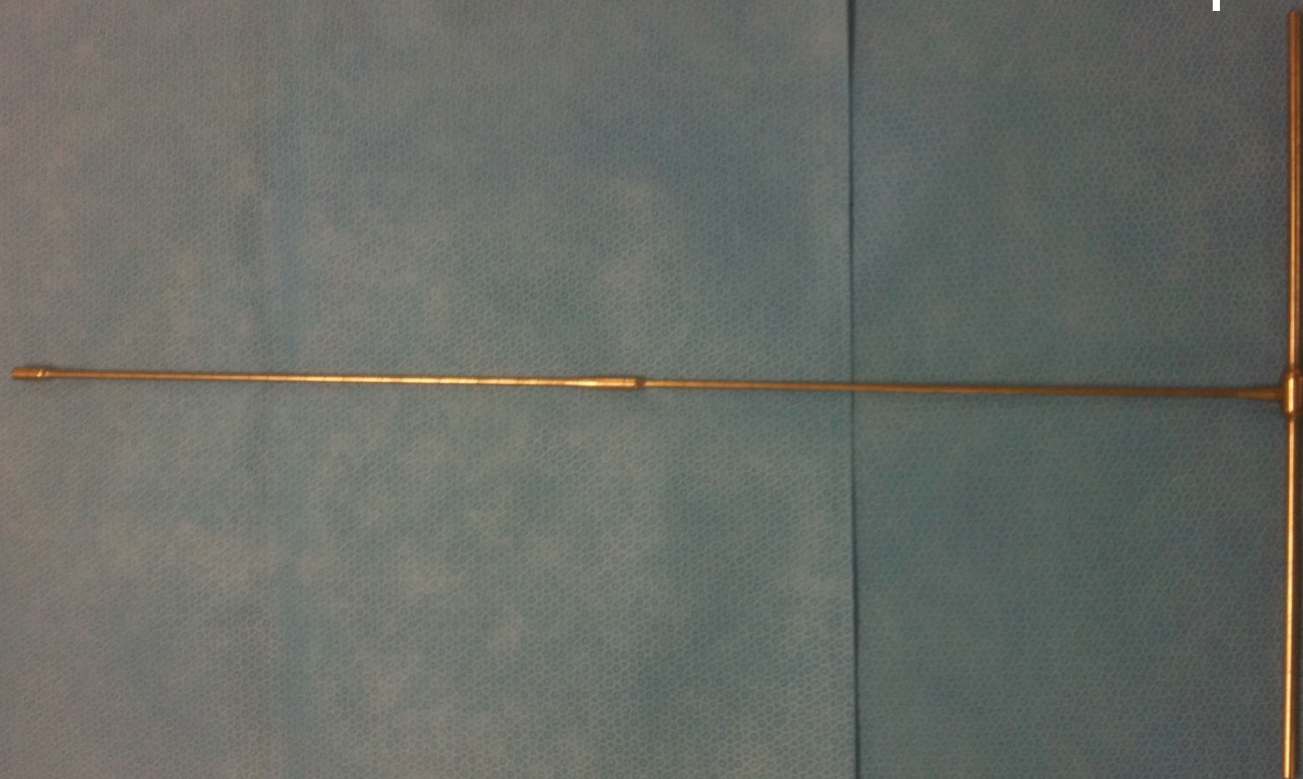




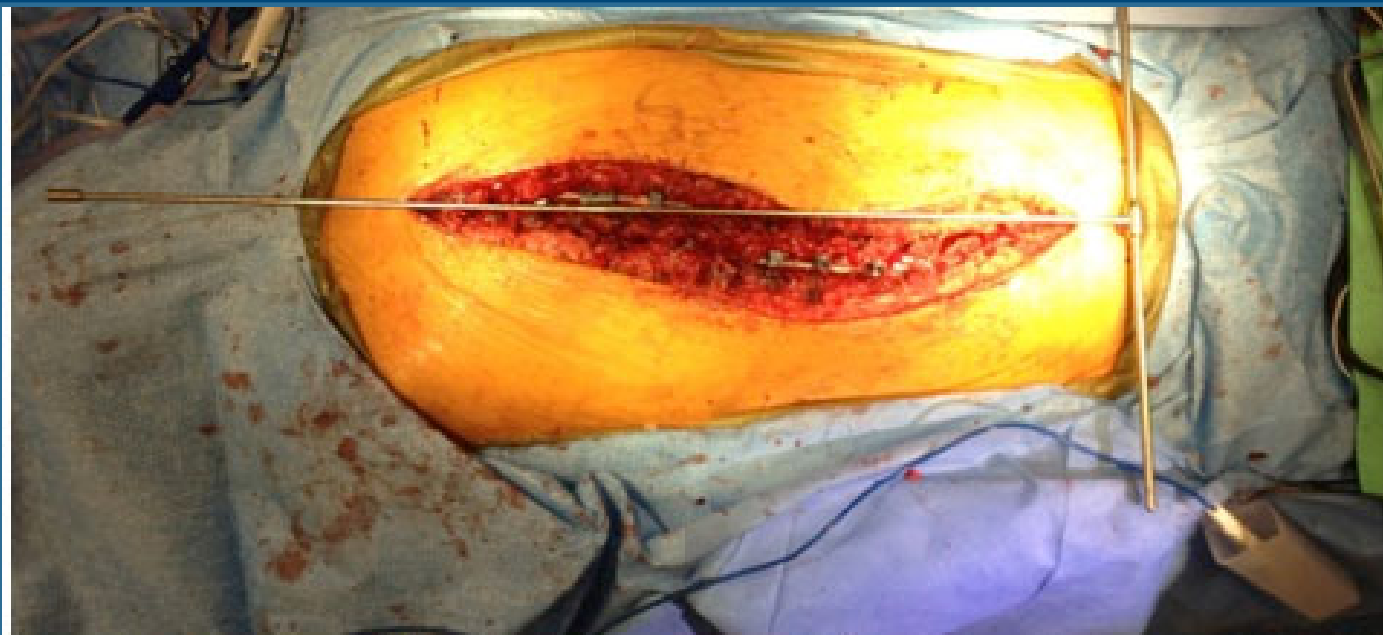
# Surgical Technique for Balancing Posterior Spinal Fusions to the Pelvis Using the T Square

*Lindsay Andras, MD, Kent T. Yamaguchi, Jr, BS, David L. Skaggs, MD, and Vernon T. Tolo, MD*

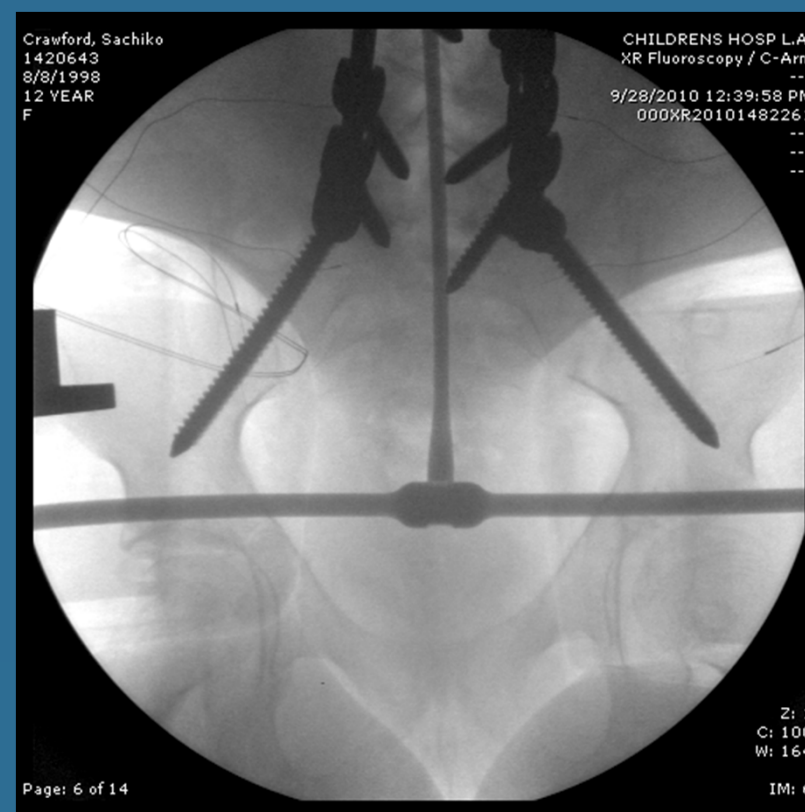
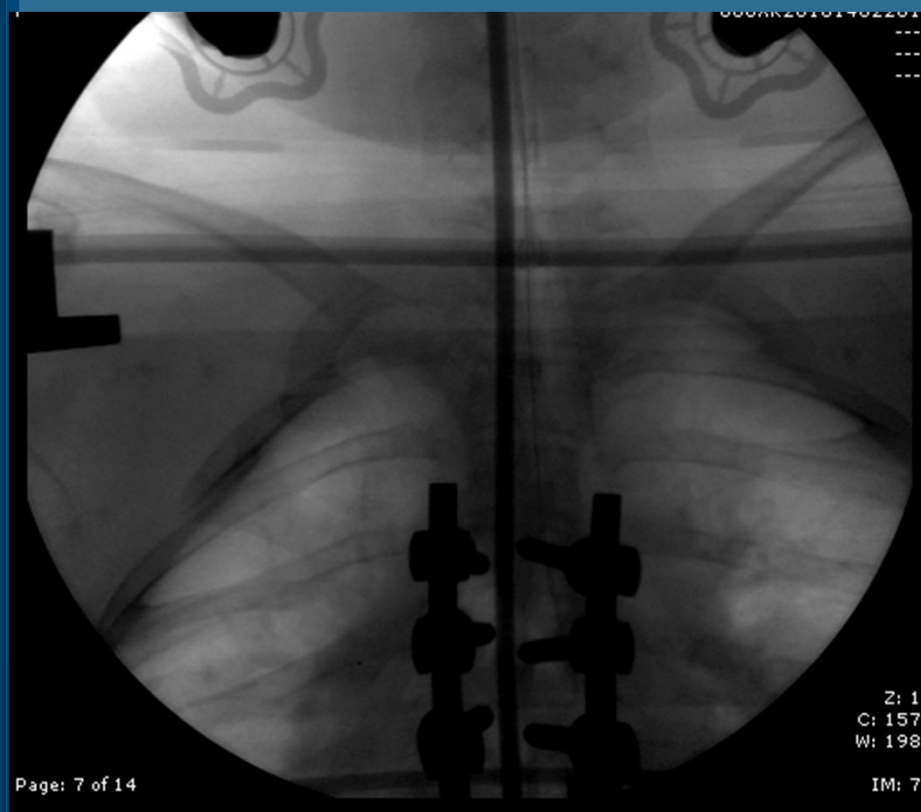
T Square of Tolo



JPO 2012



# T square

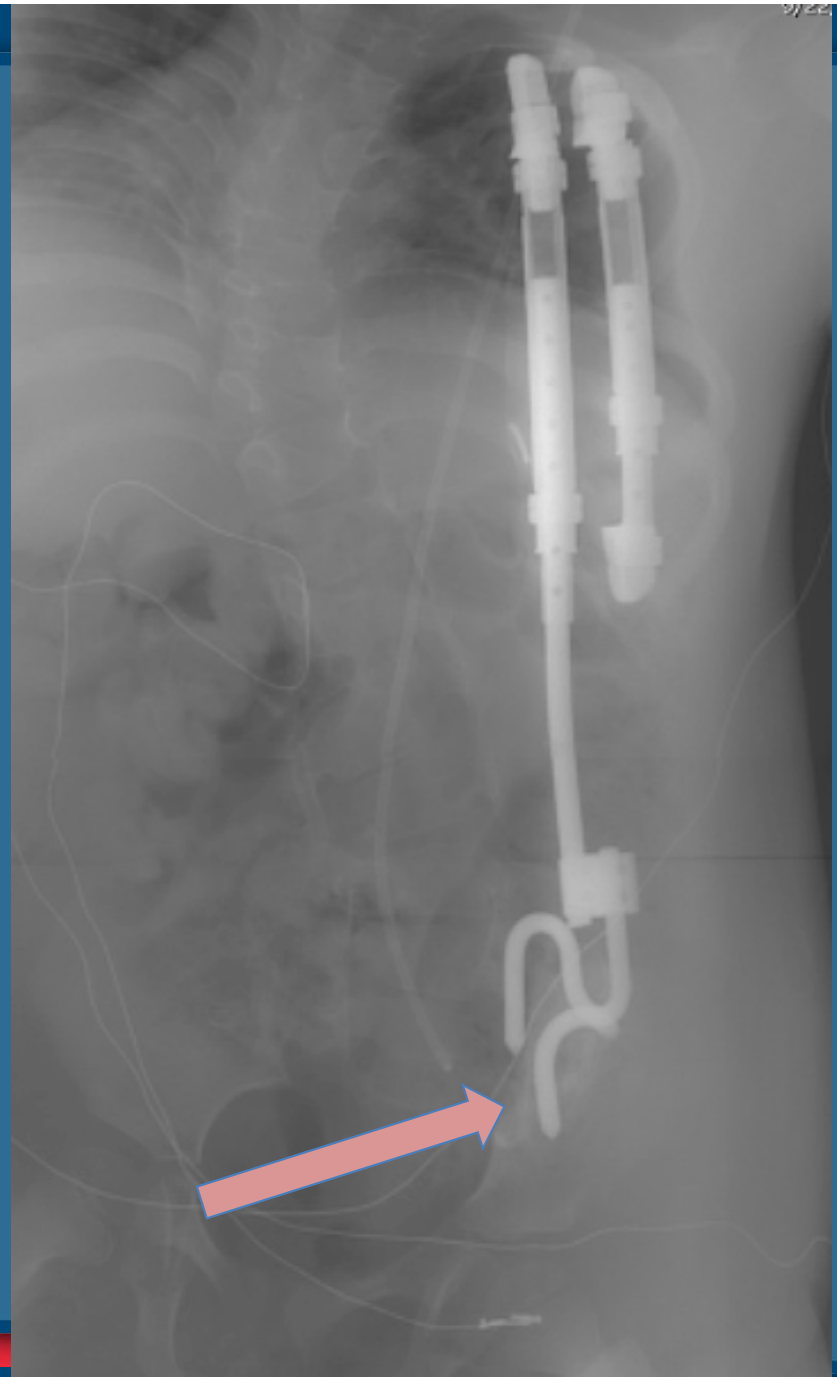
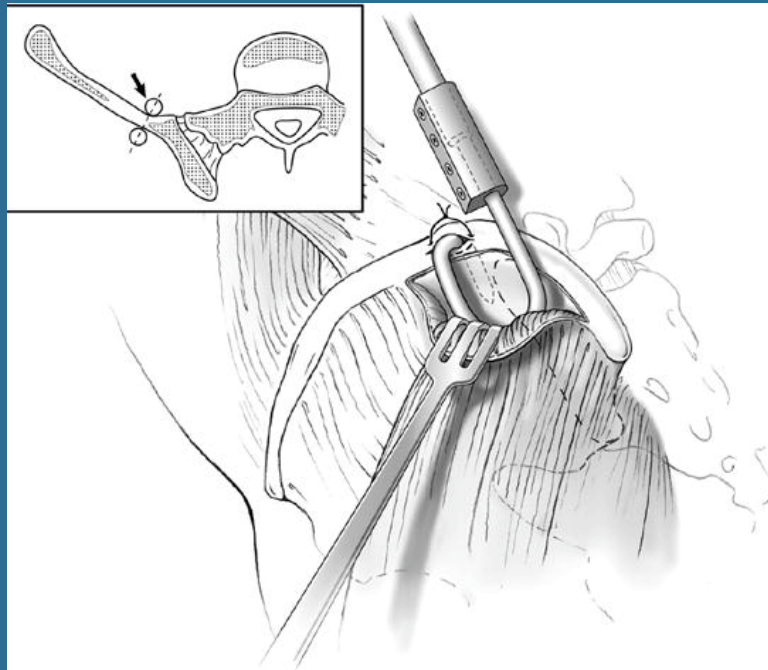




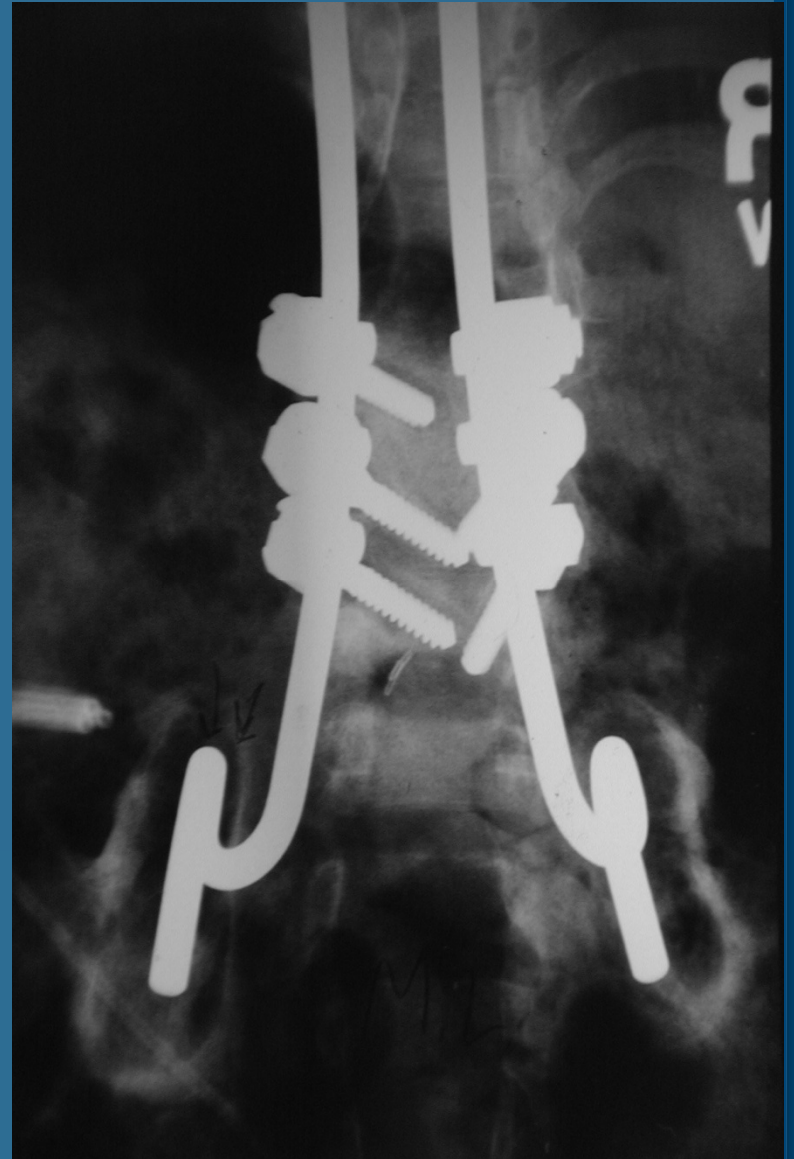
Thank You



# Pelvic Fixation in Growing Rods “S” Rods



# Infected d S-rods



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# The End







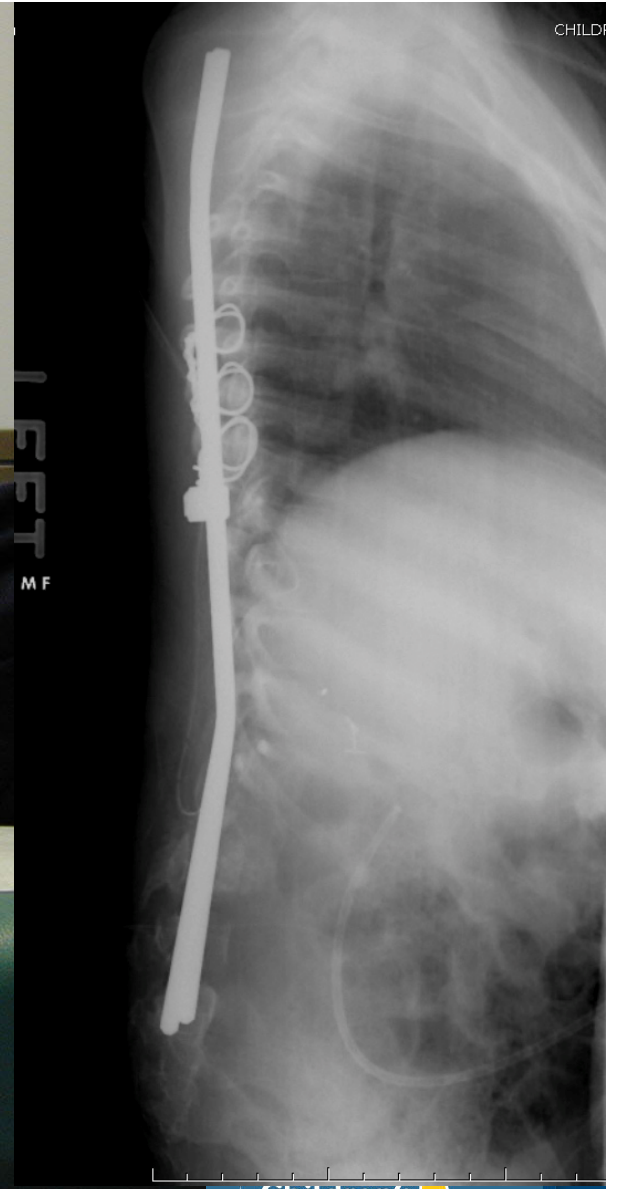




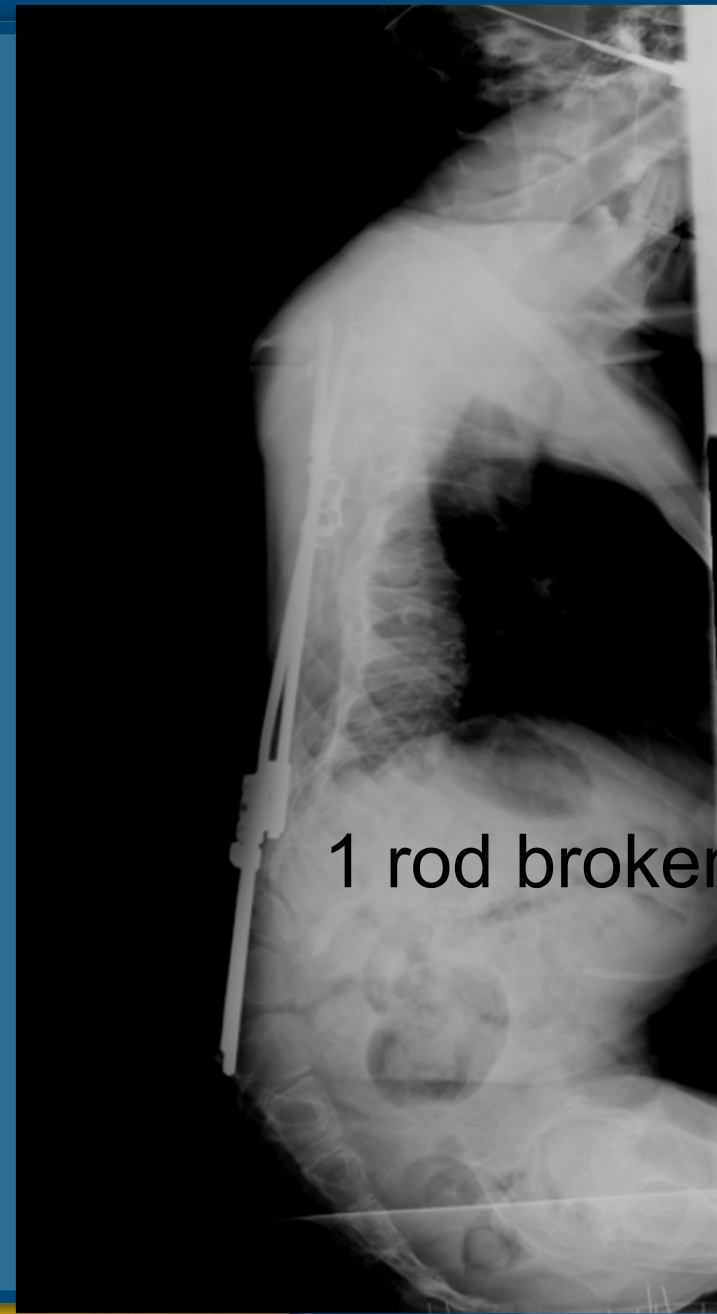








7 yo f/u, Age 13  
No clinical  
problems

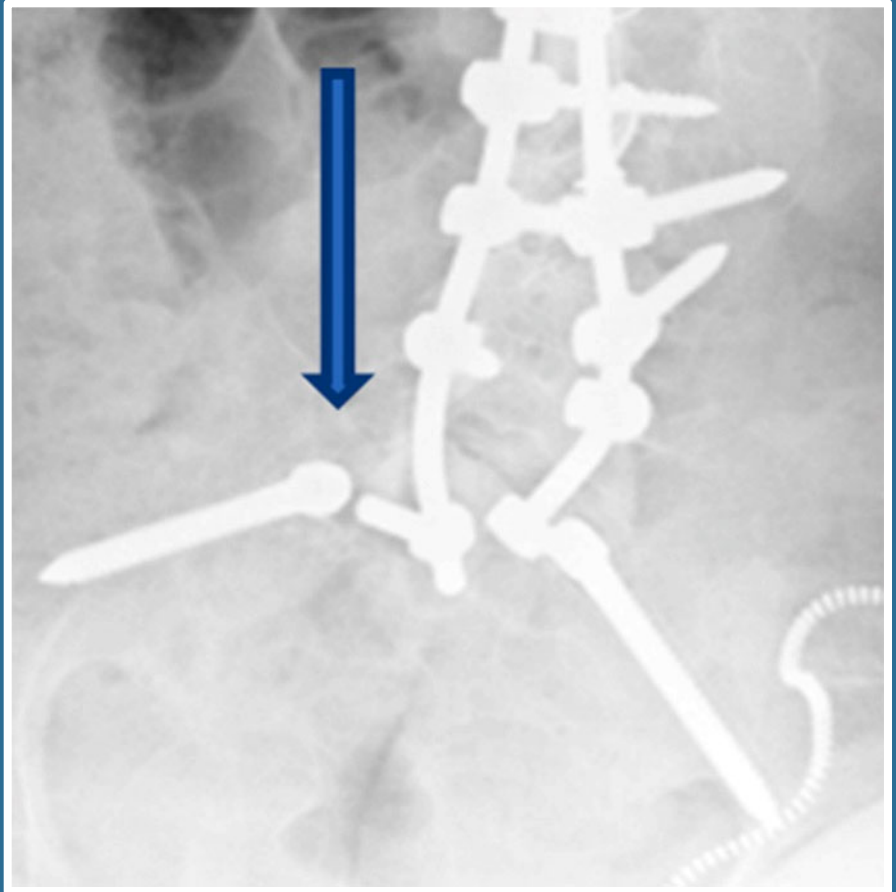


## Connector Disengagement 18%

Disengagement of the connector at the rod



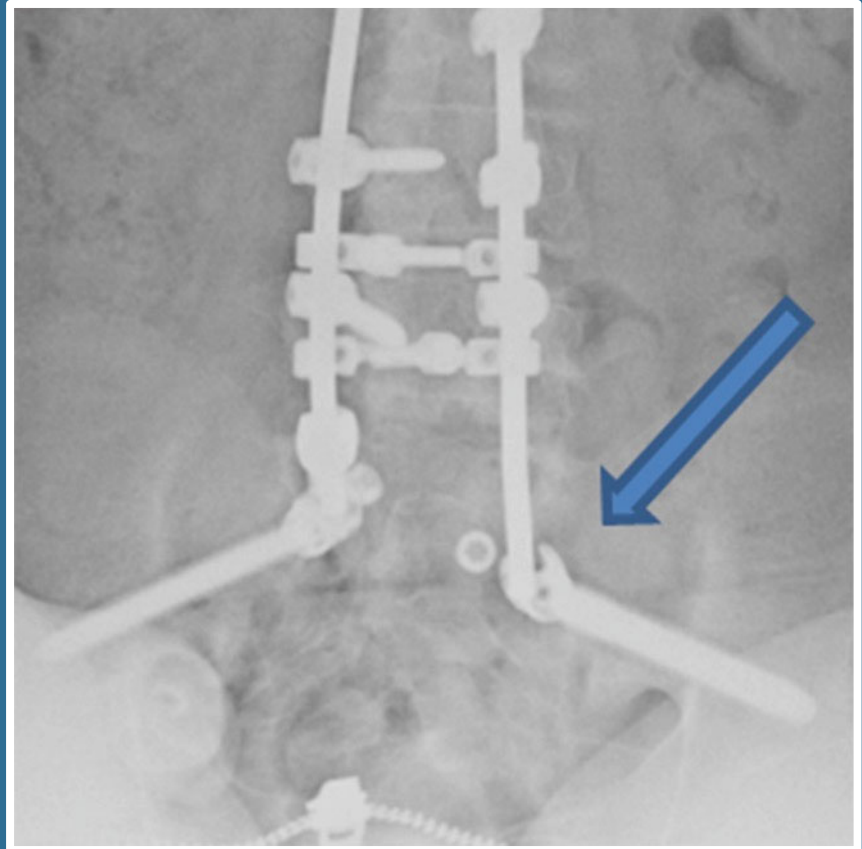
Disengagement of the connector from the screw



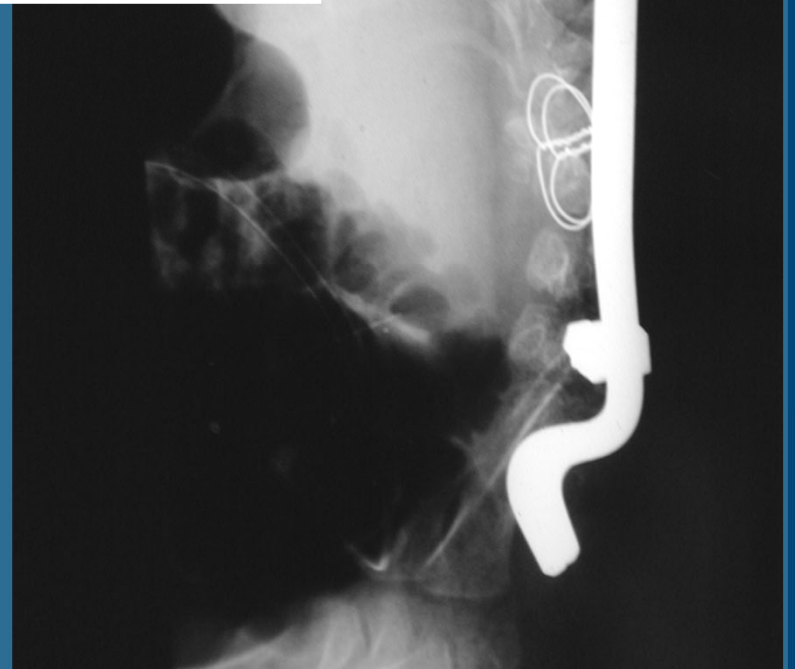
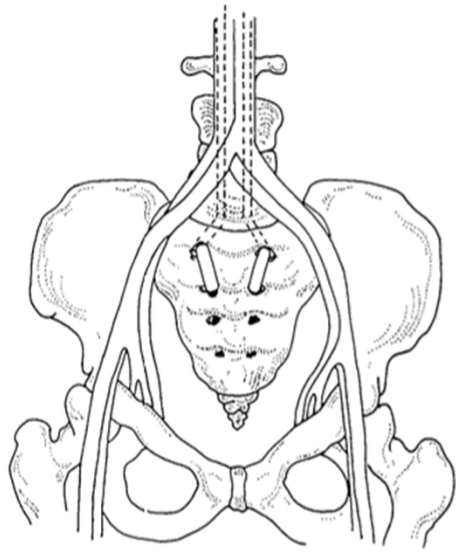
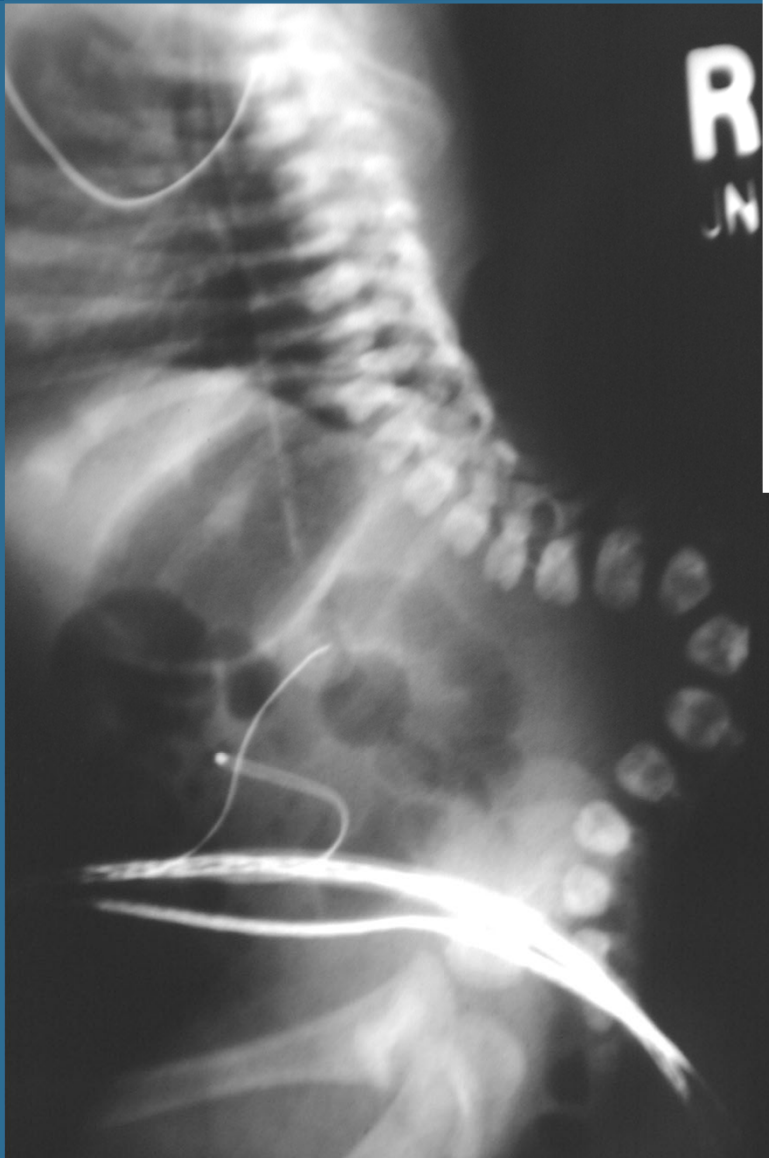
Separation of screw head from  
screw shaft



Set screw disengaged



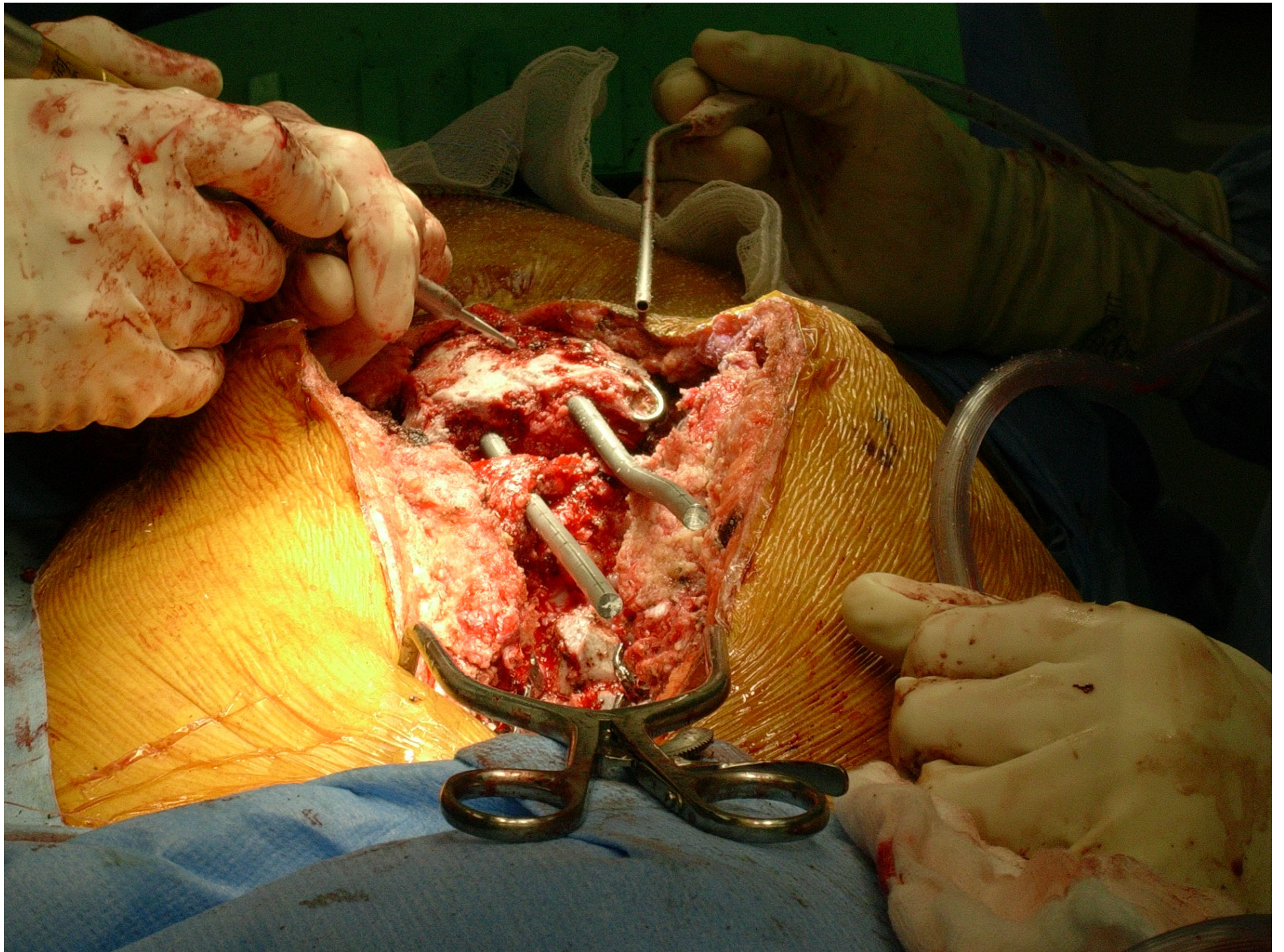




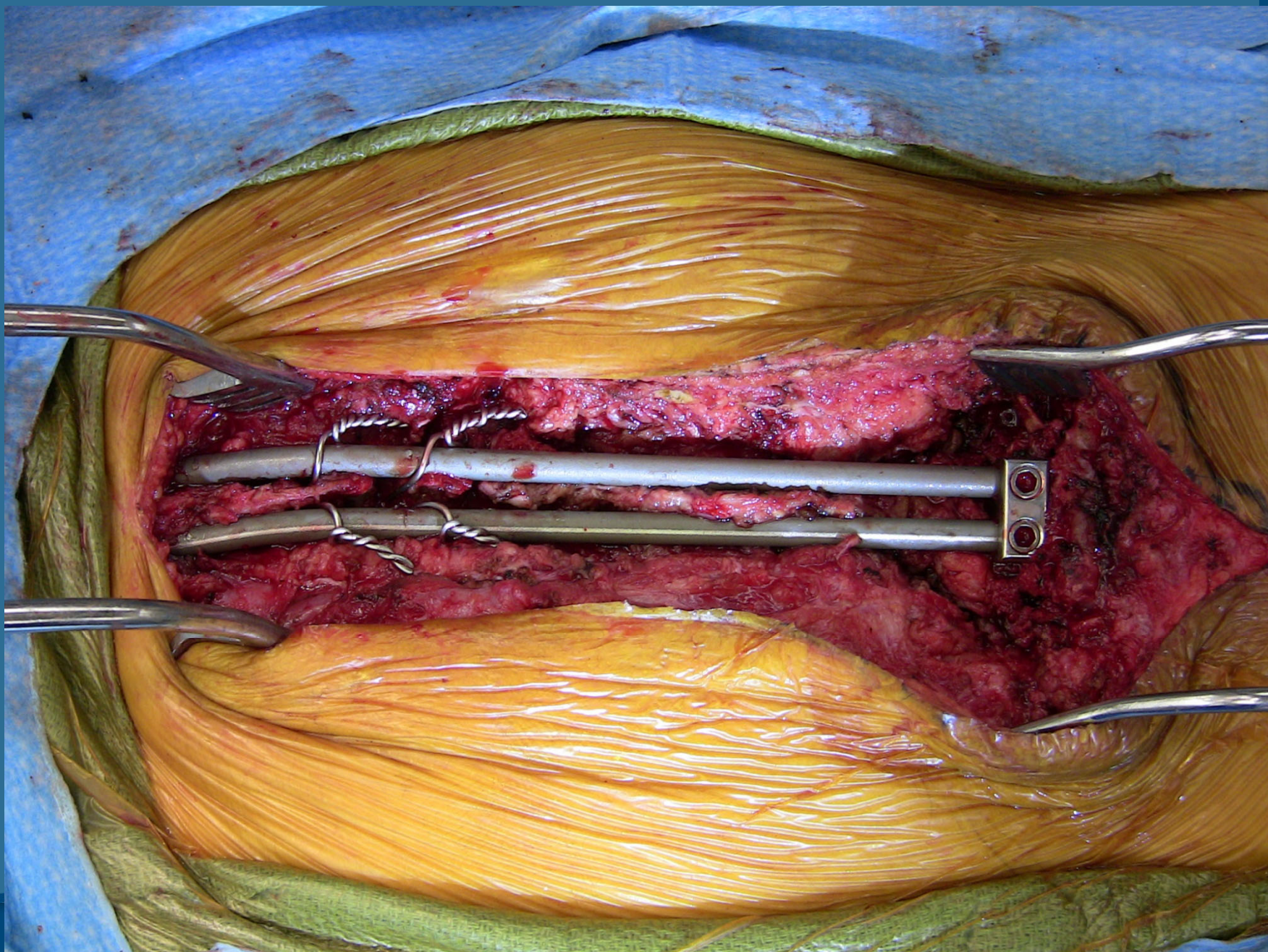
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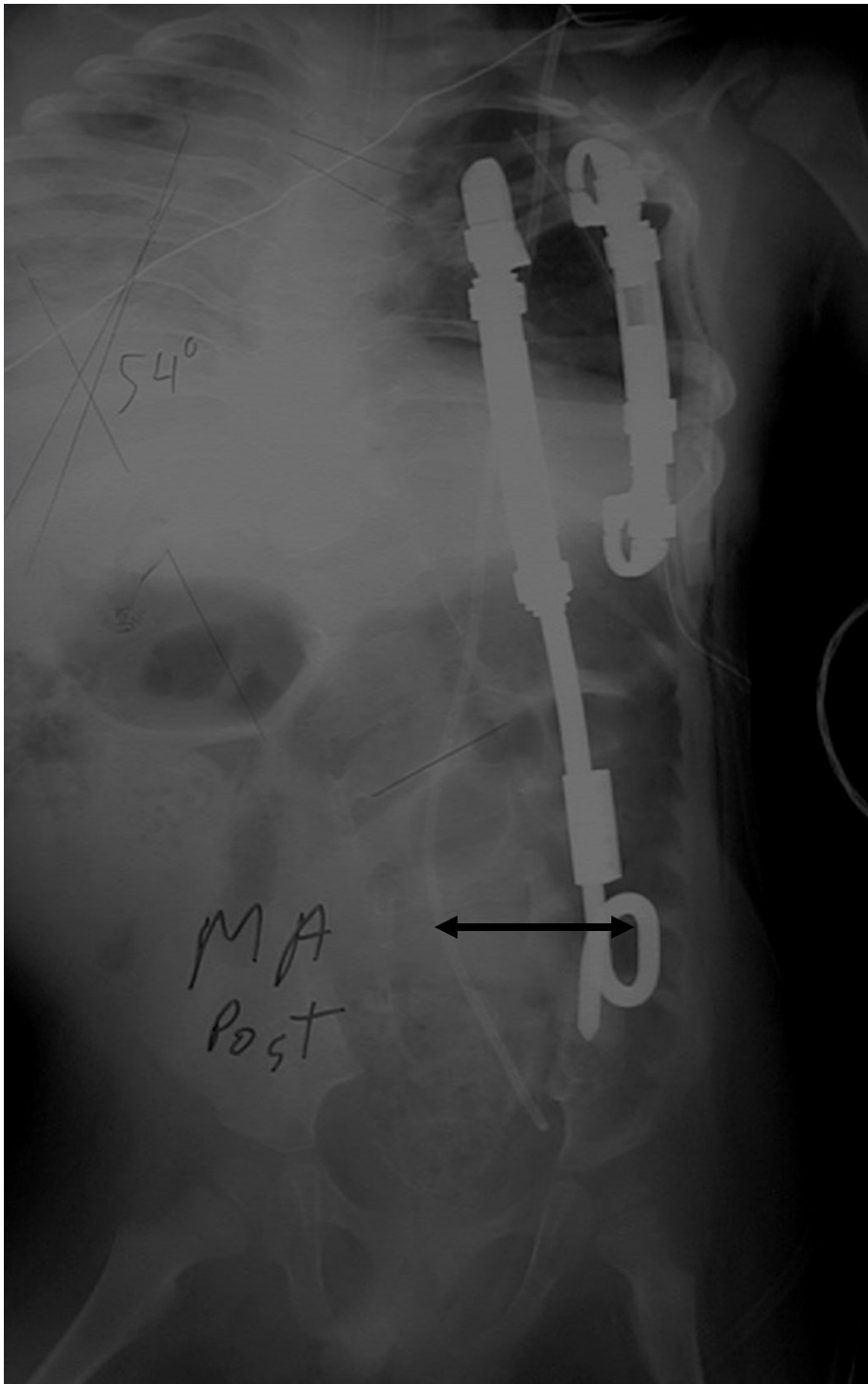








# Pelvic “S” Hook Mechanical Advantage





**Option:**  
**Feel Sciatic Notch - 3 cm incision**



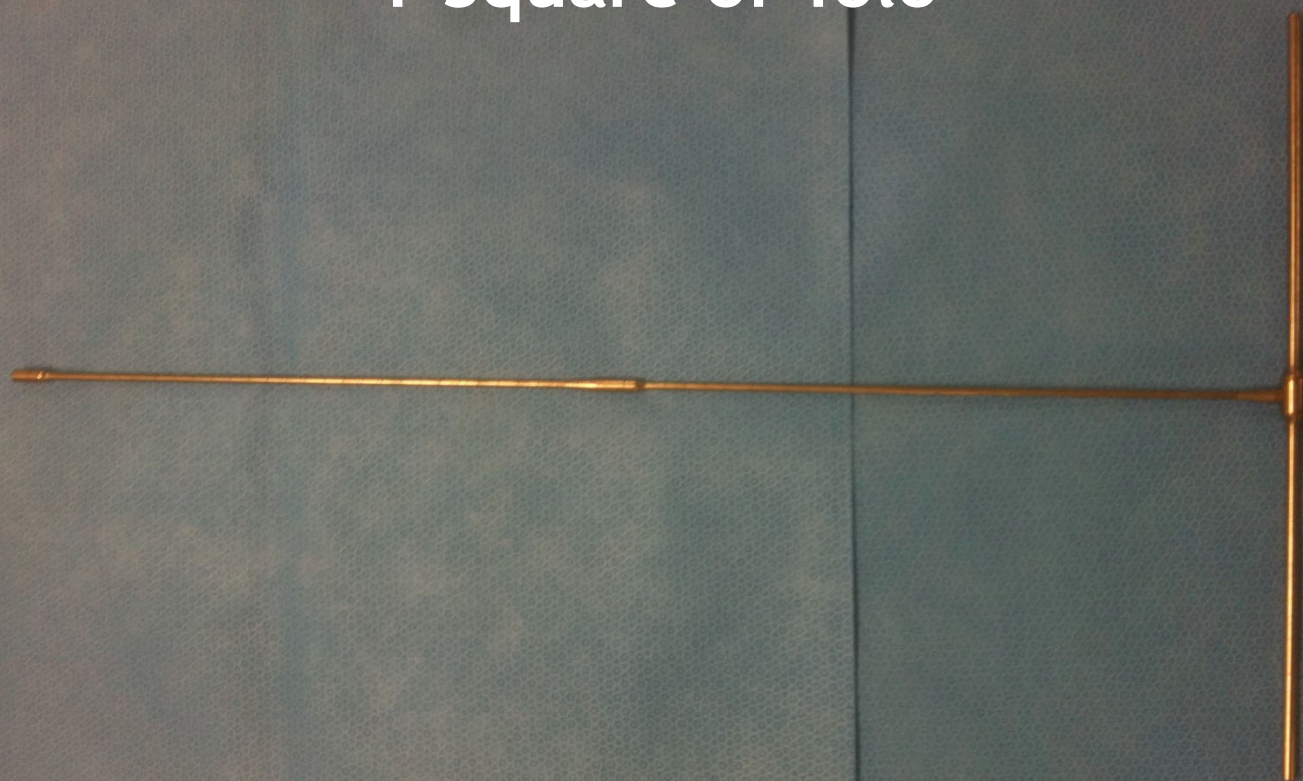
# Revision Surgery for Prominence

Iliac Screw	SAI Screw	P-value
11% (6/55)	2% (1/46)	0.027

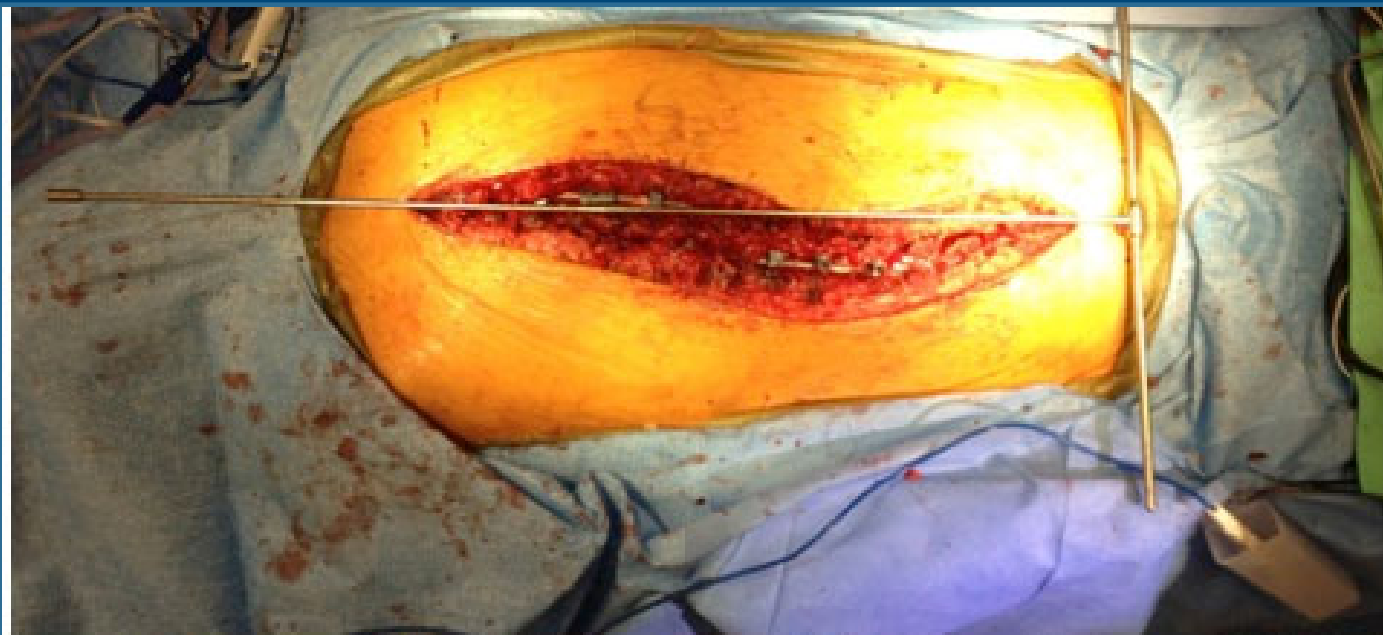
# Surgical Technique for Balancing Posterior Spinal Fusions to the Pelvis Using the T Square

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## T Square of Tolo

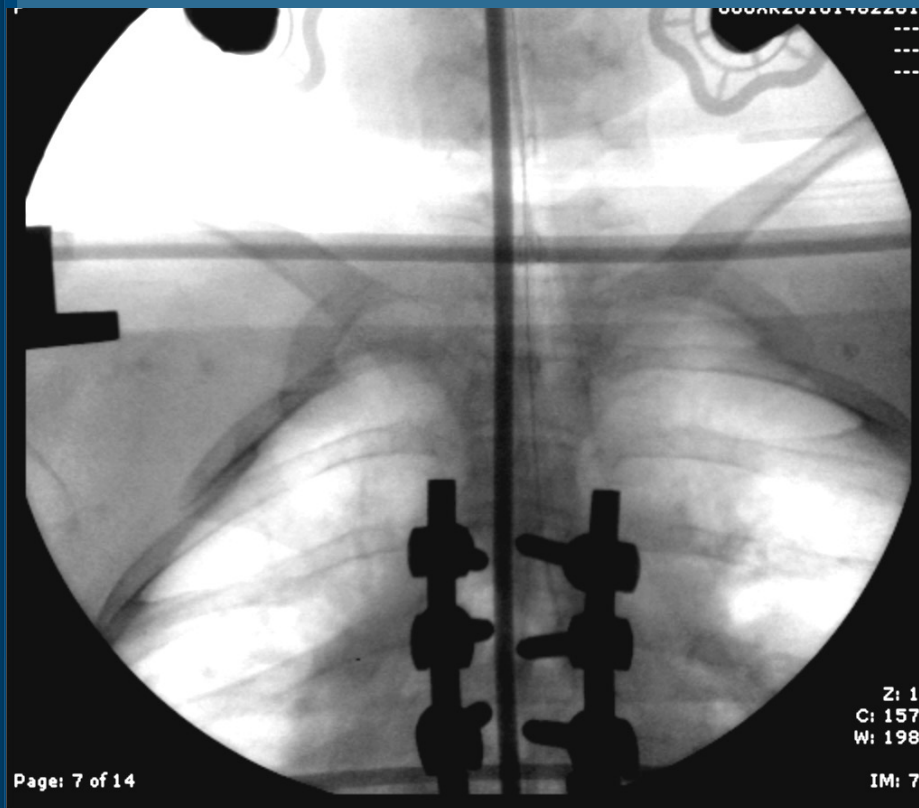






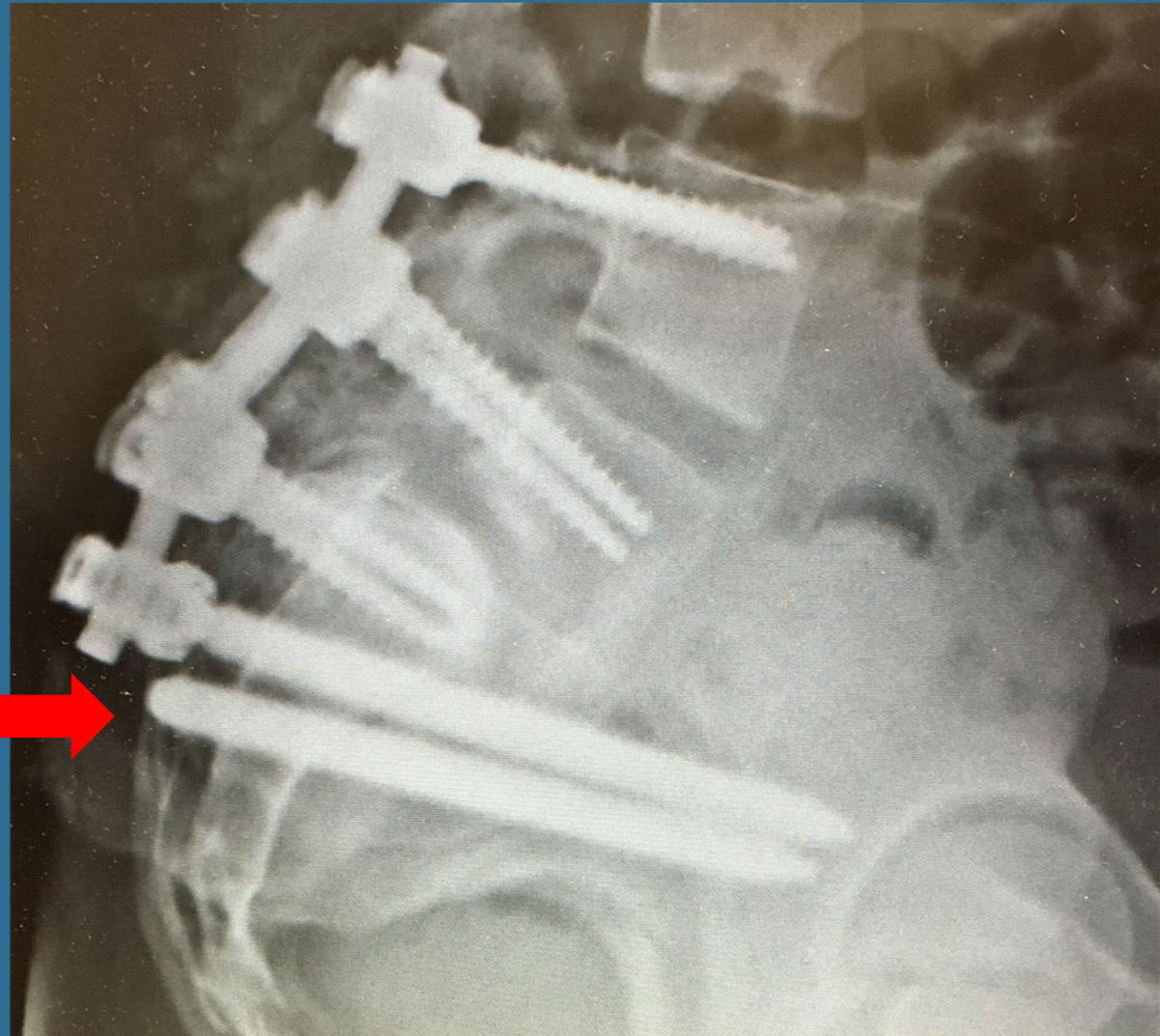
# T square

## Forces me to do a better job



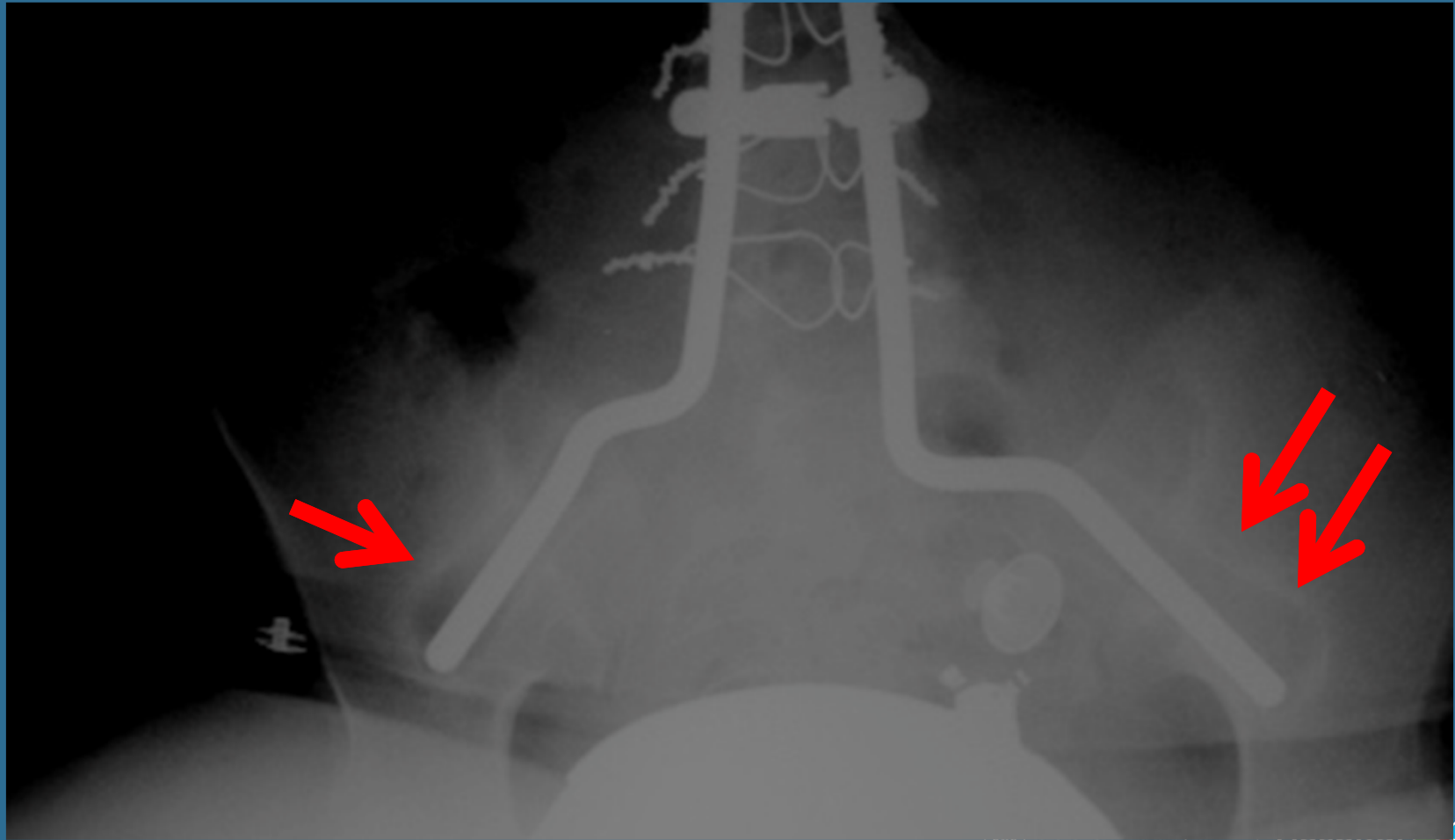
## High Forces, Consider Tapping

Screw neck broke  
during insertion





# Galveston abandoned in adults: pain



# SAI Screw Failures

## Sponseller, SRS, 2012

- 80 children, mean 3.5 yr f/u
- 9 screw fractures at neck of screw
  - All screws < 8mm
- 3 had surgery for L5-S1 pseudo arthrosis