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Association between the morphological characteristics of the zygapophysial joint and the necessity for transoral surgery in patients with Sandwich deformity

Cheng Zhang[1], Nanfang Xu[1], Shenglin Wang[1], Yinglun Tian[1], Jinguo Chen[1], Shilin Xue[1], Guodong Gao[1], Qiyue Gao[1]

[1]Peking University Third Hospital, Department of Orthopaedics, Beijing, China

Background: Sandwich deformity (combination with C1 occipitalization and C2-C3 non-segmentation) represents a subtype of Klippel-Feil syndrome. Previous studies have demonstrated that patients with this deformity are more likely to receive transoral release surgery following AAD. The aim of our study is to investigate the relationship between the morphology of the zygapophysial joint and the need for transoral surgery.

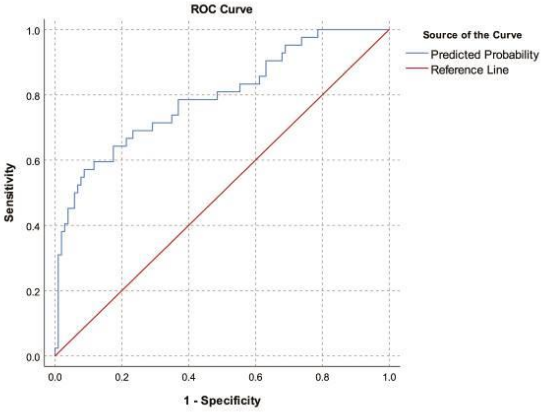
Design: Retrospective cohort study.

Methods: A total of 155 patients with Sandwich deformity admitted to our institution from 2010 to 2020 were enrolled in this study. The decision for transoral approach was based on the outcome of intraoperative traction and posterior release. Patients were divided into transoral group and non-transoral group. Data were collected and measurements were taken on CT images for sagittal inclination angle (SIA), coronal inclination angle (CIA), and listhetic distance (LD) of the C1 lateral mass. SIAmax and SIAmin referred to the larger and smaller SIA angle on either side, and their average was denoted as SIAavg. CIA and LD followed similar definitions. T-tests and Mann-Whitney U tests was applied to compare clinical data between both groups, while multivariate binary logistic regression models employed to analyze factors of transoral surgery and establish a prediction model.

Results: The groups exhibited significant differences in SIAmax, SIAmin, SIAavg, CIAmin, CIAavg, LDmax, and LDmin ($P<0.05$), all of which were included in the binary logistic model. The independent influencing factors for determining the necessity of transoral surgery were SIAmin ($P<0.001$) and CIAavg ($P=0.045$). The area under the ROC curve was 0.792. The predictive sensitivity and specificity at a specific cut-off were 71.4% and 70.9%, respectively.

Discussion: Minimal SIA and mean CIA are the key factors that contribute to decision-making in transoral approach. This model holds the potential to predict the necessity of oral surgical procedures.

Fig. 1


ROC Curve
Source of the Curve
Predicted Probability
Reference Line
Sensitivity
1 - Specificity
0.0
0.2
0.4
0.6
0.8
1.0