Past History of Opioid Use and Prior Surgery, but Not Resilience or Anxiety, Predict Outcomes Up to 1 Year following Anterior Cruciate Ligament Reconstruction

Eric Victor Neufeld, Michael Joseph Sayegh, Camille Pinpin, Michael Meade, Daniel Bowles, William Matthew Degouveia[1], Steven Eric Rokito[2]
[1]Zucker School of Medicine At Hofstra/Northwell, [2]Northwell Health Orthopaedic Institure

INTRODUCTION: Oral narcotics have traditionally been the preferred analgesic following anterior cruciate ligament reconstruction (ACLR). Abuse of these substances persists as a national health crisis with a substantial rise in opioid overdose deaths in the past several decades. Multimodal, non-opioid pain protocols have recently shown to be effective in managing pain after common arthroscopic procedures. However, completely eliminating opioids may lead to decreased patient satisfaction. Thus, it is important to identify which patients may need a small opioid prescription. The purpose of this study is to identify risk factors that predict a) the need for rescue opioid use and b) self-reported outcomes following an opioid-sparing postoperative analgesia protocol.

METHODS:

This is a prospective cohort study that recruited patients undergoing primary arthroscopic-assisted ACLR by a sports-fellowship-trained orthopaedic surgeon from a large academic health system. Preoperatively, patients were administered questionnaires including demographics, medical history, Visual Analog Scale (VAS), Brief Resilience Scale (BRS), Six-Item State-Trait Anxiety Inventory (STAI-6), and Patient Health Questionnaire-2 (PHQ-2), and various patient-reported outcome measures (PROMs). Following surgery, patients were provided an analgesic cocktail of acetaminophen, meloxicam, tramadol, and gabapentin in addition to 10 tablets of oxycodone.

Patients were followed for 1 year and queried at numerous timepoints through a combination of telephone calls and email. Postoperative rescue oxycodone use was measured cumulatively in morphine milligram equivalents (MME) at 48-72 hours, 2 weeks, and 6 weeks. VAS was also assessed at these timepoints as well as 3 months, 6 months, and 1 year. Finally, PROMs were completed at 3 months, 6 months, and 1 year. Patients were analyzed globally (i.e., as a single group), partitioned by BRS score into low-normal resilience (1.00-4.30) and high-resilience (4.31-5.00) groups, and also divided by STAI-6 score into low-anxiety (20-37) and moderate-high anxiety (38-80) groups. Statistical analysis was performed via multiple linear regression, Welch's t-tests, Fisher's exact tests, one-way repeated-measures ANOVA followed by Tukey's post-hoc tests; the family-wise error rate ($\alpha = 0.05$) was maintained via Bonferroni corrections.

RESULTS:

Forty-four patients were enrolled in the study. History of prior opioid use positively predicted VAS at 48-72 hours ($\beta = 2.0$; $p = 0.024$) as well as MME consumption at 48-72 hours ($\beta = 16.9$; $p = 0.009$) and 6 weeks ($\beta = 24.0$; $p = 0.030$). The presence of past surgical history negatively predicted VAS at 48-72 hours ($\beta = -3.6$; $p < 0.001$), but positively predicted change in Single Assessment Numeric Evaluation (SANE) score at 3 months ($\beta = 36.9$; $p = 0.017$) and 6 months ($\beta = 35.4$; $p = 0.016$). It also positively predicted change in Preoperative 10-Item Patient-Reported Outcomes Measurement Information System physical component (PROMIS-10-P) score at 6 months ($\beta = 8.3$; $p = 0.021$) and change in Tegner Activity Scale at 1 year ($\beta = 4.9$; $p = 0.042$).

Compared to the low-normal resilience cohort, the high-resilience group was older (39.5 versus 23.8 years, $p = 0.029$) and possessed lower STAI-6 scores (27.5 versus 39.9, $p = 0.002$) but higher preoperative PROMIS-10-mental component scores (61.8 versus 52.4, $p = 0.004$). Relative to the moderate-high anxiety cohort, the low-anxiety group was also older (31.0 versus 22.3 years, $p = 0.034$) and possessed higher BRS scores (4.1 versus 3.5, $p = 0.005$).

DISCUSSION AND CONCLUSION: Orthopaedic surgeons should be mindful that patients with a history of opioid use—including more than 1 year ago—may be at increased risk of greater pain and narcotic consumption in the acute postoperative period. Conversely, patients with a history of prior surgery may report less pain in the immediate postoperative period and improved self-reported outcomes. Patient characteristics of high resilience or low anxiety, however, have little effect on postoperative pain, opioid consumption, or self-reported outcomes.

Table 1

Independent Variable	N (%)	Mean (SD)
Age (years)	-	26.6 (12.8)
BMI (kg/m^2)	-	26.7 (5.4)
BRS	-	3.9 (0.7)
STAI-6	-	37.4 (13.6)
PHQ-2	-	0.7 (1.4)
Sex	16 females (36.4%)	-
Hx of Opioid Use	13 (29.5%)	-
Smoking	2 (4.5%)	-
Illicit Drug Use	2 (4.5%)	-
Alcoholism	0 (0%)	-
Psychiatric Disorder	1 (2.3%)	-
Hx of Prior Surgery	12 (27.3)	-
Type 2 DM	0 (0%)	-
HTN	0 (0%)	-
CAD	0 (0%)	-
Graft Choice	30 BTB autograft (68.2%), 7 BTB allograft (15.9%), 6 hamstring autograft (13.6%), 1 quadriceps autograft (2.3%)	

N = number of participants; SD = standard deviation; BMI = body mass index; BRS = Brief Resilience Scale (BRS), STAI-6 = Six-Item State-Trait Anxiety Inventory; PHQ-2 = Patient Health Questionnaire-2; Hx = history; DM = diabetes mellitus; HTN = hypertension; CAD = coronary artery disease; BTB = bone-patellar tendon-bone.

Table 2

Timepoint	Outcome	
	VAS	MME
48-72 Hours	4.4 (2.2)	7.0 (14.6)
2 Weeks	2.2 (1.9)	9.0 (20.8)
6 Weeks	1.2 (1.7)	9.7 (25.8)
3 Months	1.3 (1.6)	-
6 Months	0.7 (1.4)	-
1 Year	0.8 (0.6)	-

Data are presented as mean (standard deviation). Pain scores and opioid consumption (logged cumulatively) across timepoints. VAS = Visual Analog Scale; MME = morphine milligram equivalents.

Table 3

Outcome	Timepoint			
	Preoperative	3 Months	6 Months	1 Year
IKDC	52.6 (17.9)	58.9 (11.2)	70.8 (12.9)	80.4 (10.9)
SANE	43.1 (22.3)	56.2 (20.1)	71.6 (14.0)	81.5 (10.4)
MARS	7.7 (6.1)	-	-	7.9 (4.9)
Tegner	4.6 (2.9)	2.9 (1.9)	4.0 (2.1)	4.4 (1.5)
PROMIS-10-P	49.8 (7.3)	-	55.2 (6.1)	55.2 (6.9)
PROMIS-10-M	53.8 (8.4)	-	54.1 (7.0)	53.6 (7.9)

Data are presented as mean (standard deviation). IKDC = International Knee Documentation Committee Subjective Knee Form; SANE = Single Assessment Numeric Evaluation; MARS = Marx Activity Rating Scale; Tegner = Tegner Activity Scale; PROMIS-10-P = Preoperative 10-Item Patient-Reported Outcomes Measurement Information System physical component; PROMIS-10-M = Preoperative 10-Item Patient-Reported Outcomes Measurement Information System mental component.