Management of Infection in Growing Rods and VEPTR

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Surgical Site Infection Epidemiology

- **$4.5 billion are associated with healthcare-related infections**
- **Orthopaedic surgical site infections (SSIs) result in direct costs increased more than three-fold**

Added SSI Risk Factors in Distraction Techniques

- **Patient Population**
  - Younger
  - "Sicker"
    - Worse Pulmonary Function
    - More Co-Morbid Conditions
- **Repeated Procedures**
  - Repeated Abx administration
    - Resistance
  - Repeated hardware exposure
    - Increased Opportunity for Site Infection

Growing Instrumentation Infection Rates in Literature

Year Journal	Author	Title	Number of Infections	Subjects	Procedures	Infxns per Procedure	Infxns per Patient
2002 JPO	Mineiro J, Wieinsten SL.	Subcutaneous Rodding for Progressive Spinal Curvatures: early results	1 Superficial and 1 Deep Infection (2 total)	11	53	**0.04**	**0.18**
2005 Spine	Thompson GH, Akbarnia BA, Kostial P, et al.	Comparison of single and dual growing rod techniques followed through definitive surgery: a preliminary study.	2 Superficial Infections	28	122**	**0.02**	**0.07**
2008 Spine	Akbarnia BA, Breakwell LM, Marks DS, et al.	Dual Growing Rod Technique Followed for 3 to 11 Years until Final Fusion	4 Superficial and 2 Deep Infection (6 Total)	23	189	**0.03**	**0.26**
2008 43rd SRS Annual Mtg	Bess RS, Akbarnia BA, Thompson GH, et al.	Complications in 910 Growing Rod Surgeries: Use of Dual Rods and Submuscular Placement of Rods Decreases Complications	30 Wound Complications	143	910	**0.03**	**0.21**
2011 JPO	Elsebai HB, Yazici M, Thompson GH, et al.	Safety and Efficacy of Growing Rod Technique for Pediatric Congential Spinal Deformities	1 Deep Infection	19	107**	**0.01**	**0.05**

** Procedures calculated from manuscript

Complications of Growing-Rod Treatment for Early-Onset Scoliosis

Analysis of One Hundred and Forty Patients

By Shay Bess, MD, Behrooz A. Akbarnia, MD, George H. Thompson, MD, Paul D. Sponseller, MD, Suken A. Shah, MD, Hazem El Sebaie, FRCS, MD, Oheneba Boachie-Adjei, MD, Lawrence I. Karlin, MD, Sarah Canale, BS, Connie Poe-Kochert, RN, CNP, and David L. Skaggs, MD

Investigation performed at San Diego Center for Spinal Disorders, La Jolla, California

- Risk of complications occurring during the treatment period decreased by 13% for each year of increased pt age at the initiation of treatment

- Complication risk increased by 24% for each additional surgical procedure performed

Bess et al

Can Infection Associated With Rib Distraction Techniques Be Managed Without Implant Removal?

John T. Smith, MD, and Melissa S. Smith, CPNP

Results:

- 19 infxns in 16 pts who underwent 678 VEPTR procedures → 2% rate of infxn/procedure
  - 13 superficial, 6 deep
- Pts treated with I&D and IV antibiotics only
- No patient required HWR

Smith et al

Is there a difference in management of infection based on anchors?

Nonfusion Construct

Fusion-Nonfusion-Fusion

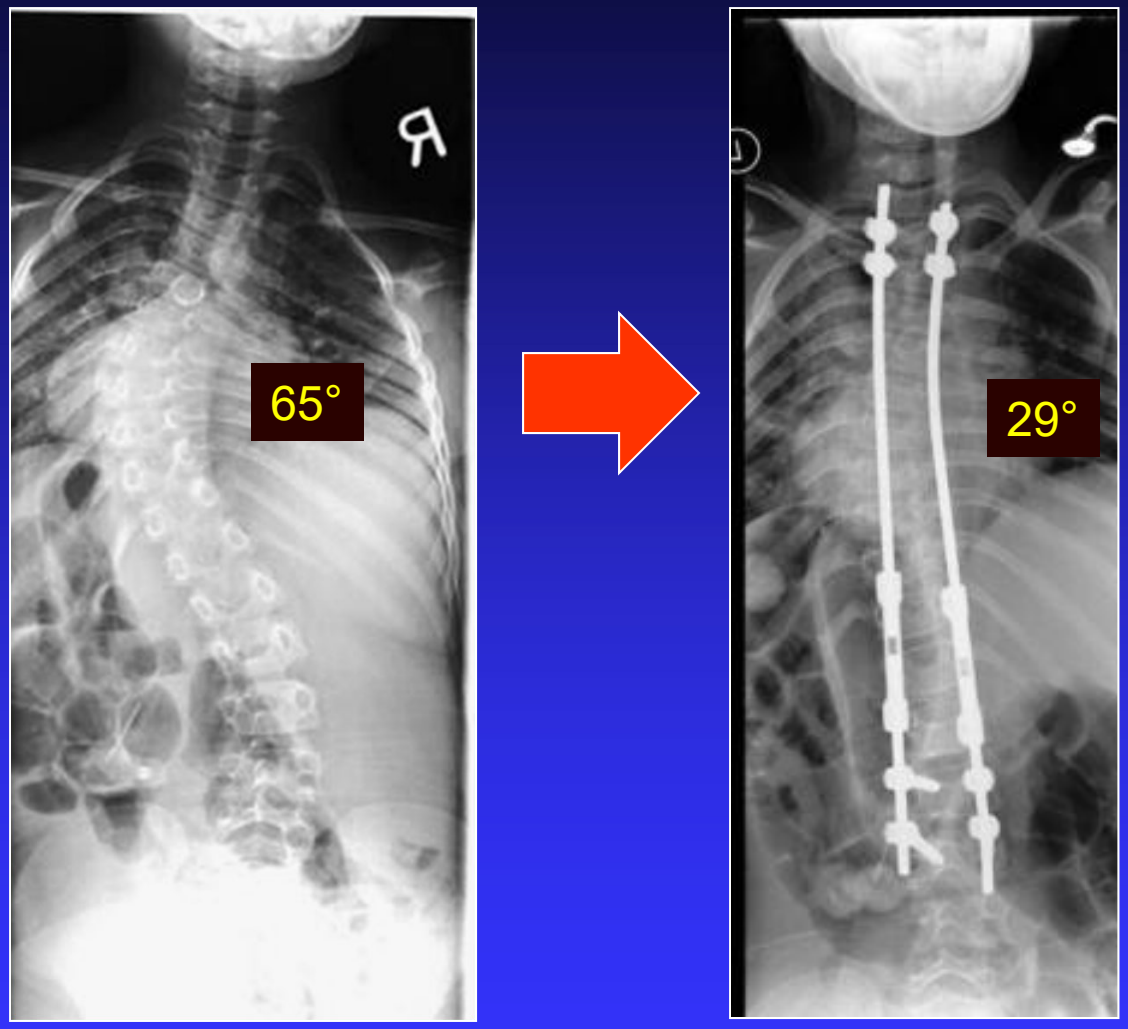
Treatment Options for Management of SSI in Growing Constructs

- Is it a wound problem or an infection?
- At site of recent lengthening?
- At site of fusion ?

SSI Presentation

8 yo
Tetralogy of Fallot

C-EOS:
C/3/N/P2



Management of Infection

- Pt presents for post-op visit after 1st lengthening (6mos post-insertion) with:
  - Low grade fever
  - Some wound dc at lengthening site

…what is the best management plan???

Case BW – 10/2009 - VEPTR implant

- Undiagnosed syndrome with some dev delay
- C-EOS: S/3/N/P2
- 22 months - Bilateral VEPTR implants
- Uneventful 1st lengthening
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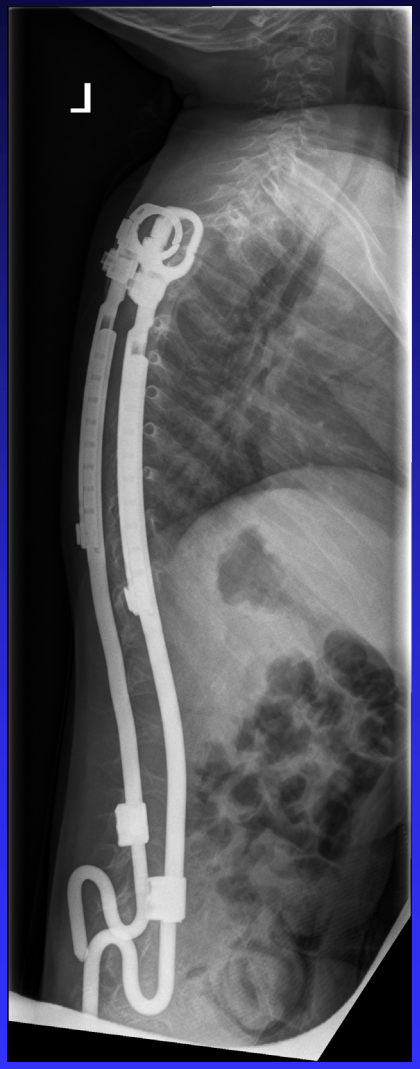
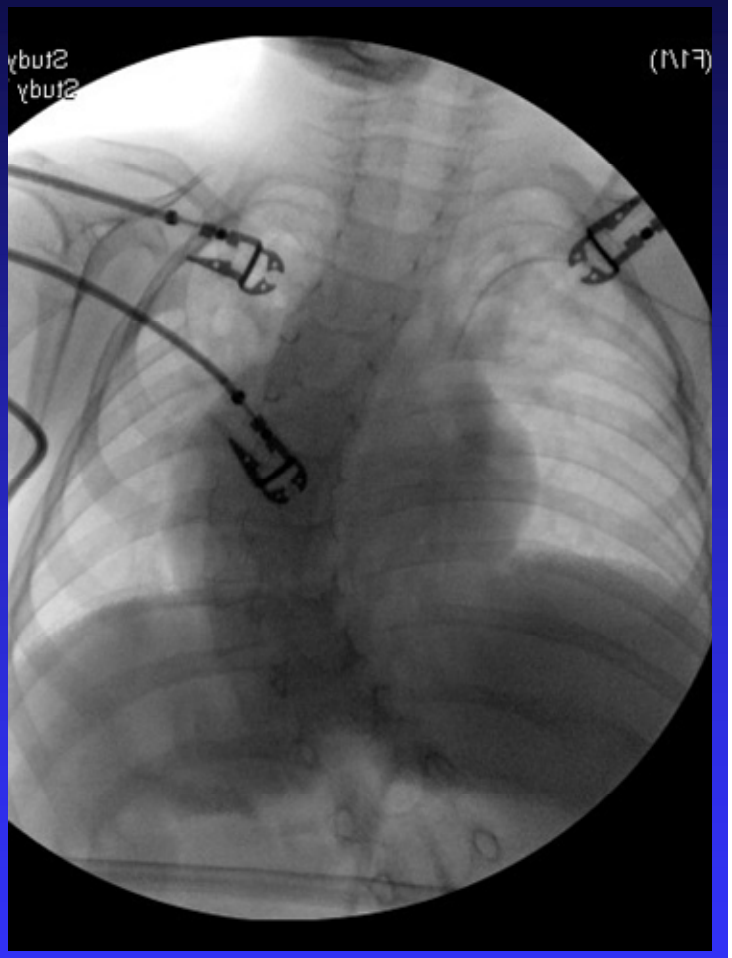


Case BW – 11/15/11 – Infection

- 2 mo post-op from lengthening:
  - 5 days of fever and vomiting
  - Stopped walking for 2 days
- Physical exam:
  - Significant prominence at upper thoracic area
  - Fluctuance at mid-thoracic area, no erythema or warmth

Case BW –VEPTR Removal

- Return to OR
  - Abundant frank pus under the fascia in continuity with the hardware
  - Removed hardware and irrigated wound meticulously

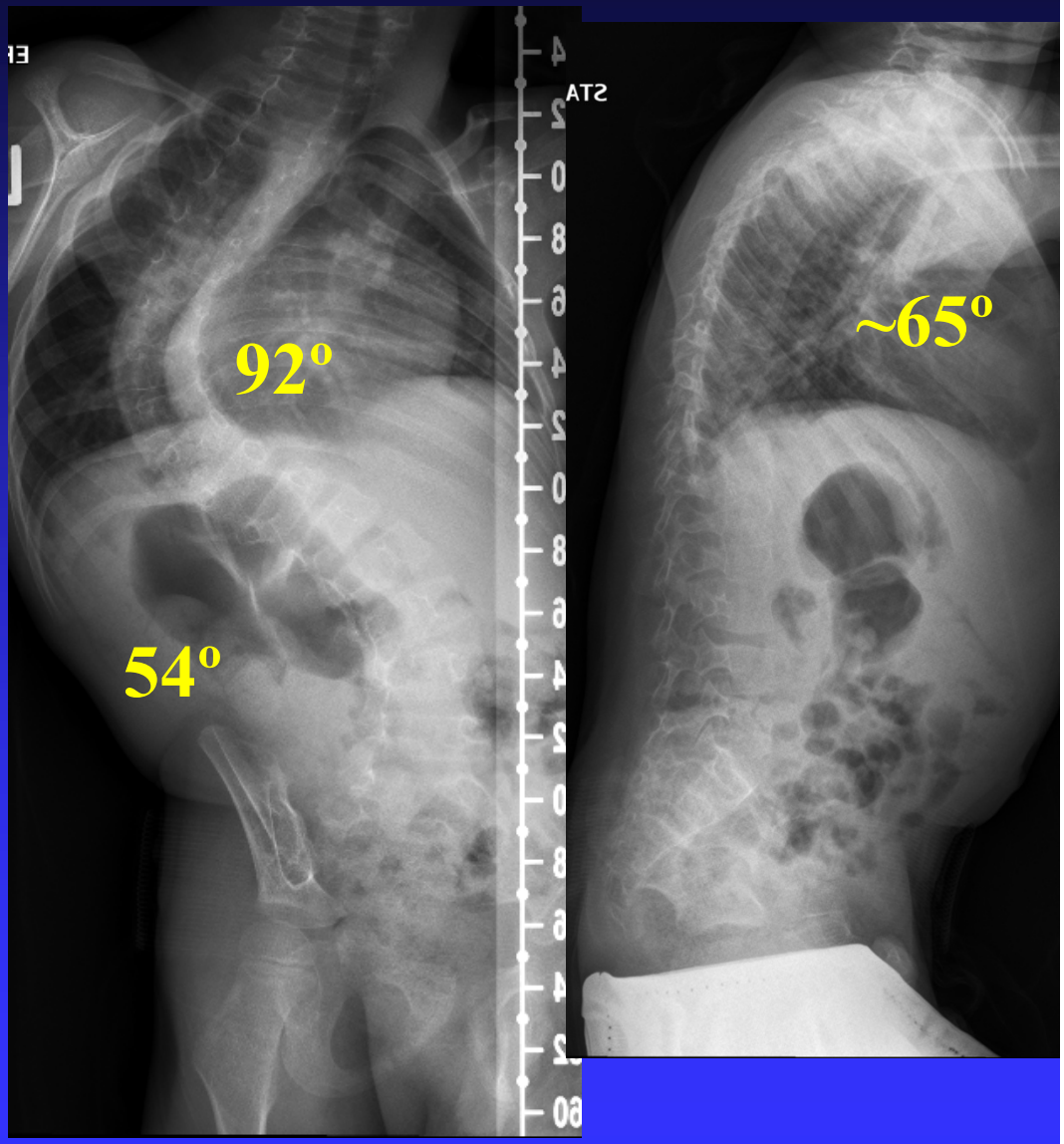


- Post Op
  - Afebrile, wound intact
  - On PO antibiotics with ID Following
  - Infection resolved

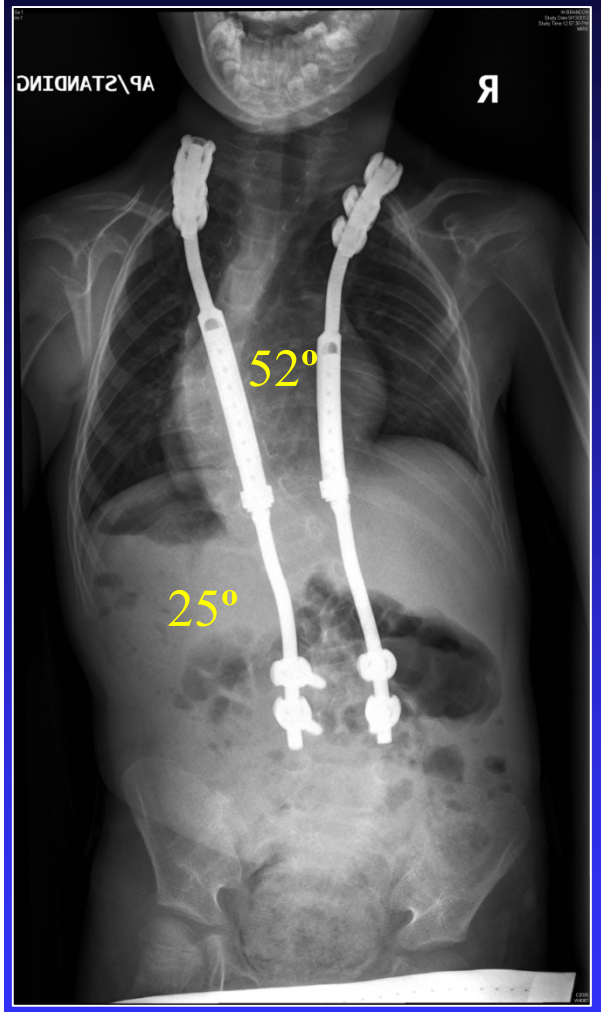
Case BW –2/2012

6 months after HWR

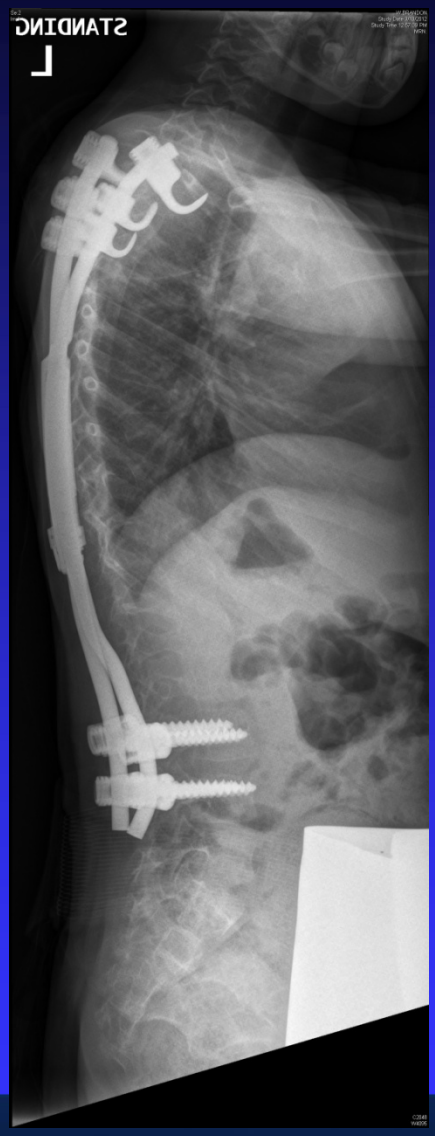
- Growth hormone started in Jan 2012
- Worsening Curve
- S/4/N/P2



Reinstrumentation at 12 months



- One year PO Abx
- Markers normalized
- Re-instrumentation
  - T2, T3, T4 to L3, L4 bilaterally
  - Fused L3-L4
- 7 months f/u OK



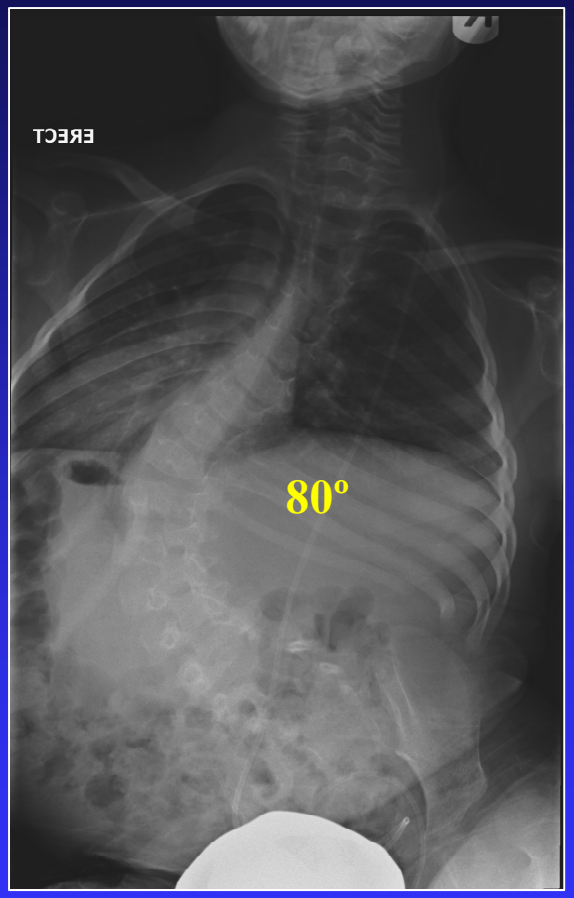
Case AL
Skin Breakdown and Deep Infection

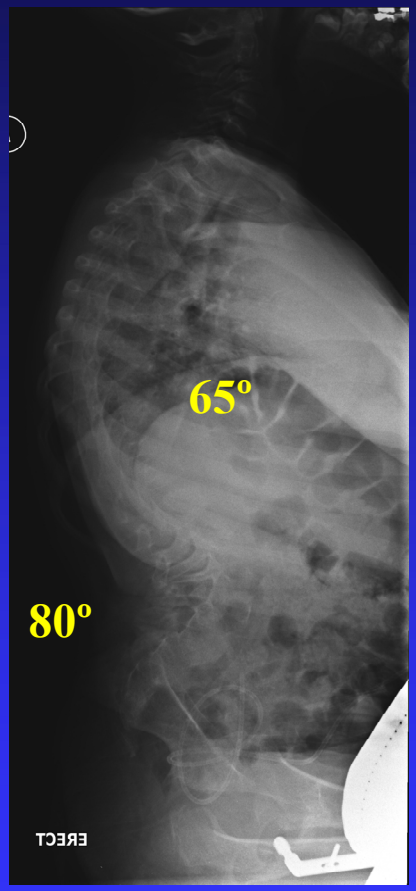
Case AL – 7/2008

History

- 7 yo M with high lumbar myelomeningocele and tethered cord
- Extensive prior surgical history, including hydrocephalus s/p VP shunt 2001

C-EOS: N/3/+/P1

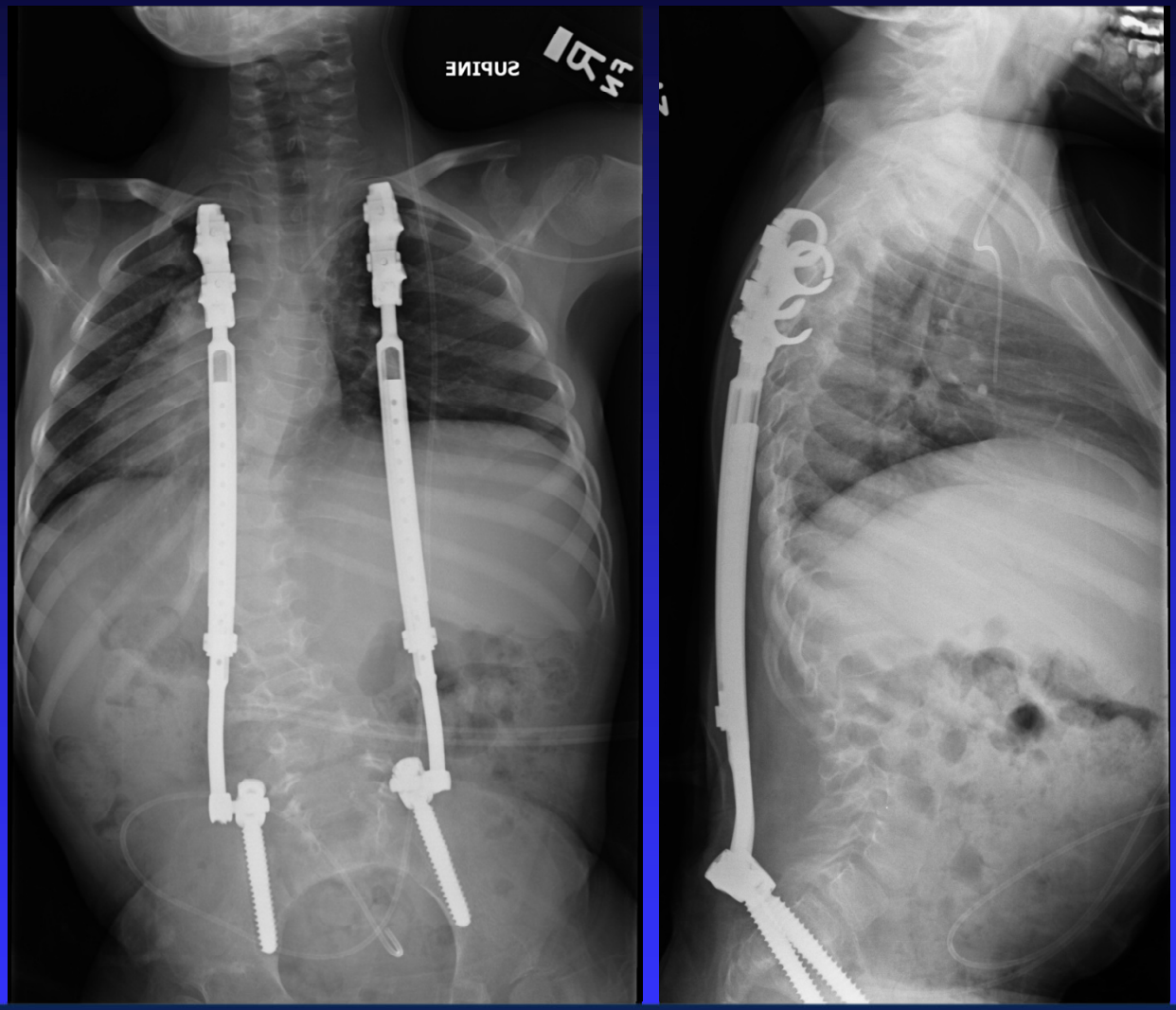




Case AL – VEPTR Insertion

Insertion of VEPTR bilaterally from T3/T4 to pelvis

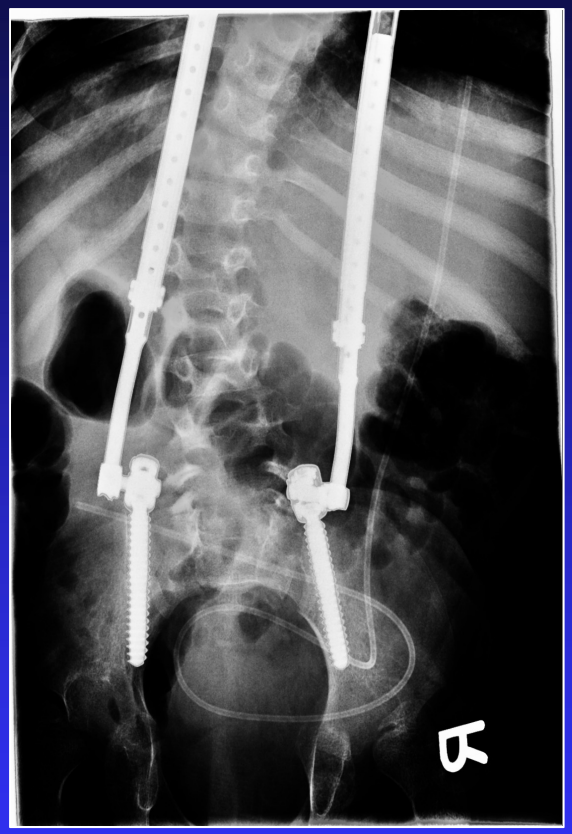
De-tethering of spinal cord



Case AL – 11 mo po – "Wound issue"

1 month post-op

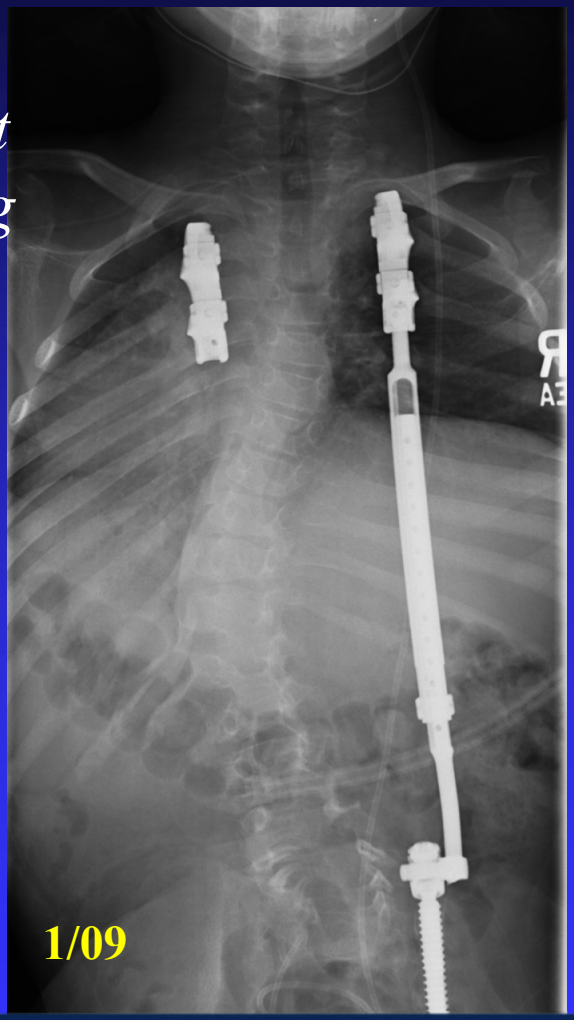
- Wound infection at L. lumbar spine incision site
- Treated with antibiotics
- No return to OR
- Discharged with outpatient antibiotics x2 mo's & wound care

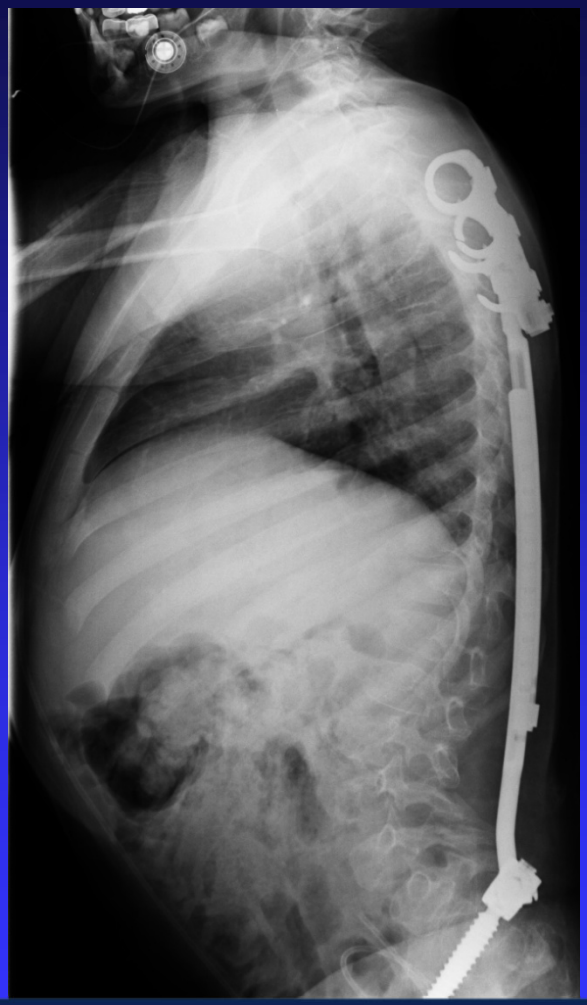


Case AL – 12/2008 - I&D and Removal of Hardware

"A large pocket of purulent material found surrounding the deep hardware"

Removal of left side instrumentation

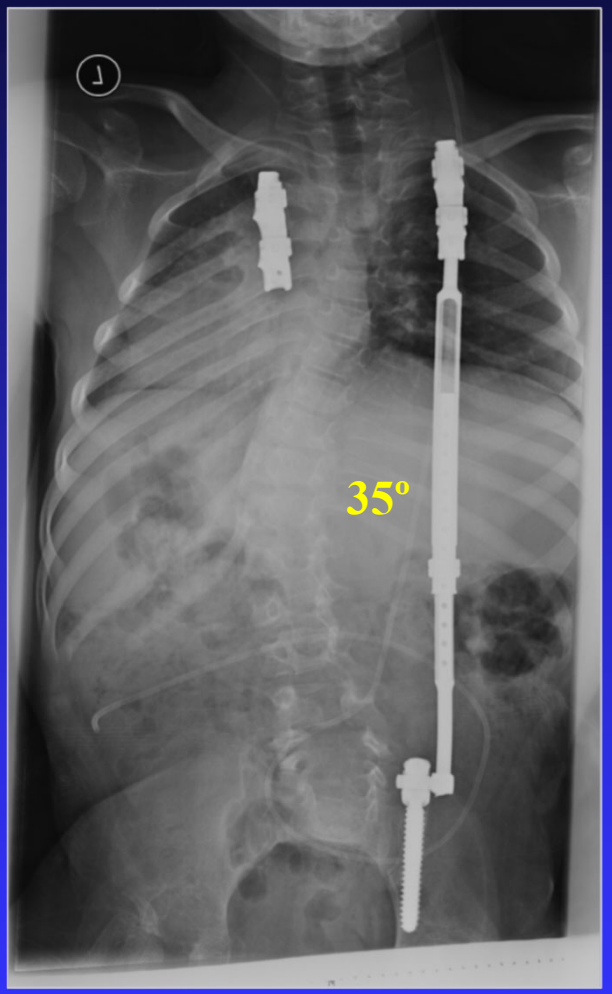


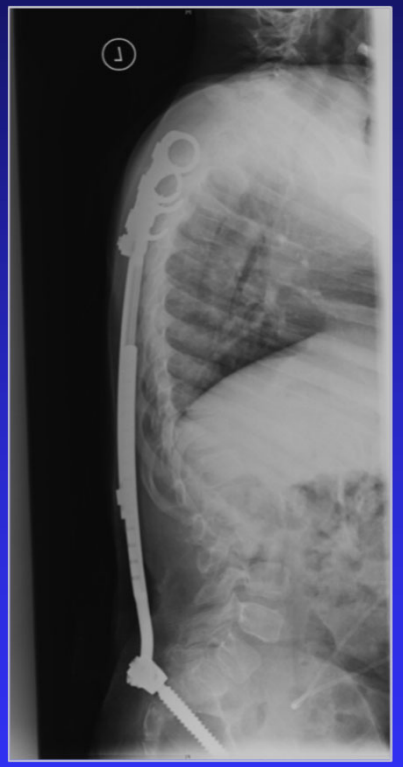


Case AL – 2009 – Lengthening x 2

History

- Lengthened twice in 2009 without incident
- Wound intact and pt without symptoms of infection





Case AE
Infected Fusion Salvaged by VEPTR

Case AE – 6/2010

History

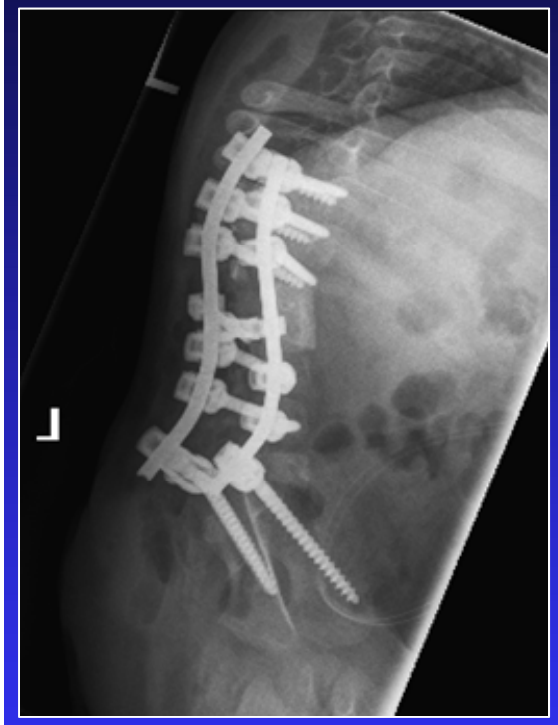
- 3 yo M s/p myelomeningocele repair with subsequent exposed-bone Gibbus Deformity
- Under care of neurosurgery

Physical

- 3cm x 3cm sacral ulcer w/ exposed bone

N/2/+

Case AE – 7/2010 – VCR & PSIF



Primary team: Neurosurgery
Wound: Plastics

3 level VCR & PSIF T9-ilium w myocutaneous flap closure

D/C with antibiotics x 6wks

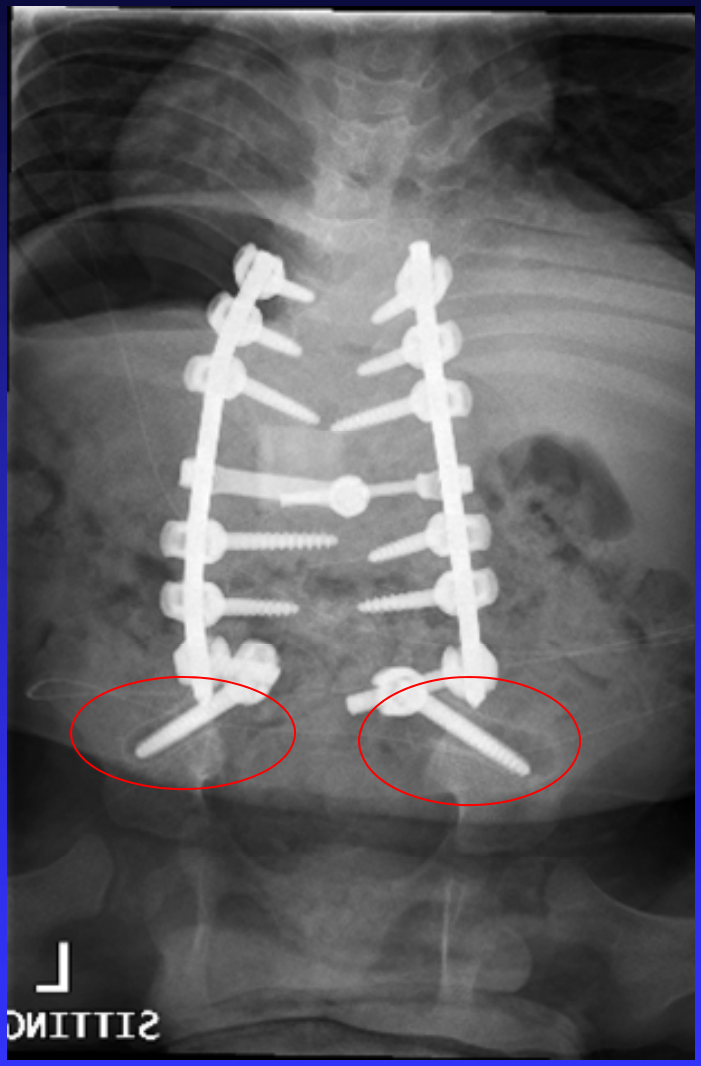
Case AE – 3/2011 – Skin Breakdown

3/2011

- 2cm open wound on L. buttock with exposed hardware due to skin breakdown
- OR for closure by plastics

4/2011

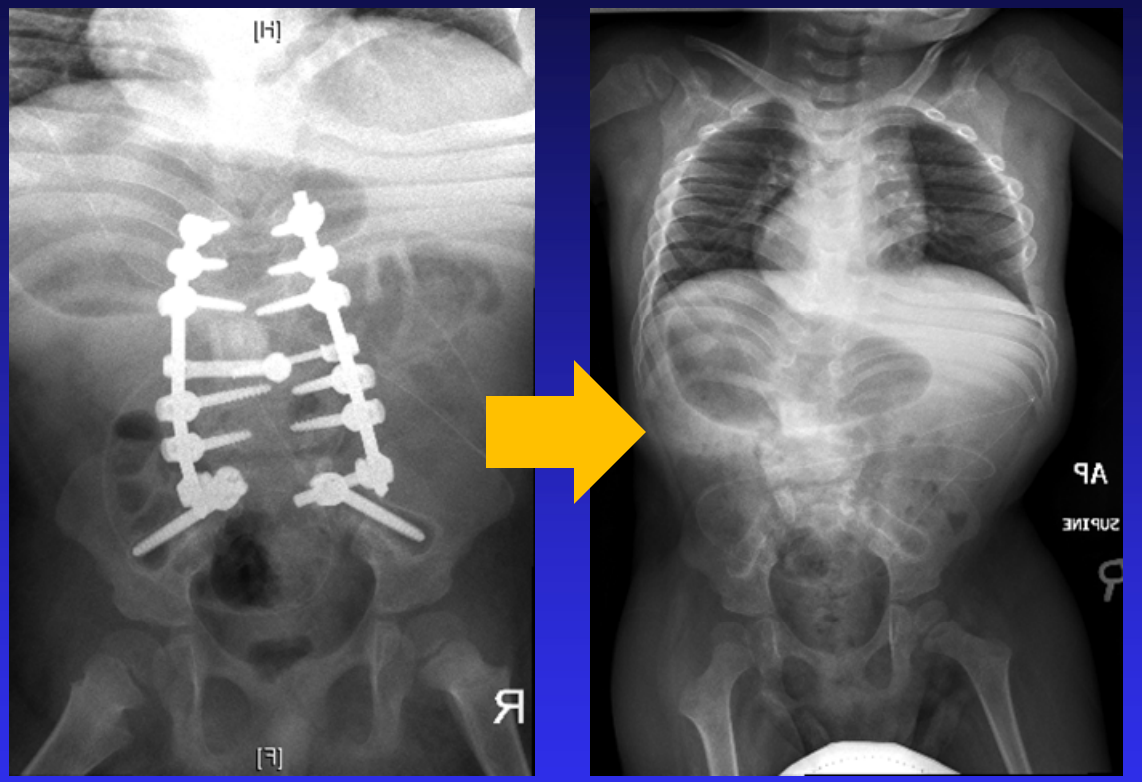
- Wound dehiscence L. skin flap at level of lumbar spine with exposed hardware
- OR for I&D and closure
- Loosened iliac screws noted during procedure



Case AE – 1/2012 – Infection

Presented to ED with infection at open wound over L iliac screw

OR for removal of hardware

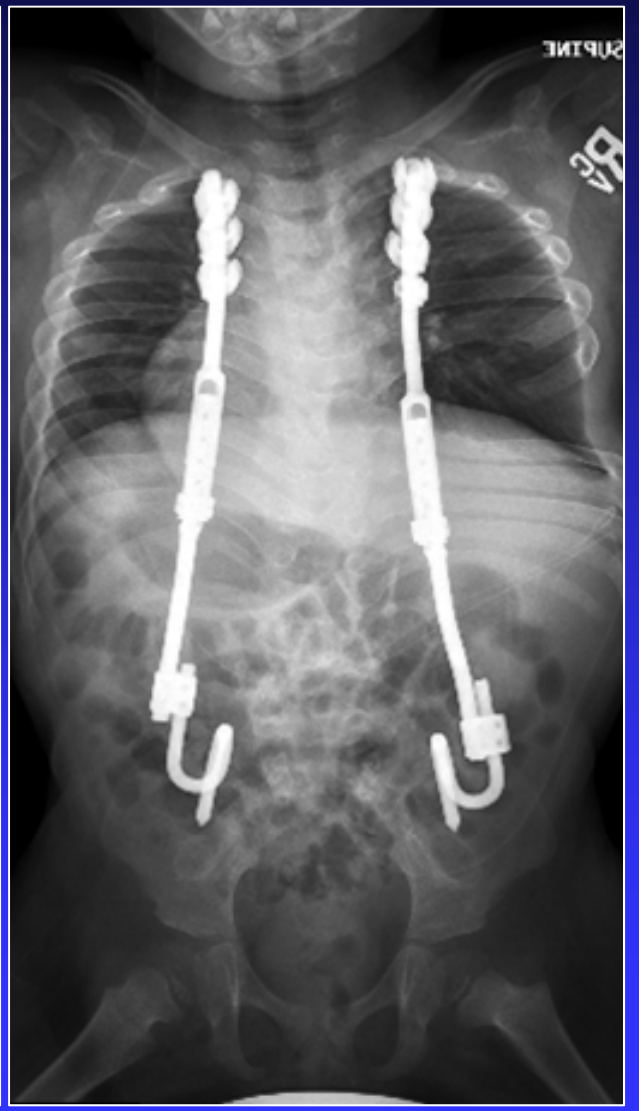


Case AE – 7/2012

12 mo PO Antibiotics

Markers Normal

VEPTR implantation with use of virgin tissue lateral to midline wounds



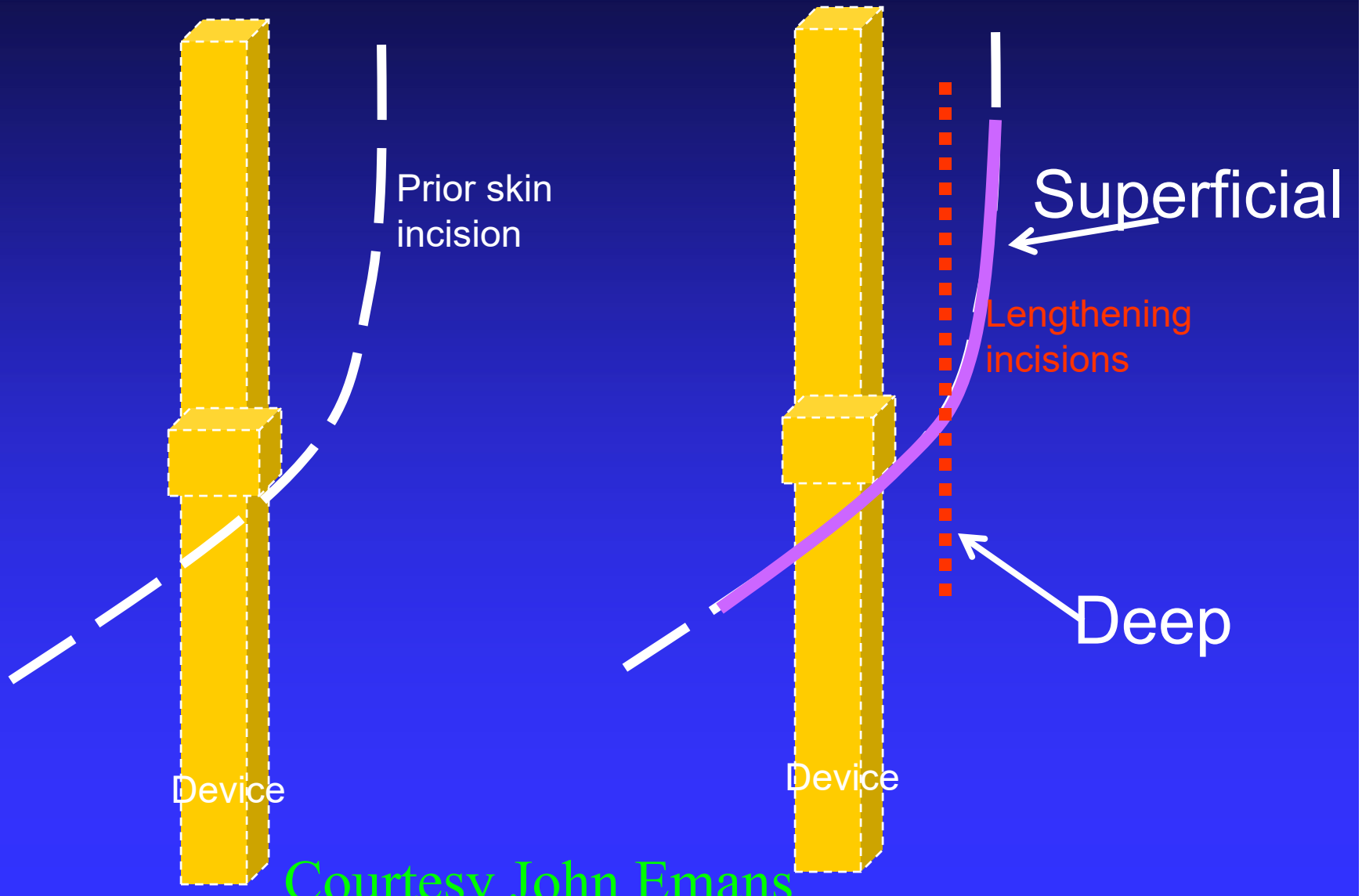
Decreasing Infection in Growing Systems

1. Optimize nutrition; Consider G tube
2. Careful Opening/Closure

   layered flaps

   separate superficial and muscular incisions

Avoiding *full thickness* incisions at the time of *device lengthening*:



Courtesy John Emans

Decreasing Infection in Growing Systems

- Protect prominent devices post-op
- Consider betadine rinse/ Vanco in graft

Conclusions

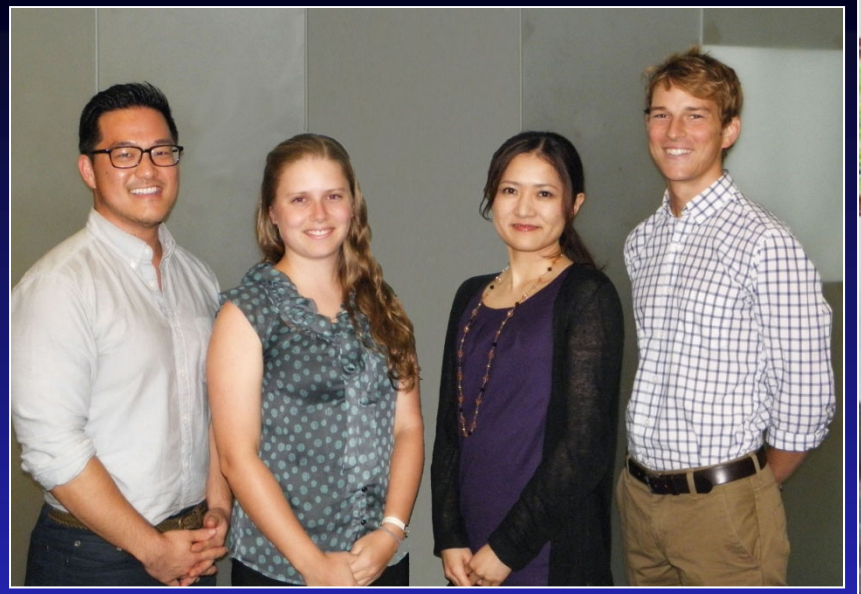
"A chance to cut is a chance to infect"

Not much difference between spine and rib anchors

Discern between wound problem and deep infection

Can often try to "treat through"

Partial explantation is an option



Thank You

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