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INCIDENCE AND PREDICTORS OF MYOCARDIAL INJURY AFTER NONCARDIAC SURGERY: A RETROSPECTIVE COHORT ANALYSIS FROM A TERTIARY CENTRE

KALP DIŞI CERRAHİ SONRASI MİYOKARD YARALANMASININ GÖRÜLME SIKLIĞI VE TAHMİN EDİCİLERİ: ÜÇÜNCÜ BASAMAK BİR MERKEZDEN RETROSPEKTİF BİR KOHORT ANALİZİ

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Abstract

Objective: Myocardial injury after noncardiac surgery (MINS) is a prevalent and frequently underdiagnosed perioperative complication, characterised by elevated cardiac troponin levels in the absence of overt ischaemic symptoms. It is strongly associated with increased morbidity and mortality. This study aimed to determine the incidence of MINS, identify its perioperative risk factors, and evaluate its impact on early postoperative mortality.

Material and Methods: This retrospective cohort study included 418 adult patients who underwent noncardiac surgery between January 2024 and May 2025 and were admitted to a tertiary hospital intensive care unit (ICU). High-sensitivity troponin I levels were measured at 1, 24, and 48 h postoperatively. MINS was defined as troponin I >17 ng/L in females and >35 ng/L in males. Demographic data, surgical variables, comorbidities, and outcomes were analysed. Logistic regression analysis identified independent predictors of MINS and mortality.

Results: MINS was detected in 28.5% of patients. It was significantly associated with male sex (OR=1.61; 95% CI: 1.03–2.53), surgery type (p=0.034), and elective surgery, with a paradoxically lower incidence in emergency cases (OR=0.51; 95% CI: 0.33–0.81). Postoperative mortality was significantly higher in the MINS group (18.5% vs. 4%, p<0.001). Independent predictors of mortality included emergency surgery (OR=8.39), longer ICU stay (OR=1.12 per day), and lower body mass index (p=0.02).

Conclusion: MINS constitutes a prevalent postoperative complication that significantly contributes to adverse clinical outcomes. Routine postoperative troponin surveillance in high-risk patients

Öz

Amaç: Kalp dışı cerrahi sonrası miyokard hasarı (MINS), belirgin iskemik semptomlar olmaksızın yüksek kardiyak troponin seviyeleri ile karakterize, yaygın ve sıklıkla gözden kaçan bir perioperatif komplikasyondur. Artmış morbidite ve mortalite ile güçlü bir şekilde ilişkilidir. Bu çalışmanın amacı, MINS insidansını belirlemek, perioperatif risk faktörlerini belirlemek ve erken postoperatif mortalite üzerindeki etkisini değerlendirmektir.

Gereç ve Yöntemler: Bu retrospektif kohort çalışmasına Ocak 2024 ile Mayıs 2025 arasında kalp dışı cerrahi geçiren ve üçüncü basamak bir hastanenin yoğun bakım ünitesine yatırılan 418 yetişkin hasta dahil edildi. Yüksek duyarlılıklı troponin I seviyeleri postoperatif 1,24 ve48. saatlerde ölçüldü. MINS, kadınlarda troponin I >17 ng/L ve erkeklerde >35 ng/L olarak tanımlandı. Demografik veriler, cerrahi değişkenler, eşlik eden hastalıklar ve sonuçlar analiz edildi. Lojistik regresyon, MINS ve mortalitenin bağımsız öngörücülerini belirledi.

Bulgular: Hastaların %28,5'inde MINS tespit edildi. Erkek cinsiyet (OR=1, 61; %95 GA:1,03-2,53), ameliyat türü (p=0,034) ve elektif cerrahi ile anlamlı şekilde ilişkiliydi ve acil vakalarda paradoksal olarak daha düşük bir insidans vardı (OR=0,51; %95 GA:0,33-0,81). Ameliyat sonrası mortalite MINS grubunda anlamlı şekilde daha yüksekti (%18,5'e karşı %4, p<0,001). Mortalitenin bağımsız öngörücüleri arasında acil ameliyat (OR=8,39), daha uzun yoğun bakımda kalış (OR=1,12/gün) ve daha düşük vücut kitle indeksi (p=0,02) yer aldı.

Sonuç: MINS, olumsuz klinik sonuçlara önemli ölçüde katkıda bulunan yaygın bir postoperatif komplikasyondur. Yüksek riskli

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may support earlier diagnosis and management. Optimising perioperative strategies is essential to mitigate the adverse clinical consequences of MINS.

Keywords Myocardial injury · MINS · noncardiac surgery · troponin · postoperative mortality · risk factors · retrospective cohort

hastalarda rutin postoperatif troponin sürveyansı, daha erken tanı ve tedaviyi destekleyebilir. MINS'in olumsuz klinik sonuçlarını azaltmak için perioperatif stratejilerin optimize edilmesi esastır.

Anahtar Kelimeler Miyokard hasarı · MINS · kalp dışı cerrahi · troponin · postoperatif mortalite · risk faktörleri · retrospektif kohort

INTRODUCTION

Myocardial injury is a serious complication that develops following noncardiac surgery and significantly affects postoperative morbidity and mortality. The nomenclature "myocardial injury after noncardiac surgery" (MINS) was introduced into the literature in 2014 to describe this condition and is now characterised by a postoperative increase in troponin levels (1). The asymptomatic characteristics of MINS and its different clinical features from classic myocardial infarction complicate both diagnosis and therapeutic interventions. The risk of MINS after surgery is increased, particularly in elderly patients and individuals with existing cardiovascular disease, making it an important factor to consider in surgical planning and patient management (2). Early recognition and appropriate management of MINS are critical in reducing complications in the postoperative period and enhancing the overall health outcomes for patients. Therefore, careful assessment of patients' cardiovascular status before and after surgery is a vital step in minimising the risk of MINS (3). However, due to the widespread use of highly sensitive cardiac troponin tests, the incidence of MINS is higher than the assumed rate (4).

In the current literature, it has been shown that the incidence of MINS subsequent to major noncardiac surgical procedures varies between 8% and 19% and that this condition is an independent predictor of mortality (5). MINS is more prevalent in geriatric populations, patients with cardiovascular comorbidities, and patients undergoing emergency surgery (6). Physiopathological mechanisms including myocardial ischaemia caused by surgical stress, hypotension, anaemia, tachycardia, and systemic inflammation are thought to play a role in the development of MINS. Furthermore, the type of surgery, duration of surgery, anaesthesia management, and intraoperative hemodynamic fluctuations may also increase the likelihood of MINS development (7).

Despite the growing clinical relevance of MINS, information regarding the diagnostic criteria, predictive factors, and long-term outcomes is still limited (8). Although MINS typically presents asymptomatically, studies have shown a strong association between MINS and both short- and long-term postoperative cardiac events and overall mortality (9). In this regard, a better understanding of MINS, identification of risk factors, and determination of high-risk patients are of great importance for the development of perioperative management strategies.

The primary objective of this retrospective study was to identify perioperative risk factors contributing to the development of MINS by examining troponin I levels measured postoperatively in patients undergoing noncardiac surgery at our hospital. The secondary objective was to investigate whether there was a relationship between MINS and postoperative mortality.

MATERIALS AND METHODS

This retrospective cohort study included 418 adult patients who underwent noncardiac surgery at our hospital between January 2024 and May 2025 and were followed up in the postoperative intensive care unit (ICU) after obtaining Ministry of Health University, İstanbul Education and Research Hospital Ethic Committee approval (Date: 27.06.2025, No: 154). Patients aged 18 years or older and classified as ASA I–V according to the American Society of Anaesthesiologists (ASA) classification were included in the study. Patients classified as ASA VI and those under 18 years of age were excluded.

Troponin I levels were measured three times in patients within the first 48 h after surgery, at 1 h, 24 h, and 48 h, with the highest value being recorded at 48 h (Figure 1). Any value above the reference values determined by gender (women >17 ng/L, men >35 ng/L) was considered indicative of MINS.

Demographic data, comorbidities, type of surgery (major, moderate, minor), surgical urgency (elective/emergency), surgical specialty, body mass index (BMI), age, ICU length of stay (days), and readmission to the ICU were recorded as clinical variables. The primary outcome variable was MINS incidence, while the secondary outcome variable was postoperative mortality.

Statistical analysis

Data analysis was performed using IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY, USA). Categorical data are presented as numbers and percentages, and the chi-square test was used for comparisons between groups. For continuous variables, Student's t-test was used for data showing a normal distribution, and the Mann–Whitney U test was used for data not showing a normal distribution. Multivariate logistic

regression analysis was performed to identify the risk factors associated with MINS and mortality. Statistical significance was set at p<0.05. The discriminatory power of the model was evaluated using the area under the ROC curve (AUC).

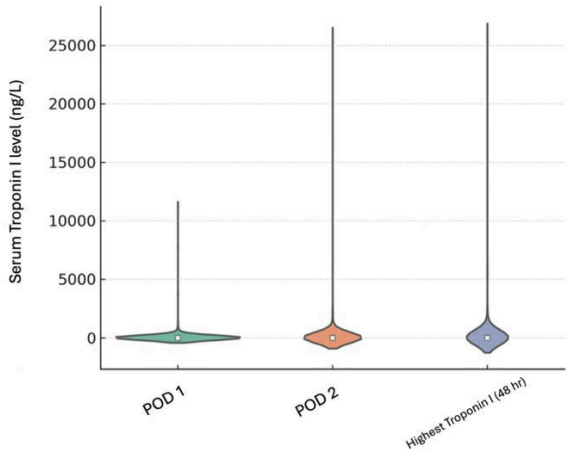


Figure 1. Change and distribution of troponin values within 48 h postoperatively
Troponin I levels measured at the 1st and 2nd postoperative hours, as well as the peak Troponin I level within the first 48 h after surgery, are presented. The figure illustrates the trend and variability of the postoperative troponin values over time.
POD: postoperative day, Hr: hour

RESULTS

The relationship between the demographic and clinical characteristics of the patients included in the study and the development of MINS is presented in Table 1. The incidence of MINS was significantly higher in female patients (69.1% vs. 45.1%; p<0.001). There was a significant association between the type of surgery and MINS; the incidence of MINS was higher in patients who underwent major surgery (86.2% vs. 74.4%; p=0.034). Additionally, the incidence of MINS was significantly higher in patients who underwent emergency surgery (49.5% vs. 32.4%; p=0.001).

The relationship between mortality and certain demographic and clinical variables in the patients included in the study is presented in Table 2. Although mortality rates differed between female and male patients, this difference was not statistically significant (p=0.11). The difference observed between the type of surgery and mortality was at the statistical limit and was not found to be significant (p=0.1). In contrast, the mortality rate in patients undergoing emergency surgery was significantly lower than that in those undergoing elective surgery (1.5% vs. 19.5%; p<0.001). Additionally, the mortality rate in patients who developed MINS was significantly higher (18.5% vs. 4%; p<0.001).

Table 1. Relationship between MINS and demographic and clinical characteristics

	MINS- negative, n (%)	MINS- positive, n (%)	P value
Gender			0.000[1]
Female	152 (45.1)	56 (69.1)	
Male	185 (54.9)	25 (30.9)	
Total	337 (100)	81 (100)	
Type of surgery			0.034[1]
Major	230 (74.4)	94 (86.2)	
Intermediate	69 (22.3)	14 (12.8)	
Minor	10 (3.2)	1 (0.9)	
Total	309 (100)	109 (100)	
Emergency surgery			0.001[1]
Elective	209 (67.6)	55 (50.5)	
Emergency	100 (32.4)	54 (49.5)	
Total	309 (100)	109 (100)	

[1]: Pearson chi-square test was used, MINS: Myocardial injury after noncardiac surgery, Pearson chi-square test was used to compare categorical variables between MINS-positive and MINS-negative groups. Statistically significant differences were observed in gender, type of surgery, and urgency of surgery.

Table 2. Relationship between mortality and demographic and clinical characteristics

	Mortality-negative, n (%)	Mortality positive, n (%)	P value
Gender			0.11[1]
Female	196 (94.2)	12 (5.8)	
Male	188 (89.5)	22 (10.5)	
Total	384 (91.9)	34 (8.1)	
Type of surgery			0.1[1]
Major	293 (90.4)	31 (9.6)	
Intermediate	81 (97.6)	2 (2.4)	
Minor	10 (99)	1 (1)	
Total	384 (91.9)	34 (8.1)	
Emergency surgery			<0.001[1]
Elective	124 (80.5)	30 (19.5)	
Emergency	260 (98.5)	4 (1.5)	
Total	384 (91.9)	34 (8.1)	
MINS			<0.001[1]
Negative	299 (96)	12 (4)	
Positive	119 (81.5)	22 (18.5)	
Total	418 (100)		

[1]: Pearson chi-square test was used, MINS: Myocardial injury after noncardiac surgery

When comparing age, BMI, and ICU length of stay between patients who developed mortality and those who did not, the mean BMI of patients who developed mortality was found to be significantly lower (26.1±5.5 vs. 28.4±6.6; p=0.02). There was no significant difference between the two groups in terms of age (p=0.12). However, the ICU length of stay was significantly longer in patients who developed mortality (8.8±11.0 days vs. 1.9±3.2 days; p<0.001) (Table 3).

Table 3. Mortality in patients with predispositioning factors: BMI, age, and ICU length of stay

	Mortalite negative (mean±SD)	Mortalite positive (mean±SD)	P value
BMI	28.4±6.6	26.1±5.5	0.02[1]
Age	62.0±17.0	65.6±12.2	0.12[1]
ICU length of stay (day)	1.9±3.2	8.8±11.0	<0.001[1]

[1]: Independent sample t-test was used, BMI: Body mass index, ICU: Intensive care unit, SD: Standard Deviation

When comparing age, BMI, and ICU length of stay between patients who developed MINS and those who did not, no statistically significant differences were found between the groups for any of the three variables. Although the mean BMI value of patients who developed MINS was lower than that of patients without MINS, this difference was not statistically significant (27.5±6.3 vs. 29.1±12.5; p=0.086). Similarly, no significant difference was observed in terms of age (p=0.663) and ICU length of stay (p=0.118) (Table 4).

Table 4. BMI, age, and ICU length of stay in patients with MINS

	MINS negative, mean±SD	MINS positive, mean±SD	P value
BMI	29.1±12.5	27.5±6.3	0.086[1]
Age	62.1±16.9	62.9±16.2	0.663[1]
ICU length of stay (day)	2.2±3.9	3.2±6.6	0.118[1]

[1]: Independent Samples t-test was used, BMI: Body mass index, ICU: Intensive care unit, MINS: Myocardial injury after noncardiac surgery, SD: Standard Deviation

In the analysis conducted to evaluate the clinical course in patients with MINS, no significant difference was found between the presence and absence of MINS in terms of readmission rates to the ICU (p=0.92). Readmission rates to the ICU were similar in both groups (presence of MINS: 3.7%; absence of MINS: 3.9%). However, the mortality rate was significantly higher in patients with MINS (15.6% vs. 5.5%; p=0.001) (Table 5).

The analysis of MINS incidence rates by surgical specialty showed the highest rates in orthopaedics (32.5%) and obstetrics (30.8%). These were followed by neurosurgery (26.9%), general surgery (25.6%), urology (19.1%), ear nose throat surgery (ENT) (13%), and ophthalmology (0%). However, these differences were not statistically significant (p=0.373) (Table 6).

Table 5. Clinical course in patients with MINS (readmission rates to the ICU and mortality rates)

	Mins-negative n (%)	Mins-positive n (%)	P value
Readmission to the ICU			0.92[1]
Yes	12 (3.9)	4 (3.7)	
No	297 (96.1)	105 (96.3)	
Total	309 (100)	109 (100)	
Mortality			0.001[1]
Yes	17 (5.5)	17 (15.6)	
No	292 (94.5)	92 (84.4)	
Total	309 (100)	109 (100)	

[1]: Pearson chi-square test was used, ICU: intensive care unit, MINS: myocardial injury after noncardiac surgery

Table 6. Distribution of MINS cases by surgical specialty

Surgical specialty	Total (n)	MINS n (%)
Orthopaedics	80	26 (32.5)
Obstetrics and gynaecology	39	12 (30.8)
Neurosurgery	93	25 (26.9)
General surgery	133	34 (25.6)
Urology	47	9 (19.1)
Ear, nose, and throat (ENT)	23	3 (13.0)
Ophtalmology	3	0 (0)

The Pearson chi-square test was used, MINS: myocardial injury after noncardiac surgery

Logistic regression analysis of factors predicting MINS revealed that three independent variables had a significant or borderline significant effect on MINS:

Gender (male): The likelihood of developing MINS is significantly higher in men than in women (OR=1.61; 95% CI: 1.03–2.53; p=0.038).

Emergency surgery: The likelihood of MINS in patients undergoing emergency surgery is significantly lower than in those undergoing elective surgery (OR=0.51; 95% CI: 0.33–0.81; p=0.004).

Type of surgery (major–moderate–minor): Although the risk of developing MINS is lower in smaller surgeries, this variable was found to be marginally significant (OR=0.73; 95% CI: 0.53–1.01; p=0.056).

No statistically significant difference was found between the presence of comorbidities in the preoperative period and the development of MINS within 48 h postoperatively and in-

hospital mortality. The change and distribution of troponin I levels within the first 48 h postoperatively are illustrated in Figure 1.

According to the logistic regression analysis of factors predicting mortality, four clinical variables that may affect mortality were evaluated: emergency surgery, presence of MINS, BMI, and length of stay in the ICU.

Emergency surgery: The risk of mortality in patients who underwent emergency surgery was found to be significantly higher than in those who underwent elective surgery (OR: 8.39; 95% CI: 2.40–29.36; p<0.001). This finding reflects the high-risk nature of emergency operations.

ICU length of stay: Each additional day spent in the ICU was associated with a statistically significant increase in mortality risk (OR: 1.12; 95% CI: 1.06–1.18; p<0.001). This indicates that prolonged ICU requirement is an indicator of overall clinical deterioration.

Presence of MINS: Although the mortality risk was higher in patients diagnosed with MINS, the effect of this variable was not statistically significant (OR:1.41; 95% CI:0.56–3.58; p0.468).

Body mass index (BMI): No statistically significant association was found between BMI and mortality (OR: 0.97; 95% CI: 0.90–1.04; p0.362).

When evaluating the overall performance of the model, the AUC value was calculated as 0.82 based on the ROC analysis, indicating that the model provides a good level of accuracy in distinguishing mortality.

DISCUSSION

In this retrospective cohort study, it was observed that the incidence of MINS was significantly high. The incidence of MINS detected in our study was similar to the rates reported in the literature. In the first large cohort studies where MINS was defined, the incidence was reported to be approximately 8% (10). Conversely, in prospective studies where troponin levels were systematically monitored during the postoperative period, this rate could rise to 15–20% (11). For instance, in a comprehensive meta-analysis, the incidence of MINS defined by troponin elevation after non-cardiac surgery was found to be 17%–19%; in a series without troponin monitoring, the incidence remained below 10% (12). The observed discrepancies may be related to the variability of the troponin measurement protocols used for MINS diagnosis and the risk profile of the patient population. Because troponin measurements in our study were performed within specific indications, it should be kept in mind that many asymptomatic MINS cases may have been missed. Indeed, it has been emphasised in the literature that a significant proportion of MINS cases may go undetected in patient groups where routine biomarker screening is not performed (12). Consequently, the true incidence is likely to be higher than the values we reported.

Our findings regarding the risk factors associated with MINS development are largely consistent with the literature. In our study, advanced age, male gender, emergency surgery, and major surgical procedures emerged as factors that increased the incidence of MINS. Furthermore, it has been documented in the academic literature that individuals who are elderly and possess cardiovascular comorbidities manifest a markedly heightened risk of developing MINS (13). Meta-analyses have demonstrated that comorbidities such as heart failure, hypertension, diabetes, and chronic renal failure increase the likelihood of developing MINS (14). Although studies have reported varying results regarding gender, comprehensive data sets indicate that the incidence of MINS is slightly higher in men than in women (e.g., 17.7% vs. 16.2%) (12). However, it is noteworthy that this difference is clinically insignificant and that Chang and colleagues did not identify male gender as an independent risk factor in their meta-analysis (14). Indeed, in our study, the MINS rates were similar between male and female patients. This finding indicates that MINS risk is primarily determined by factors such as the underlying cardiac risk profile and surgical stress rather than gender.

The classification and emergency of surgical procedures have a considerable effect on the development of MINS. In our study, we found that MINS was more common after major surgery and emergency surgery. This finding is consistent with the literature, which reports that the incidence of MINS reaches high rates of 18%–20% in patients who have undergone major vascular or orthopaedic surgery (6).

Guidelines from organisations such as the American Heart Association (AHA) and the European Society of Cardiology (ESC) also identify aortic and peripheral vascular surgery or major emergency surgery as the groups with the highest risk of perioperative major cardiac events (15). Indeed, large series have shown that emergency surgery results in approximately twice as many MINS as elective surgery (12). This phenomenon can be explained by factors such as limited preoperative preparation time in emergency cases, significant hemodynamic fluctuations, and high surgical stress load, which predispose patients to myocardial damage. Although our results are consistent with the literature in this regard, the distribution of risk factors may vary depending on the characteristics of the patient population. For example, in our study, no significant increase in MINS incidence was observed in patients with a high BMI. This finding indicates that obesity alone is not a strong predictor of perioperative troponin

elevation. Indeed, Chang et al.'s meta-analysis also reported that BMI did not significantly affect the risk of MINS (14). Although obesity is generally associated with an increase in cardiovascular morbidity, variables such as the presence of concomitant disease burdens, inflammatory responses, and hemodynamic variations during surgical procedures contribute to the emergence of MINS. Therefore, in clinical practice, the patient's overall cardiac risk profile and the characteristics of the surgery are more decisive for MINS than weight.

The relationship between MINS and mortality is one of the most critical findings of our study. According to our analyses, the early mortality rate in patients who developed MINS in the postoperative period was significantly higher than that in those who did not develop MINS.

The extant literature robustly corroborates this inference. Many studies have shown that postoperative troponin elevation, even if asymptomatic, carries significant prognostic importance. In large cohorts, it has been reported that the 30-day mortality rate in patients with MINS is 4-9 times higher than that in those without MINS (16).

Prospective data, including the VISION study, have shown that the 30-day mortality after MINS is significantly increased, regardless of symptoms (10). MINS also has a long-term effect: According to a meta-analysis, the 1-year mortality rate in patients who developed MINS exceeded 20%, while in those who did not develop MINS, this rate was around 5% (6). Our findings further substantiate that MINS is not merely a biochemical abnormality but a clinical condition that can lead to serious consequences. In patients with MINS, not only mortality but also major complications such as congestive heart failure, stroke, and sudden cardiac arrest have been reported to occur more frequently (10). Therefore, when postoperative troponin elevation is detected, clinicians should take this condition seriously and take steps to manage the underlying ischaemic process.

An interesting aspect of our findings is that some risk factors did not have the expected effect in our study. For example, although emergency surgery itself is generally defined in the literature as a factor contributing to high mortality risk, the urgency variable did not have a statistically significant effect on mortality in our study (17). There may be several possible reasons for this contradictory result. First, the number of cases in our emergency surgery group may have been relatively low or heterogeneous, which could have led to insufficient statistical power. Second, the profile of our emergency cases may have differed from the general emergency surgery population in the literature (e.g., young trauma patients vs. elderly emergency abdominal surgery patients). Third, it is possible that the effect of emergency surgery on mortality occurs indirectly through MINS. In other words, emergency surgery increases the risk of MINS, which leads to mortality; when MINS is added to the model, the “urgency” factor may not emerge as an independent determinant. Indeed, in our analyses, MINS was a dominant variable in explaining mortality, which may have overshadowed the effects of other risk factors. Finally, because our study was retrospective in design, some emergency cases that did not undergo troponin measurement may not have been diagnosed as MINS even if they experienced serious cardiac events. All these reasons may have prevented the relationship between emergency surgery and mortality from being fully revealed in our data. Prospective and larger-scale studies are needed to clarify this relationship.

The clinical significance of MINS is evident not only in increased mortality but also in the use of intensive care and hospital resources. In our study, we observed that patients who developed MINS had longer ICU and hospital stays. This finding is consistent with data in the literature; it has been reported that patients with MINS experience more perioperative complications, require reintervention, and have a significantly longer hospital stay (18). In one study, the average hospital stay for patients diagnosed with MINS was found to be approximately three times longer than for those with normal troponin levels (18). Our results also indicate that MINS prolongs the recovery process and increases the burden on the healthcare system. Therefore, it should be kept in mind that patients with MINS may require more intensive care support and close monitoring in the early stages.

This study has some strengths and limitations. Among the strengths of our study is that it is based on real-world clinical data and was conducted under a standardised perioperative care protocol at a single centre. This allows the data we obtained to provide a comprehensive reflection of the practices at the centre and ensures high internal validity of the results. Furthermore, considering the limited data available on MINS incidence and outcomes in our country, our study makes an important local contribution to the literature. In terms of limitations, there are some disadvantages associated with the retrospective design. The retrospective analysis of data creates difficulties in establishing cause-and-effect relationships and carries the risk of record gaps or information bias. The reliance of the MINS diagnosis on troponin measurement is an important limitation; since routine troponin screening was not performed in all patients as per the protocol, some asymptomatic cases of myocardial damage may have been missed. This may have led to an

underestimation of our incidence and prevented some risk factors from achieving statistical significance.

Similarly, testing for troponin only in cases with symptoms or suspected cases may prevent patients with mild troponin elevation from receiving a diagnosis of MINS. The fact that our study was conducted at a single centre limits the generalizability of our results; the frequency of MINS and risk factors may vary in centres with different patient populations and surgical practices. Finally, in our study, postoperative mortality was evaluated using early-term outcomes (in-hospital or 30-day), and long-term cardiac outcomes (e.g., 6-month or 1-year survival) were not analysed. In future studies, it will also be important to determine the effect of MINS on the long-term prognosis and the optimal follow-up period.

CONCLUSION

Myocardial injury after noncardiac surgery (MINS) is a common and clinically significant complication associated with increased postoperative mortality and prolonged hospitalisation. In our study, the incidence of MINS was 28.5%, with higher rates in elderly patients, those with cardiac risk factors, and in emergency or major surgeries. Because most cases are asymptomatic, routine postoperative troponin monitoring in high-risk patients can facilitate early diagnosis. Timely recognition allows cardiology consultation, evaluation of underlying causes, and initiation of secondary preventive strategies. Optimising perioperative management and addressing modifiable risk factors are essential to reduce the burden of MINS. Further large-scale studies are needed to define effective screening protocols and treatment approaches.

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Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul Education and Research Hospital (Date: 27.06.2025, No: 154).

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