

## ACUTE MYOCARDIAL INFARCTION DUE TO KNIFE INJURY – A CASE REPORT

Imran Hameed<sup>1</sup>

1 Anklesaria Nursing Home, Karachi, Pakistan

**Address for Correspondence:**

Dr. Imran Hameed  
Anklesaria Nursing Home, Aga Khan III road garden, Karachi, Pakistan.  
**Email:** imranhameed61@hotmail.com

**Contribution**

IH conceived the idea and designed the study, collected data and drafting and finalized the manuscript.

All authors declare no conflict of interest.

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### ABSTRACT

Acute Myocardial Infarction is usually a sequela of atherosclerotic process but can result from some rare causes as well. Trauma to the chest wall either blunt or penetrating can cause such a mishap. Case of a young man is described who sustained STEMI due to severing of Left anterior descending coronary artery by a penetrating knife injury, stabbed on the left side of the chest during a scuffle with bandits. Being resident of a remote area of a very poor neighboring country, the victim couldn't get the medical care needed and after wandering in various hospitals he reported at my clinic in congestive heart failure. Previous record showed antero-apical wall MI with Pericardial effusion. Thorough workup for elaboration of all the injuries and complications was instituted and the patient was discharged in NYHA functional class I.

**Keywords:** Acute Myocardial Infarction, Penetrating knife injury, Pericardial effusion.

## INTRODUCTION

According to WHO the main proportion for CVD (82%) at global level is contributed by developing countries.<sup>1</sup> Myocardial infarction, is usually a sequela of atherosclerosis involving the coronary arteries. However, there are rare causes of it as well.

Trauma to the chest wall by penetrating injuries (bullet or knife) or blunt impacts causing cardio-respiratory injuries have been reported in literature. Bhuller et al. have reported a case of penetrating chest injury which damaged the lung (remedied by wedge resection), however as the patient came out of OR, developed an Acute STEMI of inferolateral wall, due to a thrombus necessitating angiography and thrombus extraction.<sup>2</sup> These injuries can cause rupture/laceration of the lungs resulting in pneumothorax, pleural effusion and collapse. The heart may also be involved in such traumatic events, resulting in laceration or tearing of the myocardium, septal defects, free wall rupture or pericardial effusion (leading to tamponade). Great vessels, coronaries and atria may also be involved. In most cases of injuries caused by a knife, the lungs and heart are simultaneously involved.

This report entails a case study of a young man sustaining chest wall injury by penetration of a knife which traumatized the Left anterior descending artery causing its obstruction/dissection with resultant massive myocardial infarction and large pericardial effusion. No perforation of any chamber of the heart occurred. Such an isolated event of LAD trauma causing transmural MI has rarely been reported in literature. Transection of left anterior descending artery by a penetrating projectile has been reported by Dawson J et al which was managed conservatively as the injury affected the distal course of the vessel.<sup>3</sup> Such cases occur extremely rarely and hence only few case reports can be seen in literature.

As the patient reported nearly 30 days after the index event in congestive heart failure, he was thoroughly investigated and managed accordingly.

## CASE REPORT

A twenty-four-year-old young man reported to the clinic with a history of knife injury to the left side of the chest sustained during a quarrel with bandits about a month ago. A single vertical cut was noted in left anterior chest wall- fourth intercostal space, 3 cm in length. This the patient says, he sustained during the scuffle as he laid down the assailant and was on top of him when the assailant with his right hand poked the knife in patient's chest in a left to right direction (thus the edge of the knife reached the cardiac area although the point of entry was outside the mediastinal box).

The patient was in NYHA functional class III/IV with evidence of congestive heart failure (JVP 12 cm in sitting position, S3 gallop at apex, bibasilar rales and 2F hepatomegaly). His demographics, vitals, and laboratory parameters are as shown in Tables 1.

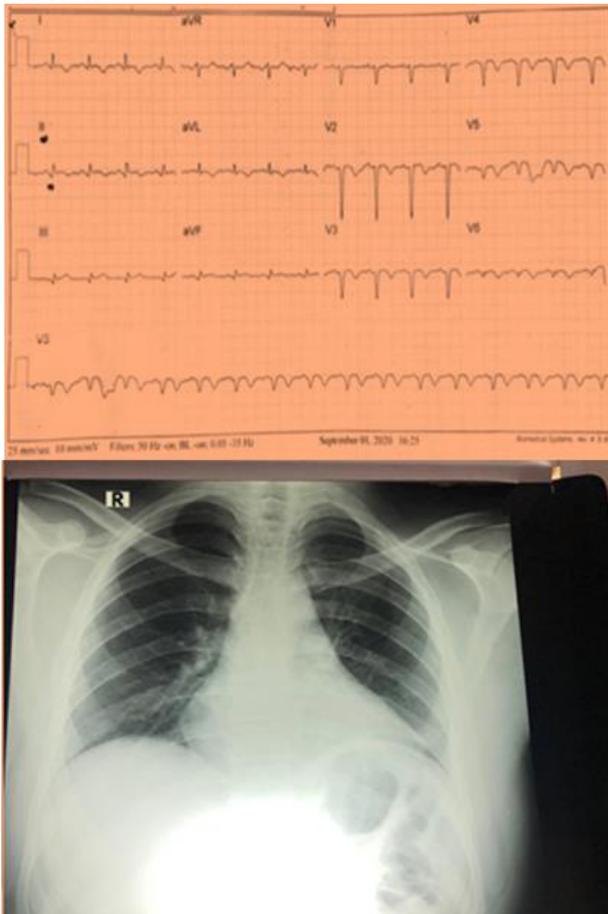
**Table 1: Patient's demographics, vitals, and laboratory parameters**

Characteristics	Summary
<b>Demographics</b>	
Age	24 y
Sex	Male
Height	170 cm
Weight	90 kg
BMI	31.1 kg/m <sup>2</sup>
BSA	2.01 m <sup>2</sup>
<b>Vitals</b>	
Pulse	95bpm
Blood Pressure	110/80
Respiratory Rate	22/ mt.
Temperature	98 Fahrenheit
<b>Laboratory Parameters</b>	
Hemoglobin	10.7 g/dl
Platelets	280000
Total Leukocyte Count	8900
Neutrophils	68%
Lymphocytes	27%
Eosinophils	2%
Basophils	0%

Monocytes	3%
ESR	128
Urea	37.94 mg/dl
Creatinine	1.2 mg/dl
Sodium	138 mEq/L
Potassium	4,8 mEq/L
Troponin I	0.02
Total Cholesterol	180
LDL Cholesterol	100
HDL Cholesterol	44

ECG showed sinus tachycardia, normal PR interval, mean QRS AXIS OF + 15 degrees, Q waves from V<sub>1</sub> to V<sub>6</sub> with coved ST segment and T wave inversion in lead I, aVL and V<sub>1</sub>-V<sub>6</sub>, Figure 1.

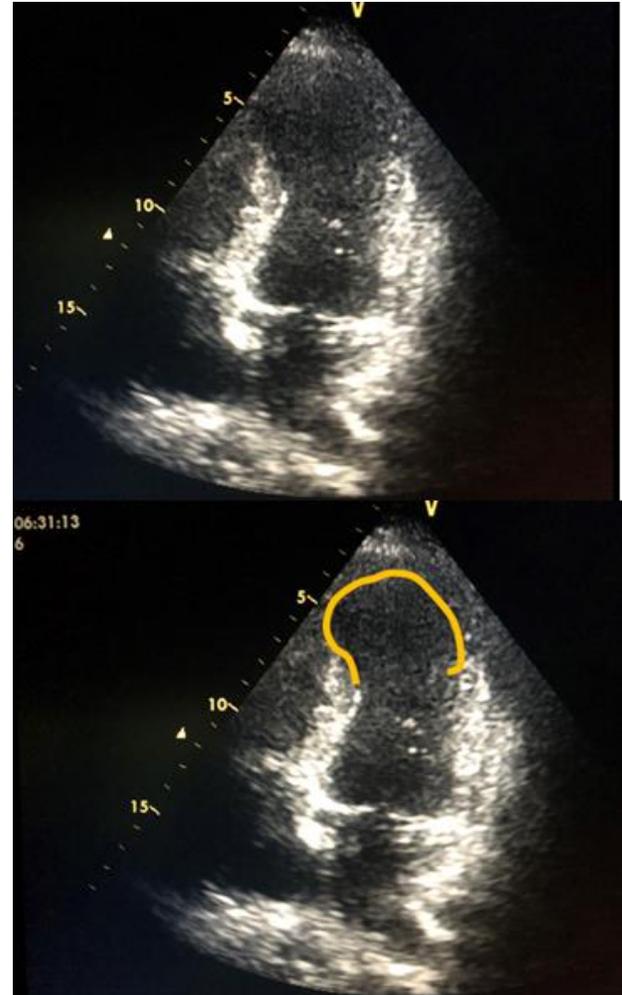
**Figure 1: 12 Lead ECG on left and Chest X-ray PA view**



Chest X-ray showed mild cardiomegaly (CT ratio - 0.52) with pulmonary congestion and no evidence of pleural effusion, pneumothorax or bony injury, Figure 1.

Echocardiography showed enlarged left ventricle with moderately severe dysfunction, approx. EF = 30 – 35%. Wall motion analysis showed a large area of akinesia involving LV apex, apical halves of IVS and the anterior wall with some aneurysmal dilatation Figure 2. Inferior, posterior and lateral walls showed normal contraction. Grade II diastolic dysfunction was noted with increased LV filling pressure.

**Figure 2: Apical 4C view showing large area of apical involvement with some aneurysmal dilatation**

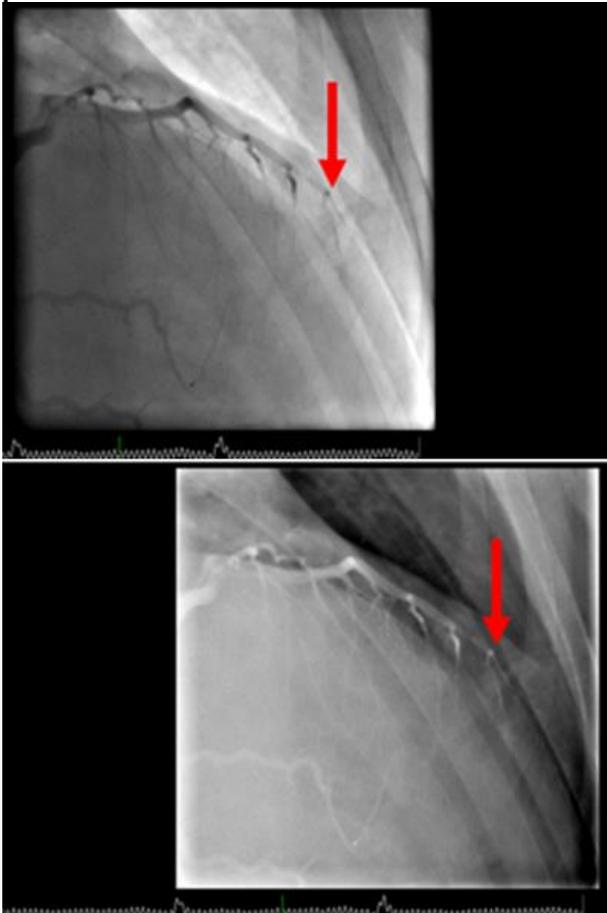


CT scan of the chest showed no evidence of pneumothorax or pleural effusion.

Coronary angiogram done showed total cut-off of LAD at the junction of mid and distal segment with other coronaries being normal, Figure 3. The lumen of LAD showed marked tapering in its mid segment as well. As the procedure was done after appreciable delay from index event, the reparative process has blunted the acute findings of a severed

vessel. However, no artery could be seen in any view supplying the large area of apex, the site of infarction.

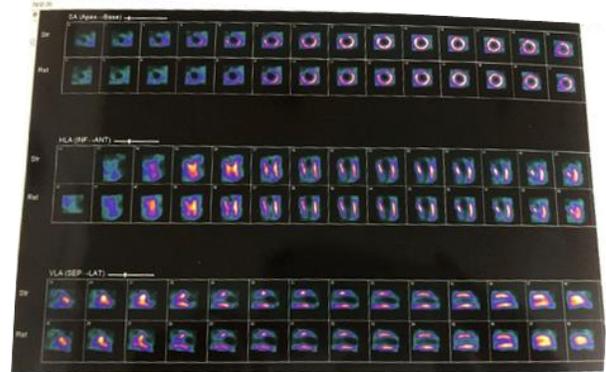
**Figure 3: RAO view showing the point of severing of LAD at its mid and distal junction (red arrow). No vessel is seen beyond this point and the apex remains devoid of any blood supply. The contours of vessel are not sharp as much time has passed and some reparative process has taken effect.**



Prior to this presentation, in his native country, after sustaining the injuries, he wandered in different hospitals where echocardiography was done three times with evidence of akinetic LV apex and moderate pericardial effusion. No evidence of cardiac chamber perforation noted in any of the study. He remained admitted in a hospital for five days but no medical record is available. He had thoracostomy tubes passed during this period most probably for drainage of Pleural Effusion.

After the presentation here he was managed with IV diuretics, ACE inhibitors, statin, anti-platelet agents and aldosterone. In about 2 days, the patient improved remarkably (gained NYHA functional class II) and was discharged on the fourth day. He gained NYHA functional class I in next 15 days. Eight weeks after the index event, an MPS done for any viable myocardium, which revealed good exercise tolerance (total exercise time 9 minutes 30 seconds achieving 100% THR) with evidence of large fixed defect involving apex, anterior septum and apical anterior wall, Figure 4. No evidence of reversible defect (viable myocardium) was noted. He was advised the same treatment and regular follow-up.

**Figure 4: Myocardial Perfusion Scan**



## DISCUSSION

Conflicts of today's life have rendered quarrels and skirmishes among human beings a common occurrence with resultant bodily injuries. Chest injuries are also very common and, as this area of the human body houses two vital organs, morbidity and mortality in such cases are very high. It has been reported that 90% of patients sustaining severe penetrating chest injuries die before reaching the hospital and, of those that do, mortality ranges from 20% -75%.<sup>4</sup>

Cardiac injuries are of two types, viz blunt trauma (blunt cardiac injury – BCI) and penetrating injury. The mechanism of blunt trauma causing internal injury could be a suddenly reduced movement of organs – halting, compression of organs between spine and sternum, extension of intra-abdominal injury (hydraulic effect) or a crush injury.<sup>5</sup> Penetrating injuries are usually more clearly defined and occur either due to stab wound (by a knife or sharp instrument) or ballistic injuries (by bullets, pellets or pieces of explosives). Gunshot wounds

have a higher incidence of death as compared to knife injuries.<sup>6</sup>

As the case report described pertains to knife injury, our discussion will be focused on this type of injury only. When ascertaining a knife injury, the size of the knife, the sex of the assailant, the direction and depth of the wound should be thoroughly examined. "The area bordered by the sternal notch (superior), xiphoid (inferior), nipples or outer third of clavicle (lateral) is referred to as cardiac box or mediastinal box".<sup>7</sup> Michael Nicoara et al in their case report have mentioned two groups of injuries, 'lethal six' and 'hidden six' which a victim can sustain if cardiac box is involved.<sup>8</sup>

Asensio J.A. et al, in their large series of cardiac penetrating injuries, have given the following frequency of involvement of heart chambers.<sup>9</sup>

Advanced Trauma Life Support (ATLS) have given classification of chest injuries for both blunt and penetrating type according to which, this patient falls into grade IV as he has a penetrating injury to the mid-distal segment of a coronary artery.<sup>10</sup>

Besides physical examination, various imaging modalities are of immense help in the evaluation of such patients.

A 12-lead ECG helps in identifying arrhythmias, infarctions, cardiac subluxation (left axis deviation) and large pericardial effusions (low voltages).

A plain chest x-ray with all its limitations in such an emergency situation (as most of the time, portable x-rays are done with limited resolution) can indicate pericardial effusion, pneumopericardium, pneumomediastinum, pneumothorax, pleural effusion and lung collapse. "However, anatomical details and hemodynamics cannot be ascertained".<sup>11</sup>

Echocardiography, because of its portability, is of paramount importance in such scenarios. Not only the presence and extent of pericardial effusion can be precisely estimated but cardiac chamber and great vessel penetration can be assessed along with injuries to intra-cardiac structures such as valves, chordae, papillary muscles and the two cardiac septae, especially ventricular. Coronary arteries, especially in their proximal courses, can also be evaluated and myocardial segmental analysis can be superbly done. In certain cases of poor acoustic window, relatively stable patient and with no evidence of cervical injury, transesophageal

echocardiography may be attempted to delineate injuries to the atria and thoracic aorta.<sup>12</sup>

FAST (Focused Assessment with Sonography for Trauma), a part of POCUS (Point of Care Ultrasound), if available in emergency department, is extremely helpful in the detection of lung water, pleural effusion and assessment of abdominal organs.

CT scan imaging is considered the cornerstone investigation nowadays in such cases.<sup>13</sup> All the conditions mentioned under chest x-ray (CXR) can not only be seen much clearly but also at greater depth. Furthermore, myocardial contusion, laceration and injuries to atria and great vessels along with cardiac subluxation are precisely evaluated.

MRI, being costly and time-consuming may not be helpful in acute situations. However, to differentiate between contusion injury and infarction, it has no parallel.

"Andres Isaza-Restrepo et in their study of 240 cases of penetrating chest injury in Colombia reported that nature of weapon, size of affected myocardium, heart chamber involved, coronary artery affected, vitals at the time of presentation, accompanying injuries and time to medical care are the factors which determine survival".<sup>14</sup>

The patient reported one month after the index event and at this stage was suffering from a complication of acute MI i.e. Congestive Heart Failure. Besides being treated for this he was thoroughly assessed for other complications also. Much time has passed for any intervention for revascularization however, an MPS was done to rule out completely any stigma of viable myocardium in which revascularization could have been beneficial. Coronary artery dissection with no cardiac chamber involved by penetrating knife injury is a rare event and as the cause of this myocardial infarction is non-atherosclerotic hence statins were withheld from his treatment. Penetrating injury to the chest with propensity to involve mediastinal box need thorough assessment and if facilities for their handling are not available the patient should be transferred to any full-fledged nearby facility.

Stab wounds of the chest causing injury to the lung and heart have been reported in literature but those involving the coronary artery only and causing myocardial infarction and pericardial effusion with total sparing of the heart chambers have been

reported rarely. Andrew R Elms et al reported involvement of Left Circumflex coronary artery by penetrating pellets from gunshot resulting in Myocardial Ischemia.<sup>15</sup> Cases of blunt chest trauma resulting in dissection of LAD have been reported more in literature managed either conservatively<sup>16</sup> or by angioplasty.<sup>17,18</sup>

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