Changes of vertebral and disk morphology following treatment with MCGR

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Disclosures

Nothing to disclose
Vertebral body growth during growing rod instrumentation: growth preservation or stimulation?

- Olgun et al, JPO 2012
- More than physiological vertical growth after treatment with TGR
- Authors observed narrowing of disc spaces
Metamorphosis of human lumbar vertebrae induced by VEPTR growth modulation and stress shielding

Hasler et al., J Child Orthop, 2015

- VEPTR vs control-group
- No increase of a.p. diameter of vertebrae after VEPTR
- Vertebral height (mm/year)
  - VEPTR: 1.4 mm/year, Control: 1.1 mm/year
- Most disc spaces reduced in height, but no measurements performed

- VEPTR changes spinal morphology significantly
Exclusion criteria, n=138

- Non ambulatory patients
- Instrumentation to L5 or to pelvis
- Patients with revision surgeries
- Treatment with 4,5 or 6,0 mm rods
- Patients < 5 and > 95 percentile for height
- < 2 years F/U
Changes of vertebral and disk height after treatment with MCGR were compared to a control group of patients treated by observation or bracing.

<table>
<thead>
<tr>
<th>MCGR group n=30</th>
<th>Control group N=19</th>
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<tbody>
<tr>
<td>21 girls 9 boys</td>
<td>12 girls, 7 boys</td>
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<tr>
<td>Age at surgery: 8+9 (4+7 – 11) years</td>
<td>Age at treatment onset: 7+9 (3+6 – 10+4) years</td>
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<tr>
<td>F/U: 45 months (24-56 months)</td>
<td>F/U: 42 months (24-65 months)</td>
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Distraction protocol:
Every 4 months, Dimeglio data
Always double rod: 5,5 mm
Measurements on x-rays
Lumbar area

- LVH wD
- LVH bD
- LVW wD
- LVW bD
- LVD wD
- LVD bD
- LDH wD
- LDH bD
Measurements on x-rays
Thoracic area

- TVH wD
- TVW wD
- TVD wD
- TDH wD
Changes of vertebral height (f/u)

Thor. Vert. Control
Thor. Vert. wD
Lum. vert. wD
Lum. vert. control
Lum. vert. bD

0 = significant

- Delta_H LS-Mean
- BWK Controll
- BWK Intervention
- LWK m. Zug Intervention
- LWK o. Zug Controll
- LWK o. Zug Intervention

LS-Means for Messungen_FU*Gruppe
With 95% Confidence Limits

Changes of vertebral height (f/u)
Thor. Vert.
Control
Thor. Vert.
wD
Lum. vert.
wD
Lum. vert.
control
Lum. vert.
bD

(cm)
Changes of vertebral width

Thor. vert. Control
Thor. vert. wD
Lum. vert. wD
Lum. vert. control
Lum. vert. bD

Δ_B LS-Mean
BWK Controll
BWK Intervention
LWK m. Zug Intervention
LWK o. Zug Controll
LWK o. Zug Intervention
Messungen_FU*Gruppe
LS-Means for Messungen_FU*Gruppe
With 95% Confidence Limits

Changes of vertebral width (cm)

= significant
Changes of vertebral depth

No significant changes
Changes of disk height

Thor. disk control  Thor. disk wD  Lum. disk wD  Lum. disk control  Lum. disk bD

\( \sum = \text{significant} \)
Changes of vertebral height per year (%)

Growth per year (%)

- LV (control)
- LV (bD)
- LV (with distraction)
- TV (control)
- TV (wD)
Close-up of lumbar region. Development before and 3 years after MCGR.
Lumbar vertebral height under distraction is significantly increased compared to lumbar vertebra below instrumentation.

Lumbar disk height within distraction is significantly reduced compared to lumbar disk height below instrumentation and control group.

Lumbar width is significantly decreased under distraction.

Lumbar depth is not significantly changed under distraction.

Thoracic vertebral and disk morphology is not significantly changed.

Rib cage may offer protection against significant changes in morphology of vertebra and disk.
There is more than physiological growth of vertebrae
  Are distraction forces still too high?

There is significant loss of disk height
  Is the construct too rigid? 4,5 of 5,0 rods?
  Insufficient load sharing of vertebrae and disks?
  Distraction and rigidity of construct seem to lead to degeneration of motion segments