

# Anesthetic management of stab wound in right ventricle of heart

### ABSTRACT

Stab wound in right ventricle of heart requires a prompt and focused surgical intervention. Cardiac tamponade is a common finding when dealing with stabbed hearts, which must be diagnosed and treated in a timely fashion. We report a case of 28-year-old man who presented in emergency department following accidental stab trauma during a religious ceremony. The challenges faced in the perioperative period were the management of impending cardiac tamponade and hemodynamic stability.

**Key words:** Cardiac tamponade; hemorrhage; stab wound

### Introduction

Stabbed hearts are surgical emergencies that require a prompt and focused surgical intervention. Internationally, the incidence of stabbed hearts varies, with a higher incidence in developing countries.<sup>[1,2]</sup> In the majority of the identified literature, the right ventricle was the predominant chamber damaged during a stab to the heart.<sup>[3,4]</sup> This is due to the normal anatomical position and orientation of the right ventricle within the thoracic cavity. Cardiac tamponade is a common finding when dealing with stabbed hearts.<sup>[5]</sup>

Patients presenting with major injuries requiring emergency surgery is a great challenge to the anesthesiologist and it frequently present to the operating room in an urgent manner. There is generally little time to fully evaluate the patient. This case report presents the anesthetic management of an adult male, presented in emergency department with a stab wound injury on left side of the chest, who underwent emergency sternotomy for pericardial breach, cardiac tamponade, and right ventricular tear.

### Case Report


A 28-year-old man with no known comorbid presented in emergency department with complain of pain over left side of chest following accidental stab trauma during a religious ceremony. Physical examination showed a stab wound on left side of anterior chest wall just next to sternal border with bulging of left side of chest; GCS of 15/15; heart rate of 112 bpm; blood pressures of 72/44 mmHg; oxygen saturation of 98% on face mask of 5 L/min oxygen; respiratory rate of 26/min, and decreased air entry on left lower hemithorax. Initial baseline blood investigations were normal and chest x-ray showed basal atelectasis on left lower lobe of lung. On echocardiogram, there was no pericardial effusion or other abnormality.

Patient was transported to operating room immediately for emergency sternotomy. In the operating room, routine monitoring was applied including electrocardiography, noninvasive blood pressure, pulse oximetry, and two large

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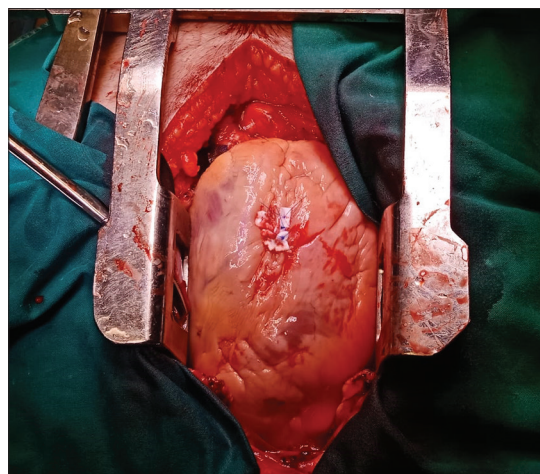
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bore intravenous cannulas were inserted. His base line blood pressure in operating room was 90/50 mmHg, heart rate of 108 beats/min, and oxygen saturation was 98% on 5 L/min oxygen. Preinduction arterial line was inserted in left radial artery. Rapid sequence induction technique was used for induction of anesthesia. After preoxygenation, anesthesia was induced with midazolam, ketamine, succinylcholine, and nalbuphine. The trachea was intubated using rapid sequence induction and patient was mechanically ventilated. Central venous pressure (CVP) line was then inserted in right internal jugular vein and baseline central venous pressure was 19 cm of H<sub>2</sub>O. On the basis of high CVP and hemodynamic instability, an initial diagnosis of impending cardiac tamponade was made. Although on preoperative echocardiogram, there was no pericardial effusion or other abnormality identified. Anesthesia was maintained with isoflurane with oxygen–air mixture and atracurium was used for muscle relaxant. Intraoperatively, ketorolac, and paracetamol were given for analgesia.

After sternotomy, it was found that the stab trauma had breached the chest wall along with pericardium. After the opening of pericardium, 300 mL of fresh blood with clots were evacuated. CVP was then decrease to 6 cm of H<sub>2</sub>O from 19 cm of H<sub>2</sub>O. There was a laceration of about 2 cm just lateral to left anterior descending artery in right ventricle, which was then repair and closed with pledgets and sutures [Figure 1]. After securing the hemostasis, chest was closed. Fluid resuscitation was done with gelofusine (1 L) and normal saline 0.9% (1 L). Total blood loss was ~500 mL intraoperatively. Patient was shifted to cardiac intensive care unit (CICU) for further management. He remained stable in the CICU. Patient was weaned from ventilator and extubated a few hours later after fulfilling the extubation criteria. On first postoperative day, he was shifted to special care unit and was discharged on fourth postoperative day.

## Discussion

The rising incidence of violence has resulted in increasing penetrating cardiac injuries, which remain a highly lethal condition. Victims are predominantly male.<sup>[6]</sup> Campbell *et al.* found that only 6% of patients with penetrating cardiac injury reached the hospital alive.<sup>[7]</sup> In contrast with this, some studies reported high survival rate up to 90% but exclude the physiological status upon presentation of these critical patients and they are biased by reporting only patients in good physiological condition at admission. In the majority of patients (>80%) having stab wound of the heart, cardiac tamponade occurs,<sup>[8]</sup> whereas the right ventricle was the predominant chamber damaged during a stabbing to the heart.<sup>[3,4]</sup>



**Figure 1: Stab wound in right ventricle of heart. Repaired**

In this case, a stab wound injury was on left side of the chest during a religious ceremony. The patient had no symptoms/signs of lung injury, such as shortness of breath, wheezing, or subcutaneous emphysema. His room air oxygen saturation (SpO<sub>2</sub>) was 100%, whereas the chest radiograph was normal. On auscultation, there was decreased air entry on left lower hemithorax. There were no signs of cardiac injury, such as muffled heart sounds, distended neck veins besides the hemodynamic instability. Echocardiogram was also normal. However, these classic signs are almost universally absent in traumatic cardiac tamponade.<sup>[9]</sup>

Asensio *et al.*<sup>[10]</sup> reported a 74% mortality rate for patients with penetrating cardiac injuries who arrived at hospital intubated, this along with the reported 82% of patients without a blood pressure and 88% without a pulse would indicate that pre-hospital intubation occurred when patients are severely hemodynamically unstable. Almost three quarters (74%) of patients in this study were intubated in theatre. This could imply that most of the hospitalized patients with stabbed hearts were relatively hemodynamically stable, therefore surviving to hospital admission.

When patient was first received at causality, his SBP was 72 mm Hg, which was brought up to 90 mm Hg by giving 500 mL of colloids and 1 L of crystalloids.

Induction of anesthesia may lead to a dramatic loss of blood pressure as occurs with propofol or there is a risk of corticosteroid synthesis suppression (in the adrenal cortex by inhibiting 11-β-hydroxylase) with etomidate administration. So, care should be taken with the choice of induction agent. Considering the hypovolemic status, it was decided to insert arterial line preinduction in operating room and induce the patient with intravenous ketamine.

Since trauma patients are considered as full stomach, rapid sequence induction or modified rapid sequence induction (MRSI) is required to secure the airway to prevent aspiration, which is in keeping with what was reported by Knott-Craig *et al.*<sup>[11]</sup> We used MRSI technique for intubation in this case to prevent aspiration.

This is not an uncommon occurrence as even hemodynamically stable and relatively stable patients can often become unstable intraoperatively when volatile anesthetic agents are used. So, anesthesia was maintained with 0.7%–0.8% isoflurane with oxygen–air mixture and propofol infusion of 2 mg/kg/h.

Although the diagnosis of cardiac tamponade can be suspected on history and physical exam findings, but the use of bedside echocardiography is the best imaging modality. It confirms the presence of pericardial effusion and determines its size. We found only unstable hemodynamics preoperatively; otherwise, rest of the findings including echocardiography were normal. The diagnosis of impending cardiac tamponade was made perioperatively on the basis of raised CVP, which was then confirmed on wound explorations and 300 mL of blood and clots were evacuated after opening of pericardium.

In literature, it is suggested that large volume fluid therapy should be avoided prior to hemorrhage control. Once it is controlled, patients will need rapid correction of hypovolemia to refill the heart and restore perfusion to nonvital organ systems. Patients will be cold and profoundly coagulopathic. Blood and component therapy should be warmed and administered rapidly after hemorrhage is controlled.<sup>[9]</sup> So, here, we maintained the patient with two intravenous lines and CVP and resuscitate with crystalloids and colloid till tear was repaired.

One of the major intraoperative management goals for stabbed hearts is the active resuscitation with fluids to combat the severe hypovolemia. Early and adequate fluid resuscitation will result in reduced intraoperative inotropic requirements, provide relative hemodynamic stability for surgical repair, and decrease postoperative neurological fall out. An adequate mean arterial pressure is required by the surgeons once cardiography has been completed in order to see if there are any other injuries or further bleeding. Ideally, the volume of blood lost should be replaced in equal volume with either cell salvage or blood products. The use of adrenaline or inotropes is contraindicated in the presence of hypovolemia. Inotropes may be required after control of hemorrhage and cardiac repaired.<sup>[9]</sup>

## Conclusion

Stabbed hearts are surgical emergencies that require a prompt and focused anesthetic intervention. Maintenance of optimal blood volume and judicious use of inotropes may be lifesaving. A systematic approach to these patients is necessary so that other life-threatening lesions are treated appropriately and in a timely fashion.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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