Does Preoperative T_1 Slope Affect the Revision Rate of Multilevel Posterior Cervical or Cervical-Thoracic Fusions: Multi-Center Analysis

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Introduction

Previous studies have highlighted the biomechanical effect of high T_1 slopes on lordic force and the subsequent acceleration of kyphosis in postoperative cervical laminoplasties. While the data and collective opinion remain varied when determining whether the caudal end of a posterior cervical fusion should routinely be in the cervical or thoracic spine, adjacent level stenosis and non-union are leading precipitating factors of revision.

Purpose

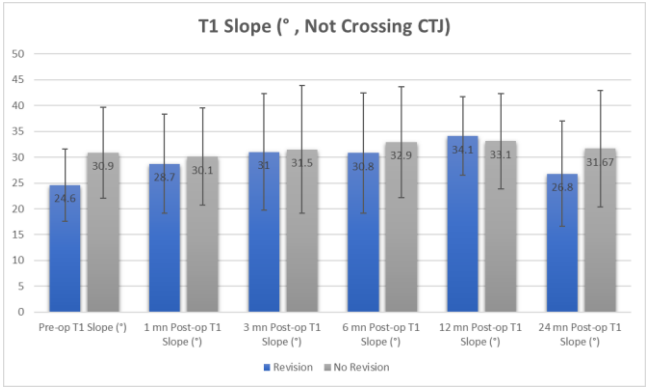
This study examines if preoperative T_1 slope should be used when planning the caudal instrumented vertebra in multilevel posterior cervical fusions.

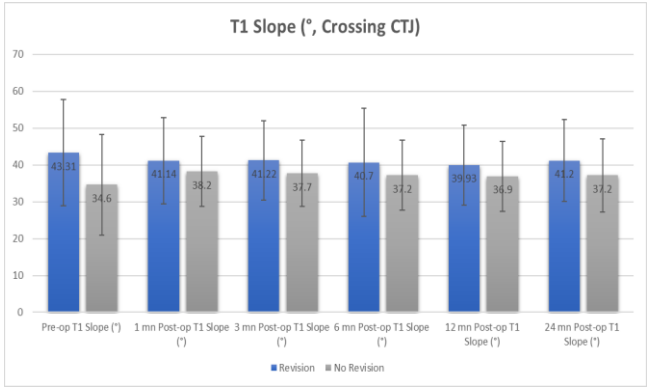
Methods

Analysis of multicenter radiographic and clinical databases of patients that underwent a three or more-level posterior cervical fusion for degenerative disease between January 2013 and May 2015, with at least two years of post-operative (post-op) data. Patients were divided into two groups: Group I (fusion ending within the cervical spine) and Group II (fusion extending into the thoracic spine). Multiple radiographic variables, including cervical lordosis, thoracic kyphosis and T_1 slope, were measured preoperatively and post-operatively at two weeks, one month, three months, six months, one year and two-year intervals. All radiographic measurements were performed by an independent, experienced clinical researcher. Paired t-test were used to compare means with a level of significance set at α=0.05.

Results

There were 168 and 96 patients in Group I and II, respectively. Overall revision rate was 10.4%. Index surgeries ending in the cervical spine (Group I) had a higher rate of revision than those extending into the thoracic spine (Group II), 11.3% and 9.4% respectively, but were not statistically significant. At two years post-op, cervical lordosis had improved in both groups (12.6° and 14.1°), but the difference between groups was not statistically significant. Though there was no significant difference in T_1 slope from two-weeks to two years post-operative, it is noted that patients with a cervical caudal level consistently had higher T_1 slopes than those that terminated in the thoracic spine, regardless of revision status. Both groups showed significant improvement in pain (Visual Analog Scale) and function (Oswestry Disability Index) outcomes at two years post-op, but there was no statistical advantage of one terminal level over the other.





Discussion

As with previous studies, this study did not reveal a clear advantage of a cervical or thoracic last instrumented vertebra (LIV) in multilevel posterior cervical fusion. There was no evidence that preoperative T_1 slope had an effect on revision rate in either the cervical or thoracic groups. It is noted, however, that though not significant, the cervical group did have higher T_1 slopes consistently throughout the analysis. While this individual measure may not be a singular determinant in end level selection, future studies may include preop T_1 slope vs. cervical lordosis mismatch in decision making about both appropriate LIV and the need for concomitant anterior interbody or osteotomy procedures.