Biomechanics of Cervical 'Skip' Corpectomy versus Standard Multilevel Corpectomy

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INTRODUCTION: Three-level cervical corpectomy with bone graft and plate has a low success rate and high rate of construct failure because these constructs provide just four points of fixation of the plate to the upper and lower intact vertebrae. An alternative construct leaving the intermediate vertebral body intact for fixation may overcome this problem by providing additional points of fixation while still allowing dural sac decompression. The aim of this study was to compare biomechanically a standard 3-level grafted and plated cervical corpectomy with a 3-level “skip” corpectomy configuration, where the middle vertebra is left intact (two 1-level corpectomies) and to reveal quantitatively the amount of pullout forces acting on the screws during various loading modes.

METHODS: Fourteen human cadaveric specimens were separated into two groups with matched bone mineral density. Quasistatic nonconstraining torques (maximum 1 Nm) induced flexion, extension, lateral bending and axial rotation while angular motion was recorded stereophotogrammetrically. During flexibility tests, the tendency for screw pullout in cervical plating constructs was quantified simultaneously with specially strain-gauged screws (4 gauges per screw). Specimens were tested normal and after corpectomy with standard plated and strut-grafted three-level corpectomy (N=7) or ‘skip’ corpectomy (N=7). Axial load on each screw was measured during each loading mode at 2 Hz.

RESULTS: Skip corpectomy allowed a slightly smaller range of motion (ROM) during lateral bending and axial rotation than standard corpectomy (Figure 1). There was no significant difference in ROM (p>0.06, non-paired 2-tailed Student’s t-tests). Screws of the contra-lateral upper and lower vertebrae sustained the highest pullout forces during axial rotation in both construct configurations (Figure 2). Skip corpectomy did not lessen these forces.

CONCLUSION: ‘Skip’ corpectomy can be a good alternative to standard three-level corpectomy to obtain better stability especially during lateral bending and axial rotation movements of the neck. After standard or skip corpectomy, the screws of a cervical multilevel plate experience the highest pullout forces during axial rotation. It may be worthwhile to restrain this movement in patients.
undergoing plated multilevel corpectomy, especially until solid fusion is achieved.

**Figure 1.** Range of motion after corpectomy and plating. Error bars show standard deviation.

**Figure 2.** Mean pullout forces during axial rotation at each screw (standard: 4 screws, skip: 6 screws). Error bars show standard deviation.

If noted the author indicates something of value received. The codes are identified as a - research or institutional support; b - miscellaneous funding; c - royalties; d - stock options; e - consultant or employee; n - no conflicts disclosed and * disclosure not available at the time of printing. For full information, refer to inside cover.