



Development of Validated Computer Based Preoperative Predictive Model for Proximal Junction Failure (PJF) or Clinically Significant PJK with 86% Accuracy based on 510 ASD Patients with 2-year Follow-up

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Introduction

PJF and PJK are significant complications. It remains unclear what are the specific drivers behind the development of either. This study attempts to develop a preoperative predictive model to identify patients at risk to develop PJF or PJK.

Methods

Inclusion criteria: age ≥18, ASD, ≥4 levels fused. Variables included in the model were: demographics, primary/revision, use of 3-column osteotomy, UIV/LIV levels and anchor (screw, hooks), number of levels fused, and baseline sagittal radiographs (PT, PI, PI-LL, TK, and SVA). PJF was defined as requiring revision for PJK and PJK was defined as an increase from baseline of PJK >20° and with deterioration by at least 1 SRS-Schwab sagittal modifier grade from 6wks postop. An ensemble of decision trees were constructed using the C5.0 algorithm with 5 different bootstrapped models, and internally validated via a 70:30 data split for training and testing. Accuracy and the area under a receiver operator characteristic curve (AUC) were calculated. Final model utilized 13 preop variables.

Results

510 patients were included, with 357 for model training and 153 as testing targets (PJF:37, PJK:102). The overall model accuracy was 86.3% with an AUC of 0.89 indicating a good model fit. The 6 strongest (importance =0.95) predictors were (% target): age (>64yrs, 41.4%), PI-LL (>48.7deg, 35.6%), UIV (T10-L3, 35.1%), SVA (>13.5cm, 32.5%), LIV (sacroiliac, 31.6%), and UIV Type (screws, 29.8%). If a patient met these criteria, they had a 66.7% chance of developing PJF or PJK with deterioration of sagittal alignment.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) understand the 13 demographic, radiographic and surgical variables useful for predicting PJF and clinically significant PJK, 2) recognize age, SVA, UIV, UIV type and PI-LL as the 5 strongest predictors, 3) discuss the possible implications of being able to predict PJF or clinically significant PJK, with 86% accuracy.

Conclusions

A successful model (86% accuracy, 0.89 AUC) was built predicting either PJF or clinically significant PJK. This model can set the groundwork for preop point of care decision making, risk stratification, and need for prophylactic strategies for patients undergoing ASD surgery.