Interlaminar Stabilization Maintains a More Normal Segmental Contribution to Total Lumbar Range of Motion Compared With Fusion at 2 Years

Joshua D Auerbach MD; Reginald J. Davis MD; Willam Sears

Department of Orthopaedics, Bronx-Lebanon Hospital Center, Albert Einstein College of Medicine, Bronx, NY; Greater Baltimore Neurosurgical Associates, Baltimore, MD; Wentworth Spine Clinic, Sydney, NSW, Australia

Introduction

The purpose of the current study is to evaluate the in vivo biomechanical performance profile of a motion-preserving Interlaminar Stabilization (IS) device compared with posterolateral fusion (PLF) by quantifying the relative segmental contribution to total lumbar ROM (TLROM) at each operative and adjacent level at baseline and 2 years.

Methods

Radiographic evaluation from a prospective, randomized, multicenter IDE trial comparing IS (n=204) with PLF (n=105) to treat stenosis or low-grade spondylolisthesis. Using previously validated methods (Refs 1-2), we defined TLROM as L1-S1 (i.e. 100%), and calculated the segmental contribution to each operative and adjacent level with IS or PLF at baseline and 2 years.

Results

Figure 1 demonstrates that there were no group differences between coflex® and fusion at baseline or 24 months in total lumbar range of motion. Figure 2 demonstrates that operative level contribution to TLROM in the coflex® cohort at baseline was 17.8% compared with 17.6% at 24 months (p=0.79). In contrast, operative level motion in the PLF group was 17.5% at baseline and was significantly less at 24months (7.3%, p=<0.0001). At the first cranial adjacent level, the percent contribution to TLROM at 24 months was unchanged with coflex® (15.9-->16.7%, p=0.30) but was significantly elevated in the PLF group (14.7-->23.1%, p<0.0001). Similarly, there were non-significant elevations at the 2nd and 3rd cranial adjacent levels in PLF, with slight reductions in the coflex® group. In the 1st caudal adjacent level, the coflex® group experienced a trend towards increased contribution to TLROM (27.2-->30.2%, p=0.053), while PLFs experienced a significant elevation (28.9-->33.7%, p=0.045), with no differences seen in the 2nd caudal adjacent level.

Conclusions

Our results demonstrate that IS preserves not only physiologic contribution to TLROM at the operative level, but at superior adjacent levels as well, with a non-significant increase seen at the caudal adjacent level. In contrast, the relative loss of motion at the operative level in fusions is compensated for by significantly elevated relative motion at both the 1st superior and the 1st inferior adjacent levels.

Learning Objectives

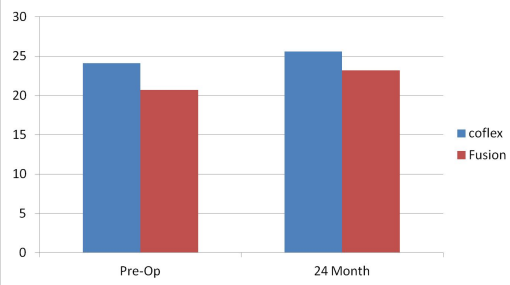
By the conclusion of this session, participants should be to: 1) Describe the importance of segmental contribution to total range of motion that occurs as a result of either motion-preserving interlaminar stabilization, or fusion; 2) Discuss, in small groups, the potential impact that this motion-preserving device may have on the possibility of protecting the adjacent levels from breakdown; 3) Identify an effective treatment for stenosis and low-grade spondylolisthesis that allows for direct neural decompression, yet maintains physiologic distribution of lumbar segmental range of motion.

References

1) Auerbach JD, Jones KJ, Milby AH, Anakwenze OA, Balderston RA. Segmental contribution toward total lumbar range of motion in disc replacement and fusions: a comparison of operative and adjacent levels. Spine 2009; 34 (23):2510-7.

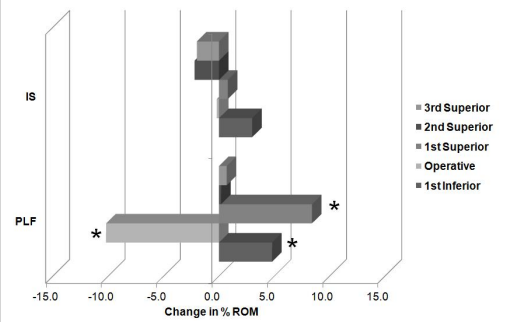
2) Auerbach JD, Anakwenze OA, Milby AH, Lonner BS, Balderston RA. Segmental contribution toward total cervical range of motion: a comparison of cervical disc arthroplasty and fusion. Spine 2011; 36(25):E1593-9.

Figure 1



Total lumbar range of motion (Baseline and 24 months)

Figure 2



Segmental contributon to total lumbar range of motion from baseline to 24 months