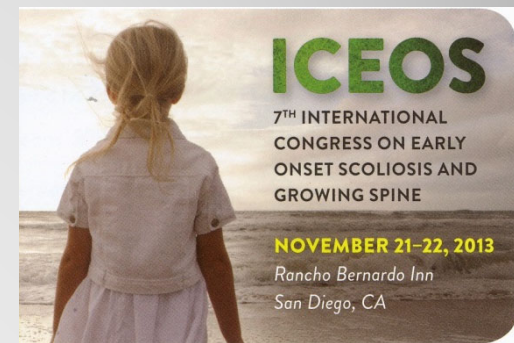


# The sagittal balance challenge in fusionless surgery : P.J.K. predicting factors in VEPTR technique

N. Ventura PhD. , A. Ey-Batlle M.D, Augusto Covaro M.D, I.Vilalta M.D., Melisa Atitzman M.D.



## Disclosures

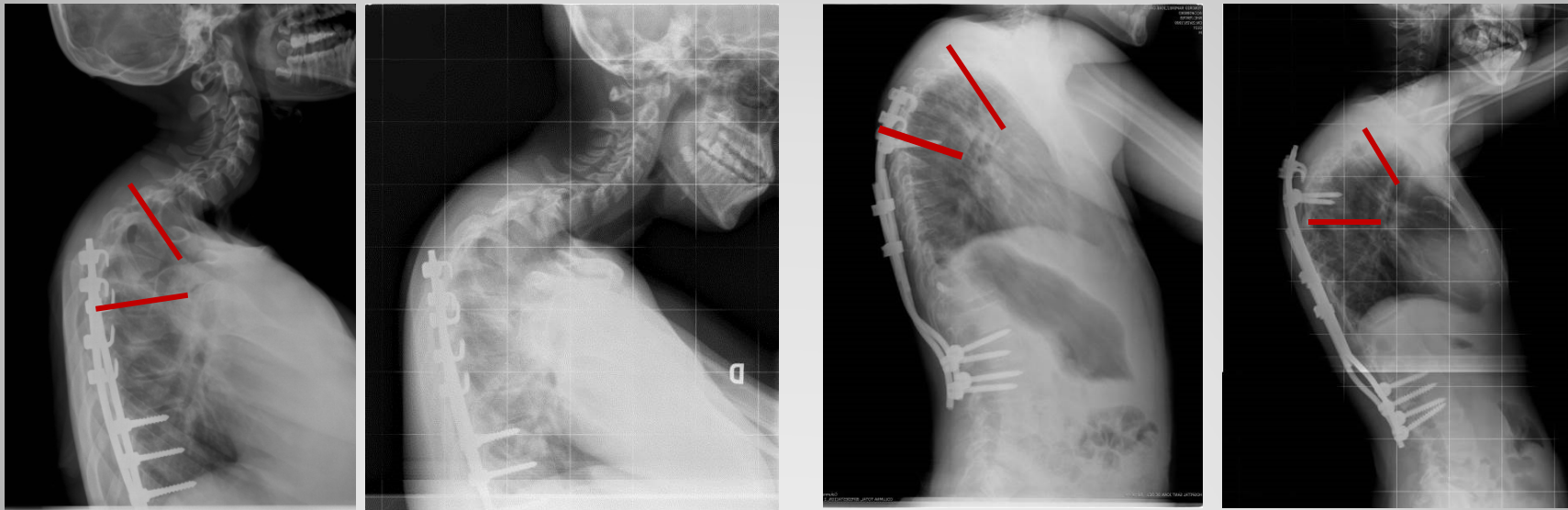
Consultant of K2M

Consultant of Synthes

## Introduction

Abnormal **P.J.K.** was defined as an angle over  $10^\circ$  between the endplates of the vertebrae 2 levels cephalad and 2 levels caudal to the U.I.V.

Incidence in A.I.S. 46%/27% and in E.O.S. 56%



**Lee et al**, Spine 1999; 24: 795-9, **Kin Y et al**, Spine 2007, 24: 2731-8),  
**Cristopher Lee, et al.** 46th annual meeting SRS; Louisville, Kentucky

**Risk Factors in E.O.S.** seem to be related  
Preoperative thoracic hyperkyphosis  
Improper proximal end vertebra selection  
Distal anchors placement at too proximal level



## Patients and Methods

We retrospectively reviewed **34** patients with E.O.S. who had VEPTR treatment for kyphoscoliosis with **minimum follow up 2 years** (average 4.5).

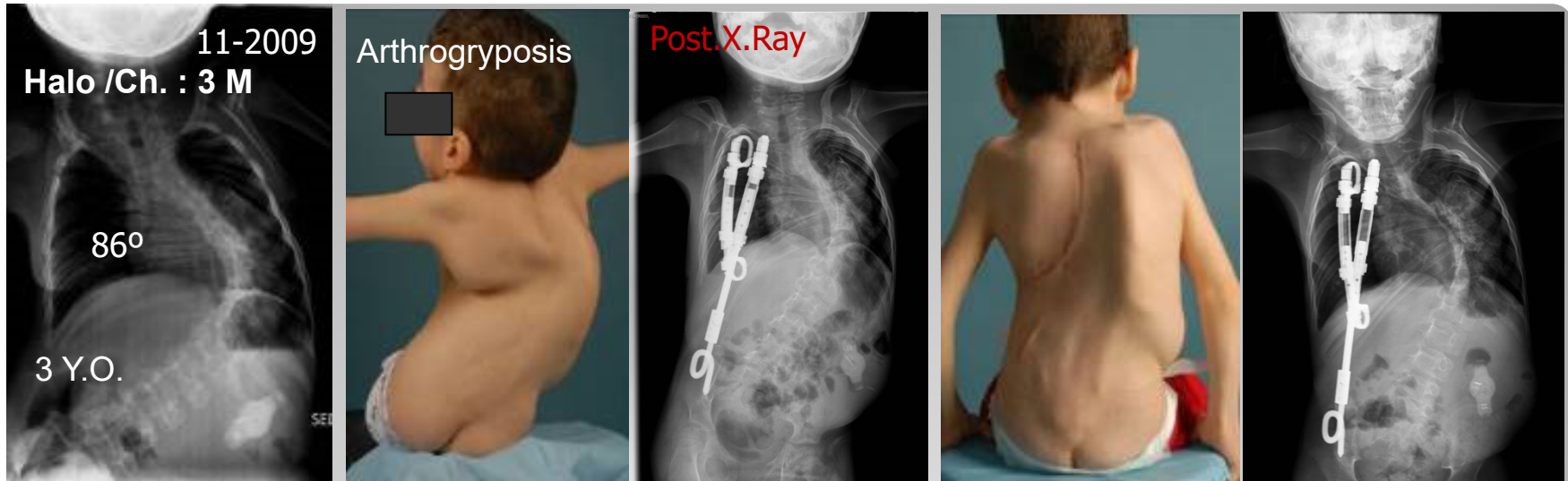
**Demographics database**, gender, age, degrees of kyphosis / scoliosis, apex of kyphosis, proximal and caudal anchorage, diagnosis and complications **were recorded**.

**Statistical analysis** using **Chi-square test** was performed (statistical significance if  $P < 0.05$ )

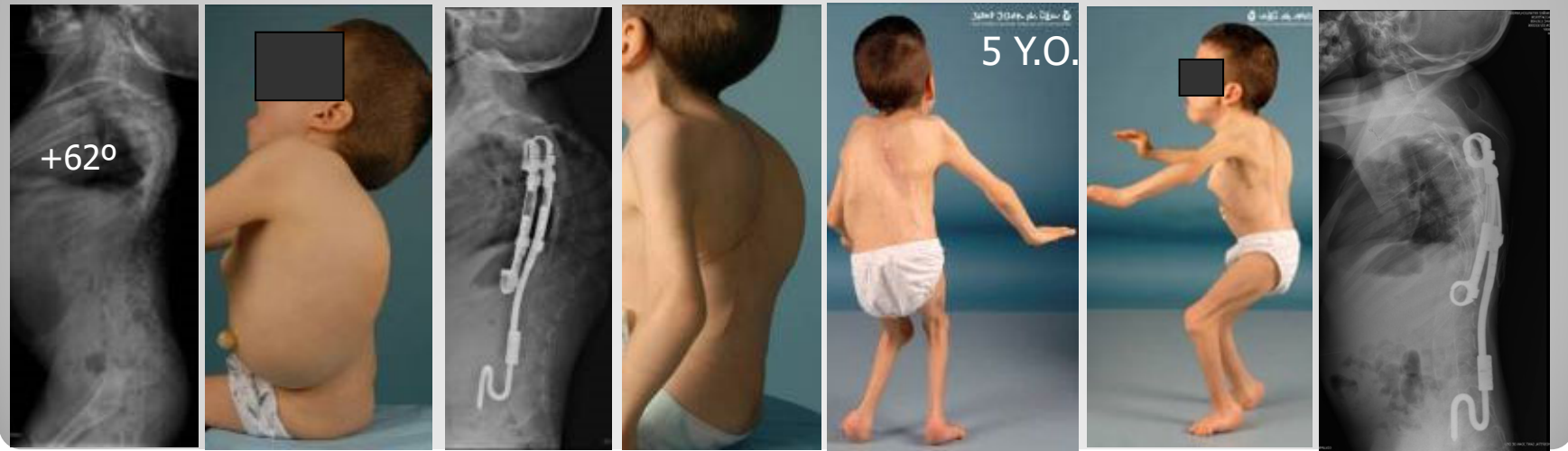
## Results

The mean age at initial surgery was **6.7** years (ranged from 3 to 12). **Diagnosis varied with** 13 patients having neuromuscular scoliosis, 11 congenital, 5 idiopathic (2 cases mentally retarded), 5 others.

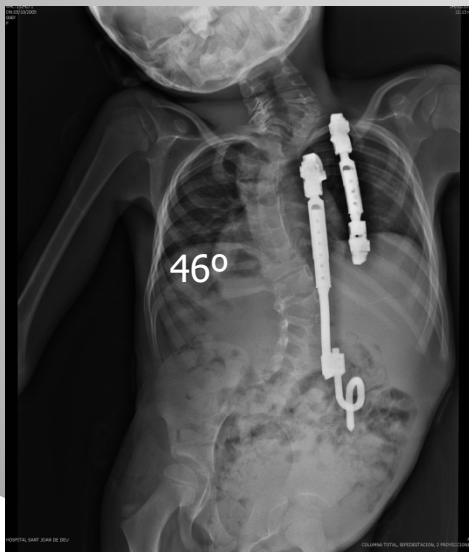
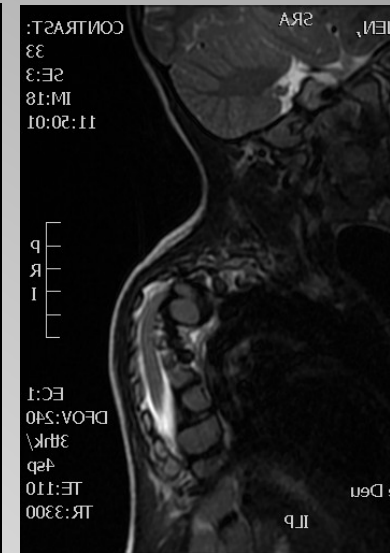
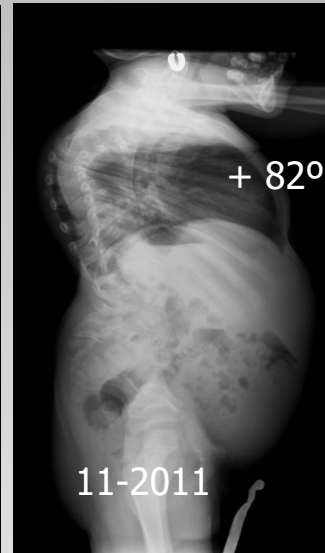
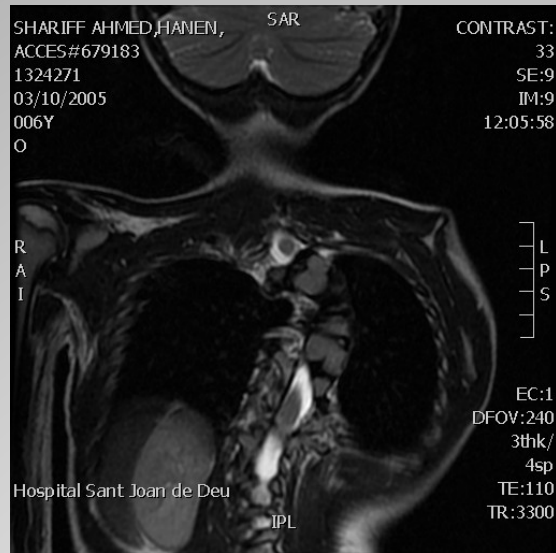
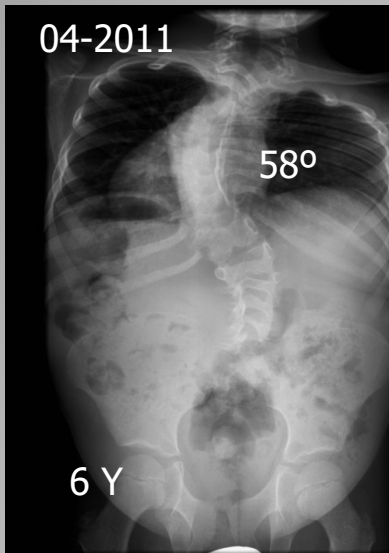
# 13 neuromuscular scoliosis



**Arthrogyrosis, 3 months Halo/chair gravity traction, VEPTR Rib/pelvis**



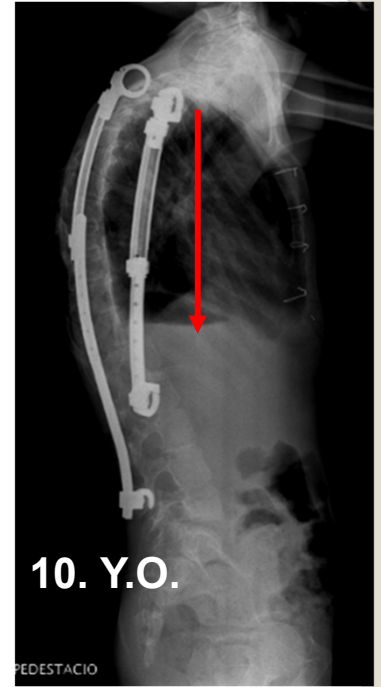
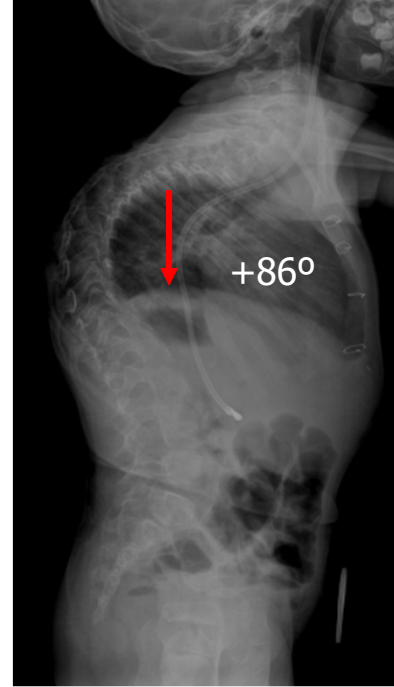
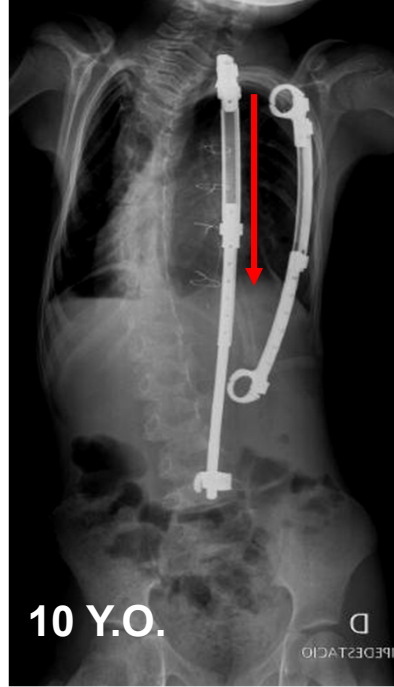
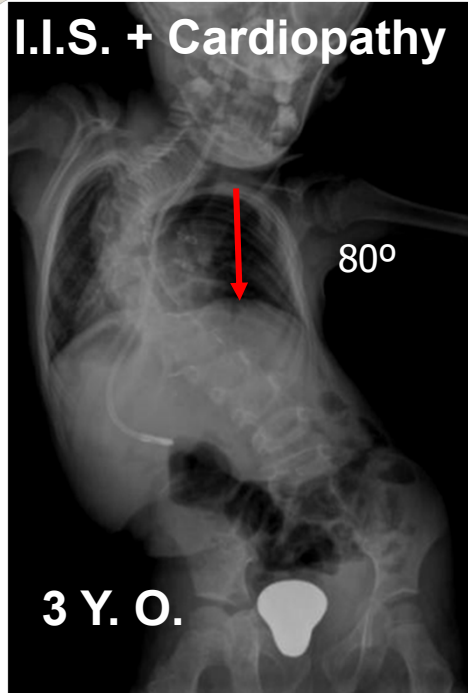
# 11 congenital kyphoscoliosis cases



Thoracic Hyperkyphosis +82°

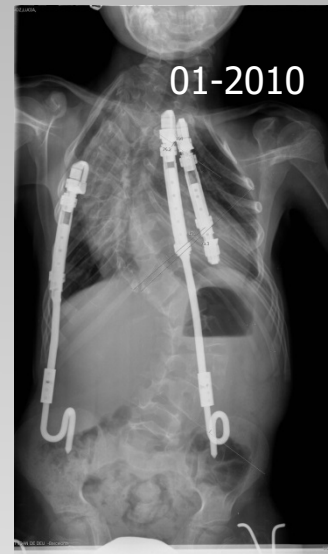
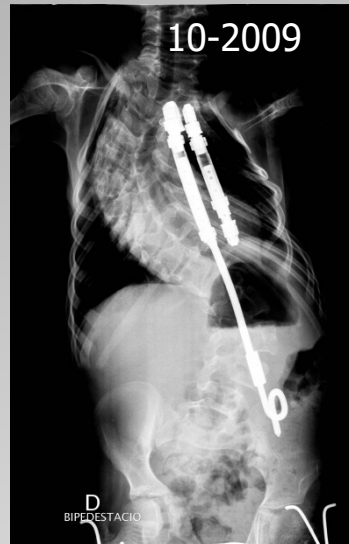
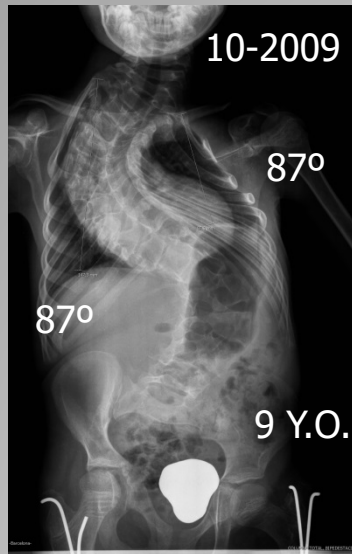
# 5 Infantile Idiopathic Scoliosis

I.I.S. + Cardiopathy





**5 others diagnosis:** osteogenesis imperfecta, Marfan 's Syndrome, cord tumor



## Radiographic Evaluation

**Preop. Kyphosis** from T.4 /T.12, ranged **22° / 110°**  
(57.2°)

**Postop. kyphosis** ranged from 25°/73° ( 52.3°)

**Preop. Coronal Cobb angle** ranged **37°/110° (80°)**

**Postop. Coronal Cobb angle** ranged from 38° to 38°  
(49.4°)

**Preop. lumbar lordosis** ranged 13°/78° ( 35.8°)

**Postop. lumbar lordosis** ranged 9° /54° (33.3°)

# Results

**12 patients** developed **P.J.K. (35%)**

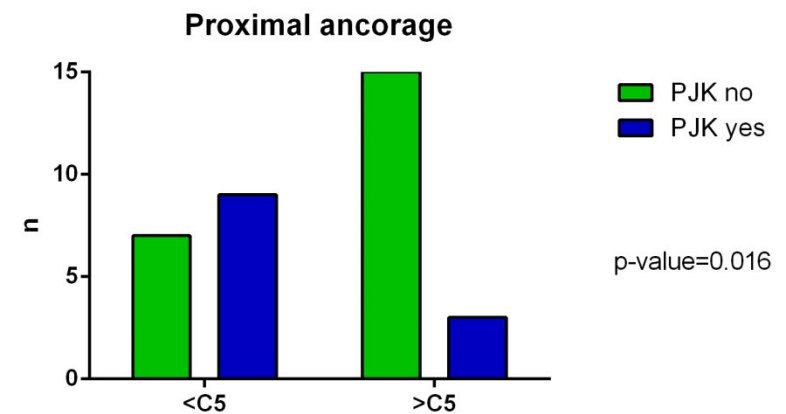
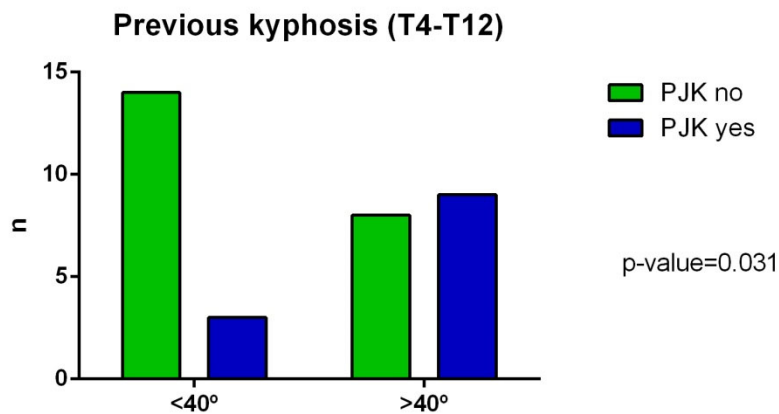
**Etiology** : **5** neuromuscular, **4** idiopathic, **2** congenital, **1** syndromic

In all cases the **thoracic kyphosis** was **> 40°** and **7** of these **12** cases had **thoracic kyphosis > 60°**

In **8** cases proximal cradle placement was at/ below **T.5. rib**

## Statistical analysis

- There was significant statistical association between PJK :
  - Previous kyphosis T4-T12  $> 40^\circ$
  - Proximal end vertebral selection from T5 rib or distally



## Results

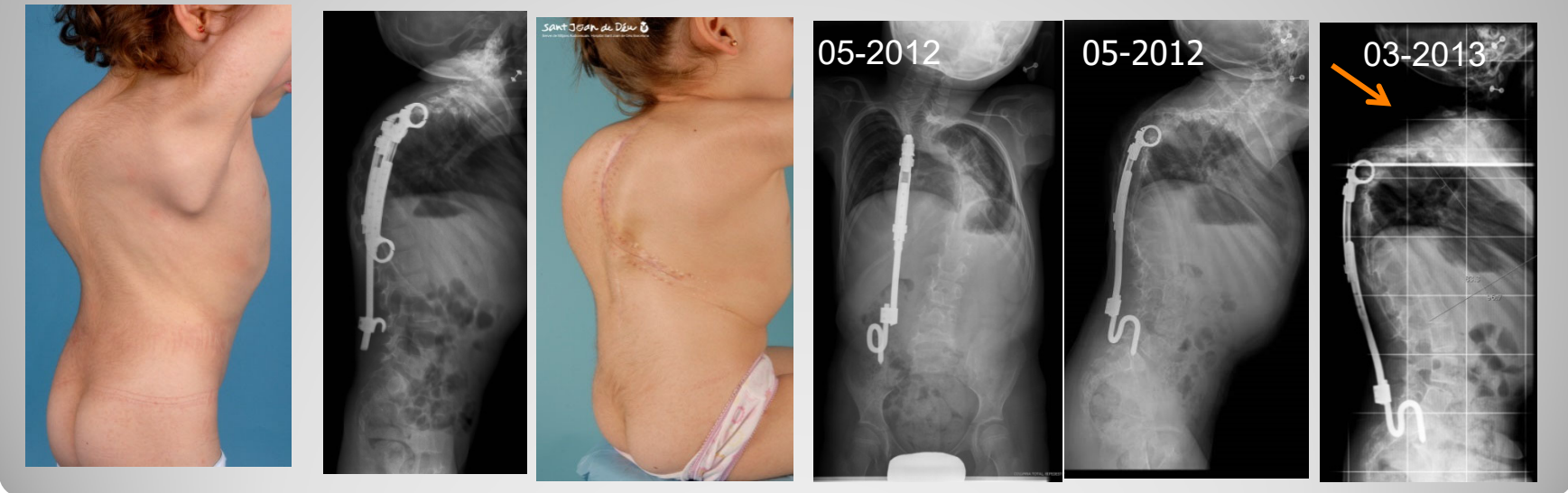
Only 3 (1 neuromuscular, 2 Inf. Idiop.S). of the 12 patients needed additional revision surgery.

Prior Halo chair/trolley gravity traction, in one case a more proximal cradle placement was performed and in the other two cases instrumentation to the cervical spine was needed

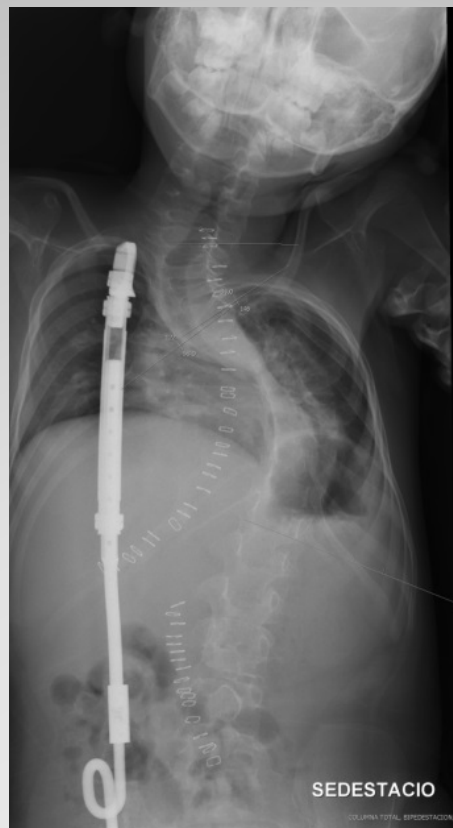




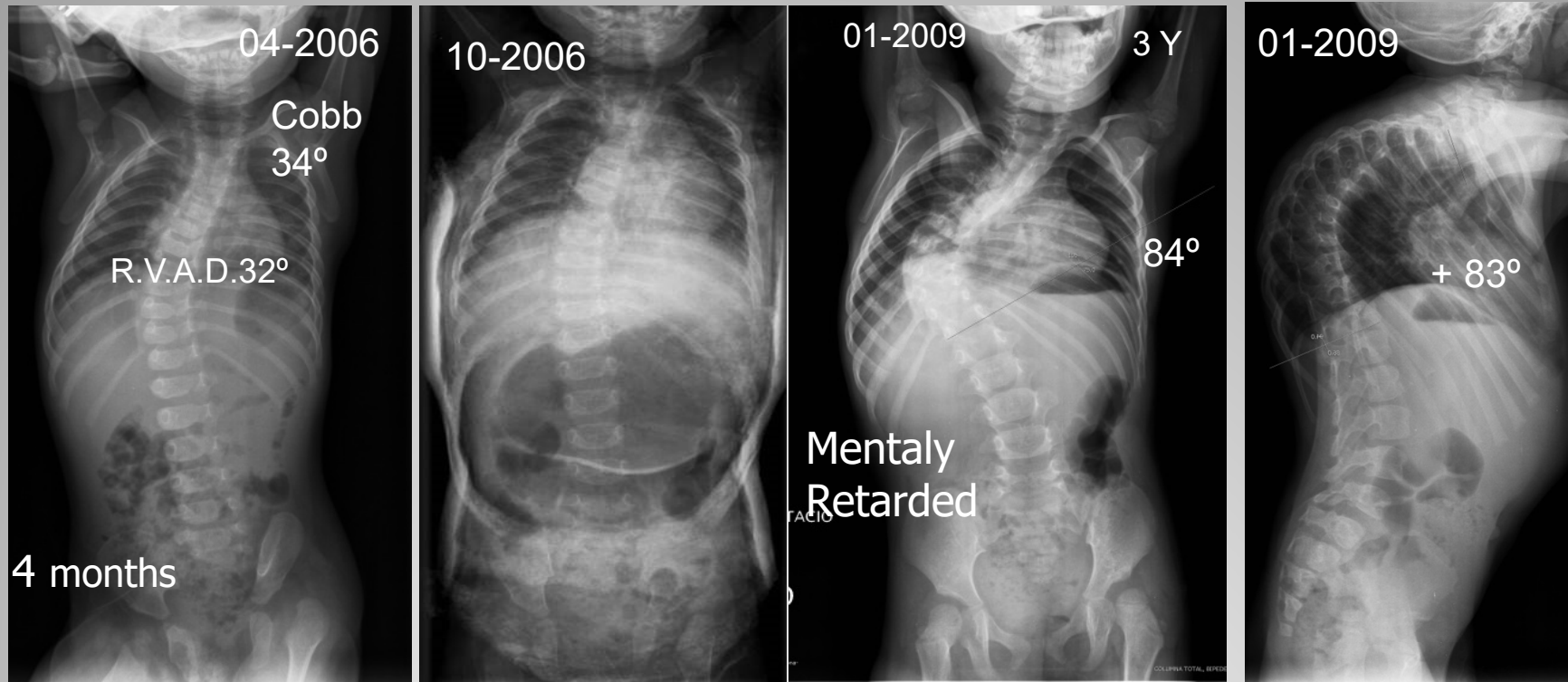
Neurom. Scolios., 3 Y.O., after changing the VEPTR, P.J.K. developed



Removal the implant, 2 monts Halo/chair/traction, resetting proximal cradle to the highest possible rib



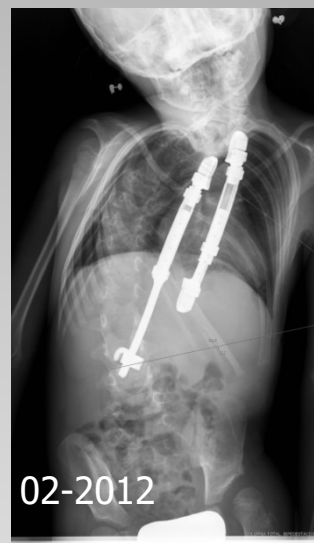
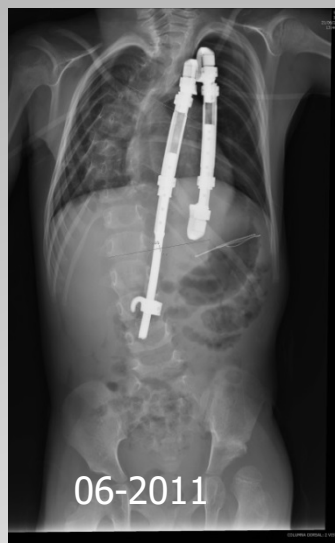
Although some improvement of the kyphosis was seen, the P.J.K. did not entirely resolve



**Infantile Idiopathic Malignant type**, in spite of casting the curve progressed steadily.

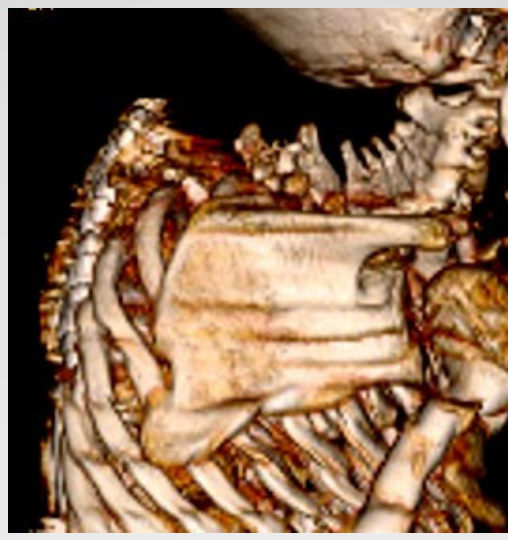
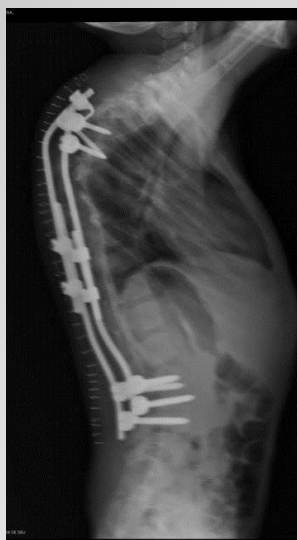
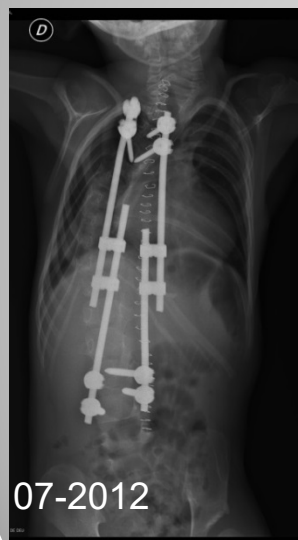
X-Ray : A.P. right curve of 75°, thoracic khyphosis T.1-T.12 of +84° (01-2009)





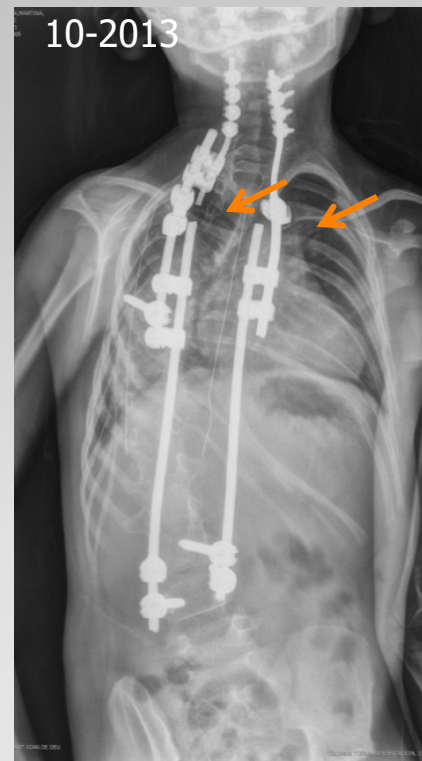
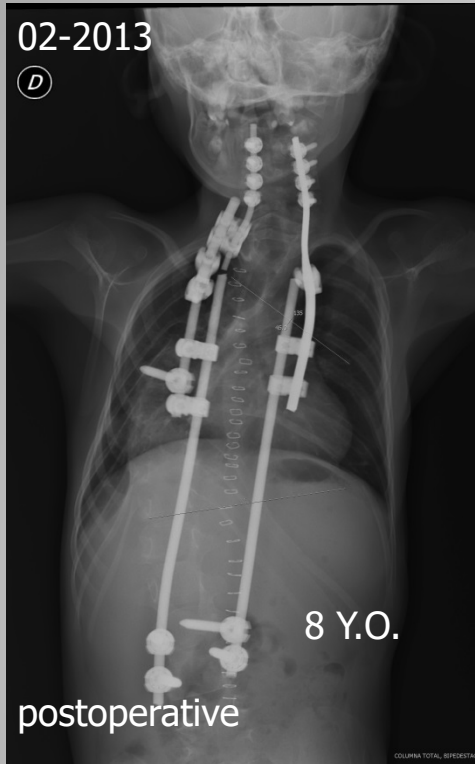
**Length. Capacity exosted**

**P.J.K. developed**

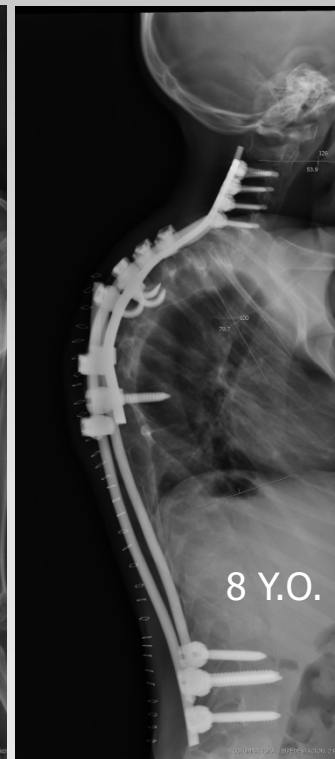


**Removal the implant, 2 monts Halo/chair/trolley traction**

## Posterior fusion C.3/ T.5 (lateral mass screw for cervical fixation)



**First lengthening**



**First lengthening**

## Conclusions

P.J.K. results in subsidence of T.1

Decrease of thoracic length

Decline in the space available for the lung

P.J.K. may be **minimized but not eliminate** by :

Extension of proximal cradle to the second / third ribs

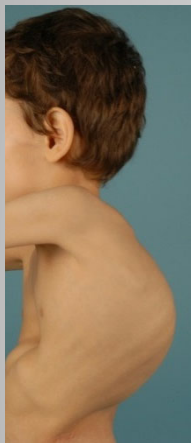
Improvement of sagittal balance (kyphosis) by Halo gravity traction before surgical treatment

## Conclusions

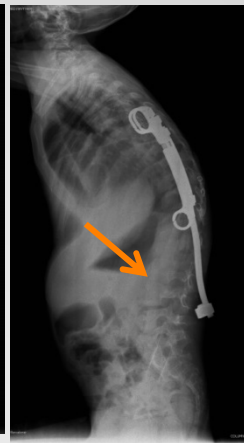
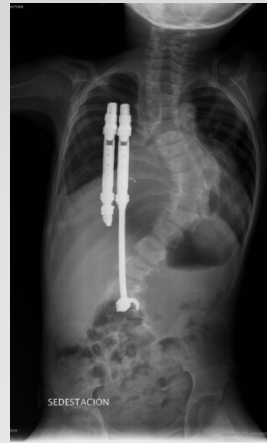
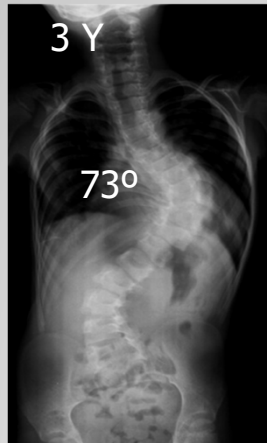
. Distal extension of the hybrid device in some cases to the pelvis

. In some cases a hybrid rod on the opposite thorax,  
**Bilateral Hybrid VEPTR** could be the best option ?

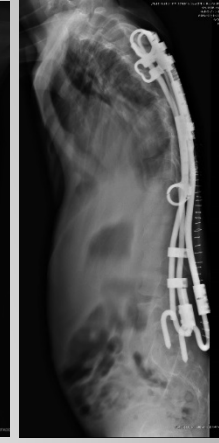
**Extension to the pelvis**



Marfan 's syndrome



Hook dislodgement



*Thanks!*

