Does CTDR Have a Lower Risk of Device Subsidence Compared to ACDF? 1 Year Results of a Prospective Multi-center Study

H.J. Meisel¹, P. Suchomel², S. Sola³, J. Antinheimo⁴, J. Pohjola⁴, J. Stulík⁵, S. Kroppenstedt⁶, M. O’Malley⁷, I. Shackleford⁷, C. Woiciechowsky⁸, B. Bruchmann⁹, R. Arregui⁹, F. Caroli¹⁰, N. Borm¹¹

¹Department of Neurosurgery, BG Clinic Bergmannstrost, Halle, Germany, ²Regional Hospital Liberec-Neurocenter, Liberec, Czech Republic, ³Department of Neurosurgery, University Rostock, Rostock, Germany, ⁴Helsinki University Central Hospital, Helsinki, Finland, ⁵Fakultní Nemocnice v Motole, Praha, Czech Republic, ⁶Charité Medical University Berlin, Berlin, Germany, ⁷Warrington District General Hospital, Warrington, United Kingdom, ⁸Department of Orthopaedic Surgery, Koblenz, Germany, ⁹Hospital Maz, Zaragoza, Spain, ¹⁰Istituti Fisioterapici Ospitalieri, Roma, Italy, ¹¹Frictionless GmbH, Kiel, Germany

Although ACDF is an effective procedure for the treatment of DDD, loss of segmental disc height and cage subsidence, possibly resulting in kyphotic deformity, pseudarthrosis and worsening of clinical outcome, are common concerns. Various factors may influence subsidence, but certainly the biomechanical situation at the bone-implant interface is an important one, influenced by the devices’ operative technique, primary stability, geometry and contact area.

While the preservation of segmental motion and a lower risk for adjacent segment degeneration are the main pros for CTDR, this technology may also contribute to a reduced risk of subsidence.

Therefore we investigated the one year interim results (n=111) of a prospective, multicenter study, performed at 11 European sites. All patients (mean age 43.3 years; male = 47, female = 64) underwent single-level total disc replacement (activ™ C disc prosthesis) between C3/4 and C6/7 (C3/4=2, C4/5=7, C5/6=56, C6/7=46) and were followed-up 6 wk, 6 mo and 1 y postoperatively. Radiographic measures were performed independently by using computer-aided image processing. Disc height is calculated as the average anterior and posterior disc height (distance between anterior (posterior) edge of the inferior endplate of the superior vertebra, and the corresponding edge of the inferior vertebra).

Mean disc heights were as follows: preop 3.7mm, postop 6.4mm, 6wk 5.8mm, 6mo 5.7mm, 1y 5.6mm. Statistically significant differences were detected between preop/postop, postop/6wk and 6wk/6mo (< 0.001), and after 1 year (p=0.009 Linear Contrasts, ANOVA). Mean loss of disc height by level was 1.1mm for C3/4, 1.2mm for C4/5, 0.8mm for C5/6 and 0.7mm for C6/7 (overall loss of disc height 0.8mm). The subsidence rate (loss of height > 3mm) in our study is 0% (0/111) or, based on a subsidence definition of > 2mm, 6.3% (7/111).

Mean segmental lordosis increased significantly from 1.9° preop to 5.5° after 1 year (p > 0.001, Paired Samples T-Test). Also clinical outcome (NDI, VAS neck pain, VAS arm pain) improved significantly from preop to 1 year postop as follows: 40.1 to 19.9, 52.0 to 24.0 and 53.6 to 20.0, respectively (p < 0.001 Wilcoxon Signed Ranks Test). There is no correlation between loss of disc height after 1y and clinical outcome (p > 0.05 Spearman’s Correlation).