### Thoughts on the genesis of PJK

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Medical University of South Carolina Charleston, SC 6+4 year old boy, spastic quadriparesis, ventilator dependent. PJK 111 degrees



Total Bending moment: 752.1 N.cm. Gravity center: y = 12.6 cm Age 8+11, sublaminar hooks, kyphosis, 122 degrees

Hooks failed. Kyphosis 143 degrees



Supplemented with pedicle screws. Kyphosis 118 degrees



Total Bending moment: 553.7 N.cm Gravity center: y = 9.3 cm



#### Screws failed. Kyphosis 145 degrees

Rib construct inserted. Kyphosis 113 degrees despite displacement of 2 superior hooks. Died 6 months after this radiograph.





### Relationship of occiput to sacrum indicates deforming forces were neutralized



Total Bending moment: 1109.4 N.cm. Gravity center: y = 18.6 cm



Total Bending moment: 374.3 N.cm. Gravity center: y = 6.3 cm

## 12 y o boy with mitochondrial phosphorylation defect





Total Bending moment: 832.9 N.cm. Gravity center: y = 13.9 cm

# Instrumentation failed over 3 years. Note increased cervical lordosis – becoming fixed





With fixed cervical lordosis, deforming forces actually INCREASED after thoracolumbar spine aligned



13.1 cm 4.5 kg 577.7 N.cn 5.4 46.5 cm

Total Bending moment: 662.4 N.cm. Gravity center: y = 11.1 cm

#### Scheurmann's kyphosis - osteoporosis





### Summary

- The weight of the body mass proximal to the superior instrumentation will place a kyphotic deforming force at the junction of fixed and unfixed spine,
- The amount of force is proportional to the distance of the center of that body mass relative to the superior fixation
- Fixed shoulder protraction places additional PJK deforming forces on the spine
- Correct thoracic deformity before cervicothoracic compensatory deformity becomes fixed