

Study of Postmortem Pericardial Fluid Concentrations of Troponin T (cTnT) in Sudden Natural Death

Sharad Kuchewar¹, Reena Wagh², Priti Puppalwar³, Kishor Pawar⁴

¹Associate Professor, Dept. of Forensic Medicine, GMCH, Nagpur, Maharashtra, India; ²Professor, Dept. of Biochemistry, GMC Kolhapur, Maharashtra, India ³Professor, Dept. of Biochemistry, GMC Chandrapur, Maharashtra, India; ⁴Junior Resident, Dept. of Biochemistry, GMCH, Nagpur, Maharashtra, India.

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Abstract

Background: Cardiovascular diseases are the most common cause of sudden natural deaths. Cardiac troponin T is a specific biochemical marker of myocardial injury. It may help in diagnosis of early myocardial ischemia when macroscopic or microscopic evidence of necrosis is not available after autopsy. Aim of this study was to assess the effectiveness of pericardial fluid troponin T in predicting the cause of death in sudden natural death and in estimating the post mortem interval.

Materials and methods: It was a pilot study. Sudden natural deaths brought to Forensic Medicine department of GMCH Nagpur for autopsy were included in this observational cross sectional study. Deaths were grouped into cardiac and non cardiac deaths. Pericardial fluid samples were collected by opening pericardial sac with sterile syringe and processed on Roche Cobas e411 autoanalyzer for estimation of levels of Troponin T.

Results: There was a statistically significant difference seen for the values between the groups ($p < 0.05$) for Trop-T (ng/ml) with higher values in Cardiac cause. There was a statistically non significant correlation between postmortem interval vs Trop T ($p > 0.05$).

Conclusion: Estimation of pericardial fluid Troponin-T may be used to predict the cause of death in sudden natural death.

Keywords: Troponin T, sudden death, natural death, post mortem interval

Introduction

Sudden death is defined as “deaths within 24 hours from the onset of the symptoms”.¹ In most of sudden deaths (SD), it is the first and last clinical

manifestation of an underlying disease in previously asymptomatic and healthy looking individual. In that case, only way to find out and register an exact cause of death is to do an autopsy.² 50-60% of the sudden deaths are due to cardiac diseases most common

Corresponding Author: Kishor Shivram Pawar, Junior Resident, Dept. of Biochemistry, GMCH, Nagpur, Maharashtra, India.

Email: drkishorpawar@gmail.com

Mobile: 8879990394

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are coronary artery disease (CAD), Cerebrovascular disease (CVD), cardiomyopathy, rheumatic heart disease and congenital heart disease, etc.³

Epidemiology of sudden cardiac death (SCD) is not well studied in India. First study from India to evaluate the burden of Sudden Cardiac Death (SCD) in the community showed that SCD contributes to 10.3% of the total recallable deaths.⁴ It is observed that more than 7 million lives per year are lost to SCD worldwide.⁵ A majority of sudden death without any trauma will be visually inspected by a forensic medical examiner and reported with death due to atherosclerotic cardiovascular disease, coronary artery disease, myocardial infarction, or similar diagnosis. During autopsy, there may be significant cardiovascular disease but no gross or histologic evidence of an acute myocardial infarct unless the patient survives for several hours following the event.⁶ Postmortem interval (PMI) in forensic medicine is commonly determined by the physical detection parameters. However, these methods do not give an exact PMI.

Troponin in body fluids degrades in a regular and predictable fashion. It could be used as a reliable biochemical marker for determining the cause of death and time since death.⁷ Cardiac troponin T (cTnT) has previously been assessed by many researchers for the postmortem diagnosis of myocardial injury with some controversy. Blood in peripheral blood vessels gets putrefied after death, hence the use of alternative biological fluids, such as pericardial fluid (PF) is possible.⁸

Hence this study was planned with the aim of assessing the effectiveness of pericardial fluid troponin T in predicting the cause of death in sudden natural death and in estimating the post mortem interval.

Objectives:

1. To estimate postmortem concentrations of Pericardial fluid Troponin T in cardiac and non-cardiac sudden natural deaths.
2. To find out the effectiveness of concentrations of Pericardial fluid Troponin T in predicting cause of death in sudden natural cardiac and non cardiac deaths.
3. To study relationship between postmortem interval and postmortem concentrations of pericardial fluid Troponin T in sudden natural cardiac and non cardiac deaths.

Materials and methods:

Sudden natural deaths brought to Forensic Medicine department of Govt. Medical college, Nagpur, Maharashtra, India from January 2022 to July 2022 for autopsy were included in this observational cross sectional study. Deaths were grouped into cardiac and non cardiac deaths. Pericardial fluid samples were processed on Roche Cobase 411 autoanalyzer for estimation of levels of Troponin T. Study was carried out after approval from Institutional Ethics Committee. Permission from Head of the department of Forensic medicine was taken before sample collection. Written informed consent was obtained from the relatives of the study subjects. The proforma was filled in after eliciting the required data.

Inclusion criteria:

- Age- more than 18 years
- Sudden natural death within 24 hrs of onset of symptoms

Exclusion criteria:

- Pericardial Fluid samples contaminated with blood or Inadequate sample
- Cases with evident decomposition.
- Person dying after 24 hrs of onset of symptoms
- Any unnatural death (road traffic accidents, homicides, suicides, and blast injuries)
- Found dead or if deceased time since death is not known

Results and Discussion:

Table no. 1- Mean, SD and range

	N	Minimum	Maximum	Mean	Std. Deviation
Age	15	25	80	50.47	14.030
PMI in min	15	145	1660	917.07	449.831
Trop T (ng/ml)	15	2.0600	57.3800	22.684000	16.4802002

Table no. 2- Distribution as per Medical history

	Frequency	Percent
Chronic alcoholic	2	13.3
Hypertension, DM	1	6.7
Septic shock	1	6.7
Jaundice	2	13.3
Liver cirrhosis with pneumonia	1	6.7
Liver disease	1	6.7
Nil	7	46.7
Total	15	100.0

Table no. 3- Distribution as per Cause of death - Cardiac / non cardiac

	Frequency	Percent
Cardiac	8	53.3
Non cardiac	7	46.7
Total	15	100.0

Table no. 4- Inter group comparison of Trop T (ng/ml) between cardiac & non cardiac causes

Cause	N	Mean	Std. Deviation	Std. Error Mean	Mann-Whitney U value	Z value	p value of Mann-Whitney U test
Cardiac	8	31.323750	17.1309952	6.0567215	10.000	-2.083	0.037*
Non cardiac	7	12.810000	8.8357946	3.3396165			

*There was a statistically significant difference seen for the values between the groups ($p < 0.05$) for Trop T (ng/ml) with higher values in Cardiac cause.

Bivariate Correlations:

		Trop T (ng/ml)
Postmortem interval in min	Pearson Correlation r value	-.059
	p value	.833
	N	15

There was a statistically non significant correlation between PMI vs Trop T ($p > 0.05$)

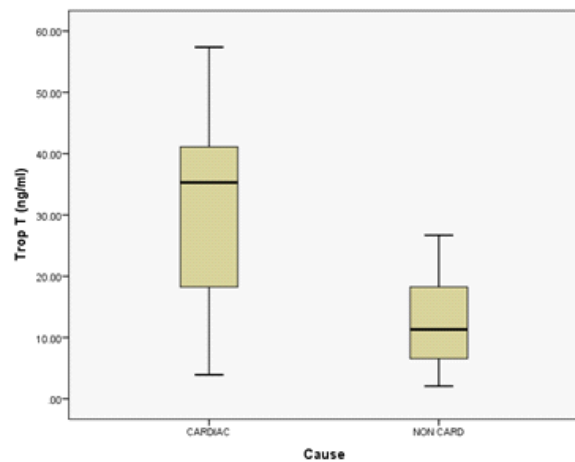


Figure no. 1: Troponin T concentration in cardiac and non cardiac deaths

Troponin T is involved in cardiac muscle contraction and it is widely used as immunochemical diagnostic marker of myocardial pathologies such as myocardial infarction, myocardial trauma, cardiomyopathies, cardiomyositis etc. The cardiac troponin-T has the same kinetics as cardiac troponin I, which is released within 6 hours after the onset of cardiac symptoms and peaks at 12 hours and remains elevated for at least 144 hours after the onset of symptoms.⁶

Major cause of sudden death is cardiovascular diseases. In this study cases among total sudden natural deaths most were due to cardiac cause.

There was a statistically significant difference seen for the values between the groups ($p < 0.05$) for Trop-T (ng/ml) with higher values in Cardiac cause. M Zribi et al, 2021; found a significant elevation of Hs-TnT levels in pericardial fluid and cardiac blood in the cardiac group ($p = 0.014$, $p = 0.004$ respectively).⁵ Study by S. Remmer et al, 2013; concluded that pericardial fluid troponin T levels were significantly higher in cardiovascular disease group than other.⁸ MD Perez et al, 2004; observed similar findings where the highest levels of troponin I was seen in the group of cadavers who had died from myocardial infarction.⁹

There was a statistically non significant correlation between PMI vs Trop T ($p > 0.05$).

Conclusion

Pericardial fluid Troponin-T may be used to predict the cause of death in sudden natural death.

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