Spinal Alignment After 1 to 3-Level Cervical Disc Replacement (ProDisc-C) Versus Fusion - Segmental and Overall Coronal and Sagittal Alignment

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INTRODUCTION: Large-scale clinical trials have shown the efficacy of lumbar artificial discs in improving pain and disability from chronic discogenic low back pain. Artificial discs represent a dynamic (mobile) reconstruction of the spinal column, and as such are unproven in cases of spinal deformity or preservation of spinal alignment when used for multiple levels. Long-term effects on cervical lordosis, especially after multi-level disc replacement (DR), have not been reported. Recent reports have demonstrated the early loss of local lordosis with DR using an artificial disc that requires endplate milling (Bryan prosthesis). This study is an analysis of segmental as well as overall sagittal and coronal cervical alignment with one to three-level disc replacements using the ProDisc-C device (Synthes Spine, West Chester, PA). This is also compared with anterior cervical discectomy and fusion (ACDF).

METHODS: This is a prospective controlled study of over 65 patients, comparing single-level cervical DR to single-level ACDF, and two and three-level DR performed in eligible patients after receiving permission from the FDA for compassionate use. It represents the largest number of 2 and 3-level cervical disc replacements in the US, with up to 2 years of follow-up. Preoperative and postoperative radiographic cobb angle measurements were performed across treated levels and overall cervical spine.

RESULTS: Over 65 patients were included in the study, and consisted of over 50 DR and 15 ACDF patients. There were over 30 1-level DRs, 10 2-level and 10 3-level DRs. Segmental lordosis increased immediately postoperatively in both DR and ACDF patients (by approximately 4 degrees each, p GT 0.05), and this increase was maintained in both groups at last follow-up (by approximately 3 degrees each, p GT 0.05). Overall cervical lordosis was maintained by both DR and ACDF. Cervical lordosis after DR went unchanged from pre-op to immediate post-op (36 degrees) and 37 degrees at final follow-up (p GT 0.05), and after ACDF went from 40 degrees pre-op to 35 degrees immediate post-op and 36 at final follow-up (p GT 0.05). Coronal alignment was also maintained by both DR and ACDF, not changing from neutral pre-op to post-op and at final follow-up (p GT 0.05). These trends were true for 1, 2 or 3-level DR.

CONCLUSIONS: Single and multi-level cervical DR with the ProDisc-C prosthesis was able to preserve coronal and sagittal cervical alignment, both segmental and overall, at up to two years after surgery. Our results show that the ability of these devices to maintain mobility does not compromise preservation of spinal alignment. The lack of need for elaborate endplate preparation may have played a role in these results.
Figure 1. Cervical lordosis is maintained by single or multi-level artificial disc replacement with ProDisc-C (at approximately 3 and 2 years respectively).

Figure 2. Coronal alignment is also maintained by single or multi-level artificial disc replacement with ProDisc-C (at approximately 3 and 2 years respectively).

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