

Review Article

Myocardial Injury after Non-Cardiac Surgery and Its Correlation with Mortality - A Brief Review on Its Scenario till 2020

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A B S T R A C T

From various studies documented/ published, myocardial injury following noncardiac surgery is the youngest entity claiming mortality of 3 to 10 percent. Among cardiac complications, Atrial Fibrillation (AF) is one of the common cause. Diagnosis is based on the perioperative 4th generation Troponin-T and 2 or 3 days after the procedure. Its rise is associated with poor prognosis. Many of the issues of pathophysiology still have to be addressed against Myocardial Injury in a Non-cardiac Surgery (MINS). Several investigations report mechanisms of MINS but sill more studies are required to establish strategies to preclude MINS and manage patients with this diagnosis in order to mitigate such mortalities. This manuscript aims to increase awareness about MINS as it is observed that MINS frequently appears in clinical practise and typically prevails in older patients with cardiovascular disease, so clinicians should be sensitized for this consequential complication.

Keywords: Myocardial Injury, Non-Cardiac Surgery, Perioperative Complications, Troponin

Introduction

Intra-operative mortality from anaesthesia is now less and so not easy to measure, but Myocardial Infarction (MI), usually referred to as a heart attack, is now one of the leading fatalities caused in surgical patients, mostly older than 45 years of age.¹ In such cases, the mortality rate is around 10% in 30 days.² The elevation of troponin from cardiac ischemia is a modern description of myocardial injury in a non-cardiac surgery known as MIMS.^{3,4} Several studies have reported a large number of non-cardiac cases to have ischemic myocardial injuries and do not meet the universal concept of myocardial infarctions.⁵ MINS varies from MI, as it is specifically identified by an elevation of troponin with or without the signs and symptoms of cardiac ischemia.⁶ This does not cover myocardial injuries aroused

by nonischemic causes like sepsis, acute fibrillation of the atrium, pulmonary embolism or renal failure; nor does it cover chronically high troponin levels.⁷ The aetiologies of high-scale hsTn measurements were adjudicated in peri-operative ischemia, from the cohort studies of non-cardiac surgery patients who were regularly monitored and in them the elevations in troponin were found to be associated with risk of death.⁸ This document explores various studies in this direction, relating to myocardial injuries in non-cardiac surgery.

Literature Review

Prevention of myocardial injury after noncardiac surgery has drawn increasing attention in recent literature. Table 1, presents recent literature of related works.

Author/ year	Paper/ report	Inference	Ref. No.
Botto et al., 2014	Myocardial injury after noncardiac surgery and its association with short-term mortality	There were 315 out of 1627 with MI out of whom 56 died as Troponin I had been increased in 19% and may be linked with death risk, it would be useful for post-operative troponin surveillance to improve patients' prognosis.	9
Abbott TEF, et al., 2015	Association between intraoperative heart rate and postoperative myocardial injury in patients following non-cardiac surgery	High heart rate is connected to myocardial damage and also mortality however, minimum heart rate was allied with myocardial injury only and not connected to the mortality.	10
Mauermann, E, Puelacher C, Lurati Buse G, 2016	Myocardial injury after noncardiac surgery: an underappreciated problem and current challenges	The system triggering a MINS is expected to shift in the direction of myocardial oxygen rather than a rupture or thrombosis of the coronary artery. It would be helpful to work on minimising myocardial imbalance of Oxygen to ensure optimal perioperative medications.	11
Ogedengbe A, 2017	Predictors of health related quality of life among hypertensive patients attending general outpatient clinic in Federal Medical Centre OWO, Ondo State.	Patients with PMI had six times 30-day mortality relative to people without PMI and sepsis had poorer prognosis with one in three patients dying within 30 days. ECG has low sensitivity and cardiac troponin is susceptible to the clinical diagnosis of PMI. Diabetes, hypertension, deranged with profile, smoking and ischemic heart disease are risk factors of PMI. PMI has been stated to be the highest in vascular surgery.	12
Puelacher Christian et al., 2016	Perioperative Myocardial Injury after Noncardiac Surgery Incidence, Mortality, and Characterization	Perioperative Myocardial Injury (PMI) was observed in one out of seven patients with elevated cardiovascular risk by increased levels of troponin. There is a variation in the presentation of PMI and acute Myocardial Infarction. In PMI patients, 30-day mortality is 6 times more. PMI is also linked to extracardiac causes such as sepsis.	13
Álvarez-García J, de Nadal M, Popova E, 2019	Myocardial Injury After Noncardiac Surgery. Could Dabigatran Be a First Step in Its Management?	Patients whose cardiovascular risk is very high and are undergoing major surgery without perioperative complications, if they have elevated level of troponin in the first days and if they are given Low dose of dabigatran, it may benefit them after assessment of bleeding risk.	14
Puelacher Christian et al., 2020	Etiology of Peri-Operative Myocardial Infarction/ Injury After Noncardiac Surgery and Associated Outcome	PMI is a heterogeneous condition of various pathologies, namely type-1 MI due to plaque rupture and type-2 MI due to oxygen supply-demand mismatch. Other extracardiac cause such as sepsis, pulmonary embolism are also associated with PMI.	15

From previous research it is seen that, although several randomised trials have been undertaken but MINS mechanism remain uncertain. Preventive steps and therapies to avoid or cure MINS also have been found to be lacking. During present time and circumstances prevalent nowadays the human race which is best of all species on the planet is terrified to come out without precautions because of coronavirus and same happens to people undertaking surgeries during these periods leading to preference for emergency surgeries only. This means that more knowledge

is required to be obtained through procedures in order to obtain a greater outcome linked to Myocardial injury and its association with mortality following noncardiac surgery. 16

Conclusion

From the multiple works that were documented in past studies, one of the major cause of morbidity and mortality after the non-cardiac procedure is cardiac complications. The literature revealed that in general there is a high prevalence of MINS during surgeries around 10 percent,

with substantial association with 30-day mortality. However, the improvements can be achieved for the high cardiac risk patient, by identifying relevant risk factors. A greater emphasis must be given to MINS and its care as it has a substantial correlation with postoperative morbidity and mortality. During clinical noncardiac surgery, high troponin has a predictive effect during the perioperative phase and operative teams should be trained for unexpected effects so that during non-cardiac surgery, they can be detected, assessed and treated in time. The timeframe between the elevation of troponin and death can cause physicians, initiating medical treatment for myocardial ischemia, to change the prognosis. Thus the findings of this study stress the need for identifying relevant risk factors and more advanced studies on MINS to recognise different risk factors and optimal therapeutic strategies for clinical variables.

Conflict of Interest: None

References

1. Sellers D, Srinivas C, Djaiani G. Cardiovascular complications after non-cardiac surgery. *Anaesthesia* 2018; 73: 34-42.
2. Mel Grover MSNA. Myocardial Injury After Non-Cardiac Surgery. *The International Student Journal of Nurse Anesthesia* 2020; 19(1): 28-32.
3. Devereaux PJ, Sessler DI. Cardiac complications in patients undergoing major noncardiac surgery. *New England Journal of Medicine* 2015; 373(23): 2258-2269.
4. Devereaux PJ, Szczeklik W. Myocardial injury after non-cardiac surgery: diagnosis and management. *European heart journal* 2020; 41(32): 3083-3091.
5. Alpert JS, Thygesen K, Jaffe A, White HD. The universal definition of myocardial infarction: a consensus document. *Heart* 2008; 94(10): 1335-1341.
6. Adams JE, Sicard GA, Allen BT, Bridwell KH, Lenke LG, Davila-Roman VG et al. Diagnosis of perioperative myocardial infarction with measurement of cardiac troponin I. *New England Journal of Medicine* 1994; 330(10): 670-674.
7. Tanindi A, Cemri M. Troponin elevation in conditions other than acute coronary syndromes. *Vascular health and risk management* 2011; 7: 597.
8. Gillmann HJ, Meinders A, Grohennig A, Larmann, J, Bunte C, Calmer S et al. *Perioperative levels and changes of high-sensitivity troponin T are associated with cardiovascular events in vascular surgery patients. Critical care medicine* 2014; 42(6): 1498-1506.
9. Botto F, Alonso-Coello P, Chan MT, Villar JC, Xavier D, Srinathan S et al. Myocardial injury after noncardiac surgery: a large, international, prospective cohort study establishing diagnostic criteria, characteristics, predictors, and 30-day outcomes. *Anesthesiology* 2014; 120(3): 564-578.
10. Abbott TEF, Ackland GL, Wragg A, Rodseth R, Archbold A, Pearse RM. Association between intraoperative heart rate and postoperative myocardial injury in patients following non-cardiac surgery. *Intensive care medicine experimental* 2015; 3(1): 1-2.
11. Mauermann E, Puelacher C, Lurati Buse G. Myocardial injury after noncardiac surgery: an underappreciated problem and current challenges. *Current opinion in anaesthesiology* 2016; 29(3): 403-412.
12. Ogedengbe A. Predictors of health related quality of life among hypertensive patients attending general outpatient clinic in federal medical centre OWO, ONDO State. Faculty of Family Medicine. 2017.
13. Puelacher C, Lurati Buse G, Seeberger D, Sazgary L, Marbot S, Lampart A et al. Perioperative myocardial injury after noncardiac surgery: incidence, mortality, and characterization. *Circulation* 2018; 137(12): 1221-1232.
14. Álvarez-García J, de Nadal M, Popova E. Myocardial Injury After Noncardiac Surgery. Could Dabigatran Be a First Step in Its Management?. *Revista espanola de cardiologia (English ed.)* 2019; 72(10): 803.
15. Puelacher C, Gualandro DM, Lurati Buse G, Bolliger D, Marbot S, Kindler C et al. Etiology of peri-operative myocardial infarction/injury after noncardiac surgery and associated outcome. *Journal of the American College of Cardiology* 2020; 76(16): 1910-1912.
16. Akhai S, Mala S, Jerin AA. Apprehending Air Conditioning Systems in Context to COVID-19 and Human Health: A Brief Communication. *International Journal of Healthcare Education & Medical Informatics* 2020; 7(1&2).