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**ORIGINAL RESEARCH PAPER**

# A clinical study of hemothorax following blunt thoracic trauma

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## ABSTRACT

***Introduction:*** *Hemothorax following blunt thoracic trauma is a common occurrence. Prompt diagnosis and proper treatment is the key for good outcome.* ***Materials and methods****: This is a retrospective study carried out in Assam Medical College and Hospital over a period of two years from January 2017 to Dec 2018 to assess our management of hemothorax following blunt thoracic trauma. Hospital records of these patients were reviewed and analyzed.* ***Results****: Total 118 patients were admitted during this period in Assam Medical College & Hospital with diagnosis of hemothorax following blunt thoracic trauma. Male patients outnumbered female patients and road traffic accident was the main mechanism of blunt thoracic trauma. Chest pain was the main presenting symptom. 8(6.78%)patients with massive hemothorax were treated during primary survey. 12(10.17%) patients with small volume hemothorax were treated successfully by observation while observation failed in 3(2.54%) patients. 95(80.51%) patients with large hemothoraces were treated by Tube thoracostomy drainage after radiological confirmation. Eleven (9.32%) patients developed clotted hemothorax and required thoracotomy. Mortality rate of the present series was 2.54%.* ***Conclusion****: Hemothorax occurs frequently following blunt thoracic trauma. The Majority of these patients can be managed successfully by tube thoracostomy drainage only.*

***Keywords****: Chest injury; traumatic hemothorax; thoracostomy; tube drainage; treatment.*

## INTRODUCTION

Hemothorax is defined as collection of blood in pleural cavity. The most of the hemothoraces occur due to blunt or penetrating thoracic trauma. Iatrogenic manipulations also cause hemothorax. Spontaneous hemothorax results from medical causes.[1] Sources of blood in hemothorax may be from lung, chest wall, ruptures of pleural adhesions, mediastinum or peritoneal cavity through ruptured diaphragm.[2] Severity of hemothorax depends upon etiology of bleeding into the pleural space, rate at which it occurs within pleural cavity and amount of blood that is collected there.[3] A study in a level I trauma center of United State found that blunt trauma is a major cause of thoracic trauma.[4]

Traditionally majority of hemothoraces are managed with tube thoracostomy drainage. However treatment advocated in the literature ranges from observation to various surgical interventions. When a hemothorax is not properly drained, retained hemothorax occurs. Its management also differs from authors to authors.[5]

The aim of the study is to review the management of patients admitted with diagnosis of hemothorax following blunt thoracic trauma and objective of the study is to analyze the outcome.

## MATERIALS AND METHODS

This was a hospital based retrospective study conducted in Assam Medical College & Hospital, Dibrugarh, Assam, India from January 2017 to December 2018.

Clinical details of the patients admitted during the above-mentioned period with hemothorax following blunt thoracic trauma were recorded from their case sheets and were analyzed with reference to their demographics, mode of injury, common presenting signs and symptoms, treatment offered to them, length of hospital stay, complications noted during the period and final outcome. Their follow-up records were reviewed for any residual symptoms and radiological findings.

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**Inclusion criteria**: All hemothoraces following blunt trauma and above the age of 12 years.

**Exclusion criteria**: Patients who did not complete their treatment in hospital, penetrating injuries of the thorax and patient not giveing consent for the study were excluded from the study. Hemothorax associated with laryngeal injuries, cervical injuries, esophageal or tracheal injuries were not included in the study.

**RESULTS**

A total of 118 patients with hemothorax following blunt thoracic trauma were admitted in Assam Medical College & Hospital, Dibrugarh over the period of two years from January 2017 to December 2018. 16 of them presented with bilateral while 102 of them had unilateral hemothorax.

Age of the patients in this study group ranged from 16 years to 74 years and average age noted was 42 years. In our study, 100(84.75%) patients were male and 18(15.25%) patients were female

72(61.02%) patients developed hemothorax following Road Traffic Accidents. Other mechanisms of injury recorded in the study were fall in 36(30.51%), physical assault in 8 (6.78%), occupational injury in 2(1.69%) patients (**Table 1**).

**Table 1** Showing mechanisms of injury

| Mechanism of injury | No. of patients | percentage |
|---|---|---|
| Road traffic accident | 72 | 61.02% |
| Fall | 36 | 30.51% |
| Physical assault | 8 | 6.78% |
| Occupational injury | 2 | 1.69% |
| **Total** | **118** | **100%** |

48 patients (40.68%) of our hemothorax had associated pneumothorax.

The common presenting symptoms in our study were chest pain in 78(66.1%) and dyspnea in 62(52.5%) patients. Common physical signs noted were tenderness over the chest wall in 100 patients (84.74%), bone crepitation in 61(51.69%) patients and surgical emphysema in 39(33.1%).

In 13(11.02%) patients, hemothorax occurred without any rib fracture. One rib fracture was noted in 6 (5.08%) , 2 ribs fractures were noted in 16(13.56%) , and more than 2 rib fractures noted in 83(70.34%) patients. Of the 83 patients with more than 2 fractures,10(8.47%) patients presented with flail chest, 48(40.7%) had associated pneumothorax, 29 (24.58%) had pulmonary contusion and 20(16.95%) patients had other organs injury.

All admitted patients were administered with adequate analgesic, mucolytics, bronchodilators, and were encouraged for vigorous respiratory physiotherapy. Radiological investigations were X-Ray of chest and CT scan of thorax.

8(6.78%) patients presented with massive hemothorax and were treated immediately in the casualty by placement of thoracostomy tube drainage. Radiological evaluations were done in them only after stabilizing their hemodynamic status. 1(0.85%) of these patients required emergency thoracotomy due to persistent bleeding.

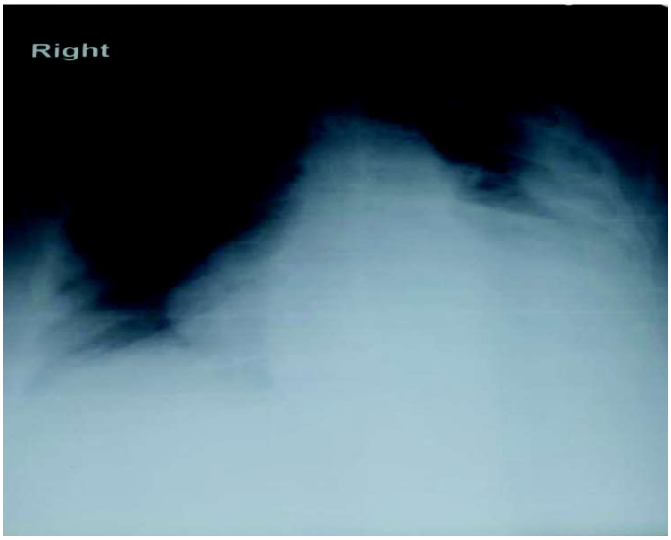


**Figure 1** X-RAY Chest showing left hemothorax

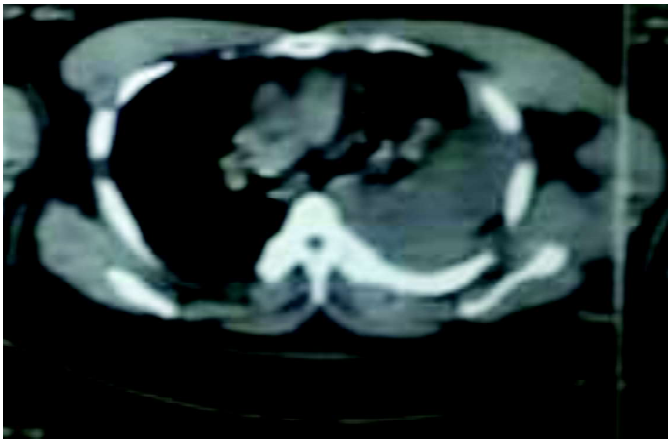

**Figure 2** CT Thorax showing left hemothorax

15(12.71%) patients with small volume hemothorax presented without any respiratory distress and were initially treated expectantly. Subsequently, 3(2.54%) of them developed respiratory distress and check X-ray established increment of hemothorax. They were treated with thoracostomy tube drainage. The average duration of hospital stay for those 12(10.17%) patients treated expectantly was 4.2 days and their hemothorax resolved completely in follow up visits.

In 95(80.51%) symptomatic patients, blood was evacuated from pleural cavity by large-bore tube thoracostomy. Of these 89 patients required unilateral and 6 patients required bilateral thoracostomy tube drainage. Average duration of thoracostomy drainage for them was 13.6 days and average duration of hospital stay was 16.1 days. In total 106(89.83%)

of our patients required tube thoracostomy drainage.

All hemothoraces were administered with first generation cephalosporin as prophylactic antibiotic and continued till removal of drainage tubes.

11(9.32%) patients developed retained hemothorax during the period and all of them required thoracotomy. Mortality of the present study was 2.54% (3 patients). All of them had multiple ribs fractures with significant hemothorax, massive pulmonary contusions and associated other organs injuries. 2 of them had flail chest and required ventilator support.

The discharged patients were followed up in OPD and follow-up period ranges from 1month to 12 months. All complaints usually disappear within one month after discharge and follow- up chest X-ray did not show any residual collection.

## DISCUSSION

The exact incidence of hemothorax following trauma is unknown.[6] Average age of our patients was 41 years. Other studies also reported similar finding.[7,8] High incidence of hemothorax was found in male. Cause of male prominence in trauma is due to more involvement of male in outdoor activities like driving, industrial works, manual works than female.[9,10]

Similar to our findings, other studies have also found that the motor vehicle accident is the major mechanism of blunt thoracic trauma. Use of rapid means of transport and lack of knowledge about traffic rules are the main reasons behind it. Other mechanisms of injury noted were accidental fall or fall from height, assault, and industrial accidents.[7,9] Concomitant pneumothorax along with traumatic hemothorax is a frequent finding in thoracic blunt trauma. Incidence varies from study to study.[4,11]

Chest pain and dyspnoea are the most common symptoms at presentation[8] and tenderness over the chest wall, subcutaneous emphysema and bone crepitation were the most common findings on physical examination.[8,9]

In our study, we have noticed that with the increase in the number of rib fractures in hemothorax, associated complications like contusion of lung, flail chest, pneumothorax and other organ injury also increases. Similar finding was also noted by other authors.[7]

A massive hemothorax (>1.5 L of blood) is an immediate life threatening condition and has to be resuscitated during primary survey.[12] Indications accepted for emergency thoracotomy are (i) drainage of more than 1,500 mL of blood immediately after placement of tube thoracostomy. (ii) Continuous drainage of 150 mL/h to 200 mL/h for 2 hours to 4 hours after placement of thoracostomy tube. (iii) Requirement of persistent blood transfusion to maintain hemodynamic stability.[13]According to our record, eight (6.78%) patients with massive hemothoraces were treated during this period and one of them required emergency thoracotomy due to persistent bleeding.

X-ray of chest and Computed tomographic scan of thorax were performed to confirm the presence of hemothorax. Plain X-ray of chest in standing posture requires a collection of more than 400 ml of blood to obliterate costophrenic angle while chest X-ray in supine position may not detect up to 1 liter of blood. CT scan of thorax is a better tool to detect hemothorax.[13]

Though many authors advocate tube thoracostomy drainage as initial treatment for all hemothoraces,[13] several retrospective studiessupport expectant management for the same.[8,14,15] Our expectant management was successful in 12 patients. Advantages of expectant management claimed are shorter length of hospital stay and reduced rate of empyema.[14]

106(89.83%) of our total patients with hemothorax were treated initially by tube thoracostomy drainage. It has been noted that about 60 to 90% of patients with chest injury can be managed by placement of thoracostomy tube.[16]

Some authors advocate Video-assisted thoracoscopic surgery (VATS) as initial treatment of hemothorax instead of tube thoracostomy. Advantages claimed are proper vision of pleural cavity, control of bleeding under direct vision, removal of any clot present inside thoracic cavity, possibility of correct placement of chest tube and post procedure short hospital stay.[17-19]

Use of antibiotics and duration of its use in hemothorax is controversial. Many authors do not find sufficient evidence to support its use while others recommend it.[19,20] We have used 1st generation cephalosporin from day of thoracostomy drainage till its removal.

Thoracentesis as a definitive treatment of a hemothorax is an obsolete intervention. The procedure is found to be associated with increased incidence of complications and high rate of failure.[2,11]

Eleven (9.32%) patients developed retained hemothorax. Reported incidence of retained hemothorax is about 0.5-30%.[15] One of the major complications of retained hemothorax is development of empyema, which are reported upto 50% of patients.[21] Incidence of empyema thoracic increases in retained hemothorax with increased in the number of rib fractures, increased in injury severity score and with increased number of attempts to drain retained hemothorax.[22.]

Malposition of, and poor drainage through thoracostomy tubes results in retained hemothorax.[23] Treatments practiced for retained hemothorax are placement of a second thoracostomy tube, intrapleural fibrinolytic therapy, Video-Assisted Thoracoscopic Surgery (VATS) and thoracotomy.[24]However, second tube thoracostomy is associated with high failure rate and further surgical interventions are usually required for them at a later stage.[25] Fibrinolytic therapy is a non-operative method of evacuation of retained hemothorax and agents used for fibrinolytic therapy are streptokinase, urokinase and tissue plasminogen activator (TPA). Separate studies using streptokinase (250,000 units/ day) and urokinase (100,000 units/day) as fibrinolytic agents have achieved overall success rate of 92%.[26,27]

Our institution does not have any facilities for VATS. It is a safe procedure, is better tolerated than thoracotomy, and has

got less postoperative complications.[22] However, conversion to open thoracotomy may be required up to 17% cases.[28] VATS procedure requires single lung anaesthetia, which is not recommended in presence of hemodynamic instability. An obliterated pleural cavity due to previous infection or surgery is also a contraindication for VATS.[29]

We performed thoracotomy for all patients with retained hemothorax. Though thoracotomy is a more invasive procedure, it offers the best view of the intrathoracic collection than any other procedures to evacuate the clotted blood. Thoracotomy has been proved to be a procedure with the highest success rate as deunitive procedure for retained hemothorax and lowest need for additional therapy after the procedure.[30]

Our mortality rate was 2.54% (3 patients of hemothorax). A study in United State also recorded overall mortality rate of 4% in trauma victims.[4] All of them had severe chest injury along with other organ injuries. Studies have found that the severity of trauma is a determinant of mortality.[9]

## CONCLUSION

In conclusion, we can state that blunt thoracic trauma is a common cause of hemothorax. Road traffic accident is the most common mechanism, and most commonly affected gender is male. Small hemothoraces can be treated by observation. Initial treatment of a large hemothorax is thoracostomy tube drainage. Only massive hemothorax require immediate intervention during primary survey. Interventions for rest of the hemothoraces can be planned after radiological confirmation. The majority of hemothoraces do not require any major surgical procedures.

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**Contribution of Authors**: We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the contents of this article will be borne by the authors.

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