Introduction: Sagittal plane alignment of the lumbar spine is generally accepted as a clinically relevant parameter, although specific guidelines for good or bad lordosis are poorly developed. This is particularly true with LDA, where the device may affect both segmental and overall lordosis. This study investigates the relationship between lumbar segmental and overall lordosis and clinical outcomes following LDA, and evaluates the ability of LDA to restore patients to normal lordotic curvature.

Methods: Analysis of monocentric data from 96 investigational patients from the prospective randomized IDE, the continued access, and the continued access metal ion studies for Maverick® (Medtronic, Memphis, TN). Follow up to 5 years is ongoing. Lordosis (disc angle), ODI and numeric leg and back pain scores were collected. The angle between the L1 and S1 endplates (global lordosis) was measured at pre-op, 2 and 5 years (N=36) using validated, computer-assisted methods from standing neutral-lateral x-rays. The change in this angle was also calculated on a per-patient basis. Standard statistical methods were used.

Results: Relative to pre-op, global lordosis increased approximately 4 degrees on average following surgery, but this change was not significant (P=0.2). A similar magnitude of change was also seen in the measured angle between adjacent endplates at the treated level and this was significant (P=0.01, Figure 1). However, it was also noted that although significant (P=0.007), there was only a weak (R²) relationship between the change that occurred in segmental disc angle and the change that occurred in overall lordosis, suggesting that factors other than local disc angle control global lordosis. Based on a review of the literature, the L1-S1 angle in asymptomatic individuals can be expected to be 66 degrees (standard deviation 11 degrees), so 95% of the population can be expected to measure between 44 and 88 degrees. Preoperatively, 15% of the patients had a too little lordosis by the above criteria, with a nearly significant drop to 5% at 5 years (P=0.087). A significant (P=0.05) but weak R² relationship was found between the ODI score and global lordosis at 5 years.

[Fig. 1: Change in Average Disc Angle]
Conclusion: The results suggest that global lordosis can partially explain some of the variability in clinical outcome scores following lumbar disc arthroplasty. Treatment using the Maverick Disc reduced the proportion of patients with too little lordosis from 15% preoperatively to 5% post-operatively. This treatment effect on overall lordosis is largely controlled by factors other than the direct effect of the surgery on disc angle at the index level. The results also support a significant but weak relationship between global lordosis and clinical outcomes, but it remains unclear whether lordosis influences outcomes or symptoms influence lordosis.