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In-vivo Kinematic Comparison of Prodisc-C, Prestige LP and Bryan Cervical Disc

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Background context: The clinical success of cervical arthroplasty hinges on the ability to preserve or improve the biomechanics of the functional spinal unit (FSU).

Purpose: The purpose of this study is to examine the kinematic parameters following cervical arthroplasty with three differing cervical disc replacements.

Study design/setting: Retrospective in-vivo study.

Patient sample: Patients underwent disc replacement with the ProDisc-C, Prestige LP and Bryan cervical disc (n=20 per group).

Outcome measures: Lateral dynamic radiographs of the cervical spine were analyzed using quantitative measurement analysis (QMA, Houston, TX) pre-operatively and post-operatively.

Methods: Kinematic parameters examined included range of motion (ROM), anterior disc height (ADH), posterior disc height (PDH), center of rotation in the X and Y directions (COR X and COR Y, respectively) and FSU angle on lateral radiographs using QMA software.

Results: Post-operatively the ROM increased in ProDisc-C group by 4.7 degrees (p=0.0002) and the Prestige LP by 3.2 degrees (p=0.03). There was no significant change in ROM for the Bryan group. The ADH and PDH increased in the Prodisc-C group (3.0 to 6.1 mm, p< 0.0001 and 2.9 to 4.8 mm, p< 0.0001, respectively) and Prestige LP group (3.69 to 4.59 mm, p=0.01 and 3.09 to 3.74 mm, p=0.002, respectively). The Bryan group demonstrated a 0.82 mm (p=0.003) decrease in ADH and a 1.27 mm (p=0.03) decrease in PDH. The ProDisc-C group had a small but significant shift in COR X values, whereas there was no significant change in the Prestige group. The Prestige LP group demonstrated a shift in COR Y values. The FSU angle significantly increased from -2.68 to 1.81 degrees (p< 0.0001) in the ProDisc-C group and decreased from 1.78 to -3.10 degrees (p=0.05) in the Bryan group.

Conclusions: Different cervical disc replacements designs have varying degrees of impact on postoperative kinematics. This is the first comparative study highlighting the in-vivo kinematic differences between differing devices.