Predicting Complications in 153 Lumbar Pedicle Subtraction Osteotomies by a Single Surgeon over a Six-Year Period

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INTRODUCTION: Pedicle subtraction osteotomy (PSO) is a complex surgical procedure that provides correction of moderate sagittal imbalance. The study aimed to describe complications and compare the performance of various sociodemographic characteristics, surgical variables, and established risk indices such as the American Society of Anesthesiologists (ASA) score and Charlson Comorbidity Index (CCI) in predicting 30-day and two-year postoperative complications, infections, and readmissions following lumbar PSO surgeries.

METHODS: A retrospective chart review of 153 lumbar PSO surgeries at a single institution was conducted. Sociodemographic, comorbidity, and surgical variables were analyzed. Receiver operating characteristic (ROC) curves were used to assess discriminative abilities of predictor variables over complications, infections, and readmissions at 30-day and 2-year follow-ups.

RESULTS: The incidence of 30-day complications was 24.8% (n = 38/153), and the incidence of 2-year complications was 52.9% (n = 81/153). Age was the best predictor of 30-day complications (AUC = 0.65), while hospital length of stay was the best predictor of 2-year complications (AUC = 0.60), Hospital length of stay was the best predictor of 30-day readmissions (AUC = 0.69) and 2-year readmissions (AUC = 0.64). Among sociodemographic variables and comorbidity indices, age was most predictive of 30-day complications (AUC = 0.65) and age, CCI score, CVD, CAD, and HCL all tied for most predictive of 2-year complications (AUC = 0.56). Additionally, BMI was the most predictive of 30-day readmissions (AUC=0.62) and CCI was most predictive for 2-year readmissions (AUC=0.60). Overall, EBL was the best predictor for both 30-day (AUC = 0.68) and 2-year (AUC = 0.68) infections (Table 1).

DISCUSSION: Our most common complications were cardiopulmonary, neurologic deficits, and instrumentation/junctional failure. Age was the best predictor of complications while hospital length of stay was the best predictor of readmissions among patients undergoing lumbar PSO surgeries. Overall, universally collected metrics such as age and BMI are able to predict complications, readmissions, and infections as well as or better than more complex indices such as CCI score and ASA class.

SIGNIFICANCE: Spine surgeons should focus on expeditious discharge and direct extra attention towards patients requiring lengthy hospital stays as these are most likely to be readmitted following lumbar PSO surgery. Additionally, surgeons should consider prioritizing easily acquired sociodemographic variables such as age and BMI as these quickly assessed factors can provide predictive value equal or superior to that of more complex assessments when assessing risk in lumbar PSO surgery.

TABLES:

	Complications			Readmissions		Infections	
	30-day	2-year	Intraoperative	30-day	2-year	30-day	2-year
Sociodemographic factors							
Sex	0.52 (0.44-0.62)	0.55 (0.45-0.62)	0.57 (0.48-0.67)	0.36 (0.30-0.46)	0.55 (0.46-0.62)	0.36 (0.28-0.55)	0.56 (0.38-0.66)
Age	**0.65 (0.56-0.76)**	0.56 (0.45-0.64)	0.50 (0.39-0.64)	0.54 (0.42-0.64)	0.59 (0.49-0.67)	0.67 (0.29-0.82)	0.58 (0.39-0.82)
BMI	0.60 (0.50-0.72)	0.55 (0.48-0.64)	0.53 (0.39-0.62)	0.62 (0.49-0.80)	0.58 (0.47-0.69)	0.63 (0.36-0.88)	0.65 (0.43-0.83)
Smoking status	0.54 (0.46-0.63)	0.51 (0.45-0.63)	0.51 (0.41-0.60)	0.54 (0.44-0.63)	0.55 (0.49-0.64)	0.51 (0.30-0.62)	0.55 (0.38-0.71)
Comorbidities and indices							
CVD	0.61 (0.53-0.68)	0.56 (0.52-0.61)	0.51 (0.43-0.59)	0.49 (0.42-0.59)	0.55 (0.46-0.61)	0.49 (0.42-0.62)	0.58 (0.55-0.62)
CAD	0.57 (0.53-0.64)	0.56 (0.53-0.60)	0.56 (0.52-0.62)	0.53 (0.46-0.65)	0.53 (0.49-0.58)	0.52 (0.46-0.74)	0.51 (0.46-0.61)
HTN	0.58 (0.50-0.65)	0.51 (0.43-0.57)	0.53 (0.40-0.61)	0.58 (0.47-0.66)	0.59 (0.53-0.68)	0.63 (0.41-0.70)	0.64 (0.51-0.70)
HCL	0.62 (0.56-0.71)	0.56 (0.50-0.63)	0.56 (0.47-0.66)	0.58 (0.44-0.70)	0.54 (0.46-0.61)	0.59 (0.45-0.77)	0.55 (0.39-0.70)
DM	0.54 (0.44-0.61)	0.51 (0.47-0.60)	0.51 (0.44-0.62)	0.60 (0.46-0.71)	0.52 (0.44-0.59)	0.58 (0.38-0.74)	0.58 (0.46-0.77)
CCI score	0.63 (0.53-0.75)	0.56 (0.47-0.65)	0.52 (0.41-0.66)	0.57 (0.42-0.71)	0.60 (0.53-0.69)	0.60 (0.36-0.73)	0.56 (0.39-0.69)
ASA class	0.55 (0.48-0.62)	0.52 (0.45-0.58)	0.52 (0.44-0.61)	0.56 (0.40-0.63)	0.58 (0.52-0.63)	0.56 (0.35-0.64)	0.52 (0.39-0.68)
Surgical variables							
Index level	0.61 (0.53-0.70)	0.51 (0.44-0.57)	0.52 (0.44-0.64)	0.57 (0.43-0.65)	0.55 (0.44-0.63)	0.44 (0.23-0.64)	0.57 (0.40-0.74)
Levels fused	0.61 (0.45-0.68)	0.51 (0.44-0.60)	0.54 (0.44-0.65)	0.50 (0.36-0.64)	0.56 (0.48-0.66)	0.47 (0.34-0.60)	0.56 (0.44-0.66)
Revision surgeries	0.53 (0.43-0.60)	0.54 (0.48-0.60)	0.55 (0.47-0.61)	0.59 (0.47-0.72)	0.58 (0.51-0.65)	0.58 (0.40-0.83)	0.53 (0.44-0.74)
SPOs	0.53 (0.47-0.64)	0.50 (0.43-0.56)	0.52 (0.42-0.59)	0.56 (0.36-0.70)	0.51 (0.42-0.58)	0.47 (0.36-0.74)	0.52 (0.38-0.63)
OR time	0.56 (0.47-0.71)	0.54 (0.46-0.62)	**0.65 (0.52-0.74)**	0.58 (0.41-0.71)	0.53 (0.45-0.62)	0.53 (0.32-0.70)	0.48 (0.35-0.62)
Length of hospital stay	0.49 (0.39-0.60)	**0.60 (0.51-0.68)**	--	**0.69 (0.55-0.77)**	**0.64 (0.57-0.72)**	0.64 (0.39-0.75)	0.46 (0.35-0.58)
EBL	0.53 (0.42-0.65)	0.55 (0.46-0.67)	0.61 (0.44-0.69)	0.49 (0.34-0.69)	0.52 (0.40-0.61)	**0.68 (0.53-0.80)**	**0.68 (0.49-0.79)**
Interbody fusion	0.51 (0.48-0.59)	0.52 (0.48-0.56)	0.52 (0.46-0.55)	0.54 (0.48-0.69)	0.53 (0.49-0.60)	0.53 (0.46-0.68)	0.52 (0.47-0.67)

Table 1. Predictiveness of patient characteristics over surgical outcomes.