MODELLING OF SCOLIOSIS CORRECTION

G.J.M. Meijer
J. Homminga
B. van Rietbergen
J.J.C. Arts
K. Ito
G.J. Verkerke

University of Twente, the Netherlands
Eindhoven University of Technology, the Netherlands
Maastricht University Medical Centre, the Netherlands
University Medical Center Groningen, the Netherlands
introduction

We developed a numerical model of the spine and trunk of an adolescent child.

This model can aid the development of new surgical techniques for scoliosis.
Finite Element model

- vertebrae
- intervertebral discs
- ligaments
- facet joints
Finite Element model

- vertebrae
- intervertebral discs
- ligaments
- facet joints
- ribcage
- interabdominal pressure.
Scoliotic model:

- Single thoracic curve
- Apex: T8
- Cobb angle: 32°
- Axial rotation of apex: 24°
Correction modeled by multiple steps, each assuming complete adaptation of the soft tissues:

- correctional load
- deformation
- complete adaptation of soft tissue
- correctional load
- ... etc ...
Finite Element model

Modeled torsional implant:
• non-fusion implant
• correction achieved post-op
• attached to T4, T8, T11
• torsion load of 1.5 Nm at T8
results – Cobb angle

- Initial scoliosis
- 1st iteration
- 2nd iteration
- 3rd iteration

Cobb angle
results – axial rotation

- Initial scoliosis
- 1\textsuperscript{st} iteration
- 2\textsuperscript{nd} iteration
- 3\textsuperscript{rd} iteration

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conclusion

modeling of both instantaneous and long-term scoliosis correction is possible by assuming total adaptation of the soft tissues

more adaptation steps are needed
future

by implementation of visco-elastic behavior and growth, a more realistic prediction of the long term behavior will be possible in the future
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