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The Relationship between Global Range of Motion and Clinical Outcomes in Lumbar Disc Arthroplasty Patients
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Introduction: A goal of disc replacement surgery is to restore and/or maintain normal lumbar spinal range of motion (ROM) for patients with lumbar disc degenerative disease. Multiple studies have shown that symptomatic patients have limited overall motion through their lumbar spine. Thus, improved global ROM following lumbar disc arthroplasty may be a simple metric for overall functional benefit, but an association with other accepted clinical outcome scores is not well-documented. This investigates the association between patient outcome scores and global ROM following lumbar disc arthroplasty (LDA).

Methods: At a single center, 96 investigational patients from the prospective randomized IDE trial (n=38), the continued access trial (n=43), and the continued access metal ion study (n=15) received the Maverick Disc. Follow up to 5 years is ongoing. ODI, numeric back and leg pain scores, total degrees of rotation (L1 to S1) during a flexion-extension test, intervertebral rotation, disc height and lordosis (disc angle) were measured at pre-op, 2 and up to 5 years using validated, computer-assisted methods. Standard statistical analysis was used.

Results: There were highly significant improvements in all outcome scores (P<0.0001), with 81% of patients having >15 point improvement in ODI at 5 years. There was a highly significant improvement in global ROM between pre-op and post-op time points, increasing from 31±18 degrees at pre-op to 49±14 degrees at 5 years (P<0.002). Using the lower limit of the 95% CI for global ROM measured in an independent study of 161 asymptomatic volunteers as a reference (<33 degrees is abnormal), 59% of patients had abnormally low motion preoperatively, while only 10% had abnormally low motion 5 years after surgery. It was also noted that 36% of patients had below normal ROM at 2 years. When calculated on a per-patient basis, the change in global ROM was significantly greater at 36 and 60 months compared to the change measured at 24 months (P<0.0001), with no significant differences between 36 and 60 months (P>0.99, Figure 1). There were significant (P<0.04) but weak (R²<0.15) negative correlations between back and leg pain scores and global ROM at the 5-year follow up. This suggests that patients with less back and leg pain have greater overall ROM, which is not surprising. There was no statistically significant relationship between the ODI scores and global ROM at 5 years post-op (P=0.09).
Conclusions: Lumbar disc arthroplasty can dramatically improve global ROM, although this improvement may take several years in some patients. There is also a significant negative association between global ROM and pain scores post-operatively, although this association can explain only a small part of the improvement in clinical outcomes.