

## Spontaneous rupture of three different chambers of heart found during autopsy, a case series

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### Abstract

Haemopericardium and death following spontaneous rupture of heart are not very uncommon. Various literatures till now have described cases of ventricular and atrial ruptures following either myocardial infarction or blunt trauma chest. This paper describes three different autopsy cases of heart wall rupture with haemopericardium, one each of left ventricular, right ventricular and left atrial ruptures.

**Keywords:** haemopericardium; myocardial infarction; left atrial rupture.

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### Introduction

Forensic Pathologists usually deal with criminal, suspicious, accidental and suicidal deaths; along with that, at times we also deal with wide range natural deaths. Many of these are sudden, unexpected, clinically unexplained or otherwise obscure.

The definition of a sudden death varies according to authority and convention. The World Health Organization defined sudden death as: death within 24 hours from the onset of symptoms. However, this 24hours time is much too long for many thus some clinicians and pathologists accepts sudden death as death within one hour from the onset of illness (1).

Almost 50% of sudden death is attributed to diseases of the cardiovascular system and out all the cardiovascular diseases, coronary artery disease and valvular heart diseases are the most common ones (2).

Free heart wall rupture occurs in approximately 5% of the cases and over 10% in patients who died in the hospital by STEMI (ST-Elevation Myocardial Infarction) (3) (4). While rupture of left ventricle

following myocardial infarction (MI) has been reported by many authors, the right ventricular rupture is a rare complication after MI (5) (6). Reports for this type of cases are very few in number (7). Literatures are available which describes cases of ventricular rupture from myocardial infarction, accidents and therapeutic causes (6) (8) (9). Mechanical trauma, myocarditis, mediastinitis, cardiac and extracardiac surgical complications, are some of the other causes of ventricular rupture (10) (11) (12) (13) (14).

Trauma, atrial infarction, fatty degeneration of the muscle, valvular heart disease, tumor of the heart and aneurysm of the atrium were reported as some of the causes of right atrial rupture (15). On rarest occasions rupture of the left atrium was found, following mitral valvular heart disease (15).

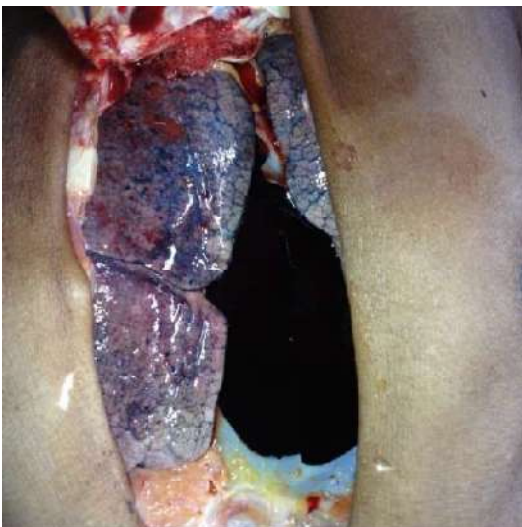
### Case reports

**Case one:** An unknown male of about age 60 years was brought for autopsy by the railway police. As per the history, he was suspected to fallen off from a running train; the body was found lying near the railway tract. External examination of the body revealed a compound fracture of both bones left leg (Figure 1.a) and a laceration over back of

right knee. From external findings, it was presumed that the person died because of haemorrhagic shock following fracture of the limb bones. But once chest cavity was opened, the whole situation was completely different. The pericardial sac was full with clotted blood of around 400ml (Figure 1.b). Examination of the heart showed a laceration over posterior wall of left atrium with dilatation of its cavity (Figure 1.c). The mitral valve was found to be stenosed with vegetations of its leaflets (Figure 1.d). There was severe oedema and congestion of pulmonary parenchyma. On histopathological examination calcification of mitral valve leaflets was present (Figure 1.e).



**Fig. 1a.** Compound fracture of both bones left leg



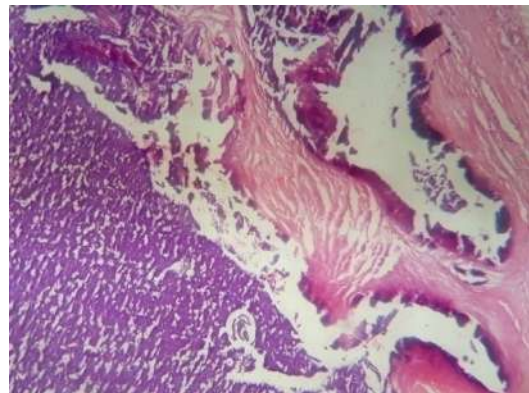
**Fig. 1b.** Pericardial sac full with clotted blood



**Fig 1c.** A laceration over posterior wall of left atrium with dilatation of its cavity



**Fig. 1d.** The mitral valve stenosed with vegetations of its leaflets

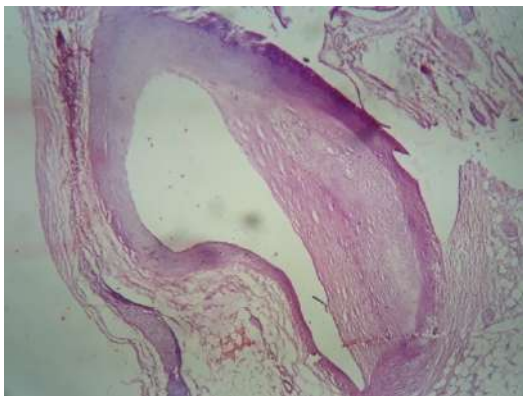


**Fig 1e.** Calcification of mitral valve leaflets

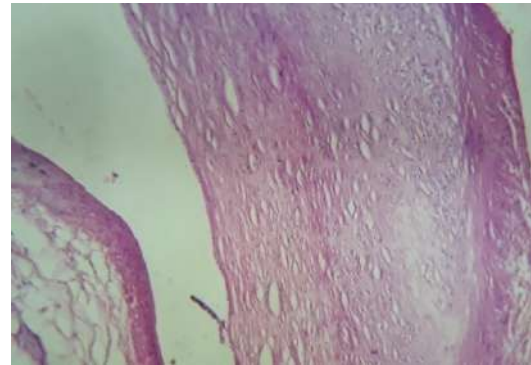
*Case two:* This was a brought dead case of 56 years old male, who had a sudden attack of chest pain with dyspnoea. He was a known diabetic with hypertension for about last 10 years. In accordance to the rule of our Institute for brought dead cases, an autopsy was done. During autopsy the heart was found to be enlarged with more than 500 ml of clotted blood inside the pericardial cavity. The left ventricle showed concentric hypertrophy with a maximum wall thickness of 23mm. There was a single full thickness and two partial thickness ruptures of the left ventricular wall (Figure 2.a).



**Fig 2a.** Single full thickness and two partial thickness ruptures of the left ventricular wall



**Fig. 2b.** 50% obliteration of lumen of left anterior descending artery of heart



**Fig 2c.** An atheromatous plaque with leucocytic infiltration

Histopathological examination showed 50% obliteration of lumen of left anterior descending artery of heart (LAD) (Figure 2.b) by an atheromatous plaque with leucocytic infiltration (Figure 2.c).

*Case three:* A 52 years old male was declared brought dead after a sudden fall from a rickshaw. The person was not known to be suffering from any disease. On opening the chest cavity, the heart was found to be enlarged with blood clot of around 300ml inside the pericardial sac (Figure 3.a).



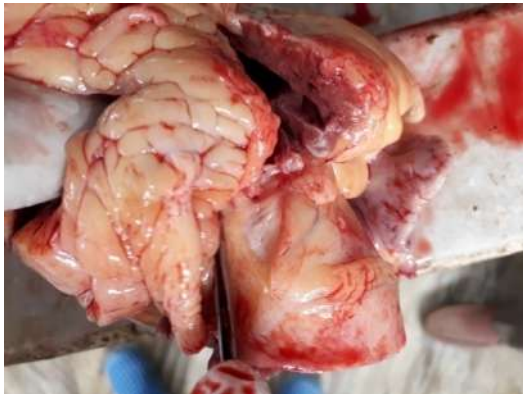
**Fig. 3a.** The heart enlarged with blood clot inside the pericardial sac



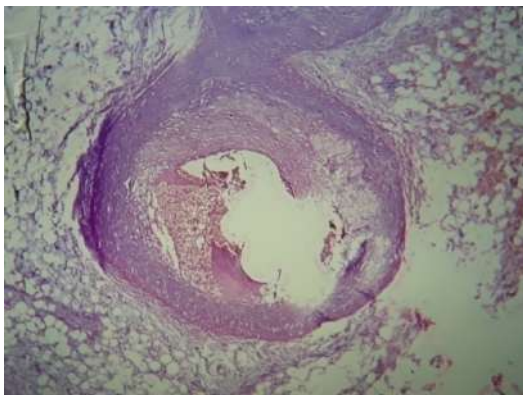


**Fig. 3b.** Right ventricle showed a full thickness rupture

The Heart weighted 525grams and right ventricle showed a full thickness rupture (Figure 3.b). On dissection it was found that there is narrowing of the lumen of right coronary artery (RCA) with almost 80% blockage (Figure 3.c).

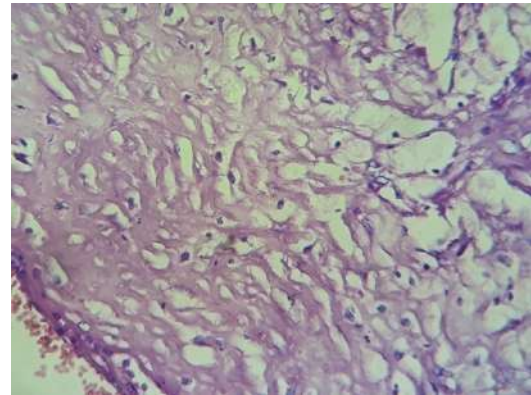


**Fig 3c.** Narrowing of the lumen of right coronary artery (RCA) with almost 80% blockage



**Fig. 3d.** Narrowed lumen of RCA with hemorrhage and atheromatous plaque formation

Histopathological examination revealed narrowed lumen of RCA with hemorrhage and atheromatous plaque formation (Figure 3.d). The atheroma also showed mixed leucocytic infiltration (Figure 3.e).



**Fig. 3e.** The atheroma showing mixed leucocytic infiltration

#### Discussion

Rupture of the free wall of the heart has been reported to be the cause of death in 4-13% of cases of acute MI (16). The incidence of this complication as a cause of death is second only to cardiogenic shock and arrhythmias (17).

Left ventricular rupture is the second leading cause of in hospital death among patients with acute MI (18). This complication is almost universally fatal, and the diagnosis is seldom made before death; therefore, a high index of suspicion is required to detect this potentially devastating complication.

Depending upon severity, rupture of free wall of heart cases usually presents with a sub-sternal chest pain of 30minutes to 6 hours duration. Physician on examination can elicit hypotension, increased venous pressure, feeble or absent heart sounds, pulsus paradoxus and cardiogenic shock (19). An associated abrupt sinus or nodal bradycardia strongly suggests rupture of the heart and cardiac tamponade (20). While transthoracic echocardiography showing free fluid in the pericardial sac is the most confirmatory and sensitive procedure to detect cardiac rupture, wall defects with echogenic mass in the effusion can be detected only in expert hands. Yet again in such cases right cardiac catheterization may show equal pressure in the both the right cardiac chambers (21) (22). Rupture of heart results in sudden haemopericardium and abrupt hemodynamic deterioration due to cardiac tamponade, and usually death occurs within a very short time

following rupture. Rarely patient survives for more than an hour. Prompt recognition of the complication based on clinical features and emergency surgical intervention is absolutely necessary to save life in such cases. Even after timely surgery, both intra and post operative mortality is very high. Lopez-Sendon and colleagues reported an immediate operative mortality rate of 24% and a hospital mortality rate of 52% (23).

Almost 85% ventricular wall ruptures occur within 1<sup>st</sup> week and 40% within 24 hours of onset of MI. An increase in the wall tension in the zone of ischaemia and necrosis leads to dilatation and thinning of the myocardium, which ultimately causes rupture (24). London and London' found in a study of 1000 cases of fatal MI that 50% of ruptures occurred within 3 days and 89% within 14 days (16). Though the anterior wall of the left ventricle is involved more commonly, in one of our cases we found rupture of posterior wall (25).

Krumbhaar et al (25) and Devenport (26) found that the atrial rupture occurred in only 51 (7.18%) cases in the 710 combined cases of spontaneous rupture of heart they had reported. The right atrium was involved in 38 (74.51%) cases and left was found ruptured in rest 13 (25.49%) cases. Kohn RM et al reported total 60 cases of atrial rupture mostly due to infarct, fatty degeneration, trauma, valvular heart disease, tumour and aneurysm (15). These conditions of atrial rupture is hardly diagnosed during life and is suspected only once in 80 cases and is frequently confused with ventricular rupture (15) (27).

#### **Possible risk factors for Cardiac Rupture:**

**Age:** Myocardial rupture (MR) rarely occurs under the age of 50 years. Kohn RM et al found only 5 cases (29.4%) of atrial ruptures following infarction in patients below the age of 50 years. Oblath and colleagues did not find a single case of ventricular rupture below 50 years of age in their study on 80 cases of ventricular rupture (28).

**Sex:** Mixed response is seen amongst various studies conducted on rupture of heart. Kohn RM found 48 (68.6%) male cases in their study of 70 atrial rupture cases. In contrary to this, Obalth et al and Griffith GC et al (29) reported more cases of MR in women with 58.75% and 53.9% cases respectively.

**Pre-morbid conditions of heart:** pre-existing diseases of the heart like MI, hypertension, valvular heart disease etc. can increase the

chances of MR. To some extent a higher BMI and diabetes mellitus also contribute to it.

#### **Conclusion**

Rupture of heart is a near fatal complication in persons suffering from MI as well as valvular heart diseases. It is however seen that there is reduction in morbidity due to myocardial rupture during the last decade or two, because of the better management of acute episode of myocardial infarction and more particularly due to the use of vasopressors and anticoagulants. The physician must be alert and well aware of signs and symptoms of cardiac tamponade, as it can be managed by timely surgical interventions.

It can be suggested now that newer techniques for diagnosis of impending MR should be developed. During therapeutic cardiac interventions as well as in patients with higher risk of rupture with more than 50 years age and sustained chest pain suffering from MI there should be a requisite protocol under which these patients should be evaluated. Treatment has to be directed towards prevention; that is reduction in size of the infarct. For a better and timely intervention of such case, tertiary health care facilities with provision for management of such cases should be created in difficult areas. Lastly, periodic cardiac check up comes up as the solitary way to prevent such complications and save precious lives.

#### **Abbreviations:**

STEMI: ST elevation myocardial infarction

RCA: Right coronary artery

MI: Myocardial Infarction

MR: Myocardial Rupture

#### **Conflict of interest**

None

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