WHY A NEW CAGE IN THE OPERATION OF DEGENERATIVE DISORDERS OF LUMBAR SPINE?

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there is no a conflict of interest!
The new findings of the Magnetic Resonance Imaging in the lumbar spine, especially the dynamic examination using the vertical open MR, were the basis for the development of this new cage.
DYNAMIC EXAMINATION OF LUMBAR SPINE USING THE VERTICAL OPEN MR
GENERAL ELECTRIC MEDICAL SYSTEMS Inc.
SIGNA 0.5 Tesla
gradient echo
acquisition time 44 sec
we found an increase of the pathological findings in flexion 32 pat. in rotation 5 pat.
mobility in the relevant segment?
We focused on a quantitative measurement (° or mm) of segmental motion in flexion / extension and rotation after standardised movements (positions) which are carried out healthy people as well as patients with degenerative disorders.
Sagittal plane rotation

\[ A - B = 8^\circ - (18^\circ - 26^\circ) \]

Abnormal if:

- L1-L2, L2-L3, L3-L4 > 15°
- or L4-L5 > 20°
- or L5-S1 > 25°

measurement of angles in flexion and extension
angle of facet joint 1 and 2

angle of rotation
50 students of medicine
without low back pain
28 male
22 female
age: Ø 25 Jahre
angle of the facet joints
L3/L4, L4/L5, L5/S1
on average of 44°/36°/29°

15 %
angle of the facet joints
L3/L4, L4/L5, L5/S1
on average of 48°/42°/30°
angle of the facet joints
L3/L4, L4/L5, L5/S1
on average of 53°/47°/35°
We found in the lower lumbar spine three predetermined types of motion constitutionally with different functional pattern of flexion, significant correlation between this pattern and the angle of the facet joints in L4/L5 and L5/S1 no correlation to gender, body weight or body height.

Eur Spine J (2001) 10; 437 - 442
50 patients
30 male, 20 female, age 53 years

degenerative disorders of lumbar spine in one segment

diagnosis  protrusion or prolaps of disc  41 pat.
osteogeneous stenosis  4 pat.
degenerative  spondylolisthesis  5 pat.

localisation  L3/L4  8 pat.
L4/L5  28 pat.
L5 / S1  14 pat.
diagnostic findings in the concerned segment

restricted segmental flexion \( (0° - 1°) \)

increased segmental rotation significantly \((L_{3/4} - 7°, L_{4/5} - 5°, L_{5/S1} - 5°)\)

in segments without degen. disorders \(2° - 3°\)

angle of facet joints \(L_{3/4}\) \(= 40° - 46°\)

\(L_{4/5}\) \(= 30° - \)

the angle of facet joint is orientated frontal-facing \((2° - 3° more)\) only on the side of disc prolaps
diagnostic findings

in the cranial adjacent segment

-- flexion increased                       (7° - 9°)
-- rotation restricted                    (0° - 1°)

in the caudal adjacent segment

-- flexion increased                     (5° - 8°)
-- rotation reversed                     0°
increased rotation in the concerned segment-is the visible expression of degeneration

König A; Vitzthum HE  Eur Spine J  2001 ; 10, 437 – 442
Vitzthum HE, König A  Eur Radiol  2000 ; 10, C 41
Ochia RS, Inoue N, Renner SM et al.  Spine. 2006 ;31(18):2073-8
Abbott JH, Fritz JM, et al.  BMC Musculoskelet Disord. 2006 ;7:45
In our opinion, the direct blocking of this increased segmental rotation permitted the abandonment of an additional dorsal fixation in cases of fusion indicated after decompression.
INVADUR - polymer especially developed for implants
Oxford Performance Materials, Inc. USA
( density 2,5 g/ccm, elasticity modulus 15 Gps,
comprehensive strength 250 Gps) with titanium-finns
finite element – evaluation
(VT Schaffhausen, CH)
cyclic static load test (Rosenheim, D)
**INDICATION**
monosegmental fusion,
dorsal structures in good order
no olisthesis
angle of facet joints above 35°

**CONTRAINDICATION**
laminectomy
spondylolisthesis Wiltse III
Filling with autologous spongiosa or hydroxylapatit is possible, but not necessary
### Diagnostic Findings Before Implantation of Stand-alone-Cages

124 patients (60 female, 64 male, age 56, 8 years)

**Diagnosis:** Degenerative stenosis of lumbar spine

18 re-operations  
Anamnesis on average 46 months

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbalgia</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>Radicular pain</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Sensitive deficit</td>
<td>102 (20 S 0)</td>
<td></td>
</tr>
<tr>
<td>Motoric deficit</td>
<td>81 (34 M 0)</td>
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<tr>
<td>Distance by walking</td>
<td>150 m</td>
<td></td>
</tr>
<tr>
<td>Vegetative deficit</td>
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<td></td>
</tr>
</tbody>
</table>
## Diagnostic Findings after Implantation of Stand-alone-Cages (16 months on average)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbalgia</td>
<td>28</td>
<td>25%</td>
<td>2</td>
</tr>
<tr>
<td>Radicular Pain</td>
<td>13</td>
<td>15%</td>
<td></td>
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<tr>
<td>Sensitive Deficit</td>
<td>21</td>
<td>20%</td>
<td>4</td>
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<tr>
<td>Motoric Deficit</td>
<td>20</td>
<td>25%</td>
<td>3</td>
</tr>
<tr>
<td>Distance by Walking</td>
<td>430 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetative Deficit</td>
<td>1</td>
<td></td>
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</tr>
</tbody>
</table>

General improvement appr. 75%, distance by walking tripled
diagnostic findings after implantation of stand-alone-cages (16 months on average)

- no dislocation of the implants
- no lesion of roots or dura
- disorder of wound healing in 3 pat. (2.8%)
diagnostic findings after implantation of stand-alone-cages (16 months on average)

sinking in 48 patients (40\%)
appr. 1-2 mm

realignment in 18 patients

quotient segm. sinking

A preop
A postop
we have not a exercise control of the operated patients using the functional MRT depending on disassembly of the vertical open MR, but a control of non-union with X-ray, CT or MR
extension of indication
(Wienecke, Quedlinburg)

no complications,
no dislocations,
improvement of the clinical findings
in 3 of 5 patients
(after 9 months)

L5/S1

bisegmental

Meyerding I

no complications,
no dislocations,
improvement of the clinical findings
in 8 of 11 patients
(after 10 months)
„ZUWACHS AN KENNTNIS IST ZUWACHS AN UNSICHERHEIT“

Johann Wolfgang von Goethe 1809