

Preoperative Troponin and Surgical Delay Predict In-Hospital Events After Hip Fracture

Aly Samory Toure, Bryan Medilien, Kenechukwu A Okafor, Joshua A Parry, Roberto C Hernandez-Irizarry, Caitlin Akard Bradley, Jaimo Ahn, Mara Lynne Schenker

INTRODUCTION: Patients with elevated preoperative troponin are known to be at higher risk of adverse perioperative outcomes. However, there is uncertainty around how surgical timing should be managed in these high-risk patients—specifically, whether delaying surgery provides time for medical optimization or simply increases risk. The 2024 AHA Guideline recommends routine preoperative troponin screening but does not provide guidance on surgical timing in the setting of elevated troponin. This study evaluates whether surgical delay independently predicts in-hospital cardiac events or mortality in hip fracture patients, and whether delayed surgery further increases the risk of adverse events in those with elevated preoperative troponin.

METHODS:

We conducted a retrospective cohort study of 520 patients who underwent hip fracture surgery at a Level 1 trauma center between 2020 and 2024. All patients had routine preoperative high-sensitivity cardiac troponin levels collected and were categorized as: normal (<30 ng/L), elevated (30–100 ng/L), or significantly elevated (>100 ng/L). Surgical delay was defined as time from emergency department arrival to the operating room and categorized as early (<24 hours), intermediate (24–48 hours), or delayed (>48 hours).

The primary outcome was a composite endpoint of in-hospital cardiac event or death. Cardiac events were identified using ICD-10 codes from the institution’s Hip Fracture Registry. Multivariable logistic regression was used to evaluate the independent and interactive effects of troponin level and surgical delay on the primary outcome, adjusting for age, sex, and cardiovascular disease.

RESULTS:

Adverse events occurred in 6.9% of patients (n = 36). Compared to patients with normal troponin levels, those with elevated troponin (30–100 ng/L) had 5.04 times higher odds of adverse events (OR = 5.04, 95% CI [1.26–20.15], p = 0.022), and those with significantly elevated troponin (>100 ng/L) had 28.54 times higher odds (OR = 28.54, 95% CI [6.95–117.15], p < 0.001). Delayed surgery (>48 hours) was independently associated with increased odds of adverse events (OR = 3.53, 95% CI [1.11–11.25], p = 0.033), while intermediate delay (24–48 hours) was not significant.

Interaction terms between troponin category and surgical delay were not statistically significant (all p > 0.05), indicating an additive rather than multiplicative effect of elevated troponin and delayed surgery on adverse outcomes.

DISCUSSION AND CONCLUSION:

Elevated preoperative troponin and delayed surgical timing each independently predict in-hospital cardiac events and mortality following hip fracture. While interaction terms were not statistically significant, the additive risk associated with both elevated troponin and surgical delay underscores the need for coordinated perioperative management. These findings support the integration of routine biomarker screening and time-to-surgery optimization in perioperative risk pathways for orthopedic trauma.

Table 1: Adjusted Odds Ratios for Composite Outcome of Adverse Events

Variable	OR	95% CI	p-value
Elevated Troponin (30–100 ng/L)	5.04	1.26 – 20.15	0.022
Significantly Elevated Troponin (>100 ng/L)	28.54	6.95 – 117.15	<0.001
Intermediate Delay (24–48h)	1.60	0.48 – 5.36	0.448
Delayed Surgery (>48h)	3.53	1.11 – 11.25	0.033
Interaction: Elevated Troponin × Intermediate Delay	0.23	0.02 – 3.05	0.264
Interaction: Elevated Troponin × Delayed Surgery	0.21	0.02 – 2.83	0.240
Interaction: Significantly Elevated Troponin × Intermediate Delay	0.32	0.04 – 2.67	0.295
Interaction: Significantly Elevated Troponin × Delayed Surgery	0.15	0.02 – 1.27	0.082
Age (per year)	1.03	1.00 – 1.06	0.059
Cardiovascular Disease	1.47	0.65 – 3.35	0.357

Table 2. Proportion of Surgical Delays by Troponin Category

Surgical Delay	Normal	Elevated	Significantly Elevated	Total
Early (<24h)	193 (81.4%)	30 (12.7%)	14 (5.9%)	237
Intermediate (24–48h)	146 (82.9%)	17 (9.7%)	13 (7.4%)	176
Delayed (>48h)	85 (79.4%)	11 (10.3%)	11 (10.3%)	107