

CARDIAC TAMPONADE: A TWO-YEAR CROSS-SECTIONAL AUTOPSY STUDY IN A TERTIARY CARE HOSPITAL IN CENTRAL MAHARASHTRA.

Forensic Medicine

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ABSTRACT

Background: Cardiac tamponade is a significant contributor to sudden death. **Materials, Methods, And Results:** Among 6000 post-mortems conducted from November 2021 to November 2023, we analyzed 39 cases of cardiac tamponade using SPSS4 software to explore epidemiological characteristics and causative factors. Among these cases, 79.48% were males, predominantly aged 51 to 60 years (35.48%), with 70.97% experiencing fatal outcomes within 24 hours due to cardiac tamponade. A pericardial cavity blood volume of 301 to 400 cc (19.35%) proved sufficient for causing death. Most cases exhibited a heart weight ranging from 301 to 350 grams (22.58%), with posterior wall rupture noted in 33.33% of myocardial infarction cases followed by coronary thrombosis at 28.2%. Among females (20.52%), the majority within the 51 to 60 age group (37.5%) and 62.5% succumbed within 24 hours, with highly variable pericardial cavity fluid volumes causing fatal outcomes. Notably, 50% of cases with heart weights of 301 to 350 grams experienced anterior wall rupture (29.2%), and trauma accounted for haemopericardium in 37.5% of cases. **Conclusion:** Individuals aged 51 to 60 years with increased heart weight, prior myocardial infarction, and pro-thrombotic tendencies are at higher risk of cardiac tamponade. Vigilance for symptoms in this demographic is crucial for prompt diagnosis and intervention within 6 to 24 hours. A pericardial cavity blood volume of 301 to 400 cc often triggers a fatal tamponade scenario, frequently associated with anterior wall rupture in females and posterior wall in male.

KEYWORDS

Cardiac tamponade, Sudden death, Coronary thrombosis, Myocardial infarction.

INTRODUCTION

The pericardium acts as a protective covering for the heart, primarily composed of dense fibrous tissue. The pericardial sac typically holds less than 50 cc of thin, clear, straw-colored fluid, providing cushioning during cardiac activity. The parietal pericardium can be distended by various fluids, including serous fluid (pericardial effusion), blood (hemo-pericardium), and pus (purulent pericarditis).¹

Cardiac Tamponade represents an increase in intra-pericardial fluid pressure that surpasses atrial venous pressure, hindering the heart's venous return. The fluid collected in the pericardium can be sero-sanguinous or blood (haemo-pericardium), evolving slowly (500 to 2000 ml) or rapidly (200 to 300 ml).¹

In cases of sudden deaths, the diagnosis of cardiac tamponade is frequently missed, resulting in delayed interventions. This article aims to delineate the risk groups and survival periods for cardiac tamponade, emphasizing the need for timely clinical interventions.

AIMS:

1. Analyze age and survival period distributions among cardiac tamponade cases.
2. Investigate gender-based distributions of rupture sites, heart weight, and causes of haemo-pericardium.
3. Examine the distribution of cardiac tamponade cases based on the presence of blood in the pericardial cavity.

MATERIALS AND METHODS:

This cross-sectional study was conducted at Government Medical College, Nagpur, spanning from November 2021 to November 2023. Throughout this period, 6000 post-mortem examinations were undertaken at this institute. Among these, 39 cases of cardiac tamponade were analyzed for this study. Inclusion criteria encompassed all cases of cardiac tamponade, regardless of age, gender, or hospitalization status, during this study period, except for decomposed and skeletonized bodies.

A proforma detailing the epidemiological characteristics and autopsy findings was completed and analyzed using SPSS4 software and MS Excel. The resulting analyses were compared with previous studies to draw appropriate conclusions.

RESULTS:

1. Age Distribution of Cardiac Tamponade Cases:

Among the 39 cases of cardiac tamponade, the highest percentage of affected males (35.48%) fell within the 51-60 age group. Additionally, 29.05% of cases were observed in the 41-50 age group, and 16.12% were in the 61-70 age group. The lowest number of affected males (6.45%) were recorded in the 21-30, 31-40, and 71-80 age groups, highlighting the susceptibility of males between 41 and 60 years of age to cardiac tamponade.

In the female cohort, the highest incidence (37.5%) occurred in the 51-60 age group, followed by 25% in both the 41-50 and 61-70 age groups. The lowest incidence (12.5%) was observed in the 71-80 age group. This emphasizes the vulnerability of females between 41 and 60 years of age to cardiac tamponade. (Table 1)

Table 1: Age Distribution Of Cardiac Tamponade Cases.

Age Group (Years)	Male Cases (%)	Female Cases (%)
21-30	6.45	-
31-40	6.45	-
41-50	29.05	25
51-60	35.48	37.5
61-70	16.12	25
71-80	6.45	12.5

Survival Period Distribution of Cardiac Tamponade Cases:

- Among males, 70.97% succumbed to cardiac tamponade within 24 hours, while 29.03% survived for more than 24 hours (Figure 1)
- Among females, 62.5% succumbed within 24 hours, and 37.5% survived beyond 24 hours. (Figure 2)

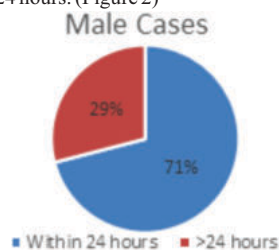


Figure 1: Survival Period Distributions In Males.

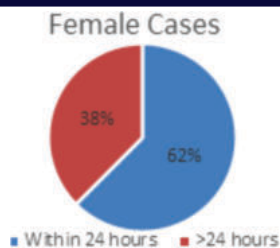


Figure 2: Survival Period Distributions In Females.

Distribution Of Cardiac Tamponade Cases According To Blood In The Pericardial Cavity:

- Out of 39 cardiac tamponade cases in males, 19.35% had 301-400 cc of blood in the pericardial cavity. (Figure 3).
- Additionally, 12.9% had 50-100cc, and 401-500 cc and 10.78% had 601-700 cc of blood in the pericardial cavity, causing fatality.
- Moreover, 9.67% had 101-200cc, 501-600 cc, and 701-800 cc of blood and 5.39 % had 201-300cc, leading to death.
- Only 6.45% had 801-900 cc of blood, and merely 3.22% had 901-1000cc, resulting from slow effusion, causing fatality.

In females, 25% had 101-200 cc and 701-800 cc of blood in the pericardial cavity, leading to fatality. Additionally, 12.5% had 50-100 cc, 301-400 cc, 501-600 cc, and 1001-1100 cc of blood causing death. These statistics highlight the variability of haemo-pericardium leading to fatality in females.



Figure 3- 350g blood clot in the pericardial cavity.

Gender Distribution of Heart Weight Among Cardiac Tamponade Cases:

- Among males, 22.58% of cardiac tamponade cases exhibited heart weights ranging between 301 to 350 grams.
- Additionally, 19.35% displayed heart weights between 401 to 450 grams, and 16.12% between 351 to 400 grams.
- Furthermore, 12.87% had heart weights varying from 551 to 600 grams and 601 to 650 grams.
- In a smaller proportion, 9.74% had heart weights between 501 to 550 grams, and merely 3.23% had weights of 451 to 500 grams.

Among females, 50% showed heart weights of 301 to 350 grams, followed by 25% with 351 to 400 grams. Only 12.5% showed weights between 401 to 450 grams and 601 to 650 grams.

Conflict Of Interest: None

DISCUSSION AND CONCLUSIONS

1. Haemo-pericardium And Age:

Fewer autopsy studies in the literature reflect demographic details of cardiac tamponade cases. While individual case reports and case series exist, detailed autopsy findings and referenced studies are limited. This highlights the necessity for more groundwork on haemo-pericardium cases, underscoring the importance of the conclusions presented in this study.

According to Swaminathan et al (2007)¹⁹, the mean age for haemo-pericardium among males is 73.4 +/- 8.6, and among females, it is 72.5 +/- 13. This is in contract with our present study, indicating susceptibility to haemo-pericardium for cardiac tamponade in the 51 to 60 years age group in both genders.

Haemo-pericardium And Rupture Site:

The present study is consistent with Swaminathan et al (2007)¹⁹

wherein the anterior wall is the most common rupture site in females, accounting for 29.2% of cases. However, in males, the findings do not correlate; the posterior wall is involved as the rupture site in the majority of cases in the present study (40.6%). (Figure4)

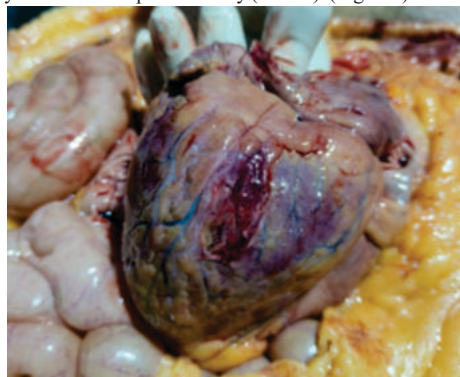


Figure 4: Thinning And Rupture Of Posterior Wall Of Left Ventricle Of Heart.

Haemo-pericardium And Heart Weight:

Literature lacks studies on heart weight in haemo-pericardium cases. The present study concludes that heart weights ranging from 301 to 350 grams, associated with thinning of the heart walls, indicate susceptibility to haemo-pericardium in both males and females.

Haemo-pericardium And Blood Volume:

Swaminathan et al (2007) findings correlate with the present study, indicating that 300 to 400 cc of blood in the pericardial cavity is sufficient for death due to cardiac tamponade.

Haemo-pericardium And Its Causes:

The present study's findings contrast with Swaminathan et al (2007), where rupture following aortic aneurysm is a significant cause of death in men (45%) and women (55%). In this study, myocardial infarction following coronary artery thrombus is an important cause of haemo-pericardium, whereas traumatic haemo-pericardium is significant in females.

Haemo-pericardium And Survival Period:

In males (70.97%) and females (62.5%), haemo-pericardium cases result in death within 24 hours, emphasizing the necessity for earlier diagnosis and intervention. (Figure 1 and 2).

CONCLUSION:

The present study concludes that males within the age group of 51-60 years are vulnerable to myocardial rupture following coronary thrombosis, a significant cause of cardiac tamponade and death within 24 hours, emphasizing the critical need for timely diagnosis and intervention.

REFERENCES:

1. Agrawal A, Zabad MN, Dayanand S, et al. Pericardium: the forgotten space during acute myocardial infarction. *J Emerg Med*. 2018; 55: 85–91.
2. Altun G, Altun A, Yilmaz A: Hemopericardium-related fatalities: a 10-year medicolegal autopsy experience. *Cardiology*. 2005;104(3):133-137.
3. Berner HW, Seisler EP, Barlow J: Fetal cardiac tamponade. A complication of amniocentesis. *Obstet Gynecol*. 1972;40(4):599-604.
4. Cerek B, Shah PK. Acute coronary syndromes: complications of acute myocardial infarction. In *Cardiology*. 2003;2:373.
5. Chandra NC, Ziegelstein RC, Rogers WJ, et al. Observations of the treatment of women in the United States with myocardial infarction: a report from the National Registry of Myocardial Infarction-I. *Arch Intern Med*. 1998; 158(9):981-988.
6. Cheung A, Chan CW: Dissecting aneurysm of coronary artery presenting as cardiac tamponade. *NZ Med J*. 1990; 103(886):129-130.
7. Craven CM, Allred T, Garry SL, Pickrell J, Buys SS: Three cases of fatal cardiac tamponade following ventricular endocardial biopsy. *Arch Pathol Lab Med*. 1990; 114(8):836-839.
8. Fan CC, Andersen BR, Sahgal S: Isolated myocardial abscess causing coronary artery rupture and fatal haemo-pericardium. *Arch Pathol Lab Med*. 1994;118(10):1023-1025.
9. Goldstein S. The necessity of a uniform definition of coronary death: witnessed death within 1 h of the onset of acute symptoms. *Am Heart J*. 1982; 103:156–159.
10. Greenspoon JS, Masaki DI, Kurz CR: Cardiac tamponade in pregnancy during central hyperalimentation. *Obstet Gynecol*. 1989;70:465-466.
11. Guevara RB, Carroll GF and Iteld BJ. Acute non-traumatic cardiac tamponade. *JACEP*. 1979; 8: 270–271.
12. Haskell RJ and French WJ. Cardiac tamponade as the initial presentation of malignancy. *Chest*. 1985; 88: 70–73.
13. Hoit BD. Pericardial disease and pericardial tamponade. *Crit Care Ed*. 2007; 35: S355–S364.
14. Lateef F, Nimbkar N. Ventricular free wall rupture after myocardial infarction. *Hong Kong journal of emergency medicine*. 2003;10(4):238-246.
15. Lee C-Y. Cardiac tamponade: a case series. *Clin Surg*. 2018; 3: 2051.

16. Oliva PB, Hammill SC, Edwards WD. Cardiac rupture, a clinically predictable complication of acute myocardial infarction: report of 70 cases with clinico-pathologic correlations. *J Am Coll Cardiol*. 1993;22(3):720-726.
17. Reddy PS, Curtiss EI, O'Toole JD, Shaver JA. Cardiac tamponade: hemodynamic observations in man. *Circulation*. 1978;58:265-272.
18. Spodick DH. Acute Cardiac Tamponade. *N Engl J Med*. 2003;344(7): 684-690.
19. Swaminathan A, Kadaswamy K, Powari M et al. Dying from cardiac tamponade. *World Journal of Emergency Surgery*. 2007;2:22.
20. Wang ML, Liao WB, Bullard MJ, et al. Cardiac tamponade; in Taiwan. *Jpn Circ J*. 1997; 61: 767-771.