Case Report

Penetrating Cardiac Injury from a Single Stab Wound: Autopsy Findings of a Lethal Left Ventricular Perforation

Ekky Andhika Ilham, Ahmad Yudianto, William Daniel Napitupulu, Muhammad Kholil Ikhsan and Galih Endradita

ABSTRACT

Penetrating cardiac injuries are uncommon but carry a high mortality rate, particularly when involving the left ventricle. Survival is rare because of rapid blood loss or cardiac tamponade before medical intervention. This case describes the forensic examination of a 27-year-old man who sustained a single stab wound to the left anterior chest inflicted by an unknown assailant. External examination revealed pallor of the conjunctivae and an open wound on the left chest. Internal examination demonstrated blood infiltration of the left anterior thoracic wall extending to the fourth intercostal space. Approximately 1,000 mL of blood was present in the left pleural cavity and 250 mL within the pericardial sac. The stab wound penetrated the pericardium and left ventricle, causing fatal hemopericardium and cardiac tamponade. This case shows how a single deep chest wound can rapidly cause death and highlights the value of detailed autopsy in determining cause and manner of death.

Key Words: cardiac penetrating injury, hemopericardium, cardiac tamponade, stab wound

Citation of Case Report: Ilham EA, Yudianto A, Napitupulu WD, Ikhsan MK, Endradita G. Penetrating Cardiac Injury from a Single Stab Wound: Autopsy Findings of a Lethal Left Ventricular Perforation. Med Forum 2025;36(11):99-101. doi:10.60110/medforum.361120.

INTRODUCTION

Wounds represent a disruption of tissue integrity caused by external mechanical forces and may affect any part of the body.[1] Among these, sharp force injuries remain a major category encountered in forensic practice, encompassing incised wounds, chop wounds, and stab wounds.[2] A stab wound is typically deeper than its surface length and often results from a pointed weapon such as a knife or dagger. When directed toward the thoracic cavity, the consequences can be devastating, particularly if vital structures such as the heart or great vessels are involved.

Penetrating cardiac injuries are relatively uncommon but are associated with very high mortality. Most patients die at the scene before reaching definitive care due to massive hemorrhage or cardiac tamponade.[3,4]

Department of Department of Forensic Medicine and Medicolegal, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Correspondence: Ekky Andhika Ilham, MD, Department of Forensic Medicine and Medicolegal, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.
Email: ekky_andhika_ilham@um-surabaya.ac.id

Received: July, 2025
Reviewed: August-September, 2025
Accepted: October, 2025

The left ventricle is the most frequently affected chamber in fatal cardiac stab wounds because of its anterior position and proximity to the chest wall.[5] Outcomes are determined by the weapon's characteristics, the force of penetration, and whether major cardiac chambers or vessels are compromised.[6]

This report presents the forensic findings of a 27-year-old man who sustained a single fatal stab wound penetrating the left ventricle. The case highlights the mechanism of death resulting from hemopericardium and cardiac tamponade, demonstrating the crucial role of forensic autopsy in establishing both the cause and manner of death.

CASE REPORT

A 27-year-old man was brought to Bhayangkara Pusdik Gasum Porong Hospital, East Java, Indonesia on August 24, 2021, for forensic examination following a report of suspected homicide. The examination was conducted upon police request (visum et repertum number VER/13/VIII/2021/Reskrim, received at 22:05).

External Examination: The conjunctivae appeared pale, and cyanosis was noted on the lips and fingertips. A single open wound was identified on the left anterior chest. The wound measured approximately 2 centimeters in length and 1 centimeter in width, located near the fourth intercostal space. The depth was estimated at 10 centimeters, consistent with a stab wound where the depth exceeded the surface length (Figure 1). No defensive wounds were observed on the upper limbs.

Internal Examination: Blood infiltration was found in the soft tissues of the left anterior thoracic wall extending to the fourth intercostal space. Within the thoracic cavity, approximately 1,000 mL of blood was present in the left pleural cavity and 250 mL within the pericardial sac (Figure 2). Examination of the heart revealed a penetrating wound that passed through the pericardium and into the anterior wall of the left ventricle (Figure 3). The wound edges were clean and sharply defined, consistent with a stab injury caused by a pointed, single-edged weapon.

The trajectory of the wound extended inward and slightly downward from the left anterior chest, corresponding to the external wound site. The depth and direction suggested a strong, deliberate thrust consistent with homicide. The cause of death was determined to be hemorrhagic shock and cardiac tamponade secondary to a stab wound that penetrated the pericardium and left ventricle.

Comparable cases in the literature have described similar fatal outcomes following left ventricular penetration, with survival being exceedingly rare.[5,6] The present findings support that even a single penetrating wound to the heart can cause immediate circulatory collapse through rapid blood accumulation within the pericardial cavity.

Figure No.1: The pathway of the stab wound reconstructed from autopsy findings, showing the trajectory from the external chest entry to the left ventricle.

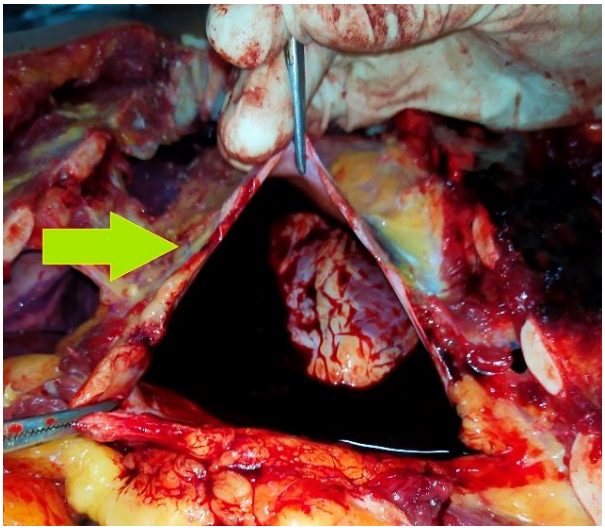

Figure No.2: Accumulation of blood and clot within the pericardial space indicating hemopericardium.

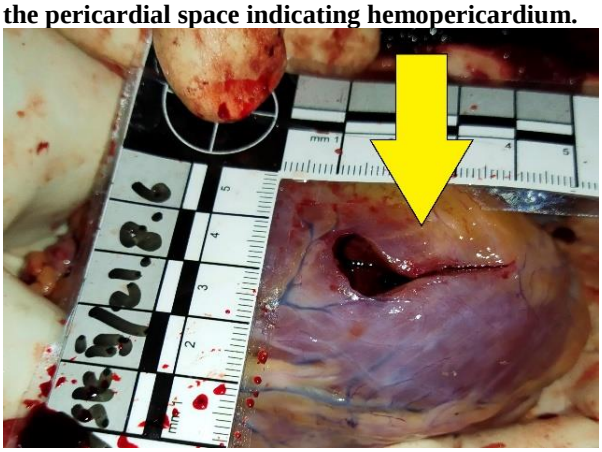

Figure No.3: Laceration of the anterior wall of the left ventricle observed during internal examination.

DISCUSSION

The fatal wound in this case measured 2 cm in length, 1 cm in width, and approximately 10 cm in depth, characteristic of a stab injury where penetration exceeds the surface dimension. Stab wounds result from pointed or sharp-edged weapons and differ from incised wounds by their depth and mechanism of entry.[2] The severity of such wounds depends on several factors, including the sharpness of the weapon, the amount of force applied, and the trajectory of penetration. When the thrust strikes vital organs such as the heart, even a single injury can prove rapidly fatal.[1]

Cardiac stab wounds are rare but among the most lethal forms of thoracic trauma. The heart's position within the chest and the potential for massive bleeding or cardiac tamponade make survival uncommon without immediate surgical intervention.[3,4] The left ventricle, being thick-walled and positioned anteriorly, is particularly vulnerable to penetrating trauma. Injuries to this chamber frequently result in sudden hemodynamic

collapse due to loss of cardiac output and rapid accumulation of blood within the pericardial sac.[5]

In the present case, the autopsy revealed both hemothorax and hemopericardium. The pericardial blood volume of approximately 250 mL was sufficient to induce cardiac tamponade, compressing the heart and preventing diastolic filling. When this condition develops acutely, even small volumes can cause cardiac arrest. These findings align with previous reports describing similar mechanisms in fatal left ventricular wounds.[6]

Forensic examination remains essential in reconstructing the mechanism of death and determining whether the injury was self-inflicted or homicidal. The downward trajectory, absence of hesitation marks, and the force required to penetrate the left ventricle in this case strongly supported homicidal intent. Beyond its medicolegal significance, this case also illustrates how rapid blood loss and cardiac tamponade can coexist, explaining the immediate fatality often observed in penetrating cardiac trauma.

CONCLUSION

This case demonstrates how a single penetrating stab wound can lead to rapid death through combined hemothorax and cardiac tamponade. The perforation of the left ventricle resulted in immediate circulatory collapse, emphasizing the lethal potential of chest stab injuries even when inflicted once. Forensic autopsy played a crucial role in determining the mechanism and manner of death, confirming homicide based on the wound trajectory and absence of hesitation marks. Continuous documentation of such cases remains essential to improve understanding of fatal penetrating cardiac trauma and to support medicolegal investigations.

REFERENCES

1. Hromalik LR Jr, Wall MJ Jr, Mattox KL, Tsai PI. Penetrating cardiac injury: a narrative review. Mediastinum 2023;7:15.
2. Ferrara M, Baldari B, Vittorio S, Bertozzi G, Cipolloni L, De Simone S. Penetrating cardiac injuries: literature review and analysis of the forensic approach. Front Biosci (Landmark Ed) 2022;27(1):29.
3. Bamous M, Abdessamad A, Tadili J, Kettani A, Faroudy M. Evaluation of penetrating cardiac stab wounds. Scand J Trauma Resusc Emerg Med 2016;24:6.
4. Lee A, Hameed SM, Kaminsky M, Ball CG. Penetrating cardiac trauma. Surg Open Sci 2023; 11:45-55.
5. Pswarayi R, Wineberg D, Kerola A. Penetrating cardiac injuries of the left ventricle – a case series and review of literature. Ann Med Surg (Lond) 2025;87(7):4039-4045.
6. Parentić M, Podolski E, Korda M, Katić B, Kajs F J, Krzelj K, et al. Penetrating injury to the left ventricle caused by attempted suicide—a case report. J Surgical Case Reports 2024; 2024(3):rjae159.