



Acute Mitral Regurgitation after Blunt Chest Trauma: A Case Report

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Authors' contributions

This work was carried out in collaboration among all authors. Author LNT was surgeon, designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript.

Author TTM was the main surgeon, managed the analyses of the study. Author TTQ managed the literature searches, revised it critically for important intellectual content. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

The most common cardiac injury following trauma is myocardial contusions. Traumatic valve injury is a rare clinical condition and most commonly involves the aortic valve, with isolated mitral valve injury being scarce. We herein describe the clinical, para clinical and surgical characteristics of a 27-year-old male patient who suffered from an acute mitral valve regurgitation after blunt chest trauma during a traffic accident with an oriented review of the literature. The patient was successfully treated by urgent mitral valve replacement and postoperative V-A mode extracorporeal membrane oxygenation ECMO support that turned out necessary in the postoperative period.

Keywords: *Chest trauma; acute heart failure; acute mitral valve regurgitation; papillary muscle rupture; echocardiography; extracorporeal membrane oxygenation.*

1. INTRODUCTION

Acute mitral regurgitation after blunt chest trauma is a rare event. Rupture of the mitral

valve may occur when a rapid compressive force is applied at early systole, during the brief interval between the closure of the mitral valve and opening of the aortic valve. This disruption

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can lead to sudden and severe mitral regurgitation that will rapidly decompensate in to congestive heart failure and death unless operatively corrected.

2. CASE PRESENTATION

We report the case of a 27-year-old male patient who underwent a severe motorbike road accident. He was transferred to a local medical center and six hours after the accident to our center in an unstable condition with severe respiratory failure, hypotension, and deep coma status. Physical examination showed a blood pressure of 70/30 mmHg, with swelling face, sutured temple lesion, moist rale in both lungs and a heart rate within the normal range. Patient was immediately intubated and received intravenous noradrenalin 1,9 µg/kg/m, Adrenalin 0,24 µg/kg/m, furosemide 40 mgIV.

At Cho Ray Hospital, we evaluated him again and the results were GCS 8 points, hypotension which were very hard to measure, pulse 120 bpm, severe metabolic acidosis. Total body CT scans showed pulmonary edema, pulmonary contusion, pleural effusion, a possible left ventricle hematoma, and brain hemorrhage at the right parietal lobe and cerebral peduncle. Chest X ray showed alveolar edema in both lungs (Fig. 1).

Transthoracic echocardiogram (TTE) showed a severe mitral regurgitation with possible papillary muscle rupture. Subsequent transesophageal echocardiography (TEE) at the CCU confirmed a 4/4 acute mitral regurgitation (Fig. 2) resulting from an anterior leaflet tear and a papillary muscle rupture (Fig. 3) with the absence pericardial effusion.

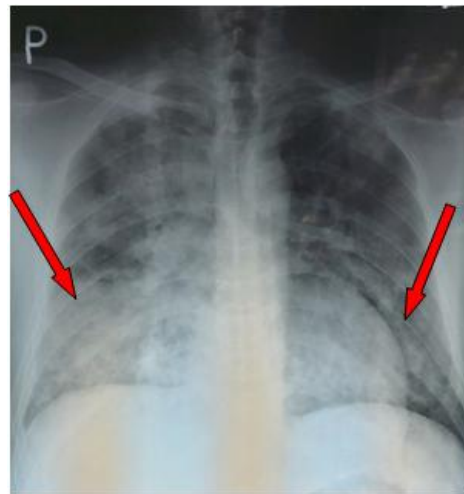


Fig. 1. Alveolar edema in chest x-ray

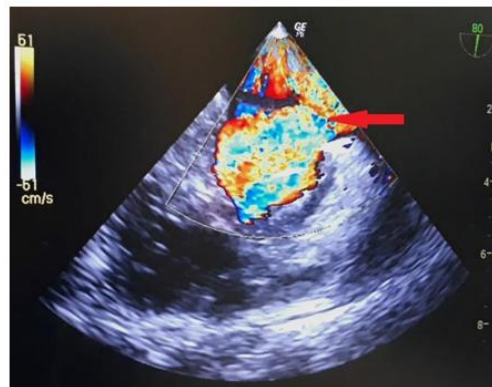


Fig. 2. Severe mitral regurgitation

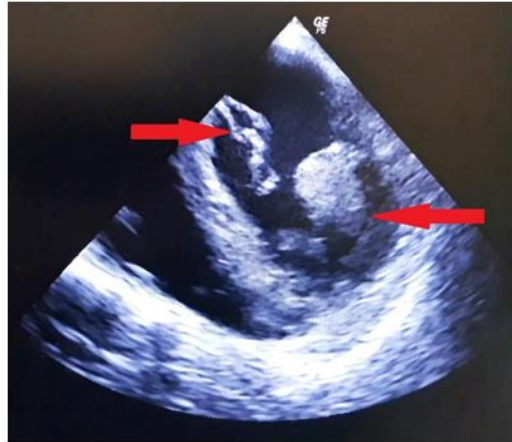


Fig. 3. Ruptured anterior leaflet and papillary muscle

An urgent surgery was undertaken and surgical view revealed a ruptured papillary muscle (Fig. 3), tear anterior leaflet at A2 position (Fig. 4), without cardiac contusion or hematoma in left ventricular. His valve was successfully replaced with mechanical valve SJM number 29. On cardiopulmonary bypass weaning, his systolic

pressure was ranging between 50 – 70 mmHg, and pink fluid was drained from the intubation tube. We decided to insert V-A ECMO to maintained the cardiac index above 2,5 with high dose Noradrenalin, Adrenalin, Dobutamine. Meropenem and Vancomycin were chosen as antibiotic drugs.

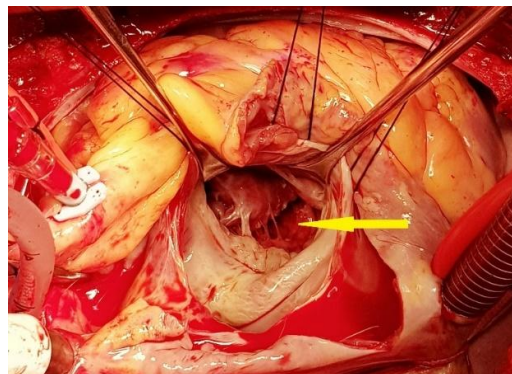


Fig. 4. Papillary muscle rupture

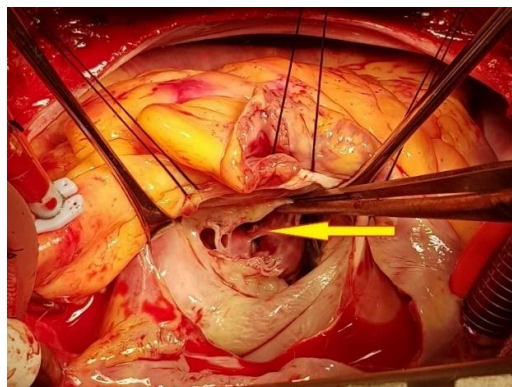


Fig. 5. Anterior mitral leaflet tear

Postoperative CT – scan showed a stable hemorrhage at falx cerebri, no ventricles compression, no midline shift. ECMO was removed after 2 days and mechanical ventilation support after 10 days. Complete recovery was achieved after 14 days.

3. DISCUSSION

The most common cardiac trauma after blunt thoracic trauma is cardiac contusion. Damaged mitral valve after blunt thoracic trauma is a very rare condition when compared to the aortic valve and requires prompt diagnosis and emergent surgical care to prevent complications and death [1]. Parmley and partners described papillary muscle rupture in 24 patients over 546 blunt thoracic trauma patients with 0.01% mortality rate [2]. Damaged mitral valve mostly occurs after a car accident (64%) or falling (15%) [3]. One research shows that papillary muscle rupture occurred in 60% of cases while leaflet rupture is less common. Our patient had both papillary muscle rupture and leaflet rupture. The damaged mitral valve in trauma is the result of a sudden increase in pressure in the early stage of the systolic or late stage of diastolic when the mitral valve closes and the aortic valve opens. A pressure over 320 mmHg in ventricular will break the heart membrane or heart valve [4]. The posterior leaflet of the mitral valve has a thinner tendon compared to anterior leaflet, therefore it is easier to be ruptured in trauma [5].

TTE has a limited role in multitrauma patient because of pneumothorax, thoracic trauma or patient's position. Fabio Chirillo noticed that TTE has low diagnostic yield in severe blunt chest trauma, while TOE provides accurate diagnosis at the bedside. It is inexpensive, minimally invasive, and does not interfere with other diagnostic or therapeutic procedures [6]. Moreover, TEE is of value when its results are suboptimal and when aortic injury is suspected [7].

The damaged mitral valve is to be ruled out in multi-trauma cases especially with TEE as this condition can be unnoticed and when left untreated it can lead to death. Urgent valvuloplasty procedure or valve replacement depends on the mechanism of the leak. The decision is made based on each patient and surgeon's experience. In our case, the anterior leaflet was extremely damaged and was associated with ruptured papillary muscle. We opted for mechanical valve replacement as

valvuloplasty using autologous pericardium has a poor prognosis as it requires prolonged cardiopulmonary bypass (CPB) with high dose of Heparin, thus increasing the risk of brain hemorrhage in an unstable patient as ours.

ECMO plays a very important role in the treatment of an ICU's patient with cardiopulmonary injury [8]. Our patient was hospitalized with cardiogenic shock and acute pulmonary edema. As we failed to wean cardiopulmonary bypass, we decided to insert central ECMO at the ascending aorta and a two stage femoral venous cannula. In contrast, peripheral VA ECMO will face the risk of distal limb ischemia, cardiac thrombus if low flows are maintained through the heart. Another disadvantage is the competing flow ejected from the left ventricle that may be hypoxic if the lungs are severely dysfunctional. This can create a "harlequin syndrome", which is associated with a risk of cardiac injury or stroke as hypoxic blood perfuses the coronary and the right brachiocephalic artery territory [9].

4. CONCLUSION

Damaged valve after blunt chest trauma is a rare medical situation with a high mortality rate but could be efficiently managed when immediately diagnosed and treated. TTE and especially TEE should be done routinely in all cases of chest trauma due to their very high accuracy in establishing the correct diagnosis and determining prognosis.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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