

## QF11 NOVEL TWO-COMPONENT INTERBODY DEVICE, IN A 360 FUSION MODEL, IMPROVES BONE-IMPLANT INTERFACE WITHOUT COMPROMISING STABILITY: A CADAVER STUDY

Finn B. Christensen, David Volkheimer, Bruce Robie,  
Hans-Joachim Wilke

Orthopedic Research Lab., Aarhus C, Denmark

**Introduction:** A novel two-piece articulating ALIF device allows motion of the treated vertebral level for lordotic adjustments until a supplementary pedicle screw system rigidly fixes the level. A potential benefit is the reduction of bone-implant relative motion with a positive impact on fusion time and sagittal balance. The aim of the study is to compare the rigidity and bone-implant relative motion of segments treated with either a two-piece ALIF fusion device or a one-piece ALIF in a 360° setting.

**Methods:** Seven lumbosacral (L3-S1) human cadaver specimens were tested (age 50–60) in a universal spine tester. The flexibility of the intact specimen, the specimens instrumented with a two-component ALIF (Statur<sup>®</sup>-L, FBC Device ApS, Denmark) and a one-piece ALIF (PezoTM-A, Ulrich, Germany), both supplemented with a pedicle screw system (tangoRSTM, Ulrich, Germany) were tested using pure moments of  $\pm 7.5$  Nm in three principal motion directions. For assessment of the bone-implant interface, fluoroscopic images were captured during motion. Three-dimensional vertebral motion was measured using an optical motion capturing system (Vicon Mx, Vicon, UK). Paired t-tests were performed to determine statistical significance at a  $p < 0.05$  level.

**Results:** Significantly less motion at the implant-endplate interface was found for the two-piece device ( $1.0^\circ \pm 0.6^\circ$ ) in comparison to the one-piece ALIF ( $4.2^\circ \pm 1.7^\circ$ ) in flexion/extension. No statistically significant differences in rigidity were found between the one and two-piece ALIF in the 360° setup (e.g.,  $3.5^\circ \pm 1.9^\circ$  for the one-piece and  $4.2^\circ \pm 1.8^\circ$  for the two-piece ALIF in flexion/extension), while both configurations significantly reduced the range of motion compared to the intact condition ( $p < 0.05$ ).

**Discussion:** The two-piece ALIF cage significantly reduced the relative motion at the bone-implant interface without compromising stability. Theoretically, this implant concept can reduce the risk of implant subsidence, improve fusion and establish better sagittal balance. They are all important factors in the process of improving long-term spinal fusion clinical outcomes.

## QF12 EPIDEMIOLOGIC STUDY ON BACK PAIN IN RUNNERS

Iago Garreta Català, Federico Balagué Gea, Frederic Font Vila,  
Paloma Bustos Bedoya, David Pereira, Daniel Cuadras Pallejà,  
Lluís González Cañas

Orthopaedic Surgery, Barcelona, Spain

**Objectives:** The objectives of this study are to determine the prevalence of back pain in runners and to assess the relationships between running and back pain.

**Patients and methods:** In February 2012 all participants in a half-marathon were invited to answer a survey. We obtained information

from 771 of them including data on age, sex, BMI, years as a regular runner, kilometers run during the last week, last time they had to stop running because of back pain, training surface used, score in the last half marathon and subjective opinion of the effect of running on back pain. On all the participants, we conducted a descriptive analysis.

On those who reported experiencing back pain, different variables were crossed with the effect of running on back pain.

Finally, multivariate analysis was performed.

**Results:** The age and sex profile of the 771 respondents was comparable to the profile of all the half marathon participants, thus we consider that the sample is representative.

Of the 771 participants, 420 reported having had back pain (54.47 %). The subjective effect that running has on back pain was improving in 48.8 %, worsening in 27.4 % and no influence in the remaining 23.8 %. We crossed the subjective effect that running has on back pain with the other variables and we found association with age ( $p < 0.001$ ), gender ( $p = 0.045$ ) and history of previous treatment ( $p = 0.001$ ).

In multivariate analysis, the variable age showed significant association with back pain, being older subjects those who reported improvement ( $p = 0.018$ ).

**Conclusions:** I. About half of the participants reported experiencing back pain.

II. Most runners suffering back pain say that running has a beneficial effect, especially the older ones.

III. The presentation of back pain in runners is not related to BMI, sex, score, mileage or training surface.

IV. We find no grounds to advice against running in patients suffering back pain. An individual assessment is required.

## QF13 MOTION PATH MEASUREMENT OF SEMI- CONSTRAINED AND UNCONSTRAINED TOTAL DISC REPLACEMENTS

Philip Hyde, John Fisher, Todd Stewart, Richard Hall

Mechanical Engineering, Leeds, UK

**Introduction:** The wear characteristics of metal-on-polyethylene total disc replacements (TDR) are sensitive to the amount of crossing-path motion at the polyethylene surface [1]. This study experimentally compared the path motion from physiologically relevant kinematic inputs using two TDR design rationales: semi-constrained and unconstrained (mobile core).

**Aim:** Investigate motion paths at the bearing surface in terms of aspect ratio (AR) for a range of input motions.

**Method:** Leeds six degree of freedom spine simulator. TDR devices were represented with purpose-designed motion track recording equipment using the same dimensions as real components. The input motions were as follows:

- 1) Standard ISO 18192-1
- 2) ISO + AP kinetics to the standard ISO (+170/-140 N for Semi-constrained disc, +2/-1.5 mm for the unconstrained)
- 3) A physiologically relevant kinematic input (based on 'normal cadence' in vivo data from a walking gait by Callaghan et al. [2]). The motion paths were measured and the width and length used to create an 'aspect ratio', i.e. width divided by length (1 = perfect circle,  $< 1$  = ellipse, 0 = straight line).

**Results:** Semi-constrained disc: The AR using the ISO cycle was 0.42. The addition of AP load gave a non-significant change to 0.45. The Callaghan input also resulted in an AR of 0.42. Unconstrained disc: The AR for the ISO cycle was 0.45 (superior surface) but was