

Letter to the editor: Novel indication for posterior dynamic stabilization: correction of disc tilt after lumbar total disc replacement

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Editorial

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Cheng et al¹ have discussed using a dynamic posterior stabilization device to treat asymmetric collapse of an artificial disc in the coronal plane. Although this may correct the radiographic coronal-plane abnormality, there are significant biomechanical considerations to be kept in mind. When using these 2 devices in conjunction with each other at the same motion segment, the degrees of freedom and the center of rotation for both devices may not match and will act independently. This mismatch in the center of rotation can cause competitive domination between the 2 systems and result in early failures of the surrounding tissue and/or 1 or both fixation systems, contributing to compromised stability or progressive degeneration of the motion segment. Furthermore, multiple biomaterials and motion-enabling components have been incorporated into the design of posterior dynamic stabilization devices to allow for constrained, semiconstrained, or unconstrained motion across a motion segment. However, these design additions consist of various biomaterials with different elastic moduli or variations in subcomponent mechanisms that allow for applied limited motion, which may result in different overall mechanical performance for each fixation system.

Polymeric materials are used in motion-enabling implants to provide a gradual, attenuated stopping mechanism of the dynamic implant, which in essence dampens the motion and lowers the stress transfer to the surrounding tissues. When metallic stopping mechanisms are integrated into the implant for a controlled motion, there is no attenuation of the applied motion at these "hard stops," thus causing repetitive impact forces at the metal interfaces. These repetitive impact loads may result in detrimental stress transfers to the local and adjacent surrounding tissues

and early failure of the implant components, contributing to eventual loss of fixation across the motion segment and the potential for augmented degeneration of local and adjacent segments. In addition, there are competitive differences between the 2 device types when reaching the terminal endpoints of motion for all planes, such that the dampening effect for each implant will differ and cause abnormal force transfer between the 2 devices and loosening of either or both devices. Essentially, the devices will compete for control during the physiologic range of motion. The biomechanics of such combinations need to be further investigated. Combined posterior and interbody motion-sparing devices have been designed with matched centers of rotation and final physiologic endpoints and have been used, although no long-term results are available. Hence, at this point, fusion of such symptomatic levels may be a better option.

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1. Cheng WK, Palmer DK, Jadhav V. Novel indication for posterior dynamic stabilization: correction of disc tilt after lumbar total disc replacement. *SAS J* 2011;5:44–7.