Reciprocal Changes in Unfused Spinal Regions after Treatment of Cervical Deformity Based on Deformity Driver and Surgical Strategies

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Introduction

Reciprocal changes (RC) may occur if the primary driver (PD) of cervical spine deformity (CSD) is included in the fusion construct. RC in spinal alignment adjacent to fusions for CSD correction are poorly understood, notably in relation to surgical strategy for deformity driver location.

Methods

CSD patients=18yr with pre-/post-op (3M) radiographs. PD type and apex were determined: CS=cervical, CTJ=cervicothoracic junction, TH=thoracic, SP=spinopelvic. Patients were evaluated if the surgery included the PD based on the lowest instrumented vertebra (LIV) - CS: LIV=C7, CTJ: LIV=T3, TH: LIV=T12. Paired t-tests compared post-op RC in unfused segments in PD groups.

Results

PD distributions in 84 CSD patients: CS=33 (40.2%), CTJ=12 (14.6%), TH=26 (31.7%), SP=11 (13.4%). PD groups were similar in surgical approach and osteotomy type ($p>.05$ all cases), but CS and TH drivers differed in levels fused (8.00 vs. 11.39, $p=.032$). Construct ranges for PD type: CS=C2-T3, CTJ=C3-T6, TH=C3-T8. If the fusion included CTJ driver (LIV =T3; n=7, 63.6%), patients had a reciprocal LL decrease (59.86° vs. 54.71°, $p=.039$). Fusions including TH drivers (LIV =T12; n=20, 76.9%) experienced RC in PI-LL (-5.42° vs. -1.11°, $p=.018$), LL (58.05° vs. 53.95°, $p=.017$), and cranial parameters: C1 slope (17.68° vs. 0.11°, $p<.001$), C2-0 angle (46.72° vs. 37.28°, $p=.003$), and MGS (-27.00° vs. -2.60°, $p=.010$). Patients whose fusion did not include the PD did not display improvements in global/spinopelvic alignment ($p>.05$), but had lower C1 (3.00° vs. -10.28°, $p=.001$) and C0 (1.73° vs. -10.28, $p=.001$) angles.

Conclusions

Cervical and thoracic were the main CSD drivers. Cranial and thoracolumbar RC occurred after CSD surgery when the construct included the primary driver. RC that trend toward normalized values depended on PD apex and levels

Learning Objectives

By the conclusion of this session, participants should be able to, 1) Describe how unfused spinal regions either proximal or distal to fusion constructs may be affected in thoracolumbar versus cervical surgeries, 2) Describe how pre-operative surgical planning fails to address these concerns.

References