



CASE REPORT

Ventricular silent rupture leading to sudden death: Navigating diagnostic challenges in a resource-constraint setting

Angela Pallangyo^{1,2} | Jeremia J. Pyuza¹  | Gilbert Nkya¹ | Patrick Amsi^{1,2} |
Alice Andongolile³ | Ahmed M. Makata⁴ | Alex Mremi^{1,2} 

¹Department of Pathology, Kilimanjaro Christian Medical Centre, Moshi, Tanzania

²Faculty of Medicine, Kilimanjaro Christian Medical University College, Moshi, Tanzania

³Kilimanjaro Clinical Research Institute, Moshi, Tanzania

⁴Department of Pathology, Kampala International University in Tanzania, Kampala, Tanzania

Correspondence

Alex Mremi, Department of Pathology, Kilimanjaro Christian Medical Centre, Moshi 3010, Tanzania.
Email: alex.mremi@kcmuco.ac.tz

Key Clinical Message

Ventricular myocardial rupture is a rare complication of myocardial infarction. It occurs within hours to weeks after an infarction. Mortality is high. Antemortem diagnosis is a challenge in low-resource settings, leading to potential misdiagnosis.

Abstract

Left ventricular myocardial rupture is a potentially fatal yet common complication in acute myocardial infarction patients. Rupture can occur as early as hours after an infarction. However, rupture may also occur later in the first week in the setting of myocardial necrosis and neutrophilic infiltration. Patients may survive several days to weeks before rupture occurs, and cardiac tamponade may present subacutely with a slow or repetitive clinical course. Sudden death can be attributed to ventricular rupture, more commonly during this time frame. Myocardial rupture can also occur as a result of trauma, infections, or cancer. Mortality is exceedingly high if surgical intervention is delayed. In most patients, myocardial rupture manifests as a catastrophic event within days of a first, small, uncomplicated acute myocardial infarction. Acute onset of shortness of breath, chest pain, shock, diaphoresis, unexplained emesis, cool and clammy skin, and syncope may herald the onset of ventricular septal rupture after acute myocardial infarction. Sudden death from myocardial rupture during acute myocardial infarction in patients with no apparent previous symptoms of myocardial ischemia represents a challenge for medical examiners, law enforcement officers, and society as a whole. An autopsy is critical for establishing the cause of death. We present the case of a 54-year-old male whose body was found beside the road after a trivial quarrel a day before. Further medical information about the deceased was not available. The preliminary cause of death was presumed to be traumatic. No evidence of trauma was seen during the autopsy. Massive pericardial blood collection compressing the heart and concealed left ventricular myocardial rupture were noted. Histopathological examination of the heart demonstrated myocardial infarction

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2024 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

with a tear associated with bleeding that was contained in the pericardial sac. We ruled cardiac tamponade as the cause of death due to an infarcted myocardial rupture. Antemortem diagnosis of myocardial rupture can be challenging in low-resource settings, leading to potential misdiagnosis and negative impacts such as community conflicts.

KEYWORDS

acute myocardial infarction, diagnostic challenges, resource-constraint, silent cardiac rupture, sudden death

1 | BACKGROUND

Myocardial rupture (MR) is rare but known fatal complication caused by death of myocardial muscles resulting into tear or break.¹ Sudden death can be attributed to ventricular rupture more commonly during this time frame. Usually, it occurs from 1 day to 3 weeks after infarction. Although the incidence of left ventricular wall rupture after an acute myocardial infarction is less than 1%, mortality is exceedingly high if surgical intervention is delayed. It can also occur as a result of trauma, infections, or cancer. In most patients, myocardial rupture manifests as a catastrophic event (acute pulmonary edema, cardiogenic shock, or circulatory collapse) within days of a first, small, uncomplicated acute myocardial infarction. Acute onset of shortness of breath, chest pain, shock, diaphoresis, unexplained emesis, cool and clammy skin, and syncope may herald the onset of ventricular septal rupture after acute myocardial infarction.

This can result in serious complications such as cardiac tamponade, which is a condition where a significant volume of blood accumulates in pericardium and compresses it, leading to decreased cardiac output and potentially fatal consequences.² Myocardial infarction has major legal and psychological implications.³ For example, in a community, a sudden death may raise rumors or false assumptions particularly in previous asymptomatic individuals. In these circumstances, the cause of death will remain suspicious, and the innocent person may wrongly held accountable. The major cause of MR is acute myocardial infarction or heart attack. Myocardial infarction may go silently and undetected and therefore cause sudden death.³ Silent myocardial infarction refers to the presence of a myocardial infarction not clinically recognized at one point in time and discovered at a later point in time, while silent myocardial ischemia refers to the presence of objective evidence of myocardial ischemia in the absence of symptoms related to that ischemia.

The majority of cases of acute myocardial infarctions are caused by coronary atherosclerosis, which is accompanied by luminal thrombus. Rare causes of heart attacks

include coronary spasm, coronary embolism, trauma, other underlying heart conditions, and thrombosis in vessels that are not affected by atherosclerosis.⁴ Sudden deaths resulting from natural causes, particularly those associated with cardiovascular disease, are frequently encountered in the field of forensic practice.⁵ Sudden death can be the initial indication of an underlying illness in individuals who were previously asymptomatic and appeared to be in good health. In such cases, an autopsy is essential as it provides the first and only opportunity to accurately determine and record the cause of death.⁶ In such cases, pathologists play a critical role in discriminating between myocardial infarction as the cause of death and other potential causes, such as myocardial injury. Even with the expertise of distinguished pathologists, the diagnosis of myocardial infarction in the absence of acute coronary occlusion remains challenging.

Pathologists are responsible for the histological identification and timing of myocardial infarction in humans, but achieving precision in these tasks can be difficult.⁵ Proper knowledge of ischemic coronary pathology, guided by appropriate interpretation through correlation with the clinical scenario of the deceased, is necessary to achieve precision.⁶ Cardiac tamponade is a significant factor contributing to sudden cardiac death, often identified as the fatal outcome during autopsy.⁶ However, in low-resource settings like Tanzania, diagnosing sudden death due to myocardial rupture can be a challenging task due to limited access to medical equipment and diagnostic tests.

In addition, cultural beliefs and practices may affect the willingness of family members to allow autopsies or other diagnostic procedures to be performed.⁷ For example, a study that was conducted in the same settings back in 2016 demonstrated that complete diagnostic autopsy (CDA) was viewed as a tool for identifying potential witchcraft involvement, which is often given as a cause of death and a reason for agreeing to a postmortem examination. This means that when relatives see doctors performing autopsy, they wait for possible news on who was involved in causing the death of their relative. Furthermore, in Tanzania, postmortem examinations

are not routinely performed,^{8,9} and the cause of death is often determined based on clinical history and examination. This can lead to misdiagnosis or underdiagnosis of conditions such as myocardial rupture, which may not have obvious clinical signs or symptoms. Consequently, this has negative impacts, which may include community conflicts. For example, in our case, relatives may assume that the deceased family member died because he was traumatized by a person with whom they had a conflict while drinking alcohol. Addressing these challenges requires a multi-faceted approach, including improving access to diagnostic tools, increasing awareness of the signs and symptoms of heart disease especially among people with risk, and promoting the importance of seeking medical care for heart-related symptoms. Apart from that, training healthcare providers to recognize and manage cardiac emergencies, such as myocardial rupture, can also help improve patient outcomes and reduce the risk of sudden cardiac death. This altogether highlights the importance of addressing healthcare infrastructure and resource limitations in improving the diagnosis and management of sudden cardiac death in low-resource settings.

2 | CASE PRESENTATION

A body of a 54-year-old African male, a resident of rural Kilimanjaro, Tanzania, was found by pedestrians lying beside the road one morning. Police officers were informed, and they confirmed that the victim was dead. The body

was taken to morgue for medicolegal autopsy, which was done 2 days later. During autopsy, one of the witnesses reported that a day prior to the incident, the victim was publicly witnessed being quarreling with his friend over money-related issues. The quarrel did not involve physical fight; it was just exchange of open verbal threats. The incident took place in street bar. The following morning, the victim's body was found beside the road. Detailed past medical history of the deceased was not available. The cause of death was presumed to be traumatic.

On external examining, the body had multiple minor bruises but without any serious injury. However, when the chest cavity was opened, the heart size was strangely big and heavy (770 gm) with remarkable left ventricular hypertrophy, but without external evidence of trauma. When the pericardial cavity was open, there was a blood collection of 700 mLs mixed with clots compressing the heart (Figure 1A). In addition, a sharply circumscribed infarcted lesion measuring 7 × 6 cm that was hemorrhagic, soft, and fragile on the apex was seen (Figure 1B). There was about 15-mm-long thrombus stuck in the anterior descending branch of the coronary artery along with considerable atherosclerosis. The remained part of his circulatory system demonstrated mild atherosclerosis. The lesion was biopsied for histopathology evaluation. The lungs were pale with anthracosis. Other body systems examination was essentially normal. Histopathology results from the ischemic lesion showed ischemic left ventricular wall rupture with contained blood in the pericardium (Figure 2A) and coronary artery (presumably left anterior descending) rupture (Figure 2B). The

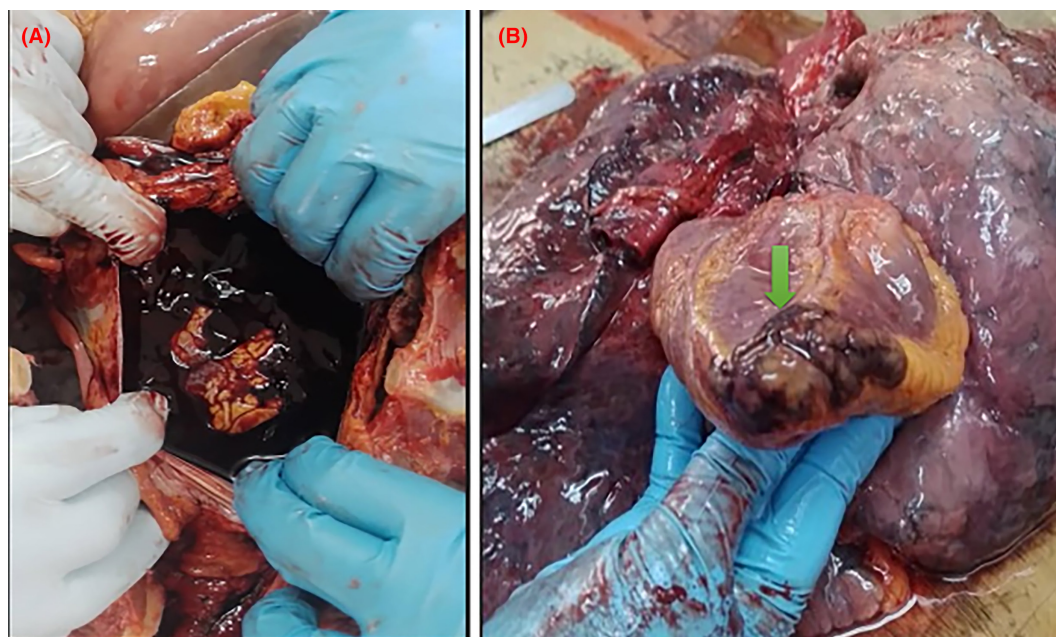


FIGURE 1 Photographs showing the pericardial sac filled with blood surrounding the heart (A), the heart with a sharply circumscribed infarcted lesion measuring 7 × 6 cm around the apex involving anterior interventricular artery (B).

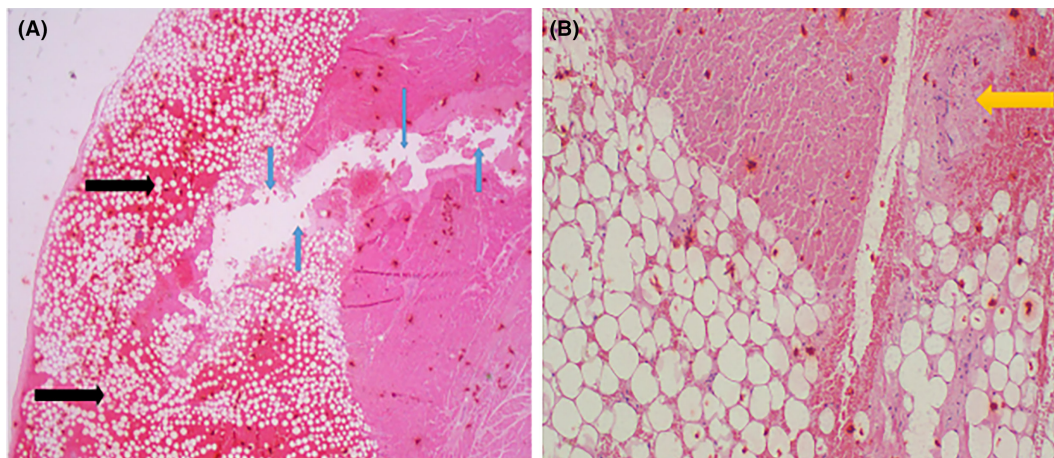


FIGURE 2 Photomicrographs showing necrotic left ventricle rupture (blue arrows) with entrapped blood in the pericardium (black arrows), H&E staining 2x original magnification (A), histopathology demonstrating a ruptured coronary artery (yellow) surrounded by a viable myocytes, H&E staining 10 x original magnification (B).

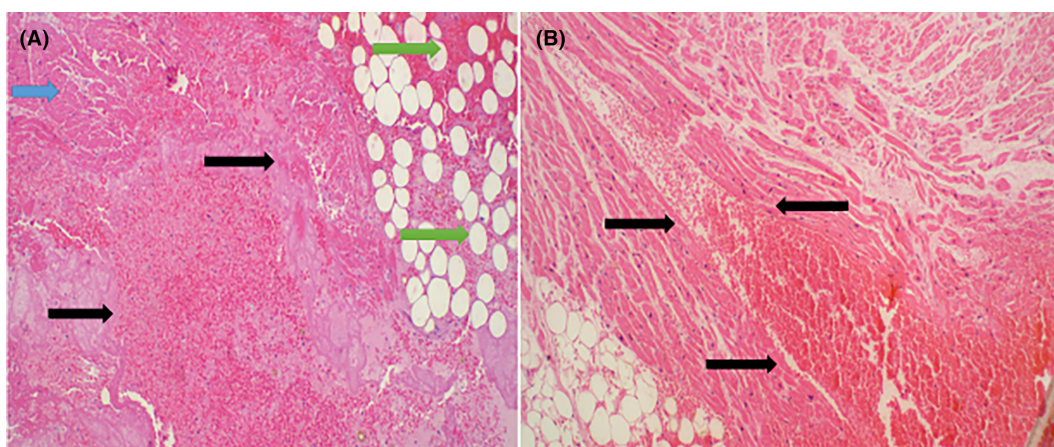


FIGURE 3 Histopathology of myocardium illustrating areas of acute myocardial infarction (black arrows), viable myocardium (blue arrow) and hemorrhage in the pericardium (green arrows) (A), myocardial rupture H&E staining 10x original magnification (B).

surrounding myocytes had necrosis and inflammatory cells (Figure 3A,B). Thus, the immediate cause of death was confirmed to be to cardiac tamponade due to hemopericardium secondary to free ischemic myocardium rupture in ischemic heart disease, which was contrary to what the family and the detectives had in mind.

3 | DISCUSSION

Mechanical problems following a myocardial infarction (MI) are becoming less common due to advances in catheter-based, surgical, and pharmaceutical reperfusion treatments.¹⁰ They do, however, arise in people who have massive or undiagnosed myocardial infarctions and have not had revascularization. Papillary muscle rupture, free-wall rupture, and ventricular septal rupture are all common mechanical problems. Because these consequences

have extraordinarily high fatality rates, prompt diagnosis and treatment are essential.

Myocardial rupture is a cardiac emergency causing cardiogenic shock and carries a high mortality risk despite prompt surgical treatment; hence, in order to improve the treatment outcomes, a high suspicion is warranted.^{11,12} When the diagnosis of ventricular septal rupture is made in timely manner, the patient should be handled in specialized facility with sufficient resources to perform risky and dangerous cardiovascular surgery. However, due to the potentially fatal nature of this consequence, our patient's condition went undiagnosed and kept deteriorating in the absence of cardiac resuscitation, which was required, and finally he succumbed even without a first aid. Myocardial rupture is rare but fatal complication caused by the death of myocardial muscles resulting in tears or breaks.^{13–15} The resulting cardiac tamponade can compress the heart, leading to

decreased cardiac output and potentially fatal consequences. Sudden death can be the first clinical manifestation of underlying disease in individuals who were previously asymptomatic and appeared to be in good health. In low-resource settings like Tanzania, diagnosing sudden death due to myocardial rupture can be a challenging task due to limited access to medical equipment and diagnostic tests. Moreover, cultural beliefs and practices may affect the willingness of family members to allow autopsies or other diagnostic procedures to be performed, which can lead to misdiagnosis or underdiagnosis of conditions such as myocardial rupture.

The definition of a sudden death varies according to authority and convention. The World Health Organization definition is of death within 24 h from the onset of symptoms, but this is much too long for many clinicians and pathologists, some will only accept death within 1 h from the onset of illness.¹⁶ We have to also bear in mind that a death may appear sudden and unexpected to an outsider but may not necessarily been so from the point of the pathological disease process. The deceased may have been symptomless and utterly unaware of his chronic disease, or he may have had symptoms but interpreted them as harmless. Also, fear, lack of human contact, or his own disposition may have prevented him mentioning symptoms to anyone, including a doctor.

Myocardial rupture always occur through an infarct. The softened, necrotic muscle gives way from the internal pressure of the ventricular blood during systole; there being no equalizing rise in external pressure. Hypertension will increase the risk, but a more potent factor is a senile, soft myocardium. Elderly people particularly women, are common victims of a ruptured heart. This by no means excludes younger men if the infarct is extensive and transmural. The most common area for rupture is the more distal part of the free wall of the left ventricle. The septum occasionally ruptures, and the consequent left-right shunt, while the patient survives, provides a classical diagnostic sign for the stethoscopes of clinicians.¹⁶ The rupture does not take place in the early stages of a new infarct, but after a day or two when necrotic softening is well established. The blood usually tracks through tortuous channels between muscle bundles rather than bursting a direct fistula from ventricle to pericardial sac. The infarcted area may not always be obvious, as the haemorrhagic patch may obscure it, but histologically, the ragged tissues and the periphery may be seen to be necrotized. Hemopericardium, as it was mirrored in the index case, is the pathological condition found at autopsy and is not quite synonymous with 'cardiac tamponade', which is a clinical state caused by the progressive accumulation of blood within the closed pericardial sac. As the external pressure rises, the heart cannot fully expand in diastole to

allow filling from the great veins. As input volume falls, so does stroke output. The venous drainage is dammed back so that congestion and cyanosis of the face and neck occur until a fatal endpoint is reached.⁶

The absence of symptoms often associated with myocardial ischemia is referred to as a silent myocardial infarction. Silent myocardial infarction is thought to occur in 2%–4% of young adult asymptomatic men. At autopsy, the majority of individuals with no obvious cause of sudden death were discovered to have substantial coronary heart disease, including longstanding, undiagnosed myocardial infarction. Cases of undetected silent myocardial ischemia in young males appear to be underreported.¹⁷ In this case presentation, the deceased was found lying beside the road, and the cause of death was presumed to be traumatic. However, upon examining the body, there was no evidence of trauma, but the heart size was enlarged, and there was a blood collection of 700 mLs mixed with clots compressing the heart with a lesion on the apex measuring 5×4 cm with whitish areas that were fragile. This case highlights the importance of performing autopsies to accurately determine and record the cause of death, especially in cases where sudden death occurs. Addressing the challenges in diagnosing and managing sudden cardiac death requires a multi-faceted approach, including improving access to diagnostic tools, increasing awareness of the signs and symptoms of heart disease, and promoting the importance of seeking medical care for heart-related symptoms.^{18–20} Training healthcare providers to recognize and manage cardiac emergencies, such as myocardial rupture, can also help improve patient outcomes and reduce the risk of sudden cardiac death. It is crucial to address healthcare infrastructure and resource limitations to improve the diagnosis and management of sudden cardiac death in low-resource settings.

4 | CONCLUSION

Myocardial rupture is a fatal and emergency complication of acute myocardial infarction that can result in sudden death in apparently healthy individuals. Sudden death represents a very challenging event for medical examiners, law enforcement officers, and society as a whole. Interpretation of epidemiological data poses a challenge, partly due to a lack of standardization in death certificate coding as well as variability in the definition of sudden death. Several sudden deaths are not necessarily unexpected, and some unexpected deaths are not necessarily sudden; as a result, it is critical that these autopsies be performed and executed properly. Notably, autopsy findings can have a significant impact on the lives and well-being of the deceased's family, law enforcement agencies,

hospital administrators, and private enterprises, including insurance firms.

AUTHOR CONTRIBUTIONS

Angela Pallangyo: Conceptualization; data curation; investigation; writing – original draft. **Jeremia J. Pyuza:** Data curation; writing – review and editing. **Gilbert Nkya:** Data curation; writing – review and editing. **Patrick Amsi:** Data curation; writing – review and editing. **Alice Andongolile:** Data curation; writing – review and editing. **Ahmed M. Makata:** Data curation; writing – review and editing. **Alex Mremi:** Conceptualization; data curation; investigation; writing – review and editing.

ACKNOWLEDGMENTS

The authors would like to thank Daniel Mbwambo, Ummil Khairat Koosa and Mwayi Alute of Pathology department for supporting this study.

FUNDING INFORMATION

This work did not receive any fund from any source.

CONFLICT OF INTEREST STATEMENT

All authors have declared that no competing interests exist.

DATA AVAILABILITY STATEMENT

There is no data generated from this study.

ETHICS STATEMENT

The patient's legal guardian provided written informed consent to allow for the patient's de-identified medical information to be used in this publication. A waiver for ethical approval was obtained from the authors' institution review board committee.

CONSENT

Written informed consent for publication of clinical details and images was obtained from the patient's legal guardian.

ORCID

Jeremia J. Pyuza  <https://orcid.org/0000-0001-6304-5343>

Alex Mremi  <https://orcid.org/0000-0001-7226-0168>

REFERENCES

- Meniconi A, Attenhofer Jost CH, Jenni R. How to survive myocardial rupture after myocardial infarction. *Heart*. 2000;84(5):552. doi:10.1136/heart.84.5.552
- Alsenan AK, Al Dhneem HN, Alfandi HA, et al. Iatrogenic causes of cardiac tamponade resulting from surgical procedures: an overview. *Cureus*. 2023;15(1):e33773. doi:10.7759/cureus.33773
- Thygesen K, Alpert JS, White HD. Joint ESC/ACCF/AHA/WHF task force for the redefinition of myocardial infarction. Universal definition of myocardial infarction. *Eur Heart J*. 2007;28(20):2525-2538. doi:10.1093/eurheartj/ehm355
- Burke AP, Virmani R. Pathophysiology of acute myocardial infarction. *Med Clin North Am*. 2007;91(4):553-572; ix. doi:10.1016/j.mcna.2007.03.005
- Michaud K, Basso C, d'Amati G, et al. Diagnosis of Myocardial Infarction at Autopsy: AECVP Reappraisal in the Light of the Current Clinical Classification. *Virchows Archiv*. 2020;476(2):179-194. doi:10.1007/s00428-019-02662-1
- Patil A, Singh N, Vigneshwaran S, Bharti S, Sudhakar S. Sudden death due to cardiac tamponade secondary to myocardial infarction Ventricular Wall rupture. *Cureus*. 2022;14(10):e30288. doi:10.7759/cureus.30288
- Bedwell C, Danna VA, Lyangenda K, et al. 'Moving towards Understanding', Acceptability of Investigations following Stillbirth in Sub-Saharan Africa: A Grounded Theory Study. *BJOG*. 2023;130(1):59-67. doi:10.1111/1471-0528.17319
- Byass P. Minimally invasive autopsy: a new paradigm for understanding Global Health? *PLoS Med*. 2016;13(11):e1002173. doi:10.1371/journal.pmed.1002173
- Basso C, Aguilera B, Banner J, et al. Guidelines for autopsy investigation of sudden cardiac death: 2017 update from the Association for European Cardiovascular Pathology. *Virchows Arch*. 2017;471:691-705. doi:10.1007/s00428-017-2221-0
- Soriano CJ, Pérez-Boscá JL, Canovas S, et al. Septal rupture with right ventricular wall dissection after myocardial infarction. *Cardiovasc Ultrasound*. 2005;20(3):33. doi:10.1186/1476-7120-3-33
- Trindade ML, Tsutsui JM, Rodrigues AC, Caldas MA, Ramires JA, Mathias JW. Left ventricular free wall impeding rupture in post-myocardial infarction period diagnosed by myocardial contrast echocardiography: case report. *Cardiovasc Ultrasound*. 2006;26(4):7. doi:10.1186/1476-7120-4-7
- Lou B, Luo Y, Hao X, et al. Clinical characteristics and protective factors in patients with acute myocardial infarction undergoing in-hospital myocardial free wall rupture: a single-center, retrospective analysis. *J Investig Med*. 2019;67(8):1097-1102. doi:10.1136/jim-2019-001070
- Liu X, Cui X, Zhou Z, et al. Factors associated with in-hospital mortality from free wall rupture after acute myocardial infarction. *Heart Lung*. 2023;Jan-Feb;57:198-202, 202. doi:10.1016/j.hrtlng.2022.10.002
- Telmesani A, Al Abri Q, Chamsi-Pasha M. Ventricular septal rupture complicating silent myocardial infarction. *Methodist Debakey Cardiovasc J*. 2022;18(5):77-80. doi:10.14797/mdcvj.1168
- Li T, Kong FX, Wang JL, Yang J, Ma CY. Ventricular septal rupture with right ventricular wall dissection after inferior ventricular infarction: a case report and literature review. *J Clin Ultrasound*. 2019;47(4):247-252. doi:10.1002/jcu.22684
- Saukko P, Knight B. *Knight's Forensic Pathology. Third Edition*. CRC Press; 2004:492-502.
- Solomon SD, Pfeffer MA. Renin-angiotensin system and cardiac rupture after myocardial infarction. *Circulation*. 2002;106(17):2167-2169. doi:10.1161/01.cir.0000034039.01213.39
- Perdigão C, Andrade A, Ribeiro M, Monteiro J, Ribeiro C. Incidence and forms of clinical presentation of the various morphologic types of myocardial laceration in the acute phase of infarct. A 4years'

- case load at a coronary unit. A clinico-anatomic study of 193 successive cases. *Rev Port Cardiol.* 1990;9(7–8):587–598.
19. Moorjani N, Viola N, Haw M. Post infarction inferior ventricular septal rupture: surgical repair through the right atrium. *J Card Surg.* 2009;24(2):218–220. doi:[10.1111/j.1540-8191.2009.00826.x](https://doi.org/10.1111/j.1540-8191.2009.00826.x)
 20. Ari H, Tiryakioglu O, Ari S, Bozat T, Koca V. A rare clinical entity: ventricular septal rupture with right ventricular wall dissection after inferior myocardial infarction. *Echocardiography.* 2009;26(2):211–213. doi:[10.1111/j.1540-8175.2008.00778.x](https://doi.org/10.1111/j.1540-8175.2008.00778.x)

How to cite this article: Pallangyo A, Pyuza JJ, Nkya G, et al. Ventricular silent rupture leading to sudden death: Navigating diagnostic challenges in a resource-constraint setting. *Clin Case Rep.* 2024;12:e8439. doi:[10.1002/ccr3.8439](https://doi.org/10.1002/ccr3.8439)