

Analysis of 200 Cases of Tube Thoracostomies Performed by General Surgeons

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ABSTRACT

OBJECTIVE OF STUDY: To observe various indications & complications of tube Thoracostomy.

DESIGN: Prospective, descriptive study.

PLACE & DURATION OF STUDY: Public and private sector hospitals of Nawabshah and Hyderabad from 1st Jan 2005 to Dec 2008.

METHODOLOGY: All patients of either sex above the age of 13 years having pathology related to chest cavity and underwent chest intubation were included in the study. Patients below the age of 13 years, having serious co morbid illness like Ischemic heart disease (ASA-3), severe chronic obstructive airway disease requiring ventilator support, and complicated chronic liver disease & patients who lost to follow-up were excluded. Data was collected for age, sex, indications of chest intubations, cause of the disease, procedural and post procedural complications & hospital stay. Descriptive analysis was performed using SPSS version 10 for continuous and frequency variables.

RESULTS: Total 200 patients of different pathologies related to chest cavity underwent chest intubations. Mean age was 43.57 years SD± 12.68 with 60.5% male and 39.5% female. Indications were: pleural effusion 86(43%) patients, pneumothorax 36(18%) patients, empyema thoracis 33(16.5%) patients, hydropneumothorax 24(12%) patients and haemothorax 18(9%) patients. Etiology for intubations includes 118(59%) patients of complicated pulmonary tuberculosis, 27(13.5%) patients of blunt trauma chest & 21(10.5%) patients of post pneumonic empyema. Procedural complications were found in 24(12%) patients and postoperative complications in 25 (12.5%) patients. Mean hospital stay was 5.5 days.

CONCLUSION: We found chest tube insertion as the first line of treatment for variety of life threatening chest diseases. It is safe & effective procedure associated with procedural (12%) & post procedural complications (12.5%) which are comparable to international literature.

KEYWORDS: Tube thoracostomies, indications, complications.

INTRODUCTION

Pleural drainage with chest intubation is a life saving procedure that is commonly performed throughout the world. Hippocrates was the first one who actually described the procedure¹. First completely closed intercostal drainage system was used in 1876 by Hewitt². However this procedure got its significance in World War II when it was used successfully on injured patients³. Surgeons commonly perform this procedure but recently there has been change in the trend and it is equally performed by other specialities including general physicians, pulmonologists and intensivists and in many centres of the world it is applied as a mandatory skill to be learnt by emergency room physicians^{4,5}. Common indications for this procedure includes trauma to chest wall and lung parenchyma leading to haemothorax or pneumothorax, complicated pulmonary diseases like effusion, pneumothorax, or empyema secondary to pulmonary tuberculosis, pneumonia, COPD or tumours of lung or pleura and others. Chest tube is also introduced after surgery

on lungs and chest wall.^{6,7,8}. As an invasive procedure it is associated with significant major and many minor complications, which are usually divided into insertional, positional and infective complications^{9,10}. These complications rates have been reported to be between 2 – 25%⁶.

As most of the data regarding the various parameters of this procedure is available from western countries so we decided to conduct a prospective, descriptive study. This study will help us to find out the different indications of Tube Thoracostomy in our setup. At the same time we will also look into the various procedural & post procedural complications associated with the procedure & compare it to national & international literature.

MATERIALS AND METHODS

This was a prospective, descriptive study conducted at public and private sector hospitals of Nawabshah & Hyderabad, Pakistan from Jan 2005 to Dec 2008. All patients of either sex above the age of 13 years hav-

ing pathology related to chest and underwent chest intubation were included in the study. Patients below the age of 13 years, having serious co morbid illness like Ischemic heart disease (ASA-3), severe chronic obstructive airway disease requiring ventilator support, and complicated chronic liver disease were excluded. Also patients who lost to follow-up were excluded.

These patients were admitted in ward. Detailed history was taken from these patients especially in data related to age, sex, symptomatology, co morbid illness & family history of pulmonary tuberculosis and bronchial asthma. Thorough examination was performed with special focus on variables like anemia, cyanosis, weight loss & general health of the individual. Investigations like complete blood count, blood sugar, blood urea, x-ray chest and where required ECG were performed to assess general fitness. In addition investigations related to pathology like chest x- ray, ultrasound of chest, C.T scan of chest, pleural fluid for D/R, cytology, or C/S and AFB staining or C/S, and FNAC or trucut biopsy of the mass were performed to establish diagnosis. Diagnosis was made and Patients were briefed about the diagnosis and procedure to be performed. Patients were informed and permission was obtained. They were assured that their participation is voluntary with no harms to them in terms of getting due treatment. They were also given right to withdraw from study without putting any reasons. Tube thoracostomy was performed under local anesthesia in 5th intercostals space anterior to midaxillary line. For local anesthesia 1% lignocaine with adrenaline at a dose of 3mg/kg was used. It was infiltrated into the skin, subcutaneous tissue, muscles, and at the level of pleura. Before making incision aspiration from pleural space was performed to note down the presence of fluid or air in chest cavity. Skin incision was made, muscles dissected until pleura reached. Pleural cavity opened and finger introduced into the pleural cavity to remove any adhesions. Chest tube was passed into the pleural cavity attached to artery forceps and connected to underwater sealed bottle. In pleural effusions and haemothorax 24 FR tubes were used, in pneumothorax 24 or 26 FR chest tubes and in cases of empyema 28 or 30 FR tubes were applied. Non of the patient was inserted trocoka for procedure. Direction of chest tube was kept upward in pneumothorax and downward in fluid collections. Non-absorbable sutures were applied to hold tube in place and dressing done. Before shifting the patient to ward column of the under water seal bottle was noted and confirmed that it is moving with the respiration and check x-ray done to see the position of chest tube. In patients with large pleural effusions drainage of pleural fluid was limited to 1 liter in one session to avoid pulmonary edema. Postoperatively patients received I/V antibiotics.

Chest tubes were removed when lung fully expanded and less than 10 ml discharge was coming in the drain. Patients were discharged on second day after removal of tube. However in certain cases Patients were discharged with chest tube in place & these patients were given guidelines for management of chest tube at home & followed every 5th day. In remaining Patients follow-up visits advised at 10 days, 1, 3 and 6 months.

Data was collected on preformed proforma for age, sex, indications of chest intubation, cause of the disease, procedural and post procedural complications and hospital stay. Descriptive analysis done for continuous and frequency variables were applied to categorical data with the use of statistical package for social sciences version 10.

RESULTS

During this period 200 patients of different pathologies related to chest underwent chest intubations. Mean age was 43.57 years SD± 12.68; min. 15 years and max. 80 years. Amongst them 121(60.5%) were male and 79(39.5%) were female. Male to female ratio was 1.53: 1.

Most common indication of Chest tube insertion was Pleural effusion i-e in 86(43%) patients followed by 36 (18%) patients of pneumothorax (Table I).

Regarding the etiology for intubation, it was found that 118(59%) patients had complicated pulmonary tuberculosis, which includes 86(43%) patients of pleural effusion, 21(10.5%) patients of hydropneumothorax, and 11(5.5%) patients of empyema. Second common causative factor responsible for chest intubations was blunt trauma chest i-e in 27(13.5%) patients. 21 (10.5%) patients of post pneumonic empyema followed it. Other causes leading to chest intubations include: 15(7.5%) patients of COPD, 9(4.5%) patients of pulmonary malignancy, 3(1.5%) patients of spontaneous pneumothorax, 3(1.5%) patients of penetrating trauma of chest and 3(1.5%) patients of diaphragmatic surgery. 1(0.5%) patient of ruptured lung abscess was also intubated.

Right-sided procedure was performed in 113(56.5%) patients and left tube thoracostomy in 87(43.5%) patients. No patient required bilateral chest intubation.

Eighty-two (41%) patients in this study were passed chest tube of 24 FR size, 52(26%) patients 26 FR size, 29(14.5%) patients of 28 FR size and 29(14.5%) patients of 32 FR size. In 08(4%) patients 30 FR size chest tube were passed.

Chest tube related complications were categorized into procedural complications and postoperative complications. Procedural complications encountered in 24(12%) patients. It includes 14(7%) patients in which tube was passed more than the required length as

seen in post procedure chest x-ray (Table II). Postoperative complications were recognized in 25 (12.5%) patients. It includes non-functional chest tube in 7(3.5%) patients with 5(2.5%) patients had blocked tubes by clot and 2(1%) had dislodged chest tubes (Table III).

In 4(2%) patients of empyema thoracis chest tube insertion failed to resolve problem of patient and their lung remain collapsed clinically as well as radiologically so these patients were referred to proper health care facility for further management. 1 patient of gun shot injury to lungs was operated and chest tube was placed but patient could not survive.

Mean hospital stay was 5.5 days with the range of 3 to 23 days.

TABLE I: AGE, SEX, SIDE & DURATION OF INTUBATIONS IN PATIENTS UNDERWENT CHEST TUBE INSERTION (n=200)

Mean age of patients in years with SD±	43.57 with SD±12.68
Sex distribution of patients	
Male	121(60.5%)
Female	79(39.5%)
Side of intubations	
Right side	113(56.5%)
Left side	87(43.5%)
Average duration of chest tube insertion with SD±	5.5 days

TABLE II: INDICATIONS OF TUBE THORACOSTOMY (n=200)

Indications	n & %
Pleural effusion	86(43%)
Pneumothorax	36(18%)
Empyema thoracis	33(16.5%)
Hydropneumothorax	24(12%)
Haemothorax	18(9%)
Surgery on chest & diaphragm	03(1.5%)
Total	200

DISCUSSION

Chest tube insertion is the commonly performed procedure through out the world. In the western countries it is commonly performed on injured patients as shown in studies by Chad GB et al¹, Aylwin CJ et al⁶, Maritz D et al¹¹, Bailey RC et al¹² & by Omar HR et al¹³. While in this country this procedure is commonly performed for complicated medical illnesses as depicted

TABLE III: COMPLICATIONS OF TUBE THORACOSTOMY (n=200)

Complications	n & %
Procedural complications. 24 (12%)	
1. Long insertion of Chest tube	14(7%)
2. Shallow insertion of chest tube	08(4%)
3. Bleeding form laceration of intercostal vessel	02 (1%)
Postoperative complications.	25
1. Non-functional chest tube due to;	(12.5%)
Clot	07(3.5%)
Dislodged	05(2.5%)
2. Subcutaneous emphysema.	02(1%)
3. Drain site abscess	06(3%)
4. Non-resolving empyema required	04(2%)
Thoracotomy	04(2%)
5. Recurrent pneumothorax	03(1.5%)
6. Empyema	01(0.5%)
Total	49(24.5%)

from this study. In this study the disease that required tube thoracostomy in more than half of the patients (118/200) is complicated pulmonary tuberculosis. In study by Khanzada TW and Samad A¹⁴ at Isra university hospital, Hyderabad regarding the indications and complications of tube thoracostomy performed by general surgeons they found tuberculous effusion as most common cause (36.1%) for chest drain insertion. Other diseases that commonly lead to chest tube insertion in this study were patients of blunt chest, Para pneumonic empyema, COPD, and in patients of malignant lung diseases.

Being an invasive procedure intercostals tube insertion into the chest is associated with potential complications. Some of these complications are minor in nature and required minimal further intervention. It includes; long or shallow insertion, kinking, dislodgement. Many practitioners including one by Al- Tarshihi et al¹⁵ may not classify them as complications as long-term morbidity related to them is not known. Despite this, re-adjustment of these tubes puts heavy burden on already weak economic status of people of this country on one hand while on the other hand it is uncomfortable and traumatic to the patients. In our study we divided complications into procedural complications and post-procedural complications. 22/24 patients in this study who developed procedural complications had either long insertion of tube (14) or shallow tube insertion (8), which required re-adjustment after check x-ray. Also in 7 patients chest tubes became non-functional due to blockage by clot 5) or dislodged (2). Clot was removed by milking and manipulation of tubes however dislodged chest tubes re-

quired re-adjustment. Only 2/24 patients of procedural complications had bleeding from the intercostals vessels that required ligation of bleeding vessel. Many other authors reported malpositioning of chest tube as common complication which includes studies by Chad GB et al¹, Baldt M et al¹⁶ and Stark D et al¹⁷. In their study Al- Tarshihi MI and colleagues¹⁵ demonstrated laceration of intercostal artery as one of the common complication. They found this complication in 1.5% patients of their series. Chad GB et al¹ found intercostal laceration in 4/761 patients. In this study bleeding from laceration of intercostal artery was noted in 2/200 (1%) patients that is slightly shorter than their study. Al - Tarshihi and colleagues¹⁵ & Ortnier CM¹⁸ found injury to lung parenchyma in 4.7% & 6.1% cases of their series. Huber-Wagner S and colleagues¹⁹ demonstrated higher incidence of lung injury in emergency chest tube insertions. In study by Chad GB and colleagues¹ they found lung parenchyma injury in 2/761 patients. In this study no patient sustained lung injury during intubation.

Al- Tarshihi MI and colleagues¹⁵ found diaphragmatic injury in 0.3% patients. While in our study no diaphragmatic injury was noted. This injury can be avoided by putting the chest tubes in intercostal space not lower than the 4th space as diaphragm may move up to 5th intercostal space during expiration.

In study of Khanzada TW et al¹⁴ they found subcutaneous emphysema in 5/105 patients, which resolved spontaneously within few days. In our series subcutaneous emphysema was found in 3% patients, which is slightly lower than their study.

Drain site cellulites or abscess was found in 4 patients of Diabetes Mellitus with empyema thoracis in our study. They were treated with I/V antibiotics, daily dressing and proper control of blood sugar level with regular insulin. In study of Khanzada TW and colleagues¹⁴ they found superficial site infection in 1/105 patients. Four patients of empyema thoracis required thoracotomy and were referred to proper health care facility. Recurrent pneumothorax was found in 2 patients of COPD and 1 patient of tuberculous hydropneumothorax in our study. All these patients required re-insertion of chest tubes which were kept for longer periods. In study by Collop NA and colleagues¹⁰ they used pleurodesis in 7/91 patients of their series who developed recurrent pneumothorax. Most common indication for use of pleurodesis in their study was patients with malignant pleural effusion. However in this study all patients with malignant effusions or haemothorax secondary to malignancy and required chest drain insertion was referred to oncologist for further management.

CONCLUSION

Chest tube insertion is noted as the first line of treatment for variety of life threatening chest diseases. It is found safe & effective procedure. Commonest cause that leads to need of chest tube insertion in our part of the world is complicated pulmonary tuberculosis which is noted in 59% patients. Being an invasive technique it is associated with complications. Many of them are of minor nature; however few are of great significance like injury to intercostal vessel, subcutaneous emphysema, drain site cellulites, and recurrent pneumothorax. Procedural complications were noted in 12% patients & post procedural complications in 12.5% which are comparable to international data.

Limitations

1. Inability to perform pleurodesis in cases with recurrent pneumothorax and in Malignant diseases.
2. Non-availability of specialized thoracic surgery units where specialized procedures thoracotomy can be performed.

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