# TWO-COMPONENT FUSION CAGE IMPROVES BONE-IMPLANT ALIGNMENT WITHOUT COMPROMISING RIGIDITY

**David Volkheimer[1], Hans-Joachim Wilke[1], Bruce Robie[2], Finn B. Christensen[2,3]**

[1] *University of Ulm, Institute of Orthopaedic Research and Biomechanics, Ulm, Germany*

[2] *FBC Device ApS, Aarhus; Denmark*

[3] *Aarhus University Hospital, Orthopaedic Research Laboratory, Aarhus, Denmark*

## Introduction

A novel two-piece anterior lumbar interbody fusion device (ALIF) allows for limited temporary in vivo movement of the treated segment so that the patient's body by itself can determine the appropriate position for fusion. A potential benefit includes improving the bone-implant interface with a positive impact on sagittal balance and clinical outcomes.

The aim of this study is to analyze the rigidity of the treated segment instrumented with the two-component ALIF, compared with conventional one-piece ALIF in a stand-alone setting. Furthermore, the relative motion between the respective implants and the adjoining endplates was investigated.

## Methods

Seven lumbosacral (L3-S1) human specimens (age 50-60 years, 4 males and 3 females) were tested. The motion segment L4-L5 was instrumented with a two-component ALIF (Statur-L, FBC Device ApS, Denmark) and a one-piece standard ALIF (Pezo A, Ulrich, Germany) as benchmark. The rigidity of the specimens without, and after instrumentation with the respective devices was tested under application of pure moments (±7.5 Nm) in flexion/extension, lateral bending, and axial rotation [Wilke et al, 1998]. Fluoroscopic videos of the construct were captured during motion. Relative motion between the implant and the adjoining endplates was measured from the fluoroscopic videos. Paired t-tests were performed to determine statistical significance at a p=0.05 level.

## Results

Both implants provided a comparable level of stability, even though range of motion of the two-piece ALIF was slightly higher in all motion directions (Table 1).

| | Intact (n=7) | 2-piece ALIF (n=7) | 1-piece ALIF (n=7) |
|---|---|---|---|
| Flexion/Extension | | | |
| Mean (± SD) | 8.7° ± 1.7° | 11.8° ± 3.7° | 10.4° ± 2.6° |
| Lateral bending | | | |
| Mean (± SD) | 7.9° ± 2.7° | 6.7° ± 3.2° | 5.5° ± 3.4° |
| Axial rotation | | | |
| Mean (± SD) | 4.0° ± 1.5° | 5.5° ± 2.4° | 4.2° ± 2.4° |

**Table 1: ROM intact and after instrumentation**

No significant difference between the constructs was found in flexion/extension, whereas the small, but consistent difference in lateral bending and axial rotation turned out to be significant. Relative motion between implant and bone was significantly smaller for the two-component device in both motion directions evaluated for this purpose (Table 2).

| | 2-piece ALIF (n=7) | 1-piece ALIF (n=7) |
|---|---|---|
| Flexion/Extension | | |
| Mean (± SD) | 3.1° ± 1.6° | 10.5° ± 2.7° |
| Lateral bending | | |
| Mean (± SD) | 1.9° ± 1.9° | 6.7° ± 3.8° |

**Table 2: Relative motion between implant and endplate**

## Discussion

We found a significantly improved relative motion at the bone-implant interface with the two-piece fusion implant, which theoretically can reduce the risk of implant subsidence, improve bony healing and establish better sagittal balance. Further, it was shown that both implants provide a comparable level of stability, even though statistically significant differences were found in lateral bending and axial rotation.

## References

*Wilke et al, Eur Spine J, 7:148-154, 1998*