

**Case report:**

**Autologous transfusion in a patient with life threatening traumatic haemothorax: Case Report.**

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**Abstract:**

Penetrating thoracic injuries frequently presents a challenge to the clinicians. The situation may become more deleterious owing to the unavailability of adequate blood of required group. We discuss the acute management of a patient with life threatening traumatic haemothorax following penetrating thoracic injury. In this patient, autologous transfusion of patient blood collected in chest drain was performed during intraoperative period using an indigenous technique with successful outcome.

**Keywords:** Thoracic Injuries; autologous blood transfusion; chest drain; haemothorax, allogeneic; thoracotomy.

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**Introduction:**

Management of penetrating chest injuries frequently presents a challenge to the clinicians.<sup>[1]</sup> These injuries are associated with significant blood loss with major amount shed into the chest cavity. Shed blood collected in chest drain is not well defined in trauma emergencies<sup>2</sup>. This blood can be harvested and re-infused following proper techniques in situations were grouped and cross matched blood is not available. We discuss the acute management of a patient with life threatening traumatic haemothorax following penetrating chest injury. We performed a simple indigenous technique of autologous transfusion of patient blood collected in chest drain with successful outcome.

**Case Report:**

A 28 year old male weighing 60 kg, presents in emergency room (ER) with a history of stab injury on left side of chest. On arrival, patient had a Glasgow coma score (GCS) of 15 and was complaining of severe chest and back pain. He was cold, clammy, and sweaty with a pulse rate of 120 beats/min and blood pressure 90/52 mm Hg. There were grossly diminished breath sounds on the left side of his chest and chest radiography (CXR)

showed left sided haemothorax. On examination of the affected site we found profuse oozing of blood from the wound. Large intravenous access (16 G cannula) was established in both arms and intravenous (IV) fluids (crystalloid/colloid combination) infusions were initiated. A size 32F chest drain was inserted and 400 ml of blood was drained in chest bag. Patient was managed according to trauma (ATLS™) protocol. Two units of type only and 4 units of cross-matched blood were ordered. Patient blood group was found to be O negative. Unfortunately blood of this group was not available in hospital blood bank. Due to ongoing blood loss from the affected site, surgeons decided for urgent thoracotomy and exploration.

After taking appropriate risk consent, patient was shifted to operating room (OR) and routine standard monitors (NIBP: Non invasive blood pressure, ECG: continuous electrocardiogram, SPO2: pulse oximeter, UOP: urine output, temperature probe) were applied. We planned for rapid sequence induction (RSI) with ketamine (100 mg IV) and suxamethonium (100 mg IV). Analgesia was maintained with morphine 0.1mg/kg and paracetamol (1 gm IV q 8 hrs). Patient was intubated with left sided double

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lumen tube (39 FG DLT) and its position confirmed with fiberoptic bronchoscope. Anaesthesia was maintained with oxygen and nitrous oxide mixture (50:50), intermittent boluses of vecuronium bromide (IV) and isoflurane to achieve a MAC of 1. We observed that during this time, chest drain was filled with 800 ml of blood. We kept the transfusion trigger of 7 gm % which allows blood loss of around 1300 ml. Regardless of full ionotrope support and aggressive fluid resuscitation, patient develop severe hypotension (68/46 mm of Hg) due to ongoing blood loss. ECG showed a 3 mm ST segment depression from base line in lead II and V<sub>5</sub>.



**Figure 1: Arrow indicating latex end of blood transfusion sets connected two a three-way stop cock.**

Due to non availability of O negative blood, autologous transfusion of blood collected in chest drain was considered as a possible option. Standard autotransfuser was not available in our institution at that time. We planned for indigenous method of autologous transfusion. Under all aseptic precautions, chest drain blood was collected in standard disposable PVC blood bags using simple technique. In this technique, we used two blood transfusion sets with their latex ends connected two a three-way stop cock (Smiths Medical Medex<sup>®</sup>, MX5311L, UK) (Figure1). Once the ambulatory chest bag is completely filled with blood the tubing was clipped and the chest bag is removed. The spike of one blood transfusion set was connected to the access port of the blood bag (Figure 2). The spike of another set was connected to the air vent port of ambulatory chest drain bag (Romo Drain<sup>®</sup> DB-5052, Romsons<sup>®</sup>, India) (Figure 3). Now the chest bag was raised and the blood is collected in standard

blood bags and there flow regulated by a three-way stop cock. The blood bags were then used as standard blood units. Four units of blood were collected and were immediately transfused back in patient.

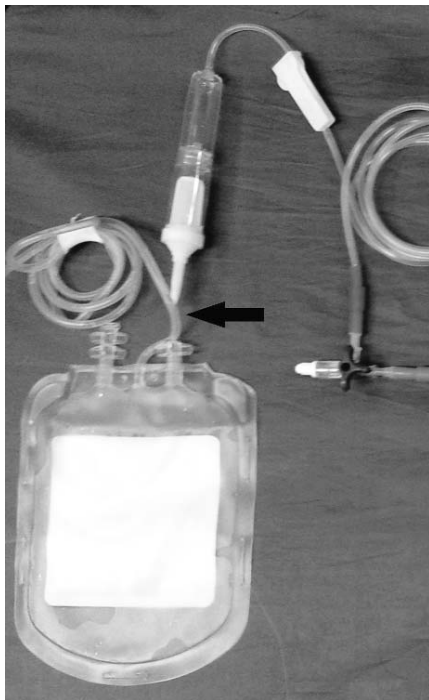
Meanwhile, left side thoracotomy was performed and surgeons found a rent (1.5 cm x 1.5 cm) in middle lobe of left lung as a potential source of ongoing ooze. The rent was surgically repaired immediately. Patient blood pressure rose to 90/62 mm of Hg with heart rate of 100/min. Intraoperatively, blood loss was approximately 3litres and he was autotransfused with four units blood. Postoperatively, patient was transferred and electively ventilated in intensive care unit (ICU) where he made uneventful recovery. During his ICU stay, we managed to transfuse him with fresh frozen plasma and platelets to normalize his coagulation profile. He was extubated on third postoperative day and subsequently discharged on 14<sup>th</sup> day.

### **Discussion**

Autologous blood transfusion or autotransfusion is defined as the collection and reinfusion of the patient's own blood<sup>3</sup>. In modern practice it has not gained widespread use due to the efficient availability of allogeneic blood component transfusion in most of the hospitals. In recent years, there is a huge increase in demand of blood at trauma center blood banks which have renewed interest in autologous transfusion as a technique of acute resuscitation<sup>2,4-5</sup>. Autologous transfusion may provide a blood source comparable with banked blood and may possibly reduce the risk of potential complications associated with allogeneic blood transfusion such as transfusion reactions, storage lesions and transmission of blood borne diseases<sup>2,3-5</sup>.

Characteristics of blood collected in chest drain in traumatic haemothorax have been poorly understood<sup>2</sup>. When compared to venous blood, pleural blood has diminished yet sufficient concentration of red blood cells. It is exceedingly deficient in coagulation factors and includes products of fibrinogen degradation<sup>2,6</sup>. The platelets are also deficient with unknown functional characteristics<sup>2</sup>. This shed blood may disrupt the balance of pro and anti coagulation factors and carry the risk of transfusing fibrin split products<sup>2</sup>. In addition, there is evidence of haemolysis seen in this shed blood which raises the

theoretical risk of acute tubular necrosis due to plasma free haemoglobin<sup>2-3</sup>. Even then, in life threatening situations where there is acute shortage of banked blood, pleural shed blood may act as a saviour. In past, autologous blood transfusion has been used as life saving therapy for many years and is now recommended as an alternative strategy to avoid allogeneic blood transfusion<sup>5,7</sup>. However, when haemothorax blood is autotransfused particularly in trauma settings, there should be strict monitoring of coagulation profile with appropriate infusions of other blood components such as fresh frozen plasma, platelets and cryoprecipitates, where indicated<sup>2</sup>. We also transfused these blood components during his ICU stay to normalize his coagulation profile.

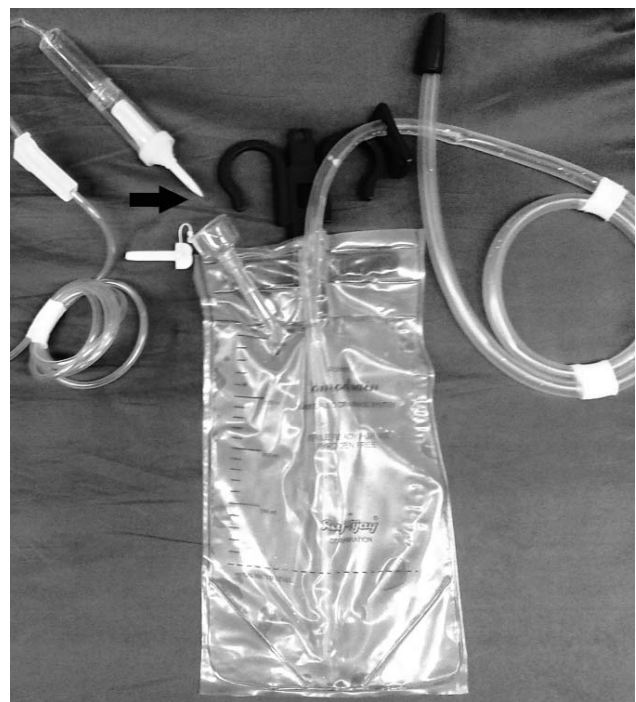


**Figure 2: Arrow indicating the spike of blood transfusion set connected to the access port of the blood bag.**

There is a potential complication associated with autologous transfusion such as airborne bacterial contamination owing to the contaminants that are pulled or fall into the operative field by suction generated air currents or by handling of salvaged blood<sup>8</sup>. The risk is further enhanced in situations where there is coexisting abdominal trauma with damage to the diaphragm.<sup>[3]</sup> In our case, the blood collected in chest drain was not exposed to these air currents and was manipulated under strict aseptic precautions hence

the chances of its contamination was minimum. Moreover, the injury was exclusively present in lung with negligible risk of contamination from other sources.

We used blood bags containing citrate, phosphate, dextrose and anticoagulation solutions for collection of shed pleural blood. The shed pleural blood generally does not coagulate due to the defibrination by passage over pleural surfaces and mechanical action of heart<sup>9</sup>. However, we used aforementioned blood bags in anticipation of possible injuries of great vessels wherein the bleeding can be at a faster rate allowing coagulable blood to enter the blood bags<sup>3</sup>. We used standard blood administration sets with characteristic filters (170 to 200 µm) for collection of autologous blood. The chest drain blood is allowed to pass through two filters before collecting in blood bags. This possibly removes larger clots and aggregates from the blood.



**Figure3: Arrow indicating the spike of blood transfusion set connected to the air vent port of chest drain bag.**

In modern clinical practice, there are commercially available autotransfusers such as Cell Saver<sup>®</sup> Elite<sup>®</sup> (Haemonetics, Munich, Germany) and CATS<sup>®</sup> (Fresenius AG, Bad Homburg, Germany). These devices are costly, expensive and need trained health personnel to operate. These devices are not

commonly accessible in most of the hospitals in developing countries due to aforementioned reasons. Our technique is simple and cost effective and requires minimum resources and manpower to operate. This technique can be extremely beneficial in acute trauma settings and disaster scenarios.

Immediate fluid replacement with assured compatibility, less risk of disease transmission, minimum metabolic derangements ( such as hypocalcemia, hyperkalemia, metabolic acidosis), better oxygen carrying capacity and less dependence on banked stored blood are the key benefits with autotransfusion in life threatening conditions<sup>2,3,10</sup>. Moreover it is

cost effective and acceptable in Jehovah's Witnesses<sup>3</sup>.

We believe that in presence of minimal resources and paucity of banked blood, this simple technique of autologous transfusion may be considered as an alternative to allogeneic blood transfusion and may play a substantial role in life threatening situations such as traumatic haemothorax<sup>2-5</sup>. Although, we strongly feel that this technique should be practice only in life threatening emergency situations where in the commercial autotransfusers are not available and the volume of shed blood is extremely large.

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