

Chinese growing rod(PRSS) in management of juvenile and adolescent scoliosis

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A variety of growing rod spinal instrument has been used

- ◆ **“Subcutaneous Harrington rod” to provide active distraction to lengthen the concavity of the curve (Moe 1962)**
- ◆ **Luque-Trolley 1977**
- ◆ **post growing rod \pm limited fusion (Akbarnia BA);
Isola Tandem Connector;
Mc Cathy technique (1993)**
- ◆ **VEPTR vertical expendable prosthetic titanium rib**

Many parts of their experiences underlies the principle of PRSS

Attempting to correct scoliosis and maintain it in one stage operation during the growing years while allowing near normal spinal growth and preserving spinal mobility. We developed PRSS (Chinese growing rod) in 1998.



A surgical tool

B implants

图1 PRSS instrumentation

PRSS (plate-Rod system for scoliosis)

- ◆ Screw-Hooks are fixed on the lamina, plate-rod is placed on convex side by way of lateral sidewise push, rod on concave side and connected by connectors forming a strong frame-like setup
- ◆ The lower end of the rods free from the hole inside of the lower connector ,which allow the rods migration upward with the growth of the spinal column after-op.
- ◆ No distraction force → no risk of paraplegia
- ◆ Bony fusion is not required, essentially normal spine can be obtained after removing the implants when the skeletal growth terminated.

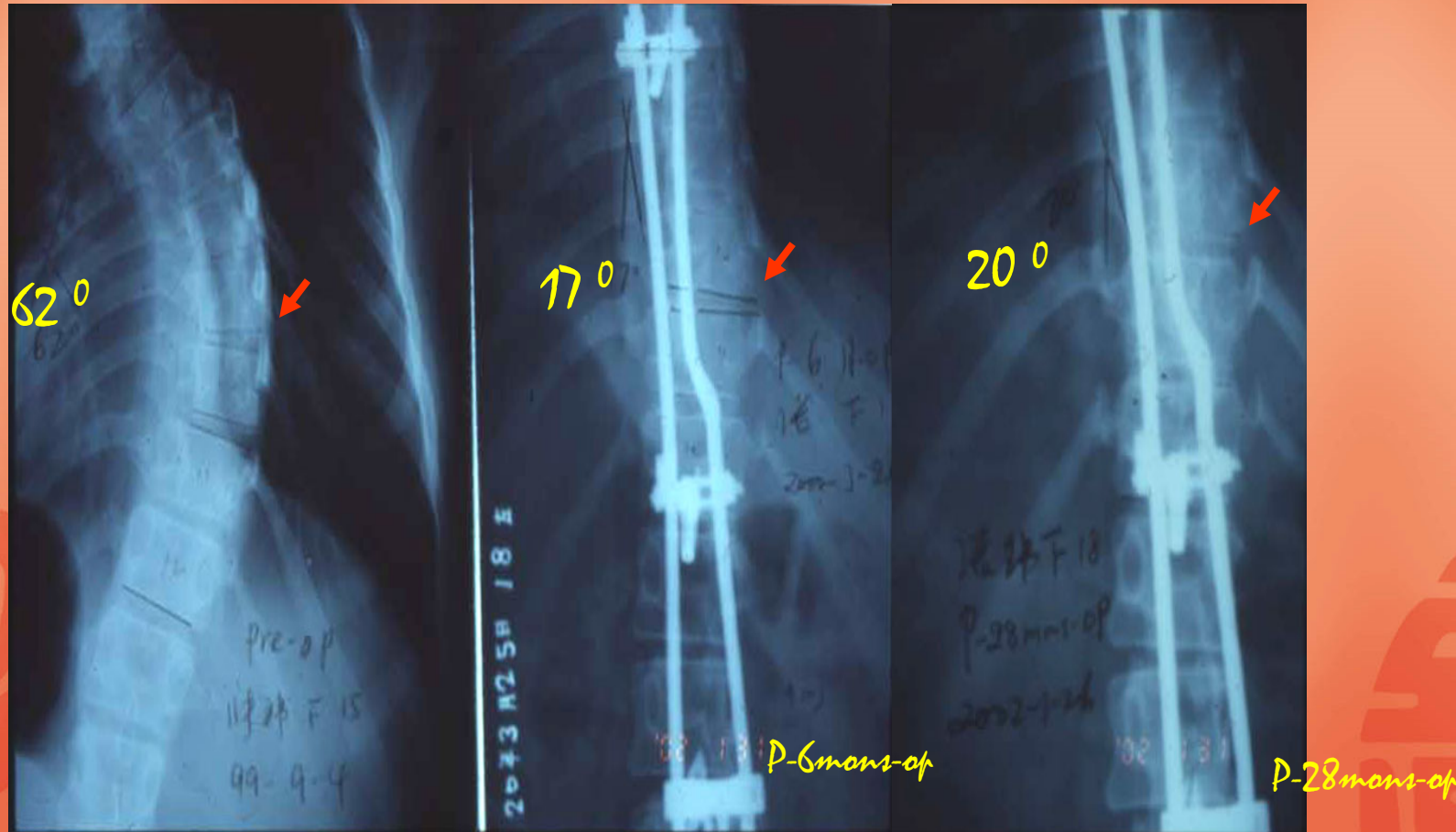




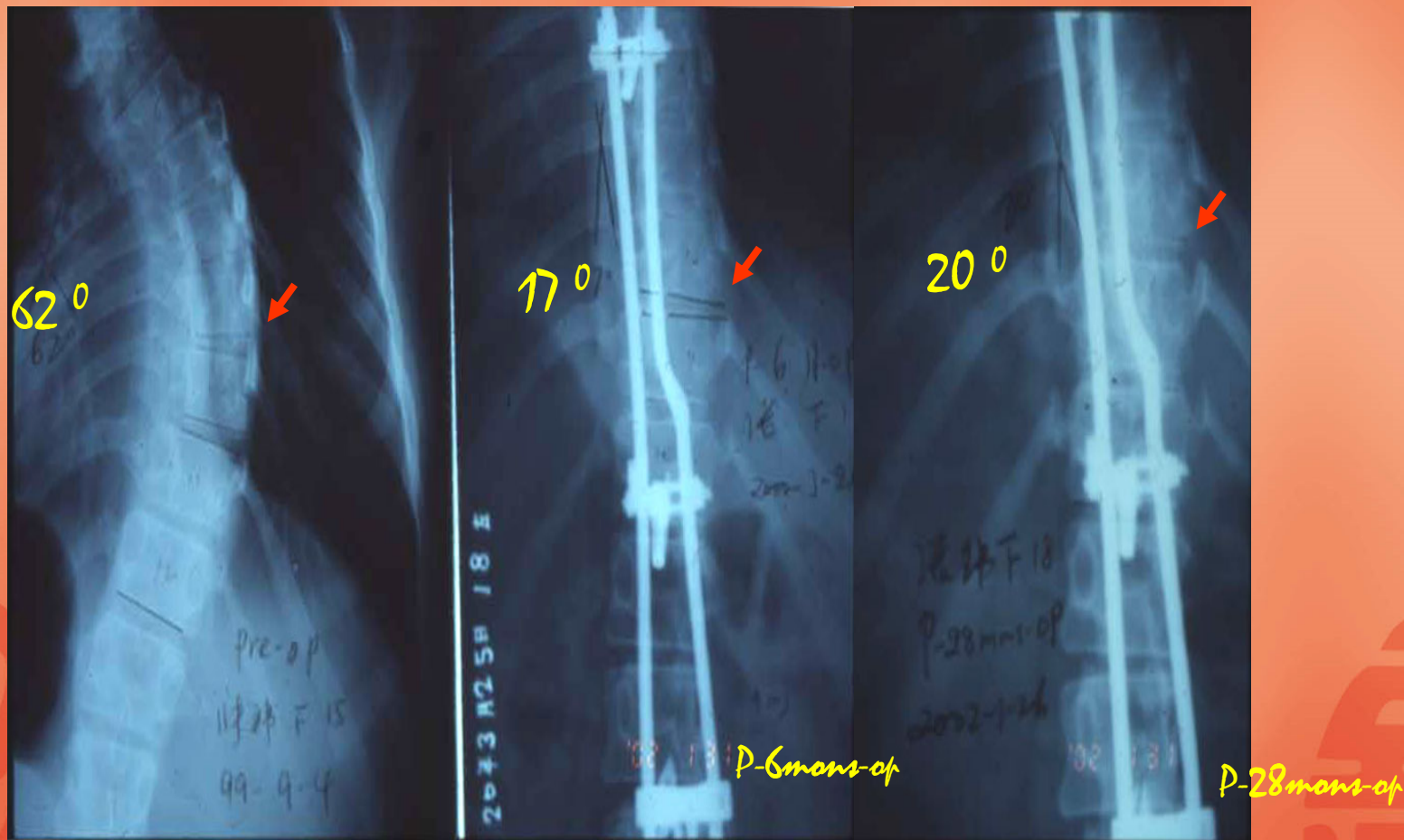


PRSS provides a function for modulating asymmetrical growth of scoliotic spine

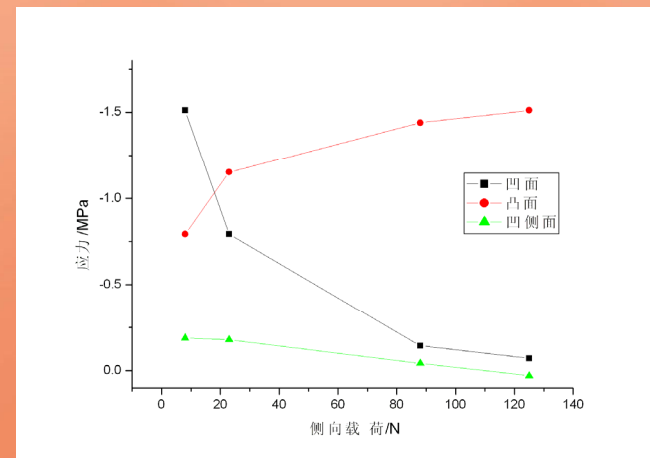
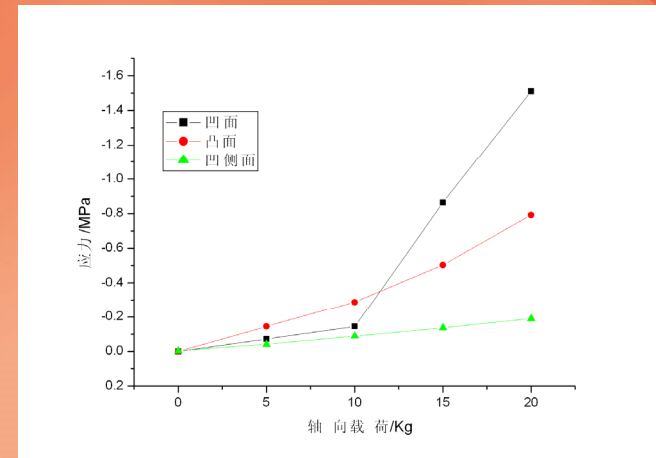
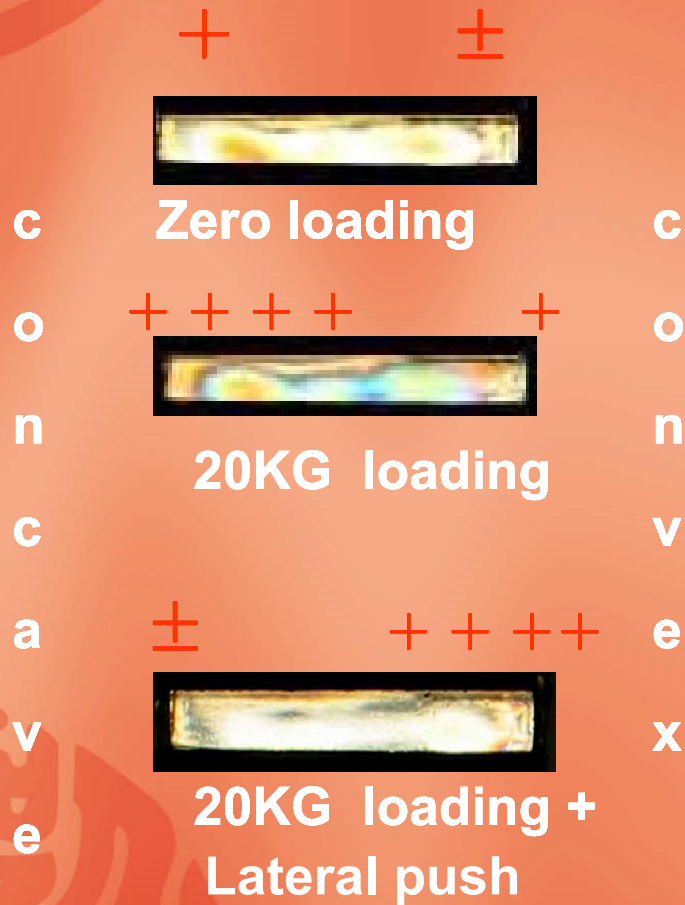
After PRSS is placed in place compressive stress is created over the convex side. While tensile stress was exerted over concave side. This is expressed in the change of width of disc space.



Asymmetrical stress would affect the growth of both side at the vertebral cartilage end-plate, and leads to the asymmetrical growth at both sides of the scoliotic spine and realignment of the spine.

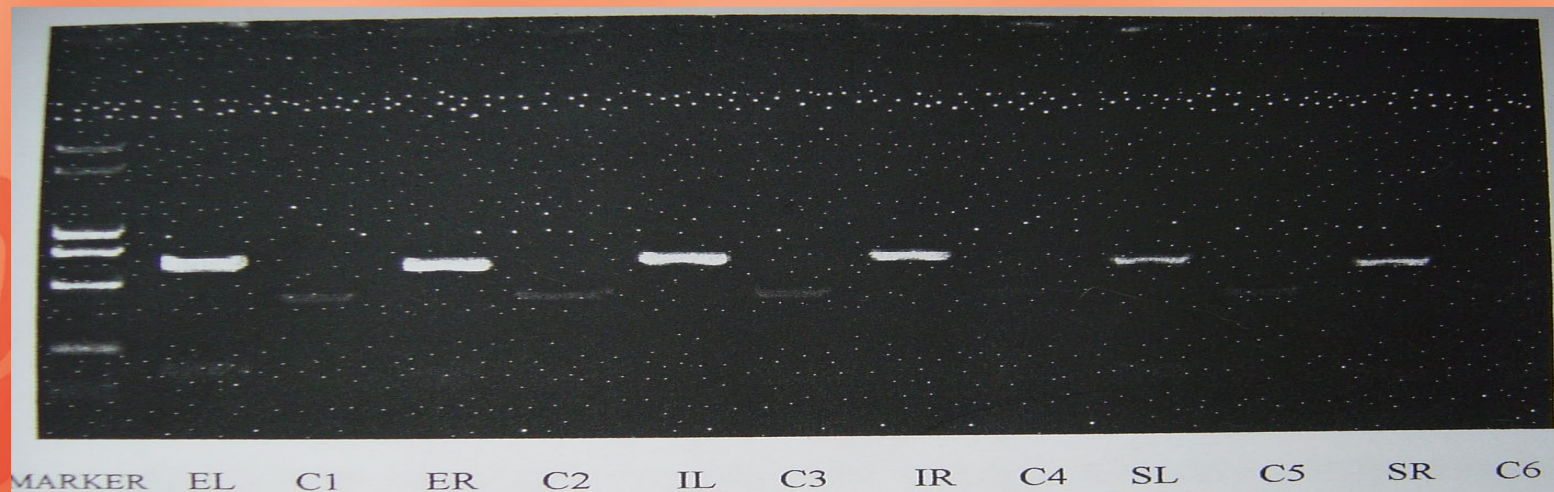


Variation of stress on both sides of scoliotic spine was reflects by the change on the color band in the photoelastic test



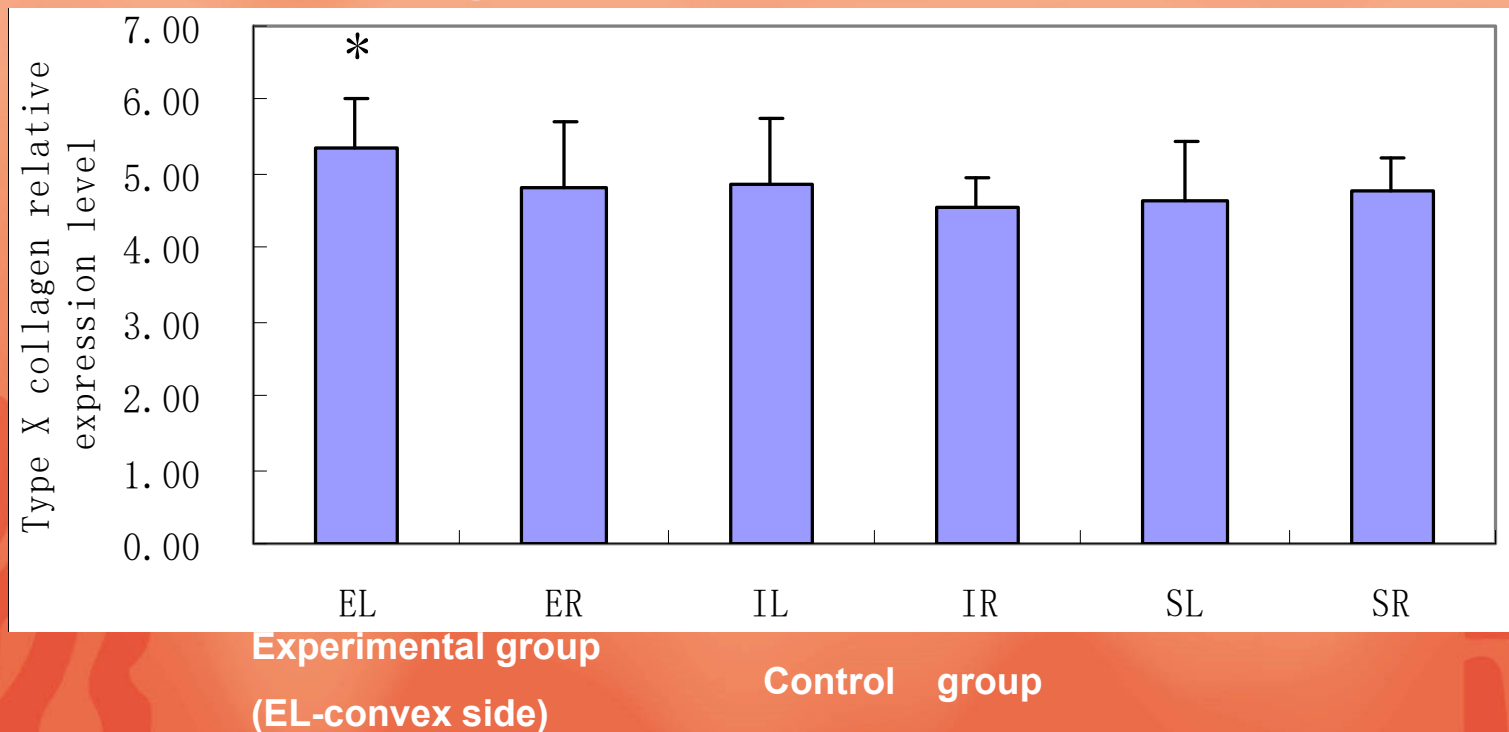
Photoelastic study was performed to quantitative the relational changes

Type X collagen which reflect chondrogenesis, subchondral bone formation and cartilage degeneration was studied as growth marker of the cartilage end-plate by semi-quantitative RT-PCR method.

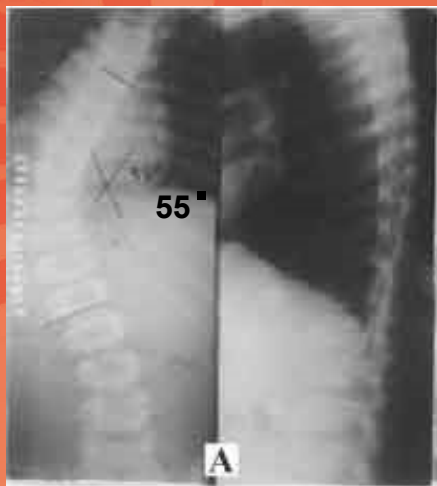


Type X collagen expression level

More type X collagen mRNA expressed on the convex side than on the concave side in the PRSS-instrumented animal spine, which suggested that compressive stress leads to increased earlier chondrogenesis, subchondral bone formation and cartilage degeneration, so as to retard the growth of vertebral cartilage end-plate over convex side.



Clinical results in the treatment of AS with PRSS



13 ys m

Since oct.1998,183 cases growing scoliotic children were operated by PRSS , 66 cases follow-up > 2 yrs were valuated .

mean age was 12.15yrs.

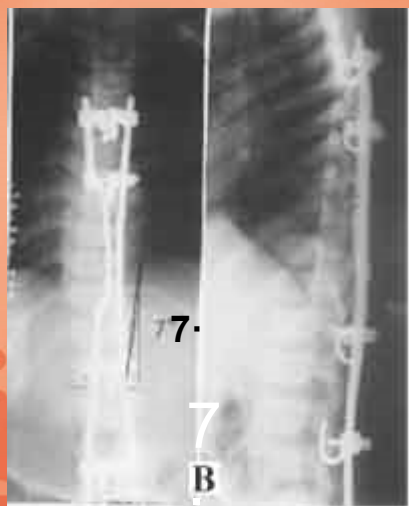
Ave follow up period 24.6(24-50.4) mons ,

Curve correction ave 62.8° (40-110°) → 22° with correction rate 68.6%, 6 pts. 100% correction



Pre-op

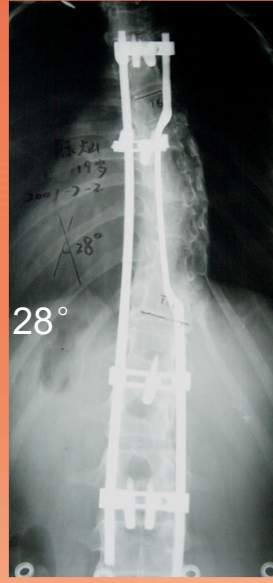
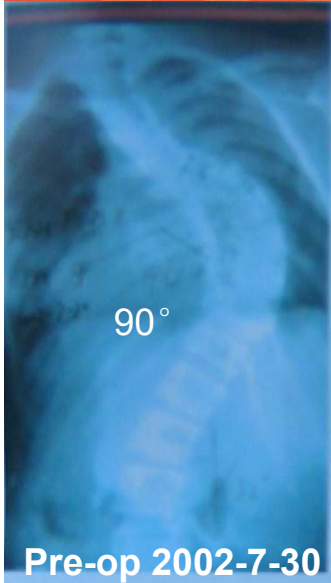
Pre-Op 55°



P-Op 7°(87.5%)



P-Op

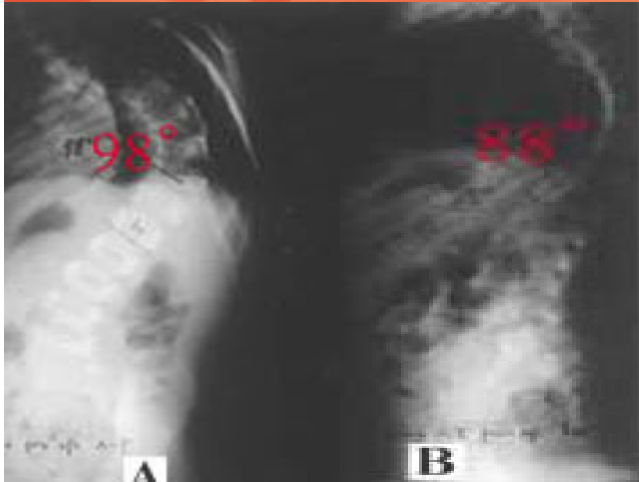


No significant loos of correction

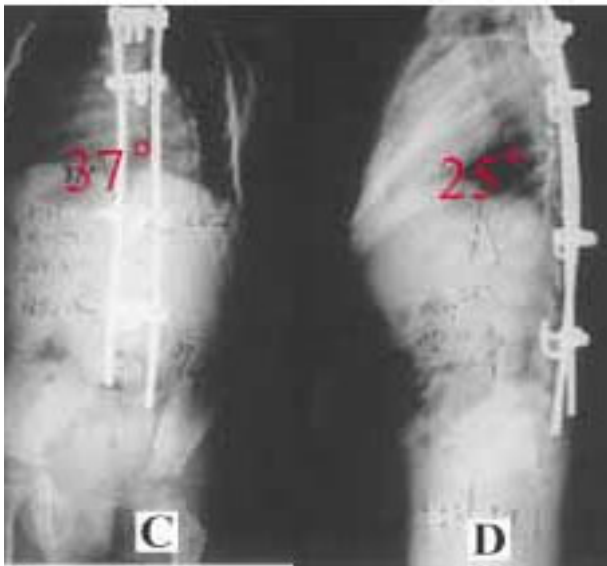
A 13 year girl with scoliotic curve 90° was corrected to 29° with PRSS, 5 yrs later, 28°



Clinical results in the treatment of EOS with PRSS



zu xx 3 yrs M, pre-op scoliosis 98°, kyphosis 88°



P-op scoliosis 37° kyphosis 25°

Since June 2000, 23 patients with Juvenile scoliosis were treated using PRSS, ave. age at surgery was 7.98+2.28 yes, Ave. follow-up period was 2.8+1.4 Yrs, 5 cases > 5 Yrs.

Curve correction: 80.7°
30.9°(61.10%)

Growth of instrumented spine was 13.34mm,
Loss of correction: 8 cases no loss, 3 cases < 5°, 12例 > 10° (P < 0.05),

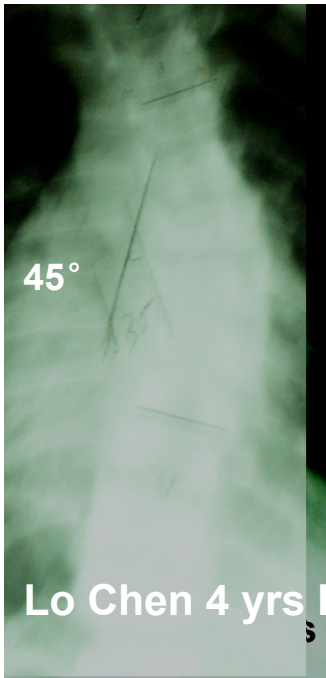


Pre-op

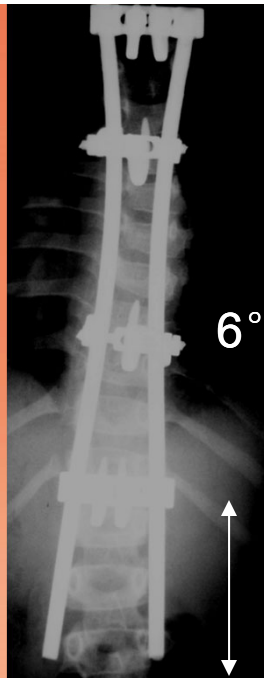
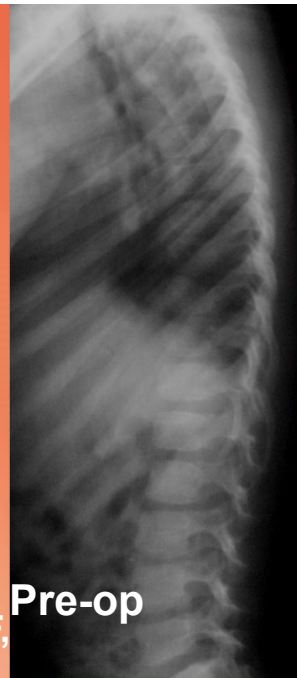
P-op



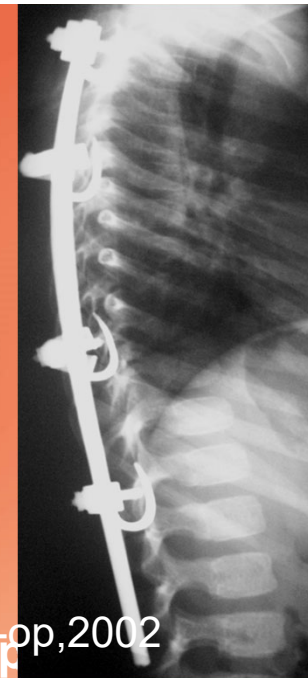
Posture appearance



Lo Chen 4 yrs F Pre-op

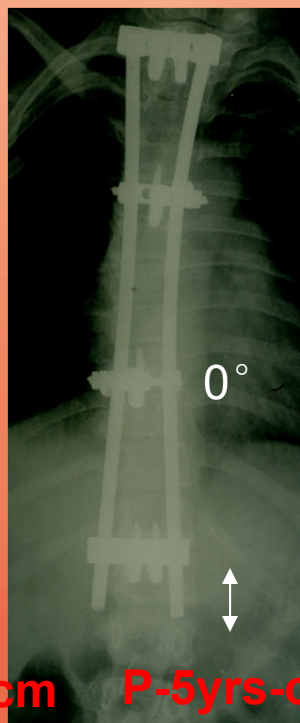


P-op, 2002



Growth of trunk and instrumented spinal segments obtained

Lo Chen F
4 yrs

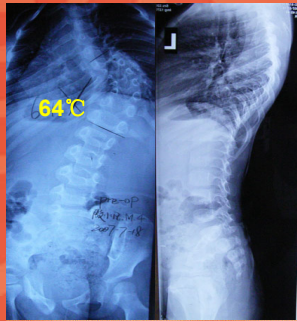


P-5yrs-op 2007

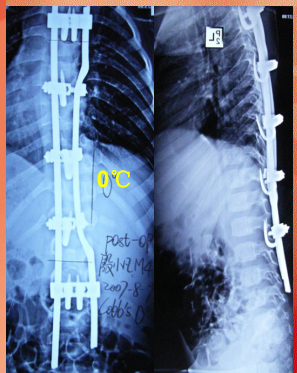


Curve correction:
45 → 0° .5 yrs
later, no loss
of correction,
growth of trunk
21cm, growth of
instrumented
spine 4.5cm

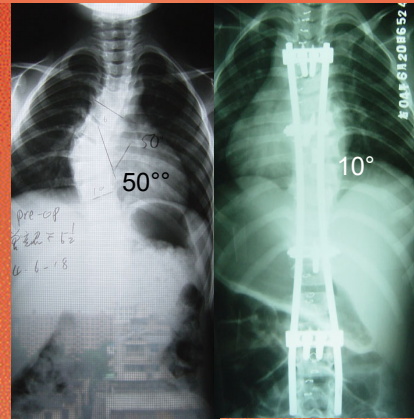
8 yrs, 119 cm



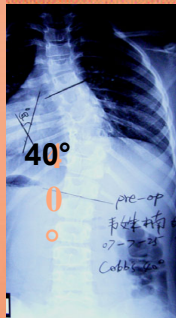
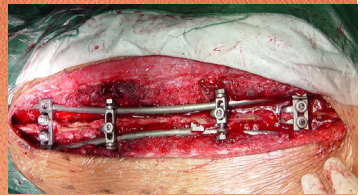
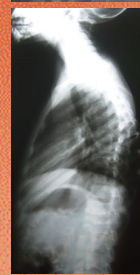
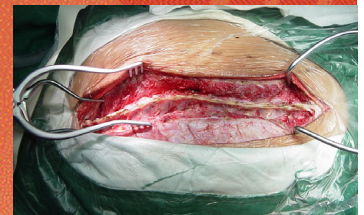
殷小凡, 男性,
4岁脊柱侧弯64
度用PRSS矫正
到0度
Yin xiao fon, M
4 yrs JIS 64°
was correct to
0° using PRSS.



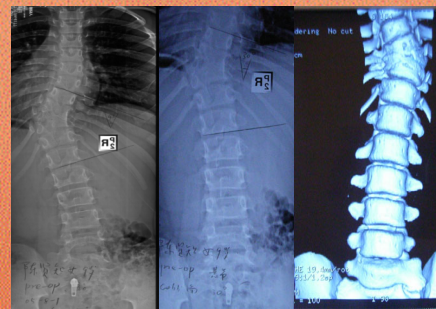
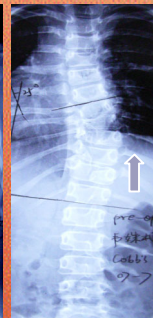
64° → 0°



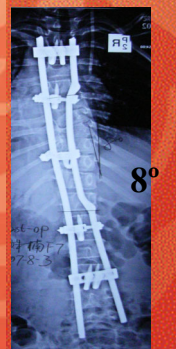
Zan xian
june F 5+Yr
50° → 10°



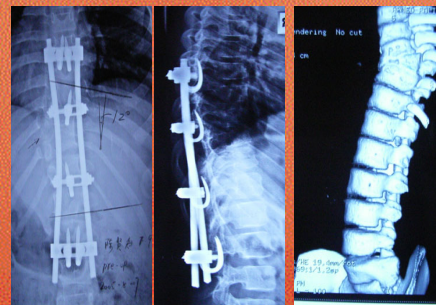
Wue shu men M
4 yrs
40° → 8°



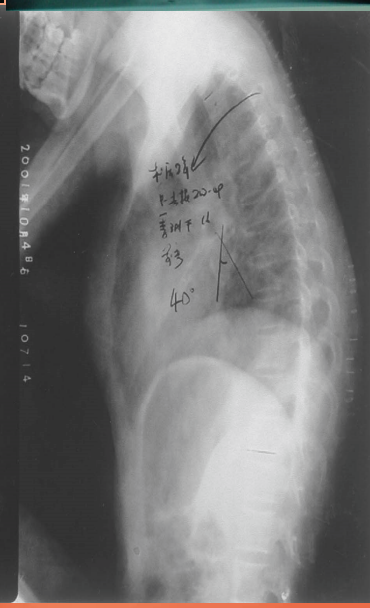
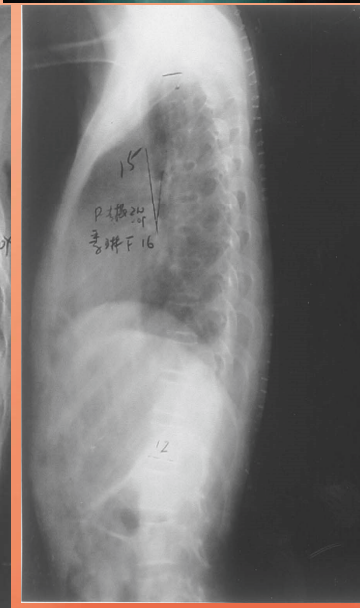
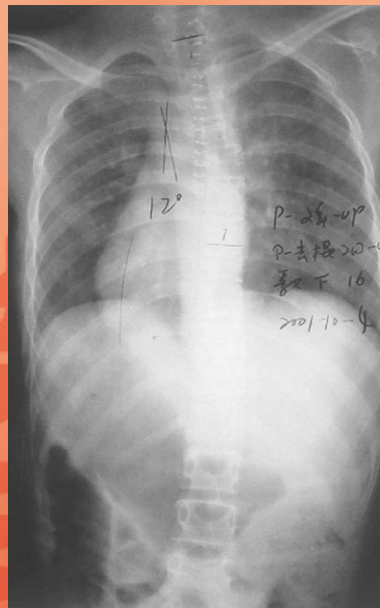
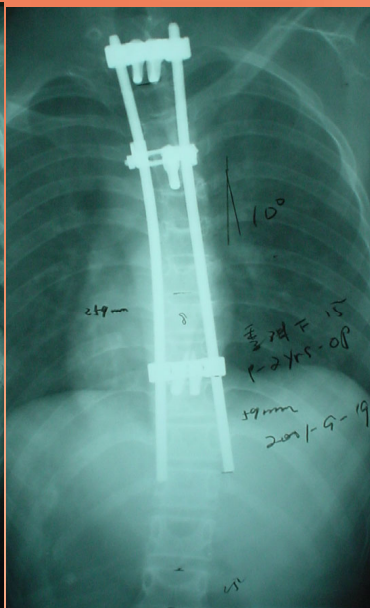
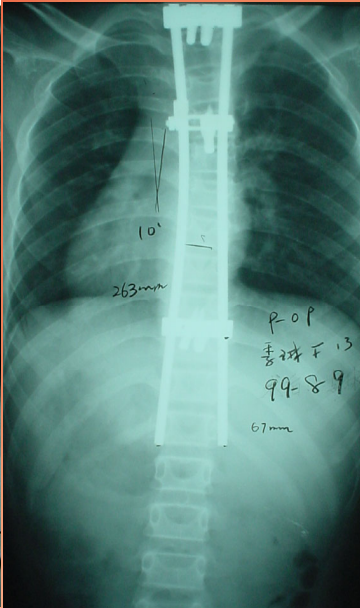
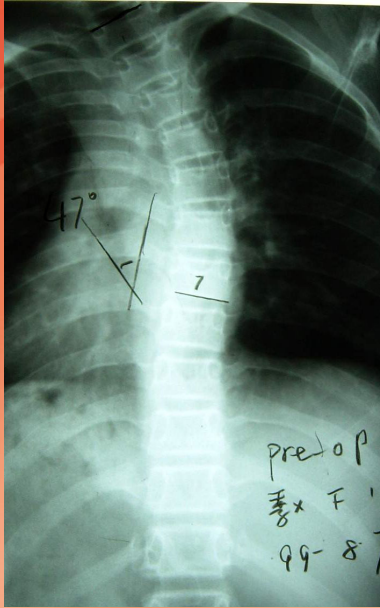
陈贤知,
女, 9岁,
Chen X Z,
9 yrs, F.
congenital
scoliosis,
Post .res
ection of
hemi-
vertebrae
& PRSS,
Curve
correction
42° → 12°

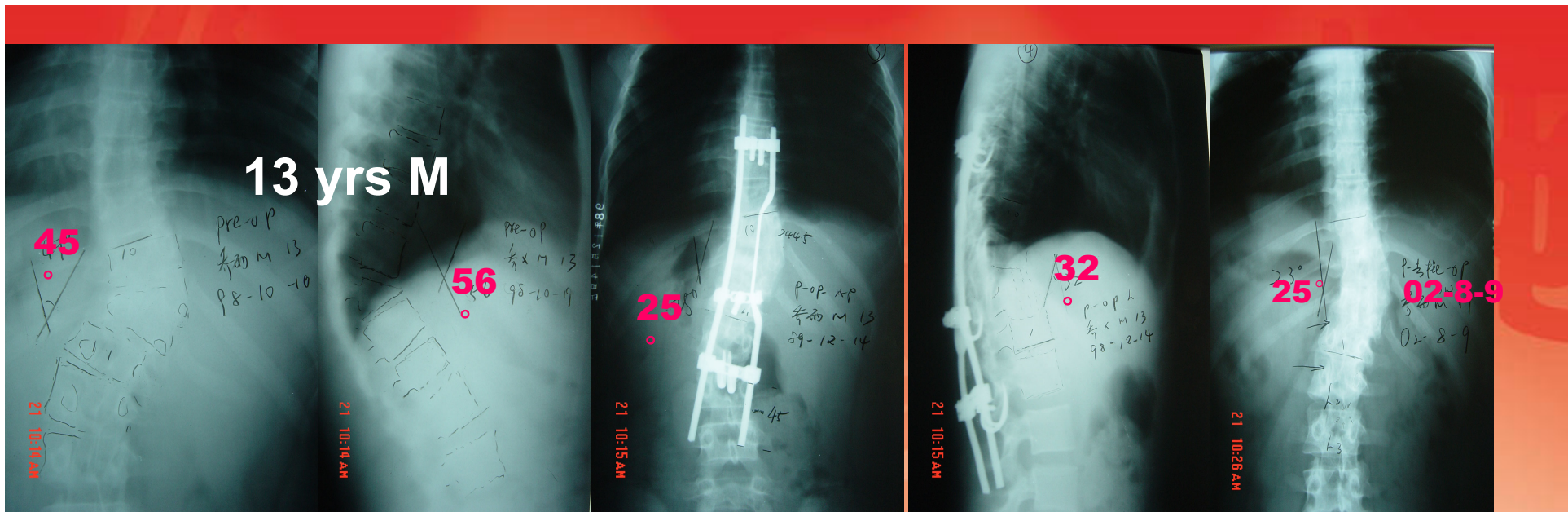


Case
presentation



Spinal flexibility was obtained after removing the implant when skeletal growth terminated

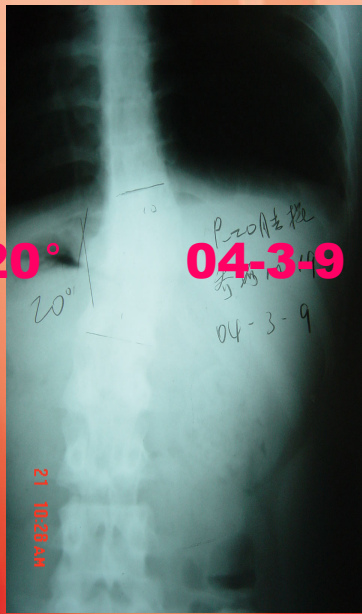




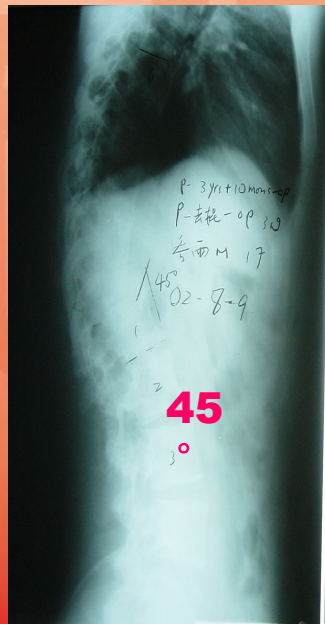
Pre-op 98-10-10

p-op 98-12-14

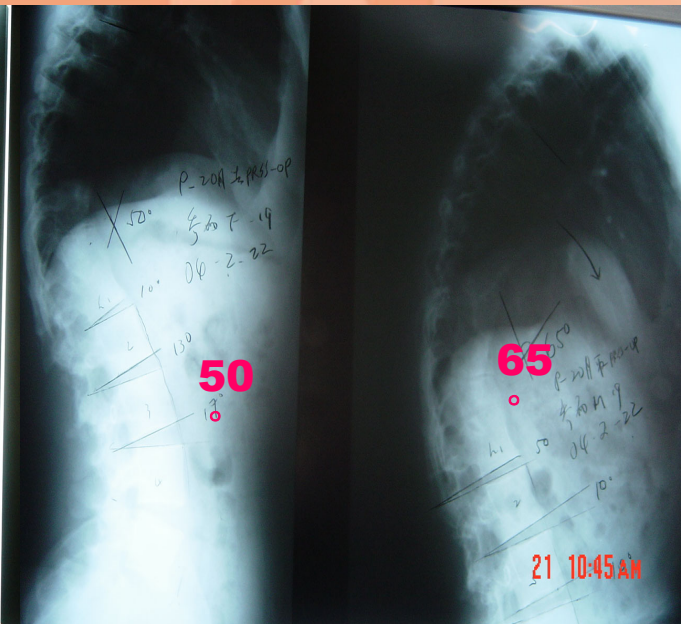
P 46mons - p-remove implante



p-R-20mons



p-R 3 W-op-Flexibility



p-R 20 mons-op-Flexibility

Conclusion

The PRSS which dispenses with spinal fusion and allows extension along with the spinal growth is an innovative and effective instrumentation for correcting scoliosis in growing children, Scoliotic curve correction was maintained in growing year after PRSS instrumentation is due to combined two factors provided by PRSS which gives better spine control with its stronger construct and provides modulating efficiency in normalizing the spine growth. It is an ongoing study and long-time follow-up is needed to conform our preliminary findings.

Thank you for your attention

