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Research Paper

Medical Science

KEYWORDS :

Emergency Tube-Thoracostomy at tertiary care centre.

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ABSTRACT

Background : Thoracostomy tube was first described by Hippocrates for the drainage of pleural cavity.[1] In 1876, Hewitt was the first to use a completely closed intercostal drainage system, but it was not until World War II that tube thoracostomy became common in the treatment of injured patients.[2] Physicians with almost all surgical specialties, intensivists, and emergency physicians are required to perform this life saving procedure.[2] In this study, we documented all possible indications and complications for chest tube insertion at Emergency Department (ED) of Civil Hospital, Ahmedabad.

Aims and Objectives : To discuss indications and complications for emergency thoracostomy tube placement.

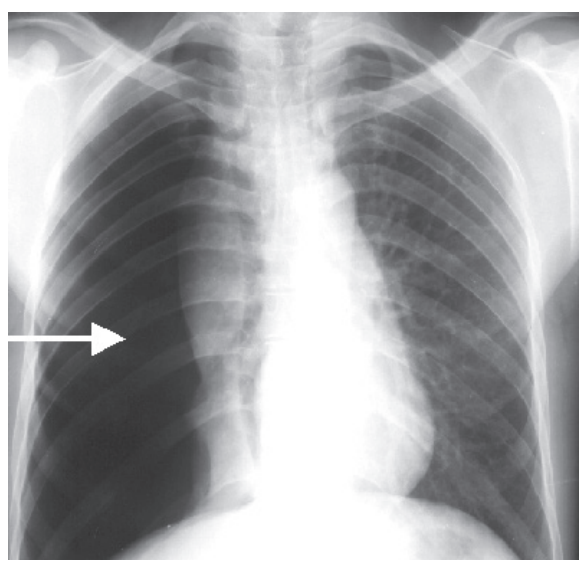
Methods : This cross sectional, descriptive, single centre study was conducted at Emergency Department (ED) of Civil Hospital, Ahmedabad, a tertiary care centre in Gujarat between January 2012 to November 2013. 119 patients fulfilling inclusion criteria were included in this study with 134 thoracostomy tube insertions. Indications and complications for the thoracostomy tube insertion were documented and analysed.

Results : We studied 119 patients in whom 134 tube thoracostomy were inserted. 83 were male patients and 36 were female patients. Most common indication for tube insertion was traumatic pneumothorax (49.57%) followed by traumatic haemothorax (29.06%). Main complication observed was kinking of tube (9.7%) followed by lung injury (2.98%), intercostal vessel injury (1.49%). Over all complication rate was 17.91%.

Conclusion : Emergent tube thoracostomy is of paramount importance for management of chest trauma patients. If proper technique and post procedural care is given than we can reduce the rate of complications.

Introduction

Chest trauma is one important factor for total morbidity and mortality in traumatized emergency patients. Drainage of pleural space by means of a tube thoracostomy is the commonest intervention in thoracic trauma, and provides definitive treatment in the majority of cases. The accurate identification of a patient at high risk for major chest injuries is necessary to avoid delays that may lead to significant morbidity and mortality. Aggressive management of the chest trauma in ED along with prompt treatment of associated injuries is essential for optimal patient outcomes. Tube thoracostomy is a simple but invasive and frequently lifesaving procedure. This carries a significant complication rate reported as between 2% to 10%.[3,4] The literature review has shown many insertional, positional and infection related complications after tube thoracostomy especially after acute trauma.[5] The overall complications rate reported is 25% to 30% in other studies. Chest tube malpositioning was found to be the most common complication of tube thoracostomy.[6,7] The objective of this study was to determine the frequency of various indications and complications of tube thoracostomy performed by emergency physicians at Emergency Department (ED) of Civil Hospital, Ahmedabad, Gujarat.



Aims and Objectives

To discuss indications and complications for emergency thoracostomy tube placement.

Clinical Presentation

Common early findings include

Chest pain
Dyspnea
Anxiety
Tachypnea
Tachycardia
Hyper resonance of the chest wall on the affected side
Diminished breath sounds on the affected side

Whereas late findings includes

Subcutaneous emphysema
Decreased level of consciousness
Tracheal deviation toward the contralateral side
Hypotension
Distension of neck veins (may not be present if hypotension is severe)
Cyanosis

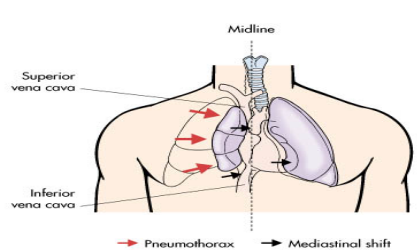


Figure 26-6 Tension pneumothorax. As pleural pressure on the affected side increases, mediastinal displacement ensues with resultant respiratory and cardiovascular compromise.

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Procedure

EMERGENCY TUBE THORACOSTOMY INDICATIONS

- Pneumothorax (tension, traumatic, spontaneous, iatrogenic)
- Penetrating chest trauma
- Hemothorax
- Flail chest (traumatic or iatrogenic)
- Complicated parapneumonic effusion or empyema
- Chylothorax

CONTRAINDICATIONS

- There are no absolute contraindications to tube thoracostomy, particularly if the patient is in respiratory distress or has a tension pneumothorax.
- Anticoagulation or a bleeding diathesis is a relative contraindication.
- Blind insertion of a chest tube is dangerous in a patient with adhesions from infection, previous pleurodesis, or a lung transplant.

TUBES AND TECHNIQUE

- Once the decision has been made to insert a chest tube, the operator must select the type of tube, the size of the tube, the insertion site, and the insertion technique to be employed.
- Type of tube — Silastic® tubes are preferred because older rubber tubes have fewer drainage holes, are not well visualized on chest radiographs, and produce more pleural inflammation. Silastic chest tubes contain a radiopaque strip with a gap that serves to mark the most proximal drainage hole.
- Size of tube — a chest tube's internal diameter and length are the critical determinants of flow. Select the appropriate chest tube size to account for the viscosity and accumulation rate of the pleural material to be drained. The rate of air leakage determines the tube size in patients with a pneumothorax. A 16 to 24 Fr chest tube is usually sufficient to maintain evacuation of the pleural space in patients with a spontaneous or iatrogenic pneumothorax. For traumatic pneumothoraces, use of 28 to 40 Fr chest tubes is prefered as drainage of blood in addition to air may be necessary. The goals of tube thoracostomy in acute hemothorax are drainage of fresh blood, quantification of the rate of bleeding, evacuation of any coexisting pneumothorax, and tamponade of the bleeding site. Large bore catheters (32 to 40 Fr) are required to reliably achieve these goals.
- Insertion site — most clinicians insert the chest tube via an incision at the fourth or fifth intercostal space in the anterior axillary or mid-axillary line. For evacuation of a pneumothorax. For evacuation of a pneumothorax, the chest tube should be directed apically, while for drainage of a pleural effusion the chest tube should be directed inferiorly and posteriorly.
- Insertion techniques — two techniques are most commonly used to place a chest tube. The standard technique employs blunt dissection to access the pleural space. In contrast, the Seldinger technique uses serial dilatation over a guide wire.

EQUIPMENTS

- Sterile gloves and gown
- Skin antiseptic solution, e.g. iodine or chlorhexidine in alcohol
- Sterile drapes
- Gauze swabs
- A selection of syringes (5, 10, 20 ml) and needles (21–25 gauge 1.5 in)
- Local anaesthetic, e.g. lignocaine (lidocaine) 1% or 2%
- Scalpel and blade
- Suture (e.g. "1-0 or 2-0" silk)
- Needle holder
- Instrument for blunt dissection (e.g. curved clamp)
- Guide wire with dilators (if small tube being used)
- Chest tube of appropriate size
  Man - 28-32F
  Woman - 28F
  Child - 12-28F
  Infant - 12-16F
  Neonate - 10-12F
- Connecting tubing
- Closed drainage system (including sterile water if underwater seal being used)
- Dressing

Materials and Methods

This cross sectional, descriptive, single centre study was conducted at Emergency Department (ED) of Civil Hospital, Ahmedabad, a tertiary care centre in Gujarat between January 2012 to November 2013. A total of 119 patients were included in this study with 134 tube insertions. After primary resuscitation and stabilization, question form were filled pertaining to indications and complications for the thoracostomy tube insertion. All the necessary data were entered in Microsoft Excel sheet (2013) and analysed using Epi. Info 7.0 software.

Inclusion criteria : age ≥ 13 years

Exclusion criteria : obstetric & gynaecological patients, refusal of giving consent

Emergency (portable) chest X-ray &/or USG thorax was performed in every patients in whom trauma to chest was seen or suspected.

After obtaining written consent, the procedure was performed by emergency medicine residents, under supervision. The first step involved positioning the patient and choosing the insertion site. In awake and cooperative patients, a suggested position was semi-decubitus on the bed at 45°, with the arm behind the head so as to expose the axillary area. The drain was inserted in the 'safe triangle', which is delineated by the lateral border of the pectoralis major, the anterior border of the latissimusdorsi and a line horizontal with the nipple. The area of insertion was prepped with 10% povidine-iodine solution (or chlorhexidine) and draped with sterile towels. Using 1% or 2% lidocaine, a 2-3 cm area of skin and subcutaneous tissue was anaesthetized. Local anaesthetic was then infiltrated above a rib to avoid the intercostal neurovascular bundle. When air or pleural fluid is aspirated (thoracocentesis), the needle was withdrawn until it ceases. Further local anaesthetic was infiltrated just above the parietal pleural, which is exquisitely painful when breached. Aspiration of air or pleural fluid confirmed the appropriate site. If aspiration was not successful, then imaging should be sought. Bed side portable ultrasound was the preferred form of imaging. After infiltrating site with local anaesthetic agent, tubes were inserted with or without trocars. The tubes were connected to a chest bottle with under water seal system or to negative suction system.

Management of trauma to other systems was done accordingly with the help of specialities like, neurosurgery, cardiothoracic and vascular surgery, orthopaedics etc.

Emergency crash cart was kept ready in case if patient developed immediate post procedural complications.

Chest X-ray was performed post insertion, for daily follow up and post removal of the tube. Chest CT scan was done, if needed. Any complication related to the insertion of the tube, any mistake during the care & management of the tube were recorded.

Results

Table – 1 Age and gender distribution

Age group (years)	No. of patients	Percentage (%)
13 – 30	43	36.56
31 – 50	52	44.08
51 – 70	13	10.76
70 and on	11	8.60
Total	119	100
Male to female ratio	7:3 (i.e. M-83, F-36)	(M-69.74%, F-30.26%)

Table – 2 Indications of emergency thoracostomy tube insertion.

Indications	No. tube inserted	Percentage (%)
Pneumothorax Spontaneous Traumatic Iatrogenic Tension	 7 66 3 4	 5.13 49.57 2.13 3.00
Traumatic Hemothorax	39	29.06
Large pleural effusion	6	4.7
Post CPR	1	0.85
Small Pneumothorax requiring PPV	8	5.56
Total	134	100

CPR – Cardio-pulmonary resuscitation, PPV – Positive pressure ventilation

Table – 3 Site of insertion of thoracostomy tube.

Insertion site	No. of tube inserted	Percentage (%)
Right sided	61	45.73
Left sided	59	44.02
Bilateral	7 (1+1) = 14	10.25
Total	134 in 119 patients	100

Table – 4 Complications related to thoracostomy tube insertion.

Complications	No. of complications	Percentage (%)
Kinking of tube	13	9.7
Lung injury	4	2.98
Intercostal vessel injury	2	1.49
Diaphragmatic injury	1	0.75
Liver injury	1	0.74
Post expansion pulmonary edema	1	0.75
Retrograde infection	2	1.49
Total	24 out of 134	17.91

Summary

In this study, we studied a total of 119 patients from which 134 tube thoracostomy were inserted. 83 were male patients and 36 were female patients. Most common indication for tube insertion was traumatic pneumothorax (49.57%) followed by traumatic haemothorax (29.06%). Main complication observed was kinking of tube (9.7%) followed by lung injury (2.98%), intercostal vessel injury (1.49%). Overall complication rate was 17.91%.

Conclusion

Emergency tube thoracostomy is of paramount importance for management of chest trauma patients. If proper technique and post procedural care is given, we can reduce the rate of complications.

REFERENCE

1. Fry W, Paape K. Shield's text book of general thoracic surgery, 6th ed. Chapter 56, p. 794-805. | 2. Ball C, Lord J, Laupl and K, Gmora S, Mulloy RH, Nq AK, et al. Chest tube indications: How well are we training our residents? Can J Surg.2007; 50:450-58. | 3. The trauma website. http://www.trauma.org/thoracic/ CHEST drain.html [March 2004]. | 4. Resnick DK. Delayed pulmonary perforation. A rare complication of tube thoracostomy. Chest 1993; 103: 311-3. | 5. Khaliq MR, Lakhani MS. Indications and relative frequencies for diseases requiring closed tube thoracostomies in medical patients. Ann Abbasi Shaheed hosp Karachi Med Dent Coll 2003; 8: 26-33. | 6. Bailey RC. Complications of tube thoracostomy in trauma. J Accid Emerg Med 2000; 17: 111-4. | 7. Collop NA, Kim S, Sahn SA. Analysis of tube thoracostomy performed by pulmonologists at teaching hospital. Chest 1997; 112: 709-13. | 8. Ali HA, Lippmann M, Mundathaje U, Khaleeq G. Spontaneous hemothorax: a comprehensive review. Chest 2008; 134:1056. |