Safety and efficacy of growing rod technique for pediatric congenital spinal deformities

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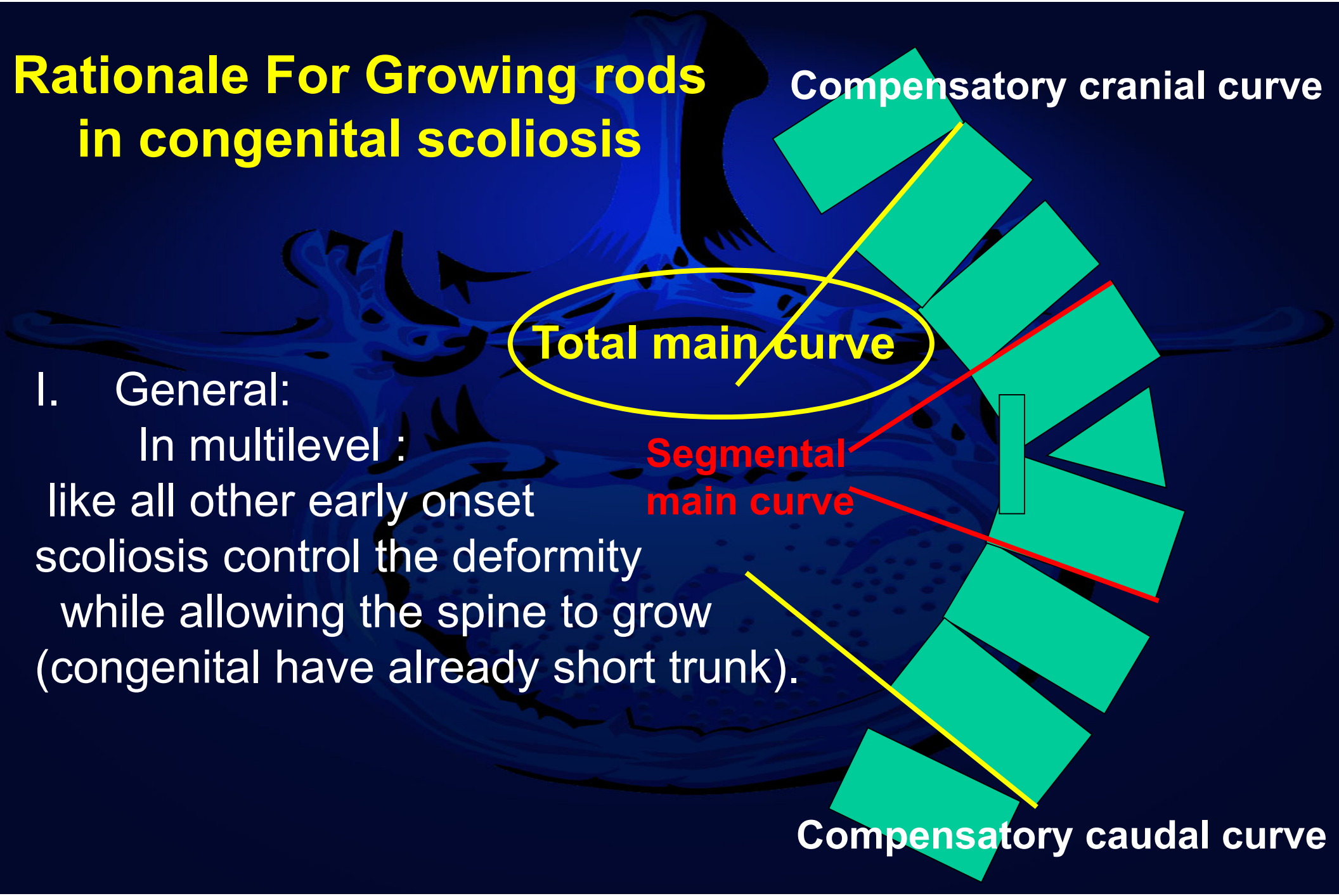
GROWING SPINE STUDY GROUP

Congenital Curves:

Rigid
Progressive (predictable ?)
Intraspinal anomalies (30%)
Increased Risk of Correction
Decreased Growth Potential
Multiple adjacent and
non adjacent segments
Unsatisfactory surgical options:
*Failure of segmentation
*Mixed,
*Unclassified.

Rationale For Growing rods in congenital scoliosis



I. General:

In multilevel :

like all other early onset scoliosis control the deformity while allowing the spine to grow (congenital have already short trunk).

II. Specific to congenital:

1.Decrease the risk of neurological affection by gradual correction during serial distractions (viscoelasticity of spinal cord, autoregulatory mechanisms compensating for initial hypoperfusion)

2.Elongation of the concave side by distraction:

VEPTR (unloading, Heuter-Volkman mechanism)

Campbell RM Jr, Hell-Vocke AK.

J Bone Joint Surg Am. 2003 Mar;85-A(3):409-20.

Growing rods and VEPTR

(elongation of unsegmented bar under distraction)

Elsebaie HB, Akbarnia BA and Skaggs DL **GSSG**

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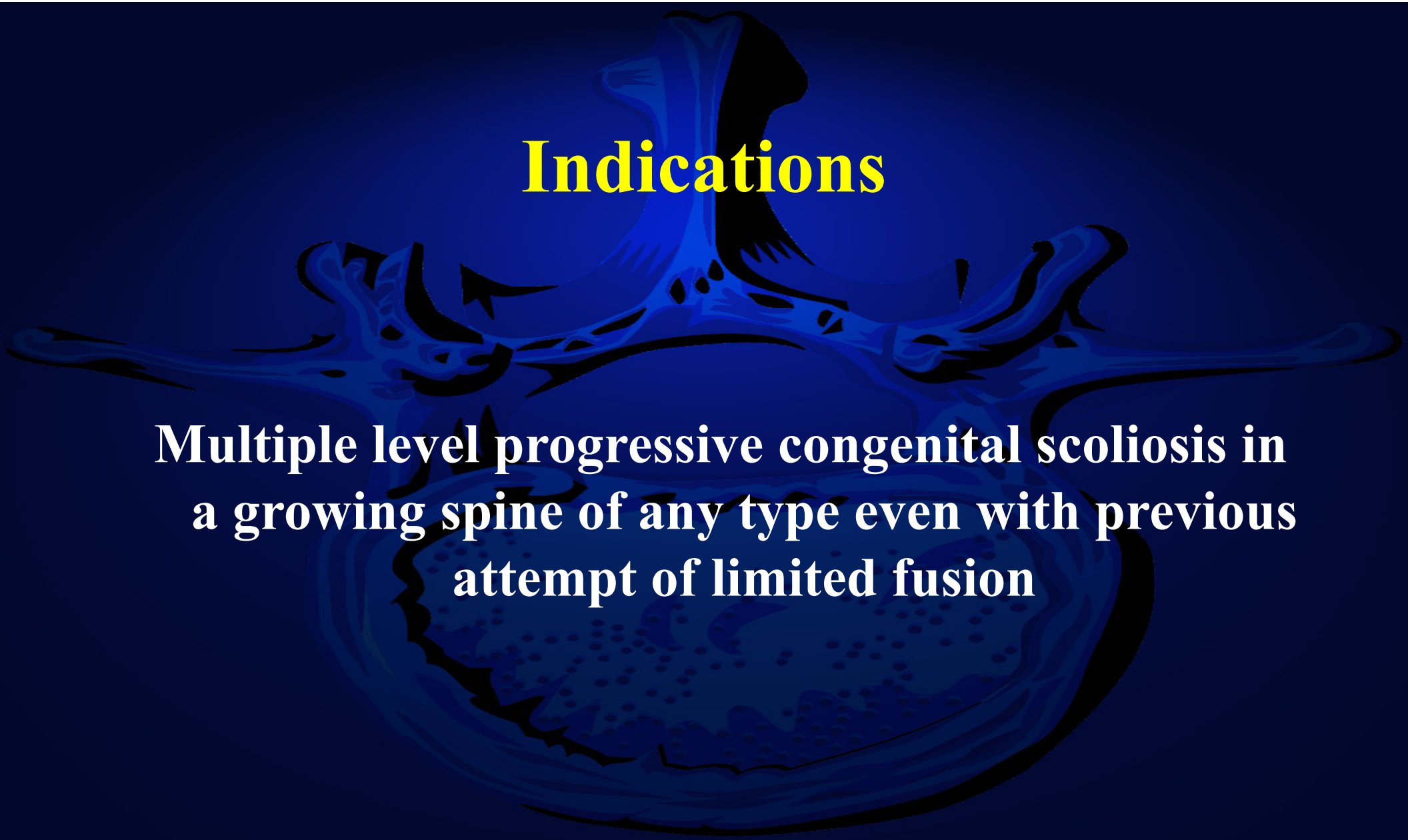
Indications



Multiple level progressive congenital scoliosis in a growing spine of any type even with previous attempt of limited fusion

Previous studies

Publications on growing rods in different pathologies including a small number of congenital cases , never assessed as a separate group.

Akbarnia et al Spine, 2005, Thompson et al Spine 2005, Thompson , Akbarnia, Campbell JPO 2007

Three case reports with small number of patients looking at specific aspects of the technique in congenital scoliosis

Grass et al Spine 1997, Cheung et al Spine 2002, Schmitz et al EJPS 2002

Current study

This is the first case series comprehensively dedicated to assess the use of Growing Rod techniques in congenital spine deformities.

Methods

19 patients with progressive congenital scoliosis

Between 1989 and 2005. Retrospective

Ten different Institutions

The congenital anomalies included failure of segmentation in 5, failure of formation in 4, mixed 5 and unclassified or not recorded in 5.

The average number of affected vertebrae per patient was 5.2 (2-9)

Results

Average age at surgery 6 years 10 months (3y-10y)

Mean follow up 3y 9 m (2y – 6y)

The number of instrumented vertebrae was 13 (10-17)

The number of lengthenings was 4.3 (1-10) with an average interval of 9 months (3-26)

Results

The mean scoliosis Cobb angle improved from 65.3 (40-90) pre-initial to 44.9 (13-79) post initial (31.2% correction) and 47.2 (18-78) at the last follow-up (28%)

T1-S1 length increased from 263.8mm (192-322) after initial surgery and to 310.5mm (261-352) an increase of 4.7cm at last follow-up pre final fusion with an average T1-S1 length increase 12mm per year

The length of instrumented segments increased from 215.4 mm (180-275) to 247.2 (19.3-29) an increase of 3.2 cm

The space available for lungs (SAL) ratio increased from 0.81 preoperatively to 0.94 post latest follow up

Complications

During the treatment period:

Complications occurred in 8 of the 19 patients (42%),

a total of 15 complications out of 100 procedures (15%):

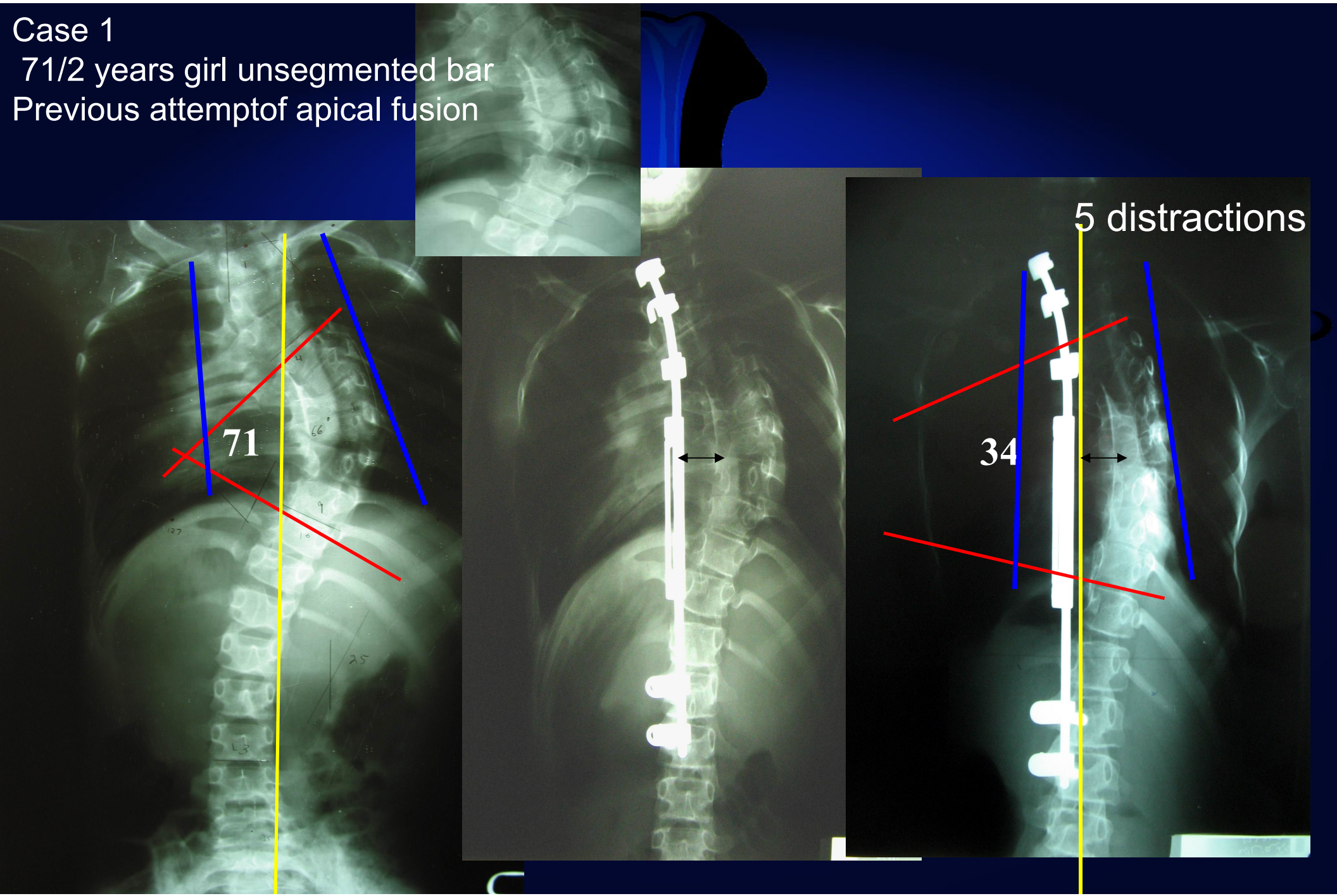
2 pulmonary, 1 deep infections and 11 implant-related:
5rod breakages, 3 proximal construct dislodgement,
2 implant failures needing whole system changing

Most importantly there were no neurological complications in any of the patients during the treatment period.

Case 1

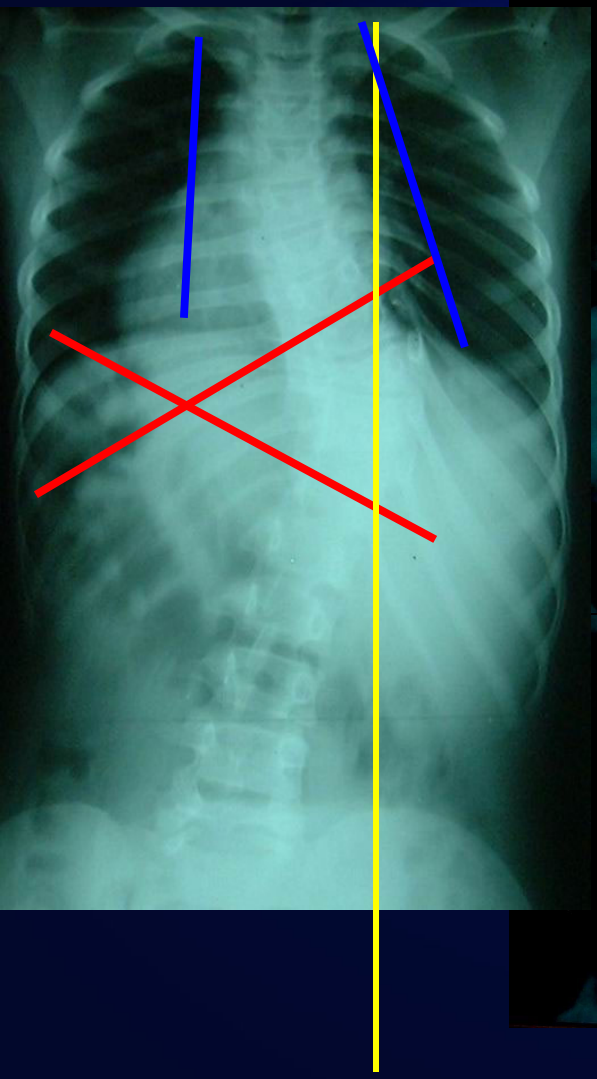
71/2 years girl unsegmented bar

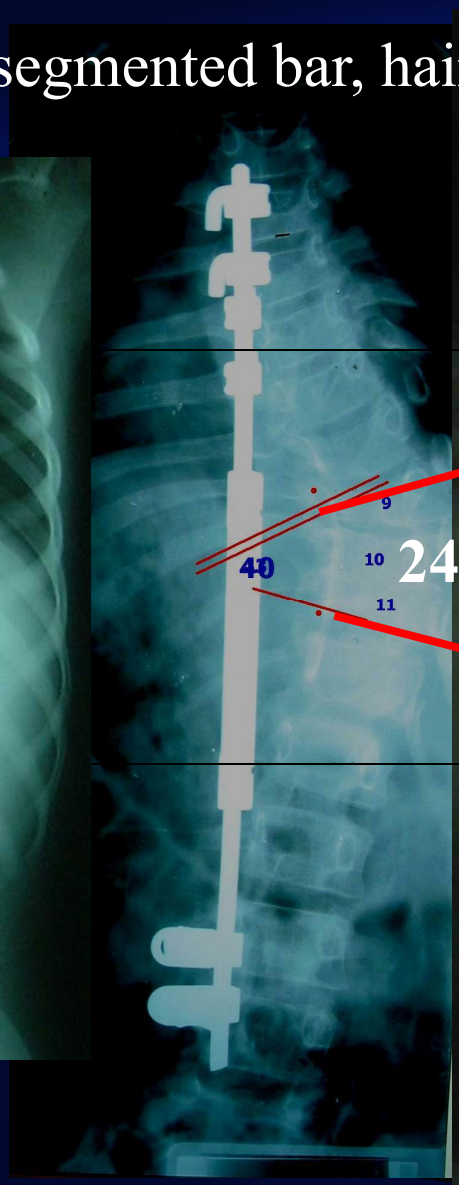
Previous attemptof apical fusion

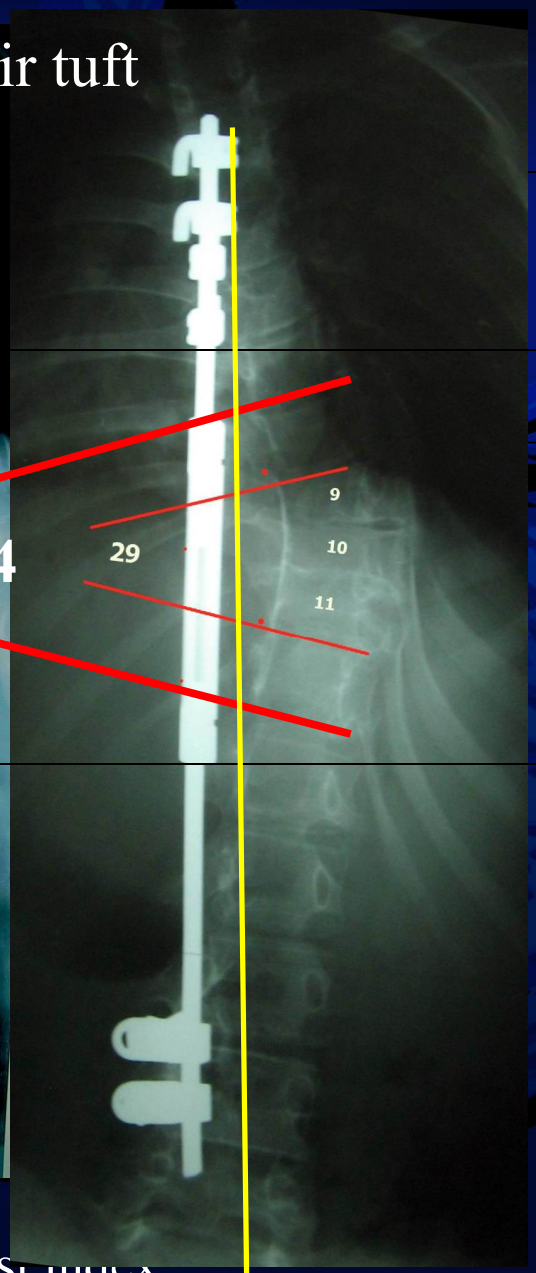


Case 2

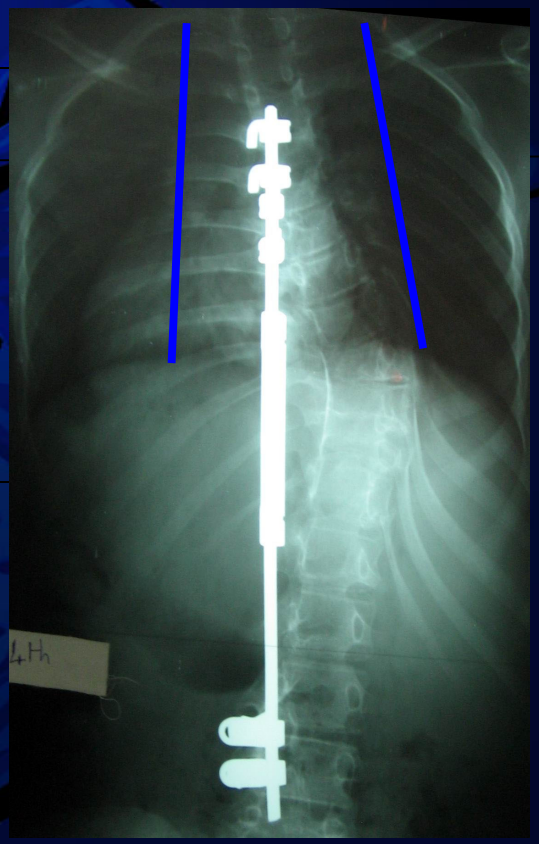
7 years girl, unsegmented bar, hair tuft





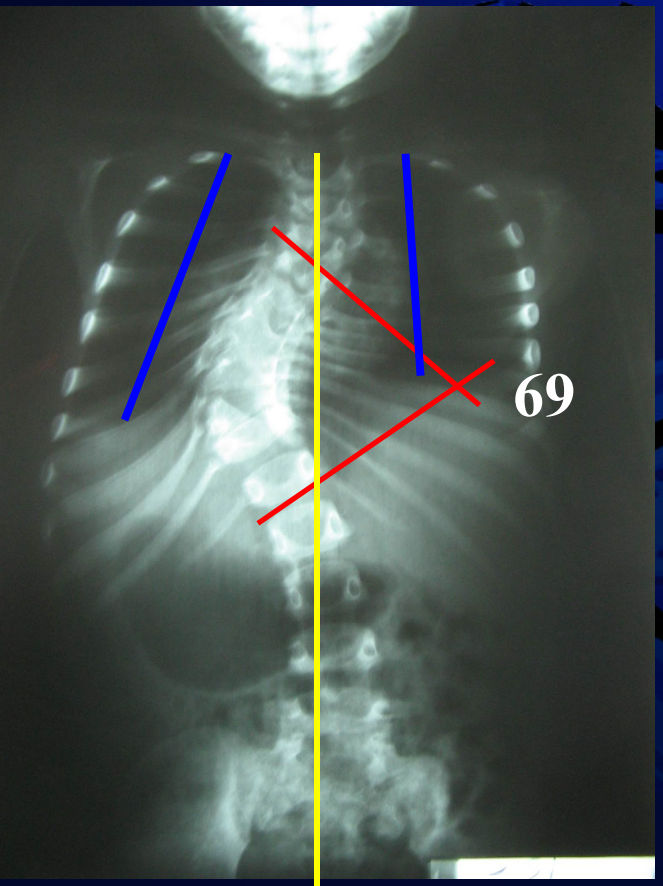


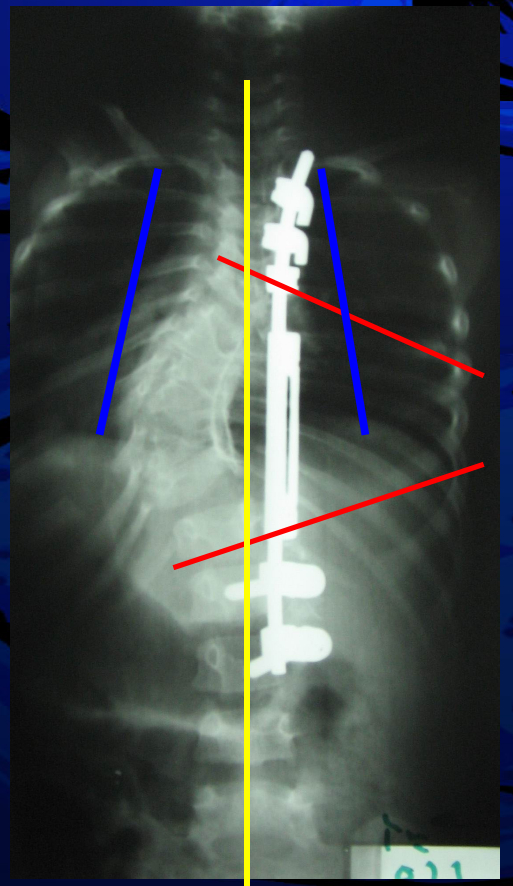
Post index

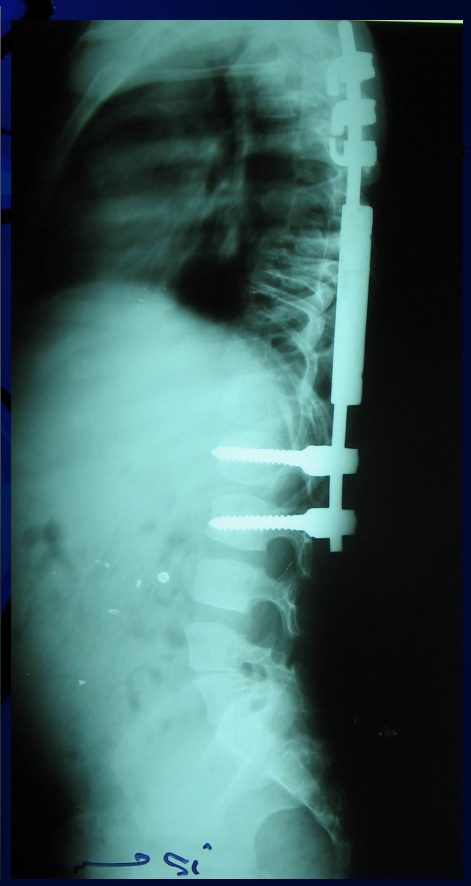


Post 2 years 4 distractions

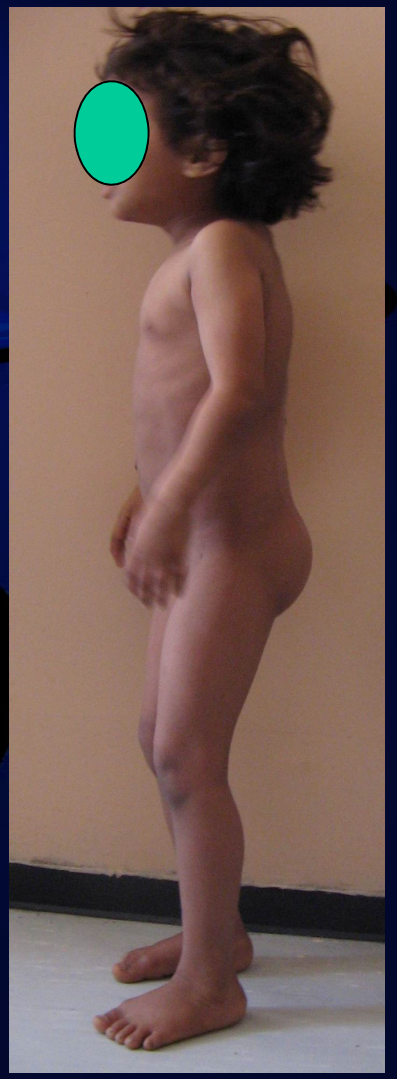
Case 3
4 1/2 years girl
mixed









CONCLUSION

The growing rod technique is a safe and effective treatment for congenital spinal deformities.

There is less correction obtained at initial surgery compared with previous reports for the same technique in other etiologies.

The spinal growth was comparable and the SAL improved.

The rate of complication is acceptable , most importantly no neurological complications