



THE LAST VOYAGE "UNVEILING A MERCHANT MARINER'S FATAL CARDIAC EVENT": A CASE REPORT

Dr. Ajay Singh*

Post Graduate Resident, Department of Forensic Medicine and Toxicology, S.N Medical College, Agra *Corresponding Author

Dr. Richa Gupta

Associate Professor, Department of Forensic Medicine and Toxicology, S.N Medical College, Agra

Dr. Pooja Agrawal

Professor, Department of Pathology, S.N Medical College Agra

Dr. Anjesh Mittal

Post Graduate Resident, Department of Forensic Medicine and Toxicology, S.N Medical College, Agra

ABSTRACT

Ischemic heart disease is the leading cause of morbidity and death worldwide. The survival rate for cardiac arrest can vary widely depending on several factors, including the location of the arrest (survival rate in-hospital is 25% whereas out-of-hospital is 10%), the promptness of medical intervention, and the availability of standard CPR and defibrillation. Cardiac arrest is a sudden and unexpected, often encounter in the clinic, and forensic autopsies and diagnosis can be challenging. Histopathological identification and timing of myocardial infarction become important questions. A proper post-mortem analysis is required with updated knowledge of the ischemic coronary heart disease, and myocardial pathologies, along with the correct interpretation of such findings about clinical scenarios of the deceased. This case report presents the autopsy findings of a young man who succumbed to sudden death with a subsequent diagnosis of myocardial infarction (MI). The deceased is a 36-year-old man, with a history of Myocardial infarction, He had a sudden death at his workplace in China and his embalmed body was sent to India after 25 days. Autopsy reveals hypertrophy and necrosis of the left ventricular, and stenosis of the left coronary artery. Histological examination demonstrates coronary artery occlusion, neutrophilic infiltration, and coagulated necrosis typical pathology of myocardial infarction. Early recognition, a heart-healthy diet, regular exercise, managing stress, managing weight, and regular health checkups can prevent myocardial infarction and its fatal outcome. This study highlights the present knowledge including histopathological findings, to reveal the difference between myocardial injuries and their clinical pathology with current different types of myocardial infarction.

KEYWORDS : ischemic heart disease, sudden death, embalmed, hypertrophy, necrosis

INTRODUCTION

Acute cardiac pathology, inclining myocardial infarctions (MI), various types of anginas, and sudden coronary death, are indeed significant life-threatening conditions with high mortality rates. Data indicate that at least one-third of patients succumb to the condition before reaching the hospital, and an additional 40% to 50% do not survive upon arrival. Furthermore, another 5% to 10% of patients will experience mortality within the first 12 months after an MI¹. These cardiac conditions are not limited to developed countries but are also prevalent in developing countries. Coronary artery disease (CAD) is the primary underlying cause of most MI cases. The ischemic myocardial pathology, which involves different stages of injury and repair, has been extensively studied to enhance post-mortem diagnosis. Recent advancements include non-invasive or minimally invasive post-mortem imaging techniques. These techniques aim to detect coronary occlusion and ischemic injury, potentially serving as an adjunct to or even replacing traditional cardiac autopsy in cases of presumed ischemic death. This is particularly relevant as autopsy rates are gradually decreasing in many countries.

The above highlights, that traditional diagnostic methods may sometimes fall short in explaining myocardial ischemia. It mentions specific scenarios such as sudden coronary deaths without thrombus, peri-procedural myocardial ischemia, and non-coronary causes of ischemia. Additionally, it emphasizes the importance of considering other types of myocardial injury beyond ischemic ones. This complexity is captured in the current clinical classification of myocardial infarction (MI), which categorizes MI into five types based on different causes, mechanisms, and treatment strategies.

Here in this article, we are reviewing the present knowledge and post-mortem diagnostics method's myocardial infarction at autopsy and distinguishing it from other

cardiac pathologies.

Pathogenesis

The selected text explains that myocardial infarction (MI) primarily occurs when coronary blood flow cannot meet the heart's demand. This is often due to narrowed coronary arteries from atherosclerotic plaques, which can be complicated by thrombosis and vasospasm. Additionally, conditions like hypertrophy and tachycardia can also cause MI by increasing the heart's demand for blood beyond what the coronary arteries can supply.



Embalming

Embalming is the process of treating dead body with chemicals to prevent decay and preserve its post-mortem appearance. Embalming is the treatment of the dead body with antiseptic and preservatives to prevent putrefaction. After treatment tissues are fixed, organs are bleached and hardened and blood is converted into a brownish mass. Embalming is indeed crucial for several reasons, such as transporting a body over long distances, delaying the funeral, using the body for future dissection or teaching, and preserving the form of important personalities for public viewing. The process can be applied to both autopsied and non-autopsied bodies, though autopsied bodies require a more specific approach to preparation.

You're right; embalming before an autopsy can indeed compromise vital medicolegal evidence, which is why it is generally avoided. However, there are rare cases where a postmortem examination is conducted after embalming. These situations require meticulous documentation and careful examination to ensure that any remaining evidence is preserved and analyzed correctly.

Case Details

A 38-year-old male deceased was brought to the Department of Forensic Medicine, The deceased died 25 days back in China on duty (working as a marine merchant). The cause of death given by China authorities was – Death due to cardiac arrest without postmortem examination. Then dead body was embalmed and handed over to his relatives after 25 days for funeral procedures in India. However, after bringing the body back to India, relatives requested to conduct a post-mortem examination of the dead body. The case was registered as a medico-legal case by local police authorities. Police did an inquest and requested this department to perform a postmortem examination to know the exact cause of death.

On External Examination

The body was stiff, and rigor mortis and livor mortis were passed. On examination pale patchy area was present over the cardiac region as shown in Figure 1., stitched wounds were present over the left side of inguinal regions as a part of the embalming procedure as shown in Figure 2.

Internal Examination

Upon opening the body there was a formalin smell, the body was pale from the inside, all organs were hardened, and fluid (a mixture of blood and formalin) was present in the visceral organ. On examining the heart, a pale, 3cm x 4 cm soft brownish necrotic patch area was observed at the apex of the left ventricle. (Figure 3).

Embalming can indeed make it challenging to assess certain postmortem findings due to the hardening of organs and the pervasive smell of formalin. In such cases, histopathological examination becomes crucial. By preserving and examining tissue samples from the lungs, brain, liver, spleen, kidneys, and heart, pathologists can still gather valuable information.

Histopathological examination plays a crucial role, In this case, we have taken a sample from the left coronary artery, and a detailed histopathological examination reveals extensive coagulative necrosis in the left ventricle, characterized by loss of muscle fiber architecture and nuclear changes. Neutrophilic infiltration (1-3 days post-infarction) and macrophage presence (3-7 days post-infarction) indicate an acute inflammatory response. Early fibrosis may be observed near necrotic areas, suggesting ongoing repair. Coronary artery examination often shows atherosclerotic changes, including fibrofatty plaques and possible thrombus formation. Secondary tissue analysis may reveal pulmonary congestion or edema and hepatic damage. Embalming can introduce artifacts, complicating histological interpretation.

DISCUSSION

This case report illustrates the challenges and complexities involved in diagnosing the cause of death, particularly in cases of cardiac arrest where embalming has occurred before the autopsy. In this case, a 36-year-old man succumbed to sudden cardiac arrest during his work duties. Despite the absence of a postmortem examination at the time of death, subsequent autopsy findings in India revealed significant cardiac pathology.

Acute myocardial infarction as cause of death can occurs due to decreased coronary blood flow, leading to insufficient oxygen supply to the heart and cardiac ischemia. Decreased coronary blood flow is multifactorial. Atherosclerotic plaques, classically rupture lead to thrombosis, contributing to acutely decreased blood flow in the coronary^{4,5}. But, The most frequent cause of acute myocardial ischemia is atherothrombotic occlusion of a coronary artery^{3,7}. Davies MJ et al⁷ & Farb A et al⁸ studied and concluded that the presence of a mural or totally occlusive thrombotic mass can be a reliable marker of myocardial ischemia, even in absence of microscopically visible necrosis which is similar to our study. Similar case of

sudden cardiac death in young adult was studied by Gupta R et al. where cause of death was Hypertrophic Obstructive Cardiomyopathy (HOCM), but in our case cause of death is myocardial infarction (MI)⁶.

The increased frequency of coronary heart disease and various risk factors, indicates the beginning of an alarming trend. In suspected myocardial infarction patients who are under 45 years of age, abuse of substances, abnormalities in coronary artery, premature CAD, and hypercoagulable status must be considered. After stabilization, risk stratification should be considered. There is a lot of significance of secondary preventable measures for all newly hospitalized patients; if not prevented, the long-term mortality rate can be as high as one-third of cases⁹.

Challenges Associated with Embalming include the alteration of Tissue Characteristics and the body's physical state by introducing chemicals such as formaldehyde, which can render organs stiff and affect the clarity of postmortem findings. This might obscure certain pathological features that would otherwise be evident without embalming. Chemical Interference by the presence of formalin can interfere with the histological examination of tissues. Forensic pathologists must account for these changes while interpreting tissue samples, these changes may misrepresent the true state of the myocardial tissue. Limited External Clues By the time embalming is performed, observable signs such as rigor mortis and livor mortis may have advanced, and the external presentation of the body may not provide sufficient information to guide the forensic investigation.

Despite these challenges, the forensic expert can provide valuable insights into the cause of death. Key findings included, Left Ventricular Hypertrophy and Necrosis and stenosis of the Left Coronary Artery. The histological analysis revealed coronary artery occlusion characterized by neutrophilic infiltration and coagulated necrosis. These features align with typical presentations of myocardial infarction, specifically indicating an acute inflammatory response to cardiac injury.

CONCLUSION

This case underscores the complex nature of diagnosing the cause of sudden cardiac death in the context of myocardial infarction, especially post-embalming. By thoroughly examining autopsy findings and correlating them with clinical knowledge of ischemic heart pathology, the medical community can enhance the accuracy of postmortem diagnoses and contribute to ongoing discussions about preventive measures for ischemic heart disease. The insights garnered from such cases are valuable in refining diagnostic standards and improving clinical outcomes related to heart disease.

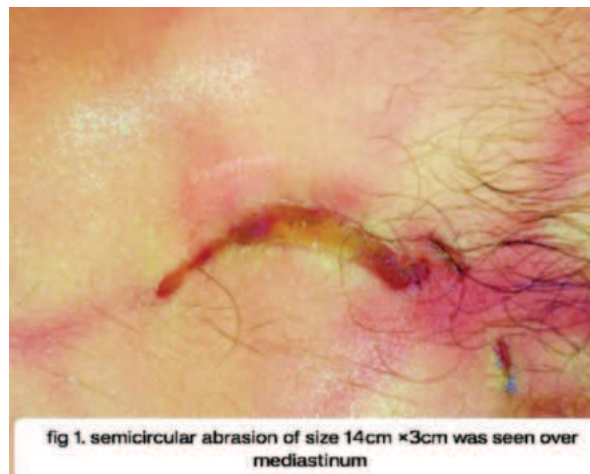




fig 2. sutured wounds were present over the left side of the inguinal region



Fig 3. shows the 3cm x4cm soft brownish necrotic patch was observed in the left ventricle and stenosed coronary artery

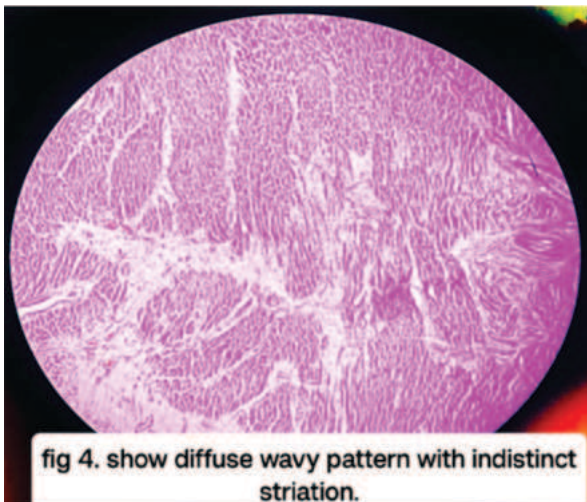


fig 4. show diffuse wavy pattern with indistinct striation.

REFERENCES

1. M Ghafoor, M Kamal, U Nadeem, N. Husain, Educational Case: Myocardial Infarction: Histopathology and Timing of Changes Acad Pathol. 2020 Jan-Dec; 7: 2374289520976639. Published online 2020 Dec 17. doi:10.1177/2374289520976639
2. Basso C, Aguilera B, Banner J, Cohle S, d'Amati G, de Gouveia RH, di Gioia C, Fabre A, Gallagher PJ, Leone O, Lucena J, Mitrofanova L, Molina P, Parsons S, Rizzo S, Sheppard MN, Mier MPS, Kim Suvama S, Thiene G, van der Wal A, Vink A, Michaud K; Association for European Cardiovascular Pathology. Guidelines for autopsy investigation of sudden cardiac death: 2017 update from the Association for European Cardiovascular Pathology. Virchows Arch. 2017 Dec;471(6):691-705. doi: 10.1007/s00428-017-2221-0. Epub 2017 Sep 9. PMID:28889247; PMCID: PMC5711979.
3. M Katarzynna, C Basso, G Amati, C Giordanò, S D Preston, S Rizzo et al, Diagnosis of myocardial infarction at autopsy: AECVP reappraisal in the light of the current clinical classification, Association for European Cardiovascular Pathology (2019) <https://doi.org/10.1007/s00428-019-02662-1>
4. Mossberg S, Polzin A. [Update ESC-Guideline 2017: Dual Antiplatelet Therapy]. Dtsch Med Wochenschr. 2018 Aug;143(15):1090-1093.
5. Scheen AJ. [From atherosclerosis to atherothrombosis: from a silent chronic pathology to an acute critical event]. Rev Med Liege. 2018 May;73(5-6):224-228
6. Gupta R, Mittal A, et al, silent storm with echoes of tragedy unraveling sudden

death in youth – an in-depth autopsy case study of hypertrophic obstructive cardiomyopathy, global journal for research analysis, DOI: 10.36106/gjra

7. Davies MJ (1992) Anatomic features in victims of sudden coronary death. Coronary artery pathology. Circulation (85):119-124 [PubMed]
8. Farb A, Tang AL, Burke AP, Sessums L, Liang Y, Virmani R. Sudden coronary death. Frequency of active coronary lesions, inactive coronary lesions, and myocardial infarction. Circulation. 1995;92(7):1701-1709. doi: 10.1161/01.cir.92.7.1701
9. Sood A, Singh A, Gadkari C. Myocardial Infarction in Young Individuals: A Review Article. Cureus. 2023 Apr 4;15(4):e37102