Short Operative Time Benefits Frail Geriatric Patients with Trochanteric Hip Fractures: Analysis of National Surgical Quality Improvement Program Datasets 2017-2021

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INTRODUCTION: Prolonged operative time has been consistently associated with increased risk of post-operative complications following orthopedic surgery, including surgical site infection (SSI), transfusion, thromboembolism, hospital readmission, and mortality. However, there is a paucity of such literature focusing solely on trochanteric hip fractures, and no studies to date have explored how pre-surgical frailty in patients affects this relationship. This study examines the association between operative time and post-surgical complications following trochanteric hip fracture repair, and to determine whether this relationship is modified by patient frailty as measured by the 5-item modified frailty index (MFI-5). The findings seek to clarify operative-time-related risks, enabling more informed surgical decision making and preoperative patient counseling.

METHODS: The National Surgical Quality Improvement Program (NSQIP) database was queried from 2017-2021 for patients who had undergone surgical treatment for trochanteric hip fractures using CPT codes (CPT 27244, 27245, 27248, 27506, 27507, 27509). Patients younger than 65 years, as well as those with missing or incomplete data for variables included in the analysis, were excluded. MFI-5 was used to quantify frailty; patients with a score greater than or equal to 2 were categorized as “Frail”, whereas a score of 0 or 1 was classified as “Non-Frail.” A total of 45,485 patients were included, of whom 37.5% were classified as frail (**Table 1**). Age distribution and operative time did not differ significantly by frailty group. Multivariable logistic regression models (R-project software) were used to determine the relationship between operative time and “any complication,” a composite of 30-day post-operative surgical outcomes including SSI, dehiscence, pneumonia, reintubation, post-operative ventilator requirements longer than 48 hours, bleeding requiring transfusion, cardiac arrest, myocardial infarction, cerebrovascular accident, pulmonary embolism, deep vein thrombosis, renal failure, urinary tract infection, sepsis, and septic shock. SSI and mortality were further assessed individually. Interaction models were used to determine how frailty modifies the relationship between operative time and complications.

RESULTS:

Operative time of >120 minutes was significantly associated with any complication ($p < 0.001$, OR [2.96], 95% CI [2.74-3.20]) and surgical site infection ($p < 0.001$, OR [3.98], 95% CI [3.10-5.07]). Interestingly, there was no significant association between mortality and operative time >120 minutes ($p = 0.283$, OR [0.91], 95% CI [0.76-1.08]). Compared to non-frail patients, frail patients had 38% higher odds of experiencing any complication ($p < 0.001$, OR [1.38], 95% CI [1.33-1.44]) and 95% higher odds of mortality ($p < 0.001$, OR [1.95], 95% CI [1.80-2.11]). There was no significant difference in rates of SSI ($p = 0.101$, OR [1.16], 95% CI [0.97-1.40]).

A statistically significant interaction was observed between frailty and operative time >120 minutes ($p = 0.012$) in the any complication model, with a combined odds ratio of 1.22 (95% CI [1.04-1.43]). However, no significant interaction between frailty and operative time >120 minutes was observed for the SSI or mortality models ($p = 0.334$ and $p = 0.239$, respectively).

DISCUSSION AND CONCLUSION: Operative time is positively, independently, and significantly associated with postoperative complications and SSIs in patients undergoing trochanteric hip fracture repair. Notably, the effect of prolonged operative time on complication risk is amplified in frail patients. Understanding how operative time influences rates of adverse outcomes in frail patients with trochanteric hip fractures can help guide preoperative counseling, inform the selection of operative versus non-operative management, and may promote thoughtful case selection for trainee involvement, which may increase operative times. Future studies should aim to assess the long-term outcomes of operative time in this high-risk patient population.

Table 1. Baseline characteristics of geriatric patients treated for trochanteric hip fractures, stratified by frailty status (MFI-5).

Variable, n (%) or Mean ± SD	Non-Frail N = 28,407[1]	Frail N = 17,078[1]	p-value[2]
Age			0.13
65 to 79	10,041 (35%)	5,918 (35%)	
80 or Older	18,366 (65%)	11,160 (65%)	
Sex			<0.001
Female	20,630 (73%)	11,897 (70%)	
Male	7,777 (27%)	5,181 (30%)	
Body Mass Index	21.6 ± 10.3	23.0 ± 11.1	<0.001
Operative Time			0.4
<60 min	18,348 (65%)	10,929 (64%)	
60-120 min	8,082 (28%)	4,941 (29%)	
>120 min	1,977 (7.0%)	1,208 (7.1%)	
ASA Class			<0.001
1-No Disturb	166 (0.6%)	10 (<0.1%)	
2-Mild Disturb	5,844 (21%)	1,099 (6.4%)	
3-Severe Disturb	17,908 (63%)	11,024 (65%)	
4-Life Threat	4,394 (15%)	4,859 (28%)	
5-Moribund	33 (0.1%)	53 (0.3%)	
None assigned	62 (0.2%)	33 (0.2%)	

[1]n (%); Mean ± SD

[2]Pearson's Chi-squared test; Wilcoxon rank sum test