Metabolic Syndrome: Is this Condition an Independent Risk Factor for Complications following Patellofemoral Arthroplasty?

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INTRODUCTION: With the rise in obesity due to the adoption of sedentary lifestyles, it is anticipated that the prevalence of metabolic syndrome will increase and become a major health concern in the near future. Metabolic syndrome is known to negatively impact the odds of cardiovascular disease and all-cause mortality in individuals. Patellofemoral arthroplasty (PFA) is a treatment option for isolated patellofemoral osteoarthritis. Since isolated patellofemoral arthritis is relatively uncommon, the existing literature surrounding PFA remains limited. Although the impact of metabolic syndrome has been studied in elective procedures, such as lumbar fusions and total joint arthroplasties, its effect on PFA has yet to be elucidated. The aim of this study is to evaluate the clinical impact of metabolic syndrome on outcomes following PFA.

METHODS: From the years 2007 to 2019, current procedural terminology (CPT) code 27438 was utilized to identify patients undergoing PFA in the National Surgical Quality Improvement Program (NSQIP) database. Two patient groups were categorized: patients with metabolic syndrome and patients without metabolic syndrome. Metabolic syndrome was defined by the simultaneous presence of diabetes mellitus, hypertension, and body mass index $\geq$30 kg/m^2. In this analysis, demographics and medical comorbidities were assessed between the 2 cohorts. Complications included mortality, wound, cardiac, pulmonary, renal, thromboembolic, and sepsis complications, as well as urinary tract infections (UTIs), transfusion, extended length of stay > 3 days, reoperation, and readmission. Bivariate and multivariate analyses were performed with significance set at P-value < 0.05.

RESULTS: Of 1,618 patients undergoing PFA, 1,443 patients (89.2%) did not have metabolic syndrome whereas 175 patients (10.8%) had metabolic syndrome. Compared to patients without metabolic syndrome, those with this condition were more likely to be older (P = 0.001), Black (P = 0.002), and have an American Society of Anesthesiologists classification of III (P < 0.001) (Table 1). Metabolic syndrome patients were also more likely to have other medical comorbidities, including chronic obstructive pulmonary disease (P = 0.023) and dyspnea on moderate exertion (P = 0.048). During the surgical procedure, patients with metabolic syndrome were more likely to require neuraxial anesthesia (P < 0.001) than those without the condition (Table 2). Following adjustment on multivariate analysis to control for the differences in baseline characteristics between the 2 cohorts, compared to patients who did not have metabolic syndrome, those with metabolic syndrome had an increased risk of UTIs (Odds ratio [OR] 4.54; P = 0.028), requirement for postoperative blood transfusion (OR 2.05; P = 0.008), and extended length of hospital stay greater than 3 days (OR 1.75; P = 0.007) (Table 3).

DISCUSSION AND CONCLUSION: Patients with metabolic syndrome are at an increased risk of postoperative complications following PFA. Despite PFA being a relatively uncommon procedure, determining patient risk factors and creating optimal preoperative and perioperative management plans in patients with metabolic syndrome undergoing PFA can be beneficial in minimizing postoperative complications. This can ultimately improve patient outcomes and reduce overall cost by mitigating the financial burden associated with complications and prolonged hospital stay.

Table 1. Baseline Demographics and Clinical Characteristics Among Patients Undergoing Patellofemoral Arthroplasty

Demographics	**No Metabolic Syndrome**	**Metabolic Syndrome**	**p-value**
Total patients, n	1,443	175	
Sex, n (%)			0.096[†]
Female	957 (66.3)	105 (60.0)	
Male	486 (33.7)	70 (40.0)	
Ethnicity, n (%)			**0.002**[†]
Caucasian	1,043 (80.9)	104 (68.4)	
Black or African American	136 (10.6)	31 (20.4)	
Hispanic	81 (6.3)	14 (9.2)	
American Indian or Alaska Native	5 (0.4)	2 (1.3)	
Asian	23 (1.8)	1 (0.7)	
Native Hawaiian or Pacific Islander	1 (0.1)	0 (0.0)	
ASA, n (%)			**< 0.001**[†]
I	53 (3.7)	0 (0.0)	
II	764 (53.2)	37 (21.1)	
III	602 (41.9)	129 (73.7)	
IV	18 (1.3)	9 (5.1)	
Smoker, n (%)	195 (13.5)	17 (9.7)	0.160[†]
Functional status preoperative, n (%)			0.077[†]
Independent	1,376 (98.3)	169 (98.3)	
Partially dependent	24 (1.7)	3 (1.7)	
Mean age, yrs (SD)	62.01 (12.75)	65.26 (9.11)	**0.001****

[†]Pearson's chi-squared test
**Analysis of variance
Bolding equals significance p<0.05
ASA, American Society of Anesthesiologists; SD, standard deviation.

Table 2. Comorbidities and Intraoperative Variables Among Patients Undergoing Patellofemoral Arthroplasty

Comorbidities	**No Metabolic Syndrome**	**Metabolic Syndrome**	**p-value**[†]
Total patients, n	1,443	175	
CHF, n (%)	4 (0.3)	0 (0.0)	0.486
COPD, n (%)	38 (2.6)	10 (5.7)	**0.023**
Dialysis, n (%)	1 (0.1)	0 (0.0)	0.728
Bleeding disorder, n (%)	18 (1.2)	5 (2.9)	0.089
Preoperative blood transfusion, n (%)	1 (0.1)	0 (0.0)	0.728
Chronic steroid use, n (%)	29 (2.0)	6 (3.4)	0.223
Dyspnea, n (%)			**0.048**
No dyspnea	1,401 (97.1)	164 (93.7)	
Moderate exertion	41 (2.8)	11 (6.3)	
At rest	1 (0.1)	0 (0.0)	
Anesthesia type, n (%)			**< 0.001**
General	758 (54.0)	75 (43.6)	
Neuraxial	549 (39.1)	90 (52.3)	
Regional	44 (3.1)	4 (2.3)	
MAC	53 (3.8)	2 (1.2)	

[†]Pearson's chi-squared test
Bolding equals significance p<0.05
CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; MAC, monitored anesthetic care.

Table 3. Multivariate Analysis of Postoperative Outcomes of Patients Following Patellofemoral Arthroplasty

Complications	**Metabolic Syndrome**	
	p-value	Odds ratio (metabolic syndrome/no metabolic syndrome) (95% CI)
Minor complication††	0.136	1.926 (0.814 to 4.554)
Pulmonary complication	0.426	1.785 (0.428 to 7.443)
Urinary tract infection	**0.028**	4.540 (1.177 to 17.509)
Postoperative transfusion	**0.008**	2.051 (1.206 to 3.488)
Extended length of stay > 3 days	**0.007**	1.750 (1.169 to 2.619)

††Includes urinary tract infection, pneumonia, deep venous thrombosis, superficial surgical site infection, or deep surgical site infection.
Bolding equals significance p<0.05
CI, confidence interval.