

Spine Based Anchors



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San Diego – Orthopaedics



Disclosures as Listed

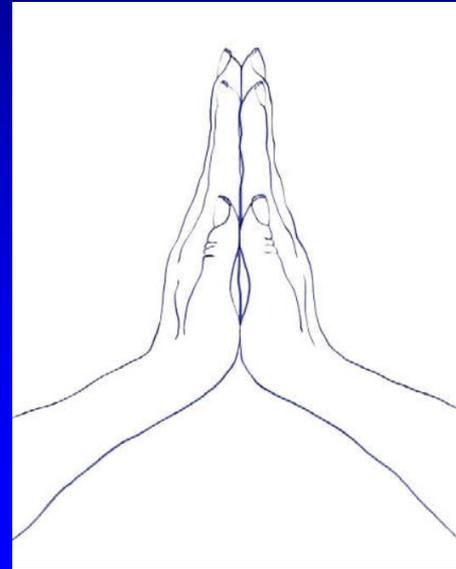
**Royalties from K2M, DePuy Synthes.
Research support: DePuy Spine, K2M,
NuVasive, Zimmer Biomet, Medtronic,
EOS Imaging.**

**Licensed IP on tethering to DePuy
Synthes and Spinologics**





“Let’s take
High Road”



Dave's Got Rib Hooks...



Proximal Fixation Options

- **Spine**

Lamina, TP, Pedicle Hooks

Pedicle, Translaminar Screws

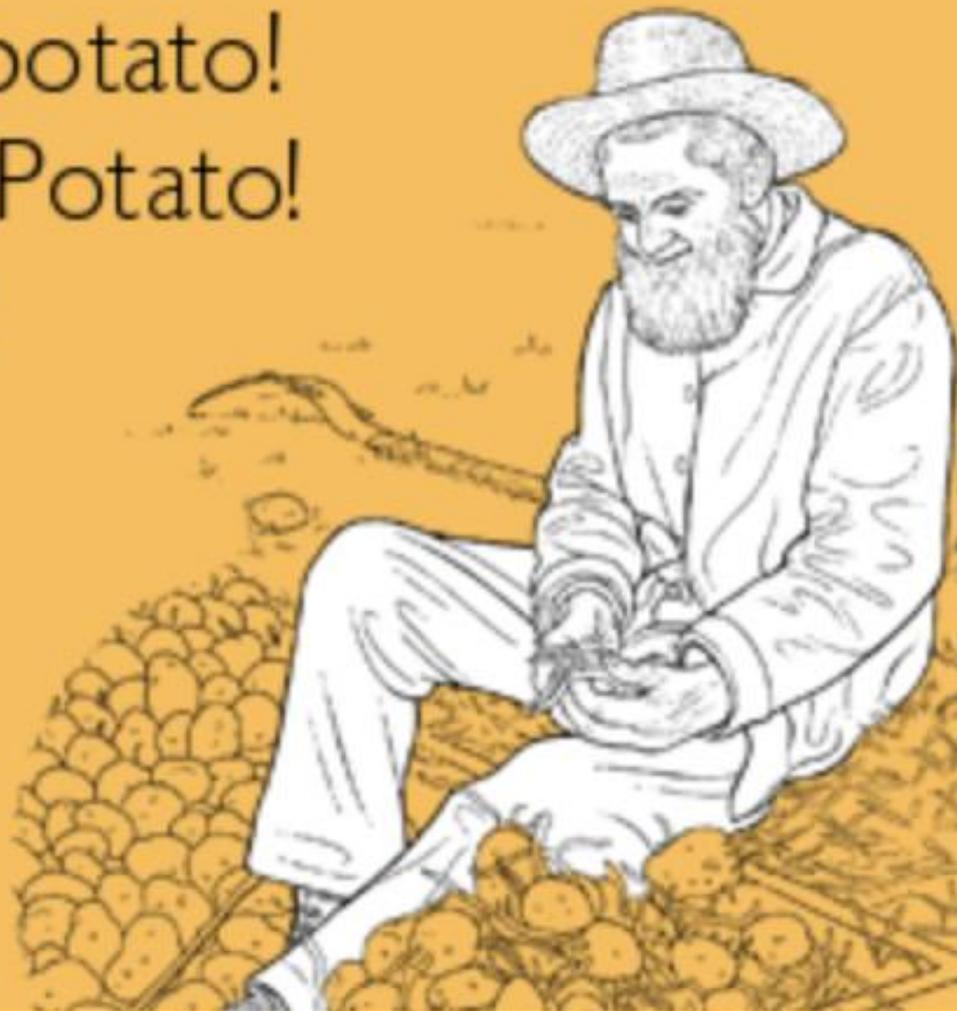
Sublaminar Wires, Cables, Bands

- **Ribs**

1 hook, 2 hooks, 3 hooks, 4...



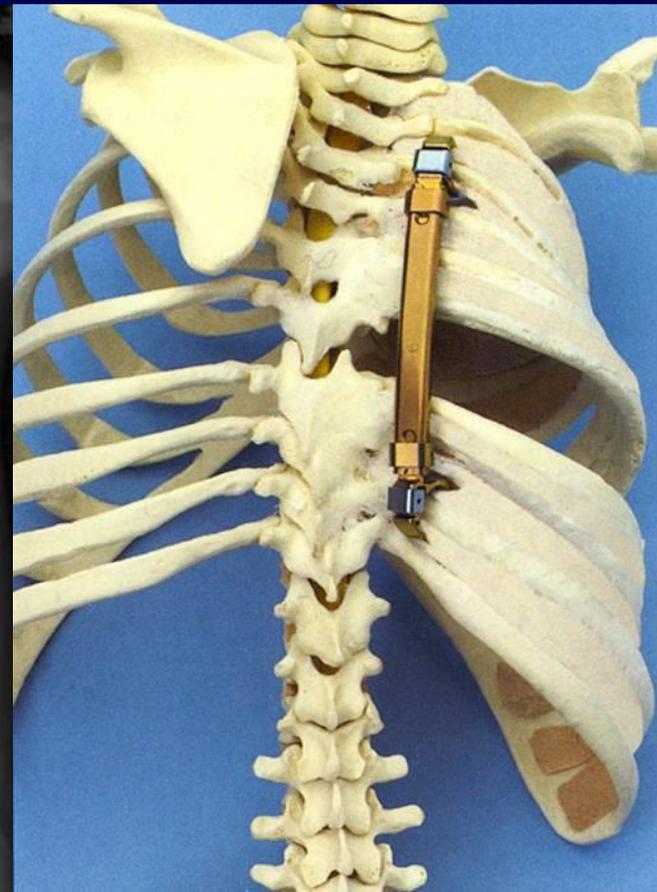
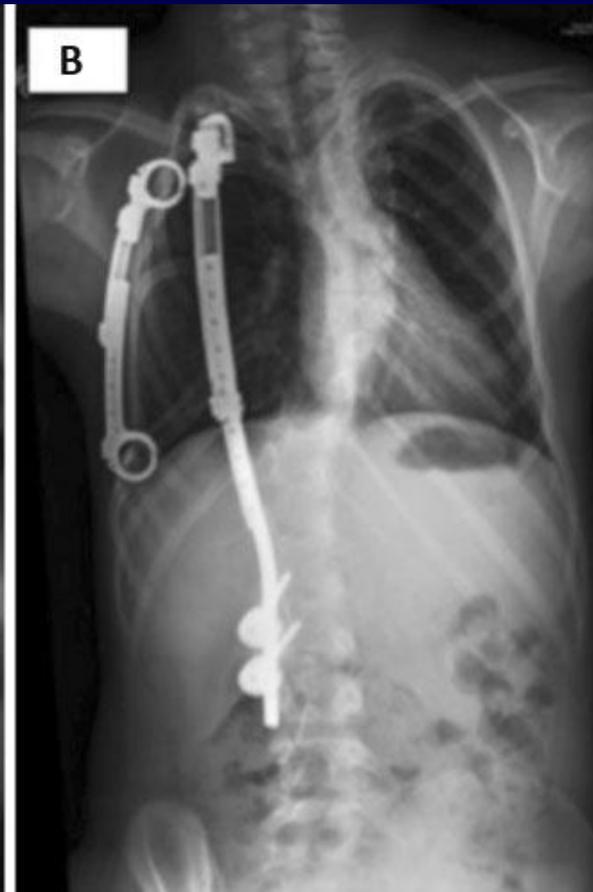
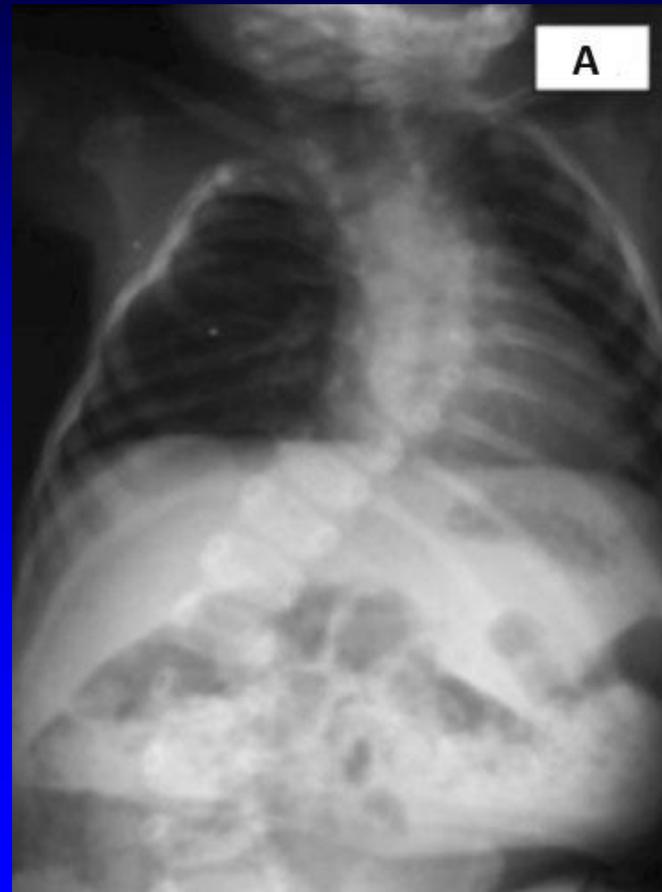
One potato! Two potato!
Three potato! 4! 5 Potato!
6 Potato! 7 Potato!
More!
And More!
And More!
And More!



1 Potato, 2 Potato...



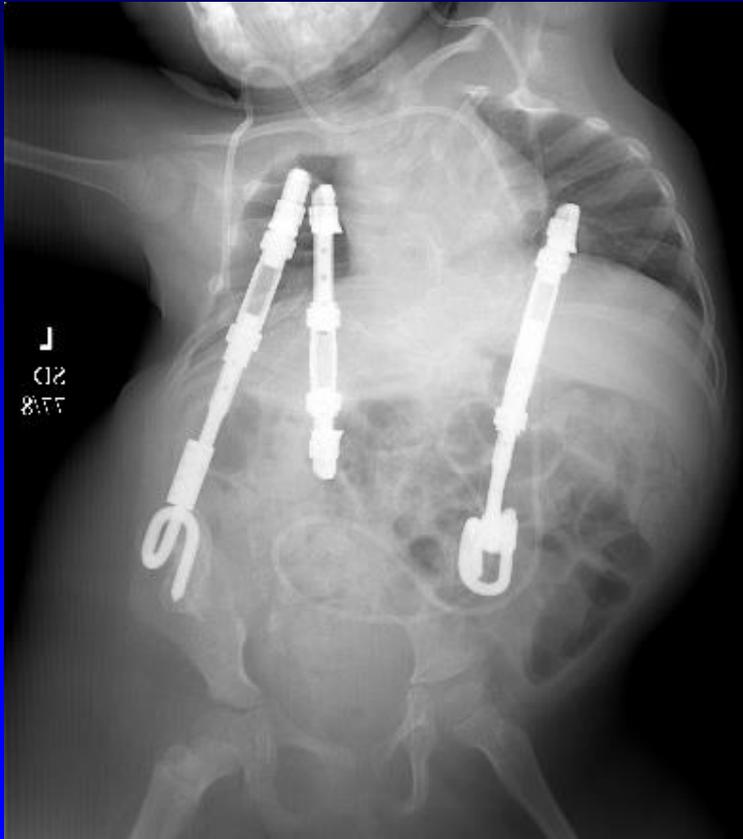
3 Potato, 4



5 Potato, 6 Potato



7 Potato, More!



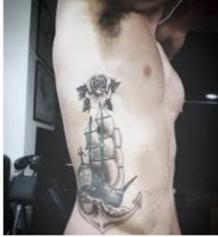
Google: Rib Anchors...



Pin by Alyx Knapp on THI...
pinterest.com



40 Small Anchor Tattoo Desi...
nextluxury.com



60 Unique Anchor Tattoos ...
nextluxury.com



100 Appealing Anchor Tattoo...
thisistattoo.com



Anchor rib tattoo - Placem...
pinterest.com



Like it Or Not, Twin Anchors' Baked Rib...
chicago.seriousseats.com



Anchors. - Tattooologist
tattooologist.nataliehanks.com



Nice Rope Anchor Tattoo ...
tattooshunt.com



40 Small Anchor Tattoo De...
nextluxury.com



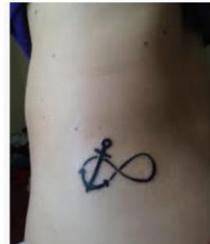
How to Care for a New Col...
pinterest.com

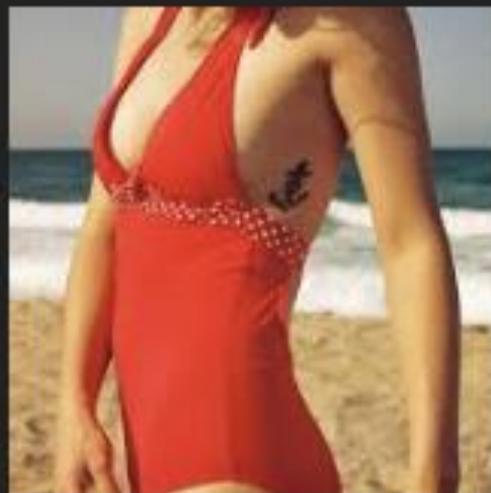
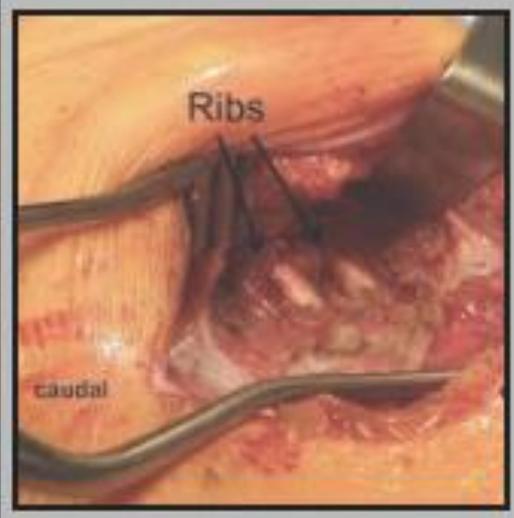


Small Anchor Tattoo On Ri...
tattoostime.com



Man Rib Side Anchor Tattoo
tattoostime.com

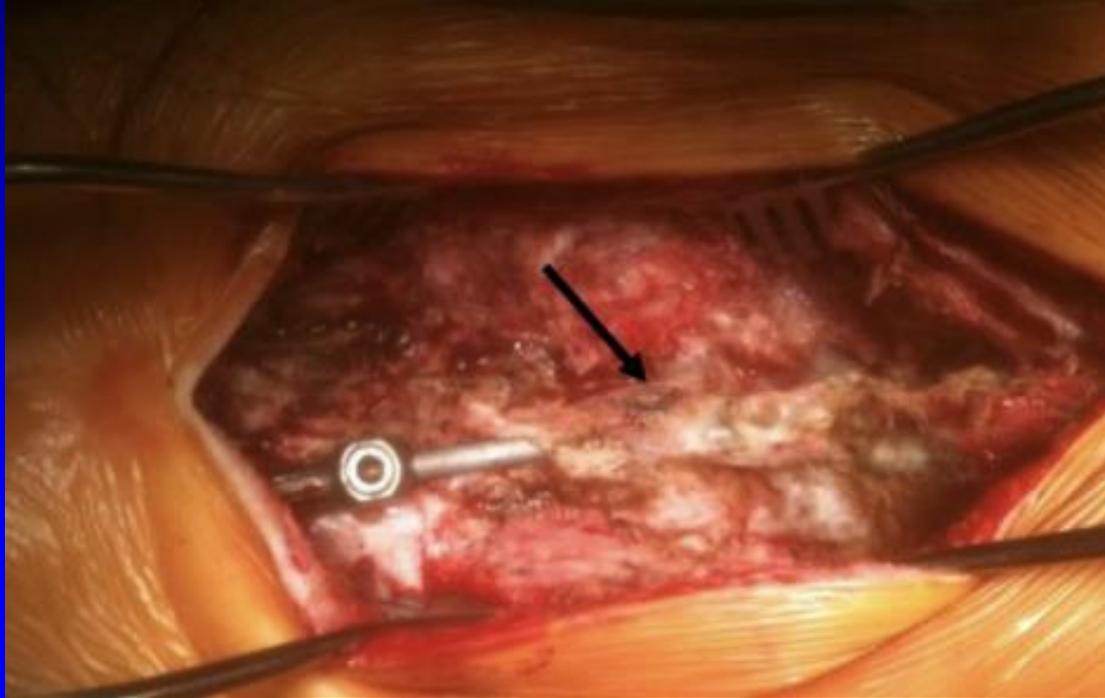




Tech: 1st prepare hamburger



Spontaneous Fusion?



Theoretical Advantages of rib fixation thus far...



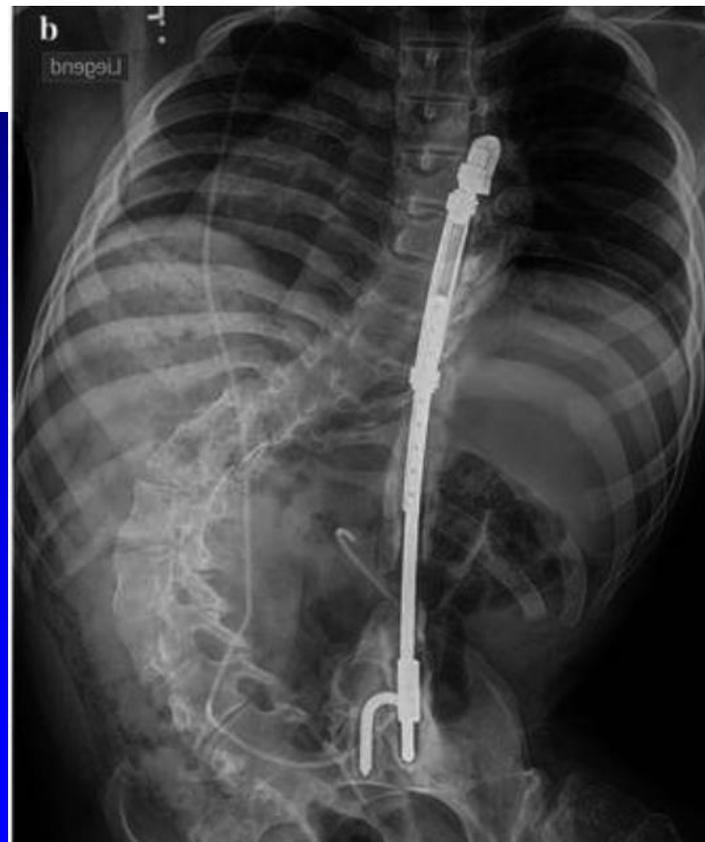
- Avoid proximal fusion
- Less rigid system
 - Minimize autofusion?
 - Less rod breakage
- Less Prominent
- Above true of VEPTR and laminar hooks...



Extraspinal ossifications after implantation of vertical expandable prosthetic titanium ribs (VEPTRs)

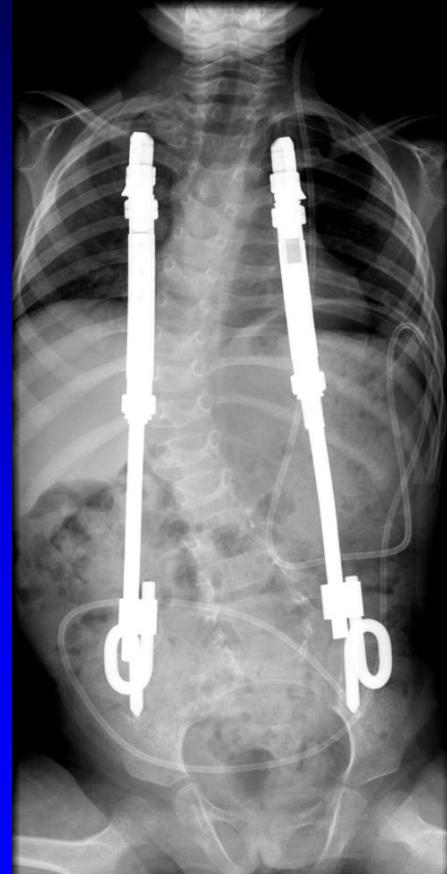
J Child Orthop (2014) 8:237–244

Vanja Zivkovic · Philippe Bächler ·
Dror Ovadia · Rolf Riise · Ralf Stuecker ·
Carol Hasler



Remember why you are there!

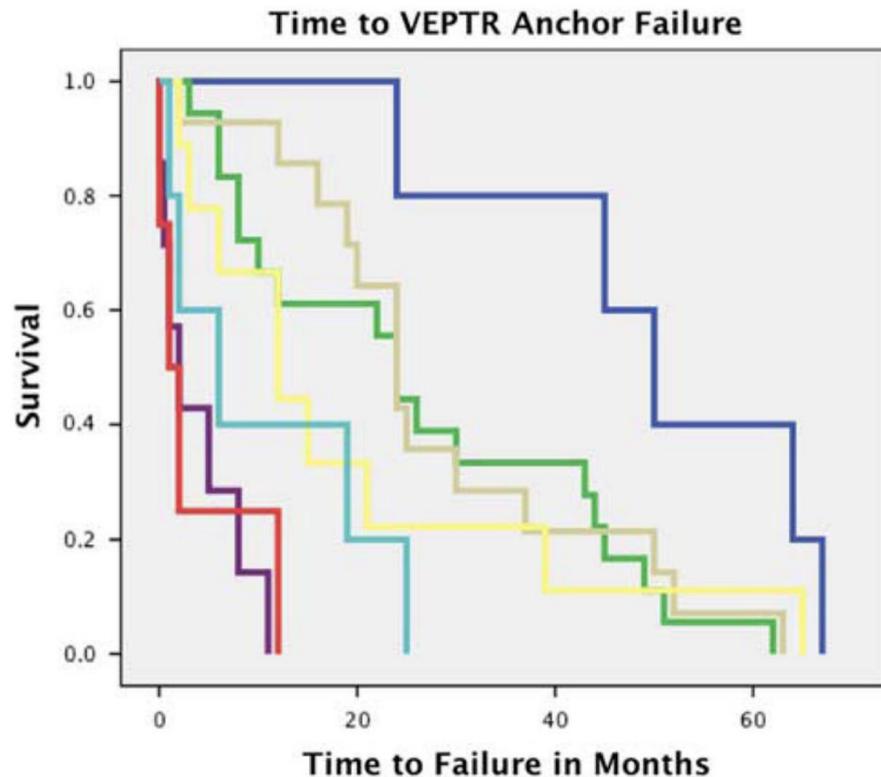
- **Don't mess up the chest to fix the spine**



The Classification for Early-onset Scoliosis (C-EOS) Correlates With the Speed of Vertical Expandable Prosthetic Titanium Rib (VEPTR) Proximal Anchor Failure

Howard Y. Park, MD^{*}, Hiroko Matsumoto, MA[†], N
Wajdi W. Kanj, BS, MD[‡], Randal R. Betz, MD[§], P
MD[¶], Scott J. Luhmann, MD[#], Sumeet Garg, MD[′]
MD^{‡‡}, John M. Flynn, MD^{§§}, and Michael G. Vital

Hooks Pull off Fast!



Are Rib Versus Spine Anchors Protective Against Breakage of Growing Rods?

NO!

Yamaguchi KT J¹, Skaggs DL², Mansour S³, Myung KS³, Yazici M⁴, Johnston C⁵, Thompson G⁶, Sponseller P⁷, Akbarnia BA⁸, Vitale MG⁹; Growing Spine Study Group.

RESULTS: Thirty-four patients had rib-anchored growing rods and 142 had spine-anchored growing rods. This analysis found that proximal rib-anchored growing rods have a 23% risk of lifetime rod breakage compared with spine-anchored growing rods (6% vs. 29%) ($p = .041$)

4 times more case done with Spine Anchors... for good reason

CONCLUSIONS: Preoperative Cobb angle appears to be the most influential factor in determining whether growing rods break ($p = .014$). Univariate analysis found that rib anchors were associated with less than one-fourth the risk of rod breakage than spine anchors ($p = .04$) but multivariate analysis found no significant association between anchors and rod breakage ($p = .07$). This trend suggests that rib-anchored growing rod systems may be associated with less rod breakage because the system is less rigid as a result of some "slop" at the hook-rib interface, as well as the normal motion of the costovertebral joint.

Rib anchors are sloppy... Bad for pushing on the spine



Adjacent to TP

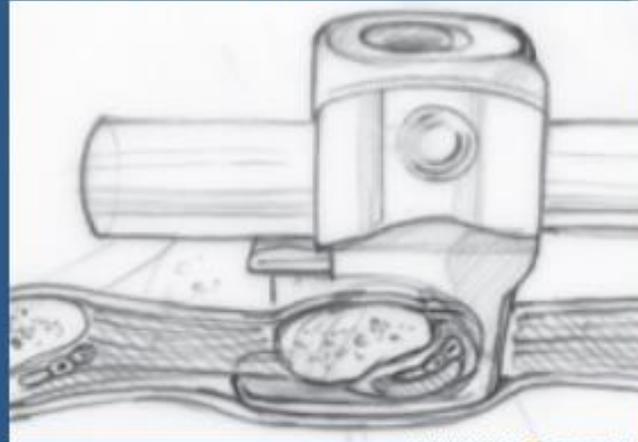


Extra-Periosteal

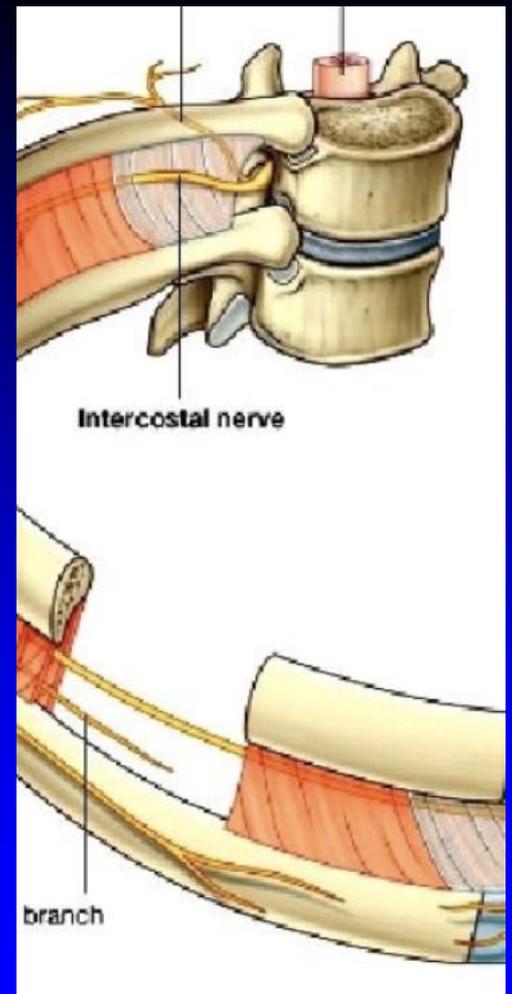
Want ribs to hypertrophy

NOT in chest

No chest tube



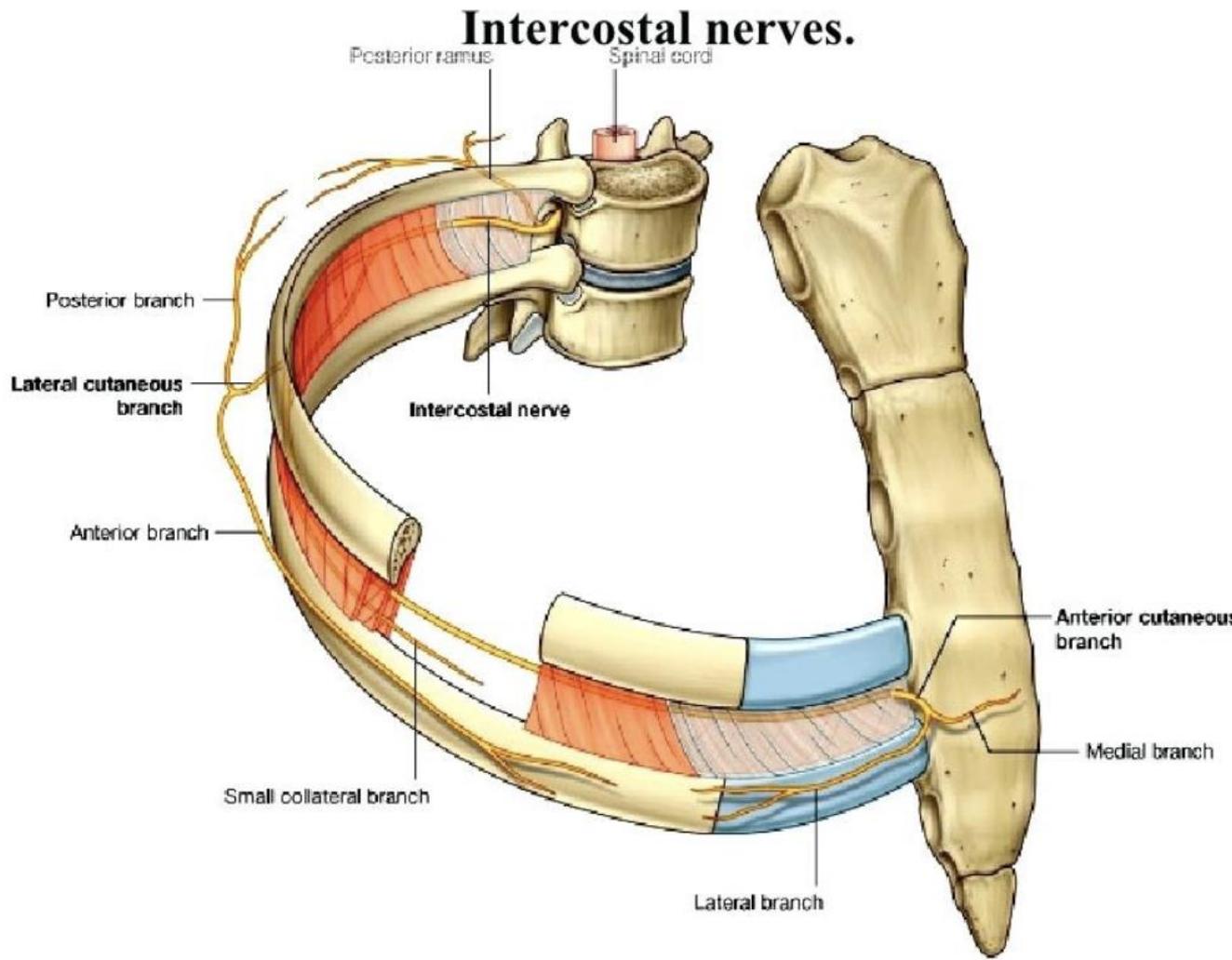
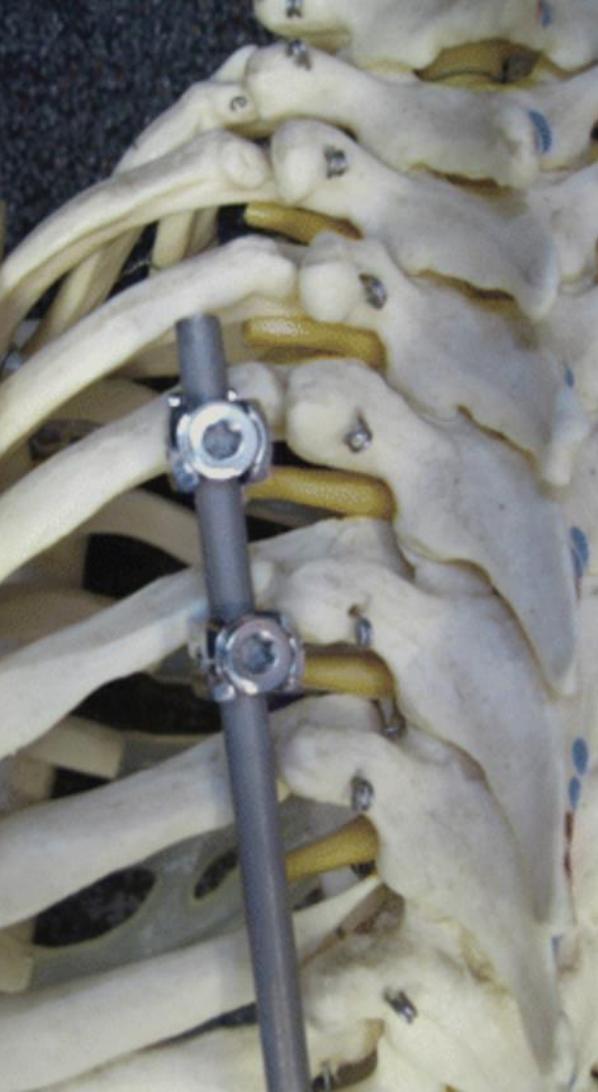
Children's Hospital
LOS ANGELES
We Treat Kids Better



Intercostal nerve

branch





Biomechanical Evaluation of 4 Different Foundation Constructs Commonly Used in Growing Spine Surgery: Are Rib Anchors Comparable to Spine Anchors?

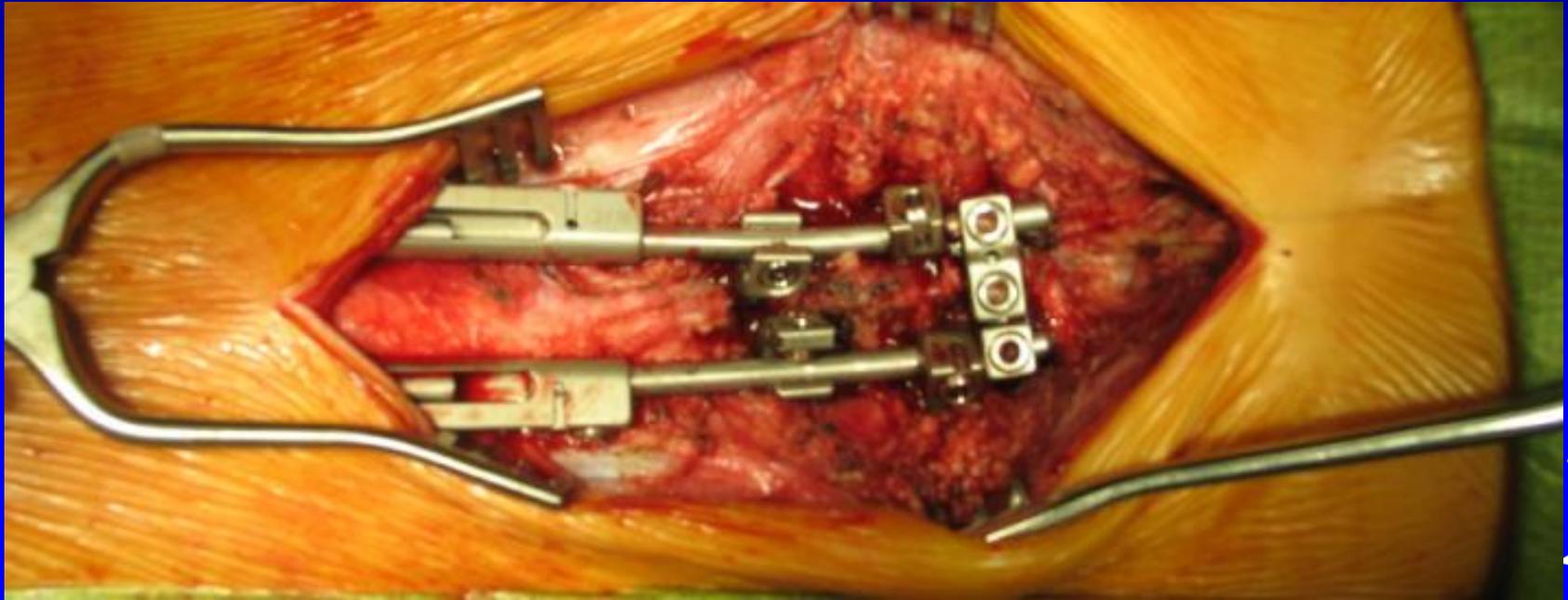
Akbarnia BA¹, Yaszay B², Yazici M³, Kabirian N⁴, Blakemore LC⁵, Strauss KR⁶, Glaser D²; Complex Spine Study Group⁶.

Not Better

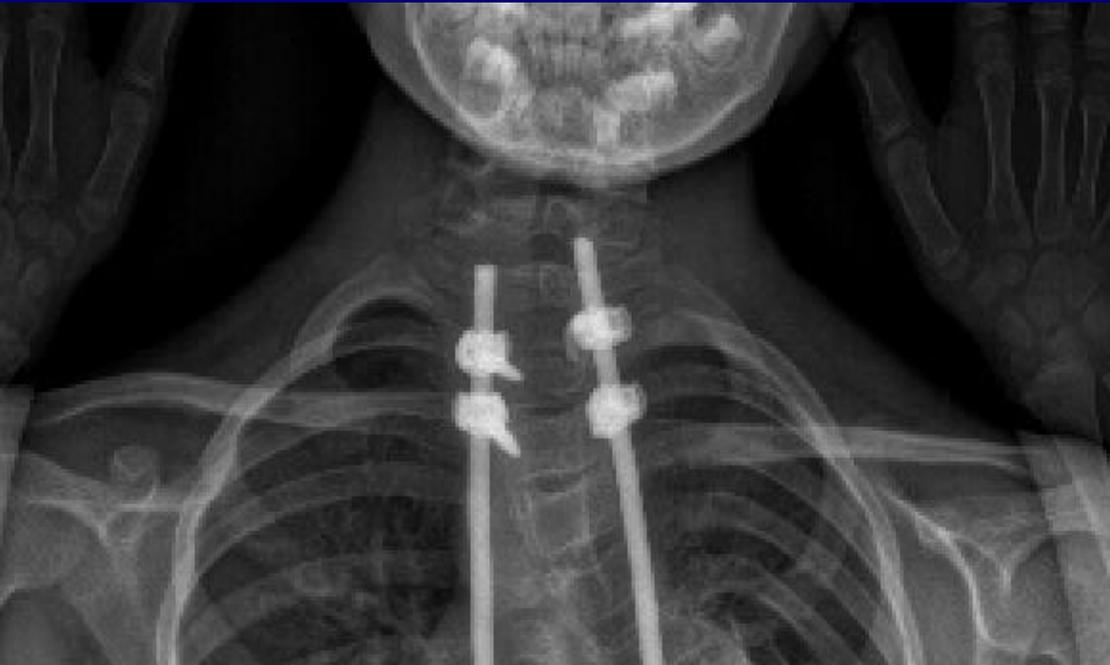
RESULTS: All specimens eventually failed at the bone-anchor interface. No and standard deviations of ultimate loads were measured as RR (429 ± 13). There was no statistically significant difference between the following constructs calculated for each construct type and no statistically significant difference

Conclusion: ...may be considered as an alternative...

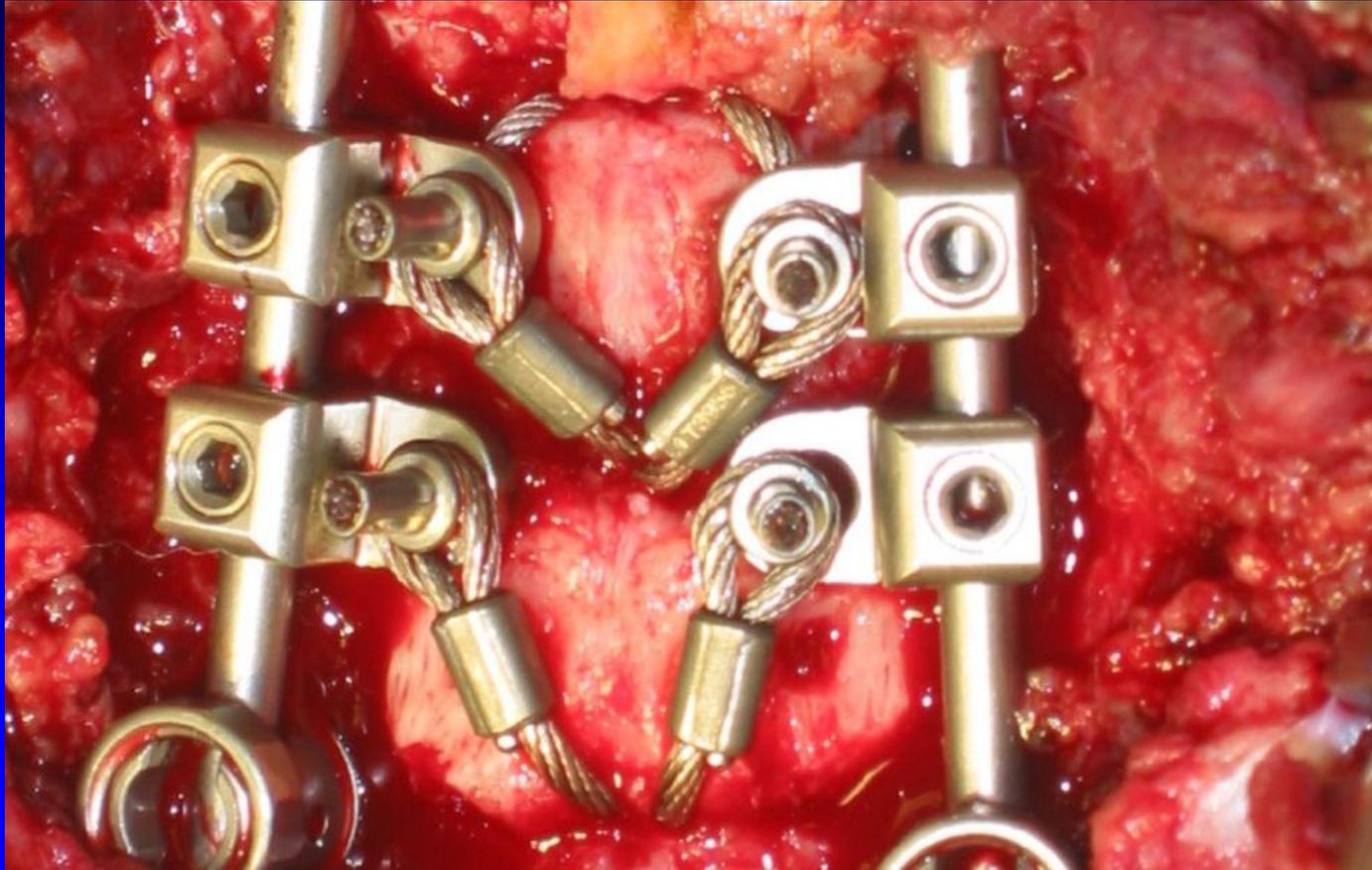
**If you want to fix the spine,
attach it to the spine**



Mix and Match



Not just Hooks & Screws

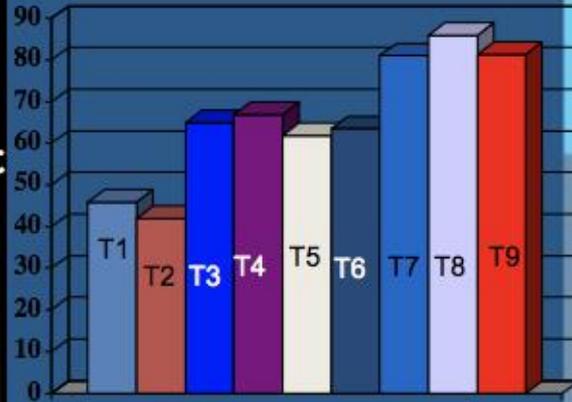


Spine Anchors

- **For spine problems...**
- **Versatile, Revisable**
- **Cross-link option**
- **Secure when incorporated into limited fusion mass**



FVC VS. PROXIMAL LEVEL OF FUSION



Karol et. al, JBJS 2008

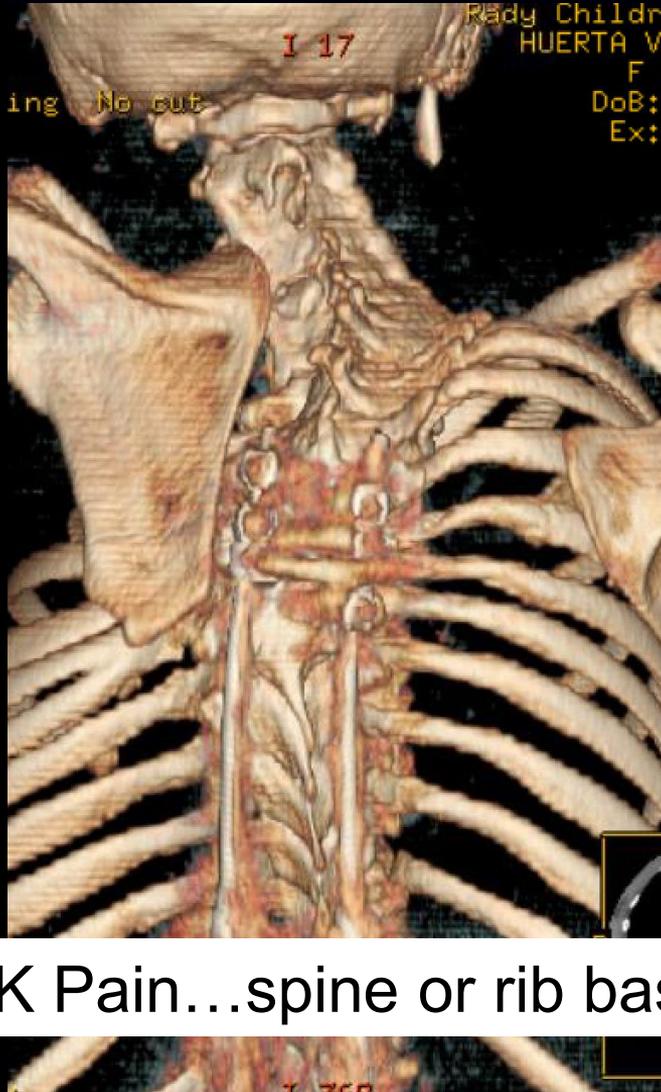
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Conclusion: More severe cases with more extensive fusions have lower FVC





PJK Pain...spine or rib based...

Be the one



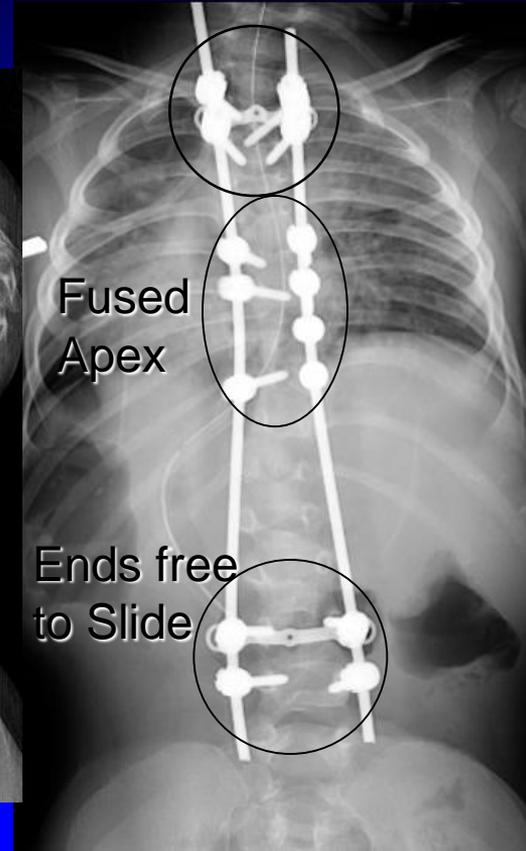
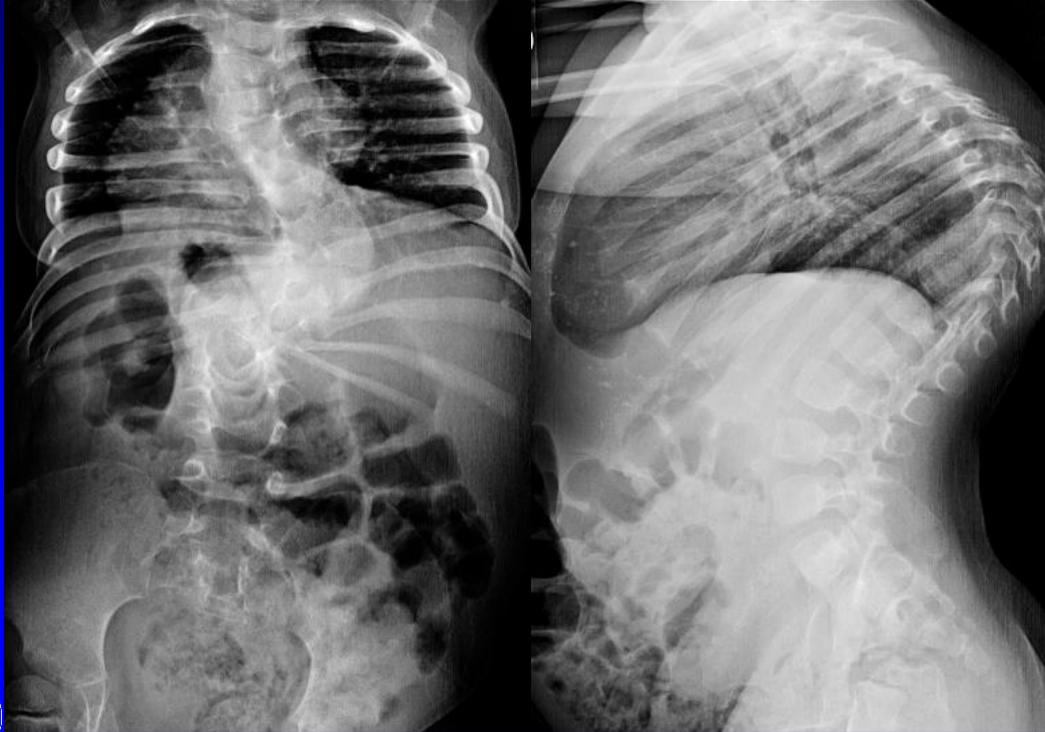
to guide me

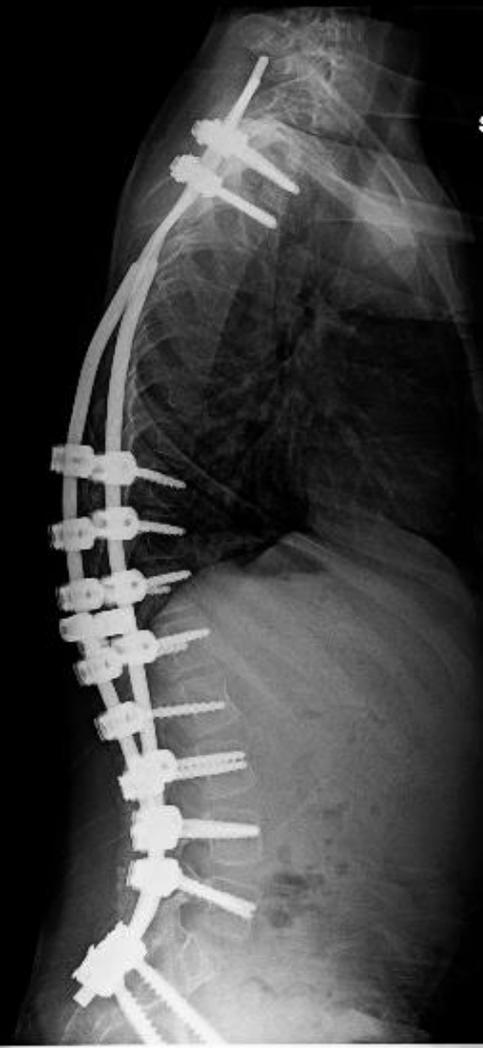
but never let



hold me down

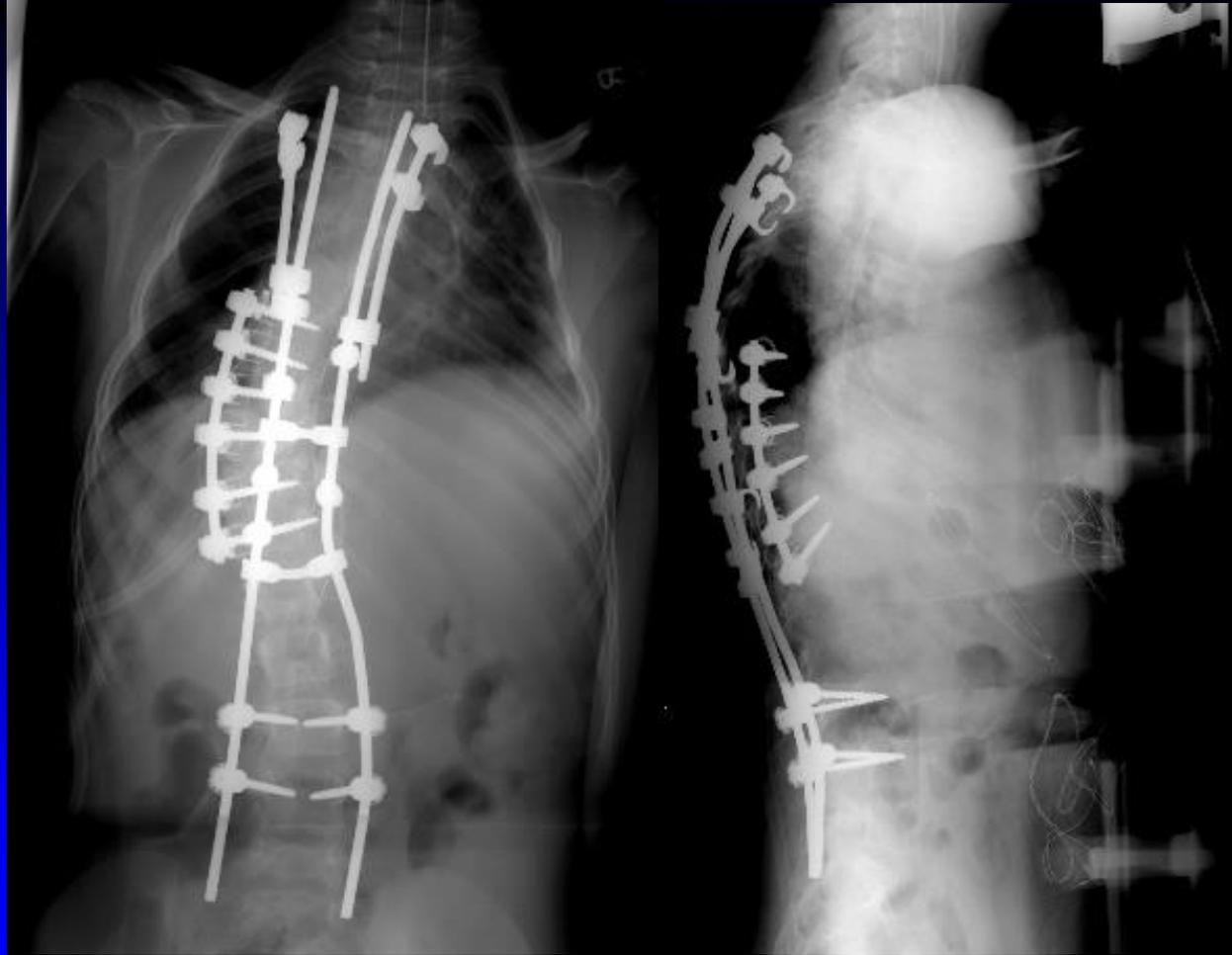
Growth Guide Me, but Never Hold Me Down





NF1

- **No Pedicles**
- **Rib Hooks**
- **Domino**



Conclusion: Rib hooks are the option of last resort



A classification of growth friendly spine implants.

Skaggs DL¹, Akbarnia BA, Flynn JM, Myung KS, Sponseller PD, Vitale MG; Chest Wall and Spine Deformity Study Group; Growing Spine Study
Pediatric Orthopaedic Society of North America; Scoliosis Research Society Growing Spine Study Committee.

The only truly growth friendly spine implants live in the front!

