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 10º 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%

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

Arthrogryposis, 3 months Halo/chair gravity traction, VEPTR Rib/pelvis

Halo/Ch.: 3 M

Post X-Ray

11-2009

86°

+62°

3 Y.O.

5 Y.O.
11 congenital kyphoscoliosis cases

Thoracic Hyperkyphosis +82°
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 > 40º
  - 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 $75^\circ$, thoracic kyphosis $T.1-T.12$ of $+84^\circ$ (01-2009)
Length. Capacity exosted

Removal the implant, 2 monts Halo/chair/trolley traction
Posterior fusion C.3/ T.5 (lateral mass screw for cervical fixation)

First lengthening

02-2013
8 Y.O.
postoperative

First lengthening

10-2013
8 Y.O.

10-2013
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?

Marfan’s syndrome

Hook dislodgement
Thanks!