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Case Report

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SUDDEN NATURAL DEATH IN AN UNUSUAL SETTING FOLLOWING RUPTURE OF LEFT VENTRICULAR WALL

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ABSTRACT

Objectives: Cardiac rupture as a complication of Acute myocardial infarction (AMI) has been described as occurring infrequently. In patients with AMI, left ventricular free wall rupture is an infrequent complication (2–4%) but it is associated with a high mortality from pericardial tamponade. It accounts for 5–24% of all in hospital deaths related to AMI. In all such cases with findings of cardiac rupture at autopsy, the forensic pathologist after meticulous autopsy, consider the relative significance of disease, trauma and toxicological findings when determining the cause of death. This requires a consideration of evidence beyond the autopsy including the history, scene and ancillary investigations. ***Methods:*** Heart retrieved and dissected along the great vessels by input output methods. ***Results:*** A case of an unknown about 40 year-old man who was found lying unconscious in a suspicious and isolated place who had findings of ventricular wall rupture complicated by pericardial tamponade. Anterior wall of left ventricle was found ruptured which is of size 3x0.5 cm through and through, 2cm above the apex. On further exploration, arterial walls were found to be thickened. Left anterior descending artery, right coronary artery and left circumflex showed about 80%, 70 % and 60% luminal narrowing respectively. There was slight increase in thickness of left ventricular wall that measured 1.2 cm whereas the right ventricular wall was 0.3 cm thick. ***Conclusions:*** The paper stresses the importance of meticulous autopsy in cases of cardiac rupture in unidentified individuals recovered from suspicious and isolated places with no antecedent history or previous treatment record of any heart related ailment such as myocardial infarct and differentiate sudden death from accidental or homicidal deaths in such cases.

KEYWORDS*:* Post Myocardial Infarction, Ruptured Ventricle, Cardiac tamponade.

INTRODUCTION

Forensic experts in addition to unnatural deaths has to deal with a wide range of natural deaths when the death is abrupt, unexpected or when the terminal event is not witnessed. Death is said to be sudden or unexpected when a person not known to have been suffering from any dangerous disease, injury or poisoning is found dead or dies within 24 hours after the onset of terminal illness. Natural death means that the death was caused entirely by the disease, and the trauma or poison did not play any part.[1] Cardiovascular causes are most commonly responsible for this in about 45-50% cases and AMI is leading entity.[2]

Myocardial rupture occurs in the setting of AMI blunt and penetrating cardiac trauma, primary cardiac infection, primary and secondary cardiac tumors, infiltrative diseases of the heart, and aortic dissection. Myocardial rupture (or perforation) may also occur iatrogenically during percutaneous cardiac procedures (including device implantation) or open heart surgery (particularly valve replacement). Ruptured heart is the most common cause of a haemopericardium and cardiac tamponade, the rupture always occurring through an infarct in non-traumatic cases.[3]

The overall incidence of cardiac rupture following myocardial infarction is estimated to be about 2-7%, but it accounts for as much as 15% of the in-hospital mortality after AMI.[4]

Left ventricular free wall rupture (LVFWR) is a rare complication of AMI, occurring in approximately 2% of cases, and is often fatal because of the development of hemopericardium and tamponade.[5] Rupture of the free wall of the heart has been reported to be the cause of death in 4-13% of fatal cases of AMI.[6]

In clinical settings, though AMI is the most common cause of sudden death, yet ventricular free wall rupture as a complication of AMI is furthermore rare cause. Detection of such rare finding may guide and help to take precautionary measures to save the life of individuals who have a history of AMI as these complications remain unnoticed and often ignored clinically.

Misdiagnosis of AMI is a common cause for malpractice claims. In the United States, diagnostic errors become the most prevalent type of malpractice claim.[7] Findings of myocardial rupture in cases such as the present case recovered from suspicious and isolated setting where no antecedent history or case record is available should be thoroughly examined and possibility of such wound being produced in homicidal or accidental trauma should be ruled out. Therefore careful dissection and thorough examination during autopsy as well as corroborating with inquest papers provided by police is the only key to success for finding the cause of death such as in this case was discussed.

CASE REPORT

A 40 years old male was found unconscious near a divider on road and brought at casualty of LHMC & Associated hospitals where he was declared brought dead. On examination, there was congestion of face and upper half of chest. There were no external injuries over the body. On internal examination, there were findings of ventricular wall rupture complicated by pericardial tamponade that contained about 150 ml of clotted blood. Anterior wall of left ventricle was found ruptured which is of size 4x3cm through and through, 2 cm above the apex. Area of infarct was present over anterior wall of left ventricle, having hyperaemic border of size 3cm x 2 cm, surrounding the tear. “Fig. 1”.

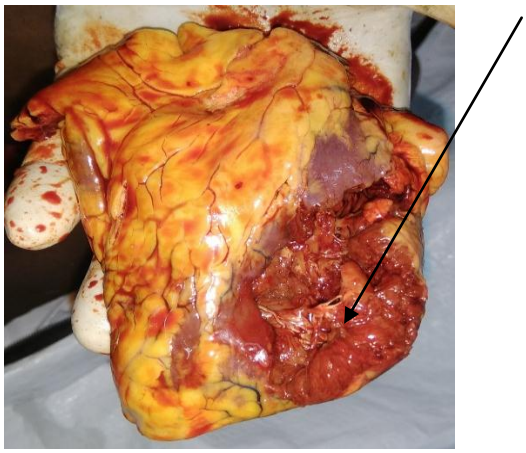

Figure 1: Anterior Ventricular wall rupture

Other visceral organs were intact and pale without any gross trauma or pathology. Stomach was empty with no peculiar odour, mucosa was pale. Toxicological analysis did not reveal any poison or drugs.

On further exploration, coronary arterial walls were found to be thickened. Left anterior descending artery, right coronary artery and left circumflex showed about 80%, 70 % and 60% luminal narrowing respectively. “Fig 2”.

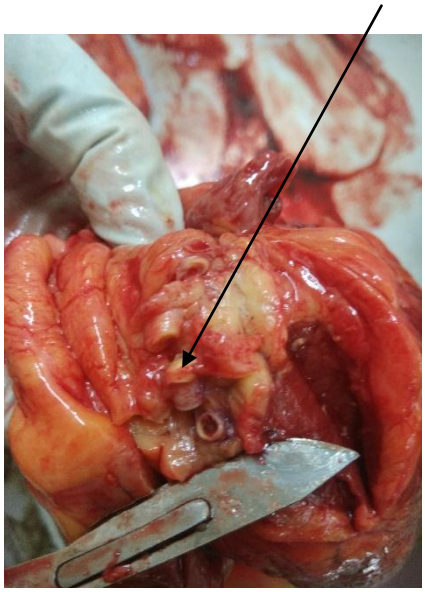

Fig 2: Anterior descending artery showing blockage along the course.

Multiple fibrotic patches suggestive of old myocardial infarct were seen over the posterior surface of heart. There was slight increase in thickness of left ventricular wall that measured 1.2 cm whereas the right ventricular wall was 0.3 cm thick. All internal visceral organs were congested. There were no records of previous history of myocardial infarction. On interrogating about the past medical history the close relatives revealed that the deceased was hypertensive. The cause of death was given as rupture of left ventricular wall secondary to myocardial infarction. Histopathological tests confirmed the diagnosis of myocardial infarction (coagulative necrosis, wavy fibers and pink cytoplasm.

DISCUSSION

Rupture of the myocardium occurs in 2.4% cases of AMI and is often associated with catastrophic haemodynamic sequelae.[8] It accounts for approximately 20% of mortality of these patients[9] and is the 2nd leading cause of in hospital death among patients with AMI.[10]

It has been noted that there has been an increase in the frequency of left ventricular free wall rupture during myocardial infarction since the use of coronary care units became widespread. Nevertheless, premortem diagnosis of rupture is made in approximately 15% of in-hospital deaths from acute MI in a coronary care unit.[9]

Various iatrogenic, traumatic and non-traumatic conditions can result in rupture of myocardium. Traumatic can occur in blunt trauma and penetrating injuries to heart. Non-traumatic conditions can be as a complication of AMI, myocardial abscesses, rarely in infections like tuberculosis, cardiac tumours like angiosacrcoma, infiltrative diseases of heart like sarcoidosis, fatty infiltration etc.

Myocardial rupture is an early complication of AMI with bimodal peak of incidence that is within 24 hours and 3-5 days and range being 1-14 days. It may present as ventricular free wall rupture, papillary muscle rupture or ventricular septal rupture.[11]

Risk Factors

Multiple risk factors are associated with free wall rupture including age, female gender, preexisting hypertension, without significant left ventricular hypertrophy, first AMI[12.13], a first lateral or anterior-wall acute myocardial infarction.[14], Killip class I or II, persistent ST segment elevation, persistent or recurrent chest pain, sudden or progressive hypotension, and sudden electromechanical dissociation.[15] In contradiction to above, in those with left ventricular hypertrophy there was three-fold increase in sudden death and an increased incidence of cardiac rupture.[16] and the overall rate of mortality due to ischemic heart disease is known to increase progressively with age.[17]

Common site of rupture

Most common site of rupture is where the wall was thinned out or dilated due to ischemia or 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. The most common area for rupture is the more distal part of free wall of left ventricle. The septum occasionally ruptures and consequent left to right shunt.[3]

Area of Heart involved

Ischemic myocardial rupture after AMI may involve left ventricular and right ventricular free walls, ventricular septum, and LV papillary muscle, in decreasing order of frequency. It rarely involves the left or right atrial walls. Most common rupture location is on the anterior or lateral wall of left ventricle. A mid-ventricular position along apex-base axis is most common. In the case of a papillary muscle rupture, the posteromedial papillary muscle is twice as likely to rupture as the anterolateral papillary muscle is. Among patients who reach the hospital alive, the right atrium is most commonly involved. In as many as 30% of cases, the rupture involves more than one chamber. Ventricular free wall rupture occurs up to ten times more frequently than septal or papillary muscle rupture.[18] It progresses from the endocardium to the pericardium and occurs through an area of necrosis.

Pathophysiology of free wall rupture

The pathophysiological process of free wall rupture involves thinning of myocardial wall with the intensity of necrosis occurring at distal end of the vessel where there is often poor collateral flow. The shearing effect of myocardial contraction against a stiffened necrotic area causes rupture.

Both hemodynamic factors that is increased intracavitary pressure and regional myocardial structural weakness (myocyte necrosis, collagen matrix resolution, and intense inflammation) can make important contributions to myocardial rupture in the setting of AMI.

Clinical features

Patients with acute cardiac rupture can present with a sudden onset chest pain, sudden loss of consciousness, pulse and blood pressure. Myocardium continues to contract but forward flow is not maintained as blood escapes into pericardial cavity. Cardiac tamponade ensues when the presentation is sub-acute and death occurs within a few minutes. In most instances, the catastrophic clinical presentation occurs within 3-5 days of a rather small infarct.

Types of cardiac rupture

There are four morphological patterns of cardiac rupture classified as Type I to Type IV. In the first two types, there is little-to-extensive bloody infiltration of the myocardium. Types III and IV ruptures are usually grouped together as pseudoaneurysms in which there is a dissection of the myocardial layers sparing the epicardium or the visceral pericardium, the orifice of the rupture being protected by fibrosis or a thrombus.[19]

Premortem diagnosis of rupture is made in approximately 15% of in-hospital deaths from acute MI in a coronary care unit. However, one series of autopsies claims that up to 31% of MI fatalities had cardiac rupture. A careful dissection and observation during autopsy can detect such an unusual finding as the cause of death.

Time duration of rupture

Eighty-five percent of ventricular wall ruptures occur within the 1st week and 40% within the first 24 hours after myocardial infarction.[20] In rare instances, patients simultaneously experience LV free-wall rupture and ventricular septal or papillary muscle rupture (double rupture) after AMI. Rupture of both papillary muscles after AMI has been reported.

Delayed myocardial rupture has been reported as a result of cardiac contusion. Acute mitral or tricuspid regurgitation, ventricular septal tamponade, or pericardial tamponade may result from myocardial rupture secondary to blunt cardiac trauma.

Consequences of myocardial rupure

The consequences of myocardial rupture in the setting of AMI can include pericardial tamponade, ventricular septal defect with left-to-right shunt, acute mitral regurgitation and formation of a pseudoaneurysm.[21] A hemopericardium due to left ventricular free wall rupture is most devastating complication of AMI and is rare cause of sudden death. It is infrequent occurring in 2–6% of all infarctions, but having high mortality (20–30%).

However as far as cardiac ruptures in unnatural settings are concerned these may occur in blunt cardiac trauma, most commonly occurring in the setting of an automobile accident, may cause myocardial rupture as a result of cardiac compression between the sternum and the spine, direct impact on the heart (sternal trauma), or deceleration injury. It may result in rupture of the papillary muscles, the cardiac free wall, or the ventricular septum.

During autopsy the heart be preserved for histopathological sampling. If the heart cannot be retained, it is essential that extensive photographic documentation is made, indicating where individual blocks are taken.[22]

Though AMI is the most common cause of sudden death, yet ventricular free wall rupture as a complication of AMI is furthermore rare cause. Detection of such rare finding may guide and help to take precautionary measures to save the life of individuals who have a history of AMI as these complications remain unnoticed and often ignored clinically. Therefore careful dissection and thorough examination during autopsy is the only key to success for finding the cause of death.

CONCLUSION

Medico-legal autopsy is done in cases of sudden, suspicious and unnatural deaths. From medicolegal point of view, unexpected aspect of death is more significant than its rapidity. It is the striking invasion of the unexpected that is often responsible for arousing the suspicion of violence.

Though AMI is the most common cause of sudden death, yet ventricular free wall rupture as a complication of AMI is furthermore rare cause. Detection of such rare finding may guide and help to take precautionary measures to save the life of individuals who have a history of AMI as these complications remain unnoticed and often ignored clinically. Therefore careful dissection and thorough examination during autopsy especially in an unidentified person in an unknown setting always arises suspicion of homicidal manner of death. In all such cases a meticulous autopsy, thorough examination of scene of crime is important. In such cases, for finding the cause of death exhaustive discussion for all probabilities and possibilities with experts of different faculties including surgeons, plastic surgeons, gastroenterologists, pathologists, the police officials, medical and paramedical staff of concerned hospital along with detailed examination of previous medical history, investigation and treatment record papers as well as other inquest papers is necessary.

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