

## **Sagittal deformity correction with expandable cages with large endplates for thoracolumbar vertebral body replacement [Abstract]**

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### **Angaben zur Veröffentlichung / Publication details:**

Motov, Stefan, B. Stemmer, B. Sommer, Maximilian-Niklas Bonk, Christina Wolfert, A. Reinke, and Ehab Shiban. 2021. "Sagittal deformity correction with expandable cages with large endplates for thoracolumbar vertebral body replacement [Abstract]." *Brain and Spine* 1 (Supplement 2): 100421.  
<https://doi.org/10.1016/j.bas.2021.100421>.

procedures on muscle destruction based on the postoperative creatine kinase (CK) course.

**Methods:** Patients treated with lumbar PSO procedures at the authors' department between 2014 and 2017 were included in this retrospective study. Baseline data, intraoperative details (surgery duration, instrumentation length) and postoperative serum CK levels were documented.

**Results:** 59 patients (38 women, 21 men) with a mean age of  $63 \pm 11.9$  years, a mean BMI of  $27.3 \pm 5.5$  kg/m<sup>2</sup> and a median ASA score of 2 [inter quartile range (IQR) 2;3] were included. The median instrumentation length was 5 (IQR 4; 7). The mean surgery duration was  $388 \pm 98$  min. An initial CK peak on the first postoperative day (POD 1) of  $1408 \pm 238$  U/l followed by a steady decrease until the last values of  $78.3 \pm 12.2$  U/l at POD 9 was detected. Compared to the remaining postoperative CK values, the peak at POD 1 turned out to be statistically significant ( $p=0.012$ ). Further analysis showed significantly higher CK values at POD 7 for male patients ( $174.5 \pm 77.8$  U/l vs.  $73.3 \pm 14.1$  U/l;  $p=0.049$ ). There was no significant correlation between serum CK and instrumentation length or surgery duration at any given time point.

**Conclusion:** Compared to minor spinal interventions, such as monosegmental spondylodeses, muscular trauma may not be effectively monitored by serum CK levels in lumbar PSO procedures. Age-related comorbidities and the low variability of instrumentation length and surgery duration in PSO procedures could be possible confounders for postoperative CK values playing a major role for the non-significant correlation.

#### BRAIN AND SPINE 1 (2021) 100307 100421 SAGITTAL DEFORMITY CORRECTION WITH EXPANDABLE CAGES WITH LARGE ENDPLATES FOR THORACOLUMBAR VERTEBRAL BODY REPLACEMENT

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**Background:** Vertebral body replacements (VBRs) with expandable cages with larger endplates allow more distraction due to their larger footprints. Aim of this study was to analyze the rate of segmental correction and subsidence rates in patients with osteoporotic and pathological fractures.

**Methods:** A retrospective analysis from February 2015 until July 2019 of patients following a staged posterior pedicle screw instrumentation and VBR with expandable cages with large endplates (Samson®, HumanTech) was performed. Plain radiographs and CT- imaging were performed before and after the surgery and at last follow up. Radiological data such as local sagittal angle and segmental height as well as revision rates were analyzed.

**Results:** A cohort of 58 consecutive patients were identified. 62% were female and the median age was 68 years. Median follow up was 8 months. There were 22, 20, and 16 cases of osteoporotic fractures, spondylodiscitis and 16 metastases respectively. VBR were performed in 31 and 27 in the thoracic and lumbar spine, respectively. There was a significant gain in segmental height of 8 and 11 mm in the thoracic and lumbar spine, respectively. There was a significant segmental angle correction 4° and 6° degrees in the lumbar and thoracic spine, respectively ( $p=0.000$ ). These significant differences remained throughout follow up ( $p=0.001$ ). In spondylodiscitis cases, cage over-distraction (mean 6 mm) was associated with higher subsidence rates (mean 8mm,  $p=0.013$ ) on follow up examinations, which resulted in revision surgery in 3 cases (5%).

**Conclusion:** Expandable vertebral body replacements with larger endplates achieve satisfactory correction of sagittal height and angle. However over-distraction, especially in infectious cases, is associated with higher subsidence rate.

#### BRAIN AND SPINE 1 (2021) 100307 100422 INVESTIGATION OF THE RELATIONSHIP BETWEEN HEAD POSITION AND CERVICAL SPINE ALIGNMENT IN CHIARI MALFORMATION PATIENTS

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**Background:** The craniocervical region (CVR) is a unique junction between the skull and cervical spine. Basilar invagination, Platybasia, Chiari Malformation (CM) are the most common malformations of CVR. The aim of this study is to

investigate whether the center of gravity of the head, craniocervical junction, and cervical spine alignment is different between healthy individuals and CVR malformation patients.

**Methods:** Group A included the patients who were operated on the diagnosis of Chiari Malformations (Type 1, and 1.5), platybasia, basilar invagination. Group B is a healthy-control group that patients were excluded with neck pain, diagnosed CVR anomaly and cranial pathology. The groups were retrospectively analyzed with cervical plain radiographs. Following angles were measured; C7 slope (C7S), cranial incidence (CI), cranial slope (CS), cranial tilt (CT), C2 Tilt (C2T), sella turcica tilt (STT), and spino-cranial (SCA) angle values; then the position of the head and its relationship with the cervical spine alignment were compared.

**Results:** A statistically significant difference was found between mean values of CI (t: -8.694, p: 0.000), CS (z: -2.512, p: 0.012), CT (z: -7.156, p: 0.000), STT (z: -3.828, p: 0.000), and SCA (z: -2.774, p: 0.006) angles between both of the two groups; however, comparing of C7S (z: -0.248, p: 0.804) and C2T (z: -1.642, p: 0.101) did not obtain statistical significance. The mean angle of CI, CT, STT, and SCA was higher in Group A, and these angles showed that the center of gravity of the head in Group A patients have shifted forward according to their cervical spine alignment.

**Conclusion:** The results pointed out biomechanical differences between CVR and healthy individuals according to the gravity center of the head and cervical spine alignment. This new perspective can cause a revision of the current procedure and guide to further treatment modalities for CVR anomalies.

#### BRAIN AND SPINE 1 (2021) 100307 100423 THE IMPORTANCE OF MEASURING CRANIOVERTEBRAL JUNCTION ANGLES FOR DIAGNOSIS AND TREATMENT OF TYPE 1 CHIARI AND COMPLEX CHIARI MALFORMATIONS

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**Background:** Type I Chiari malformation is the most common congenital deformity of the craniocervical junction (CVJ). Here we discuss the operative techniques and decision-making process for treatment based on measured pre-operative CVJ angles.

**Methods:** We retrospectively analyzed 77 patients diagnosed with type 1 and complex Chiari, operated in our clinic between 2015-2019. For this study, the syrinx cavity with cerebellar tonsil herniation determined by MRI, and Wackenheim's clivus-canal angle, dens length, clivus length, and pBC2 (maximum vertical distance to the base-infero posterior point of C2 body) on CT were measured in addition to the basic CVJ angles such as McGregor or Chamberlain. Postoperative follow-up was evaluated according to the Chicago Chiari Outcome Scale (CCOS) as well as Prolo economic and Prolo social scores.

**Results:** Of the 77 patients, 52 were female (67.5%) and 25 were male (32.5%) with an average age of 34.7 years. Type 1 CM was diagnosed in 55 cases and complex CM in 22 cases according to syrinx, bacillary invagination, clivus length, dens length, angles, and pBC2 results. Dens passed the McRae line in 6 cases. On average, Wackenheim's clivus-canal angle was 137.2 degrees and pBC2 length was 6.69 mm. Reoperations for 6 patients were performed due to recurrence, and the total operations were 83. Decompression was performed in 61 cases and additional CVD stabilization was performed in 16 cases. Upon follow-up at an average of 10 months, the average CCOS score 15, the Prolo economy score 4.8 points, and the Prolo social score 4.6 points.

**Conclusion:** Preoperative radiological examination is important in type 1 Chiari and complex Chiari cases. Many patients with complex Chiari don't benefit from simple decompression. While decompression surgery is performed as the first step, CVJ angle measurements are important to identify patients who will require stabilization for better clinical recovery.

#### 2.3 Vertebral Tumors BRAIN AND SPINE 1 (2021) 100307 100424 SURGICAL INTERVENTION FOR PATIENTS WITH ACUTE SPINAL CORD INJURY DUE TO SPINAL METASTASES: TIMING AND FUNCTIONAL OUTCOME

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**Background:** Patients with acute spinal cord injury (SCI) due to compression by spinal metastases (SM) may experience long-term functional impairment. It has