

Impact of Severity of Chronic Venous Insufficiency on Primary Total Knee Arthroplasty Outcomes



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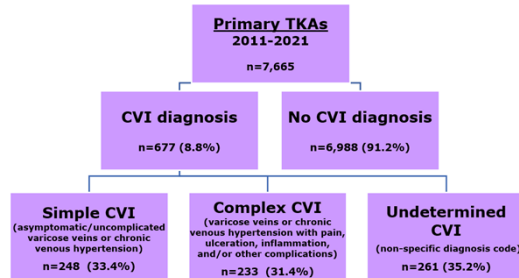
Introduction

Over 700,000 people in the United States undergo total knee arthroplasty (TKA) each year,¹ and vascular complications are well documented.^{2,3} Chronic venous insufficiency (CVI) affects 10% to 35% of adults in the United States.⁴ CVI is often caused by abnormal venous flow due to valvular damage and/or obstruction causing venous hypertension.^{5,6} Previous research found that CVI in patients undergoing TKA correlates with increases in length of hospital stay, healthcare costs, 90-day readmission, peri-prosthetic joint infections, and implant related and other medical complications,⁷ but the effects of CVI on TKA are not well documented. **To our knowledge, there is no recent study analyzing primary TKA outcomes while differentiating CVI diagnoses by severity.**

Objective

Evaluate post-TKA outcomes of patients with varying complexities of CVI in a database composed of recent public and private insurance claims

Methods



- Electronic health records obtained from Ochsner Health System
- ICD/CPT codes qualified patients':
 - Short-term complications (<90 days)
 - Long-term complications (<2 years)
 - Revision within 2 years of surgery
 - Readmissions within 90 days of discharge
 - Composite complications: Any of above events
- Multivariable logistic regression was performed to predict each complication as a function of CVI status (yes/no; simple/complex) and other potential confounding variables.
- Sensitivity analyses were conducted by adjusting classification of patients with undetermined CVI as simple, complex, and withdrawn from analysis.
- A subset analysis was done in CVI only patients.

Results

Demographics

Average patient age: 66.98 years
Average BMI: 37.15
Average adjusted CCI: 1.08

CVI associated with:

- Older age
- Higher adjusted CCI
- Higher BMI
- Public insurance status
- More recent TKA
- 90-day readmission (Table 1)

	All (7665)	Yes CVI (677)	No CVI (6988)	P-values	% with CVI
White Race	5239 (68.3)	478 (70.6)	4761 (68.1)	0.194	9.1
Black Race	2426 (31.7)	199 (29.4)	2227 (31.9)		8.2
Male Sex	2754 (35.9)	222 (32.8)	2532 (36.2)	0.078	8.1
Female Sex	4911 (64.1)	455 (67.2)	4456 (63.8)		9.3
Smoking	1837 (23.9)	181 (26.7)	1656 (23.7)	0.081	9.9
No Smoking	5828 (76)	496 (73.3)	5332 (76.3)		8.5
Private Insurance	1655 (21.6)	120 (17.7)	1535 (22)	0.011	7.3
Public Insurance	6010 (78.4)	557 (82.3)	5453 (78)		9.3
BMI=>30	6180 (80.2)	598 (88.3)	5782 (82.7)	<0.001	9.4
BMI<30	1285 (16.8)	79 (11.7)	1206 (17.3)		6.1
Age=>70	3118 (40.7)	338 (49.9)	2780 (39.8)	<0.001	10.8
Age<70	4547 (59.3)	339 (50.1)	4208 (60.2)		7.5
Composite Complication	941 (12.2)	103 (15.9)	838 (12.1)	0.157	10.9
Short Complication	302 (3.9)	37 (5.5)	265 (3.8)	0.135	12.3
Long Complication	132 (1.7)	8 (1.1)	124 (1.8)		6.1
TKA Revision	106 (1.4)	10 (1.3)	96 (1.4)	1	9.4
Hospital Readmission	496 (6.5)	62 (9.4)	434 (6.3)	0.033	12.5
Continuous Variables					
Age	66.98 (9.39)	69.1 (9.03)	66.77 (9.4)	<0.001	NA
CCI	1.08 (1.6)	1.85 (1.97)	1.01 (1.54)	<0.001	NA
YEAR of TKA	2017.21 (2.85)	2017.99 (2.43)	2017.13 (2.88)	<0.001	NA
BMI	37.15 (8.38)	39.17 (9.2)	36.95 (8.28)	<0.001	NA

Table 1. Characteristics by CVI status.

Overall complication rates[†]

No CVI (Control): 12.1%*
Simple CVI: 8.9%*
Complex CVI: 16.3%*
Unknown CVI: 16.5%

*Differences were statistically significant prior to adjustment (p = 0.045), but significance was not seen post-adjustment (p = 0.157).

† Higher complication rates were associated with male sex, smokers, those with public insurance, older age, larger CCI, higher BMI, and an earlier surgical year.

Variable	OR (CI)	P-value
Complex CVI v Simple	1.91 (1.04-3.53)	0.038
Black v White	1.12 (0.59-2.11)	0.733
Smoking	2.56 (1.43-4.59)	0.002
BMI	1 (0.96-1.03)	0.797
Private Insurance	0.99 (0.36-2.73)	0.991
Age	1.03 (0.98-1.07)	0.247
CCI	1.28 (1.11-1.47)	0.001
Surgery Year	0.87 (0.78-0.98)	0.022

Figure 1: Multivariable logistic regression results for composite complication in classifiable CVI patients

- No statistical difference in CVI groups regarding:
 - Composite complications
 - Short-term complication
 - Long-term complication
 - TKA revision (Table 1)
- Complex CVI had significantly higher risk for composite complication than simple CVI (Figure 1).
- Increased composite complication risk among CVI patients with smoking history and higher CCI (Figure 1).
- Decreased composite complication risk among CVI patients with more recently performed TKA (Figure 1)

Summary

- CVI diagnosis alone did not affect composite post-op complications, short- or long-term post-op complications, or revision.
- Complex CVI demonstrated higher risk for post-TKA composite complications compared to simple CVI.
- There was no significant difference in complication rates between simple/complex CVI compared to the control without CVI.
 - Unknown CVI did not affect complication rates.
- Recent surgery year decreased short- and long-term complications, revisions, and readmissions among all participants.
 - Interestingly, CVI prevalence increased in recent years.
- Old age and higher CCI were associated with CVI diagnoses as well as higher rates of greater composite complications.

Conclusions

Patients with complex CVI are at higher risk for post-TKA complications compared to simple CVI, although CVI alone does not affect overall complication rates compared to patients without CVI. Possible explanations include coding inconsistencies, missed CVI diagnoses, or CVI diagnosis affecting pre-operative care. CVI prevalence increased in TKAs over time, yet complications decreased indicating improved surgical care over time. Larger studies are needed using more specific ICD-10 coding.

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