Role of Endplate Morphology on Lumbar Disc Arthroplasty Clinical and Radiographic Outcomes

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Introduction: Endplate morphology (EPM) has been hypothesized to affect post-op device orientation, subsidence, and ultimately what mechanical function is provided to the patient. Understanding these hypothesized effects may lead to better patient outcomes, yet little data are available. The goal of this study was to better understand the importance of EPM to a patient who receives a lumbar disc replacement.

Methods: A total of 96 investigational patients at one site from the prospective randomized IDE (n=38), the continued access (n=43), and the continued access metal ion studies (n=15) for Maverick, followed up to 5 years. Clinical outcomes, intervertebral rotation, disc height and lordosis (disc angle) were measured at pre-op, 2 and up to 5 years post-op using validated, computer-assisted methods. EPM, subsidence and implant migration were graded by an independent radiologist using VEYBR classification (Yue and Bertagnoli).

Results: Although there were no statistically significant differences between the different endplate morphologies and the improvement in leg or back pain, the ranked order with respect to the average improvement in back pain score was exactly the same as described in the Oetgen et al ProDisc study: type IV (convex) > III (concave) > I (flat) > II (hooked) > V (combination). In contrast, the average improvement in ODI score was greatest for the flat and hooked endplate morphologies (approximately 40 pts). Concave, convex, and combinations of convex and concave morphologies had a lower improvement (approx 32 pts), although there were no significant differences between morphologies (P=0.85). There were no significant differences between endplate morphologies with respect to how much disc height was lost between the 6 week and subsequent time points. However, the average loss in disc height was 1.1 ± 1.2 mm, so the variation was only slightly greater than the error in the measurement technology (approx 1 mm). The sample size was therefore too small to determine if a difference truly exists. Interestingly, there was a significantly greater increase in sagittal plane intervertebral rotation from pre-op to 5 years post-op in those patients with flat or hooked endplates (P=0.05). A nearly significant relationship was found between the change in disc angle relative to pre-op and the type of endplate morphology (P=0.07), as well as for the relationship between changes in anterior disc height and morphology (P=0.1).

Conclusion: Consistent with Oetgen et al, a significant association between endplate morphology and clinical outcomes was not found. The exact same trends were found for Maverick patients in the relationship between improvement in back pain and EPM as was previously reported for ProDisc patients, suggesting that an effect may prove to exist when a larger sample size is analyzed. A significant relationship was found between endplate morphology and the improvement that was achieved in intervertebral rotation.