
Experience of First 250 Cases of Tube Thoracostomy Under Thoracic Surgery Unit of BSMMU, Dhaka, Bangladesh

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Abstract: *Background:* The most commonly performed surgical procedure in thoracic surgery is Tube thoracostomy. General surgeons, intensivists, emergency physicians, and respiratory physicians may at one time or the other be required to perform tube thoracostomy as a lifesaving procedure. *Objective:* To observe experience of tube thoracostomy under thoracic surgery unit of BSMMU, Dhaka, Bangladesh. *Methodology:* This was a prospective, descriptive study conducted at thoracic surgery unit of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Study duration was from 02.12.2018 to 01.10.2021, total 2 years and 10 months. All patients of all age group such as from 2 years of age to 93 years of age those who underwent Tube thoracostomy under thoracic surgery unit were included in the study. All the data were collected for age, sex, occupation, indications of tube thoracostomy, post procedural complications & hospital stay. *Results:* 250 patients of different pathologies related to chest underwent tube thoracostomy during this period. Mean age was 47.53 years SD± 2.15; minimum age was 2 years and maximum age was 93 years. Among them 173 (69.2%) were male and 77 (30.8%) were female. Male to female ratio was 2.24: 1. Pleural effusion was the most common indication of tube thoracostomy which was in 141 (56.4%) patients followed by pneumothorax 21 (11.6%) patients. Regarding the etiology for tube thoracostomy, it was found that Shows in (Figure 2) Routine 219 cases 87.6% and Emergency 31 cases 12.4% (Due to chest trauma following road traffic accident, during CV catheterization, during lung biopsy), which includes 141 (56.4%) patients of pleural effusion, 29 (11.6%) patients of hydro pneumothorax, and 27 (10.8%) patients of empyema thoracic. Postoperative complications were recognized in 8 patients in shows (Figure 6). It includes Surgical site infection in 5 (2.0%) patients and accidental withdrawal of chest tube by patient himself 3 (1.2%) had dislodged. In 56.0% cases chest drain tube was removed within 7 days (Table 3). Chest drain tube was always given in "Safety triangle". All cases were done by local anesthesia (2% lignocaine injection). Mean hospital stay was 15.5 days with the range of 2 to 45 days. *Conclusion:* Chest tube insertion is the first line treatment for variety of life-threatening chest diseases. This is a safe & effective procedure with 3.2% post procedural complications which is comparable to international literature.

Keywords: Tube Thoracostomy, Indications, Pleural Effusion, Complications

1. Introduction

The most commonly performed surgical procedure in thoracic surgery is Tube thoracostomy. General surgeons, intensivists, emergency physicians, and respiratory physicians may at one time or the other be required to perform tube thoracostomy as a lifesaving procedure. First documented description of a closed tube drainage system for

the drainage of empyema was by Hewett in 1867 [1]. However, experience was gained in military and civilian hospitals contributed to the development of tube thoracostomy in chest trauma management during the Second World War and it has become the standard of care for management of chest trauma at the time of the Vietnam war [2]. Lilienthal reported the postoperative use of chest tube following lung resection for suppurative diseases of the lung in 1992 [3]. This procedure got its significance in World War

II when it was used successfully on injured patients [4]. Tube thoracostomy was commonly performed by surgeons but there has been change in the trend recently and it is equally performed by other specialties including pulmonologists, general physicians and intensivists and it is applied as a mandatory skill to be learnt by emergency room physicians in many centers of the world [5, 6]. Trauma to chest wall and lung parenchyma leading to pneumothorax or hemothorax, pulmonary diseases like effusion, pneumothorax, or empyema secondary to pulmonary tuberculosis, pneumonia, COPD or tumors of lung or pleura are the common indications for this procedure. Chest tube is also introduced after surgery of chest wall or lungs [7-9]. It is associated with significant major and many minor complications as it is an invasive procedure, which are usually divided into positional, insertional and infective complications [10, 11]. Complications rate have been reported to be between 2 – 25% [7]. Tube thoracostomy is an invasive procedure and complications can happen due to inadequate knowledge of thoracic anatomy or inadequate training and experience. Most of the data regarding various parameters of this procedure is available from western countries. For this reason, 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.

2. Materials and Methods

This was a prospective, descriptive study conducted at Thoracic Surgery Unit of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Study duration was from 02.12.2018 to 01.10.2021, total 2 years and 10 months. All patients of all age group such as from 2 years of age to 93 years of age those who underwent Tube thoracostomy under thoracic surgery unit were included in the study. All the data were collected for age, sex, occupation, indications of tube thoracostomy, post procedural complications & hospital stay. Descriptive analysis was performed with the help of SPSS version 21 for continuous and frequency variables. There was no patient missing during follow-up and there was no exclusion. History was taken elaborately from these patients related to age, sex, occupation, symptom, co-morbidities, & about family history of pulmonary tuberculosis and bronchial asthma. Thorough general physical examination was performed with special focus on variables like anemia, cyanosis, weight loss & general health. General fitness was assessed by investigations like complete blood count, blood sugar, blood urea, x-ray chest and ECG. Investigations related to pathology like ultrasound of chest, C.T scan of chest, chest x-ray, pleural fluid for cytology, C/S and AFB staining and FNAC of the mass were performed additionally to establish the diagnosis. Briefing about the diagnosis and procedure to be performed was done before procedure. Informed written consent was taken from patient's legal guardian or from patient prior the procedure. Patients were assured that their participation is voluntary and there will be no harms to them in terms of getting treatment. They had also every right to

withdraw from study without putting any reasons. Tube thoracostomy was performed under local anesthesia in anterior to midaxillary line at 5th intercostals space. 2% lignocaine dose of 3 mg/kg was used for local anesthesia. Local anesthesia was infiltrated into the skin, subcutaneous tissue, muscles, and pleura. To note down the presence of fluid and or air in chest cavity, aspiration from pleural space was performed before making incision. Skin incision was made. Then muscles were dissected until pleura reached. Pleural cavity was opened and to remove any adhesions finger was introduced into pleural cavity. Chest tube was introduced into the pleural cavity with the help of a artery forceps and connected to underwater sealed drain bottle. In pleural effusions and hemothorax 28 FR tubes were used, in pneumothorax 24 or 26 FR chest tubes and in cases of empyema 30 or 32 FR tubes were applied. Direction of chest tube was tried to kept upward in pneumothorax and in case of fluid collections, down ward. Atraumatic silk sutures were applied to hold tube in place and then dressing was done. Column of the underwater seal bottle was noted before shifting the patient to ward and confirmation of movement with the respiration and check x-ray done to see the position of chest tube. Patients with large pleural effusion, 1 liter in one session of pleural fluid was drained and it was limited to avoid pulmonary edema. Patients were received I/V antibiotics postoperatively. Removal of chest tubes were done when lung was fully expanded and less than 100 ml/24 hours discharge was coming. 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 collection was done on preformed proforma for age, sex, cause of the disease, indications of chest intubation, procedural and post procedural complications and hospital stay. Descriptive analysis was done for continuous and frequency variables were applied to categorical data. Statistical package for "SPSS" Windows version 21 was used for analysis.

3. Results

During this period 250 patients of different pathologies related to chest underwent chest intubations. Mean age was 47.53 years SD± 2.15; minimum age was 2 years and maximum age was 93 years. Among them 173 (69.2%) were male and 77 (30.8%) were female. Male to female ratio was 2.24: 1. Most common indication for chest tube insertion was pleural effusion which was 141 (56.4%) patients followed by 21 (11.6%) patients of pneumothorax (Table 1). Regarding the etiology for intubation, it was found that Shows in (Figure 2) Routine 219 cases 87.6% and Emergency 31 cases 12.4% (Due to chest trauma following road traffic accident, during CV catheterization, during lung biopsy), which includes 141 (56.4%) patients of pleural effusion, 29 (11.6%) patients of hydro pneumothorax, and 27 (10.8%) patients of empyema thoracis (Table 2). Other causes leading to chest intubations include: Pleural Biopsy cases 140 cases 56.0%

“Diagnosis confirmed” after tube thoracostomy and pleural biopsy 173 cases 69.2% and pleurodesis done 131 case 52.4% respectively (Figures 2, 3, 4). Right-sided procedure was performed in 141 (56.4%) patients and left tube thoracostomy in 109 (43.6%) patients. No patient required bilateral chest intubation.

Table 1. Age, Sex, Side, occupation & Duration of Intubations in Patients Underwent Chest Tube Insertion (n=250).

Mean age of patients in years with SD±	47.53 with SD±2.15
Sex distribution of patients	N (%)
Male	173 (69.2%)
Female	77 (30.8%)
Side of intubations	N (%)
Right side	141 (56.4%)
Left side	109 (43.6%)
Occupation	N (%)
Farmer	92 (36.8%)
Job	45 (18.0%)
Business	33 (13.2%)
House hold worker	43 (17.2%)
Student	17 (6.8%)
Child (below 5 years old)	20 (8.0%)
Average duration of chest tube insertion with SD±	5.5 days

Table 2. Cause of Tube Thoracostomy (N=250).

Indications	N (%)
Pleural effusion	141 (56.4%)
Pneumothorax	21 (8.4%)
Empyema thoracis	27 (10.8%)
Hydropneumothorax	29 (11.6%)
Haemothorax	19 (7.6%)
Chylothorax	03 (1.2%)
Total	00.0%

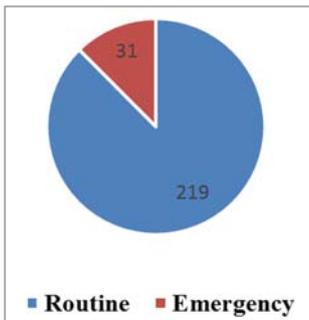


Figure 1. Type of Tube Thoracostomy (n=250).

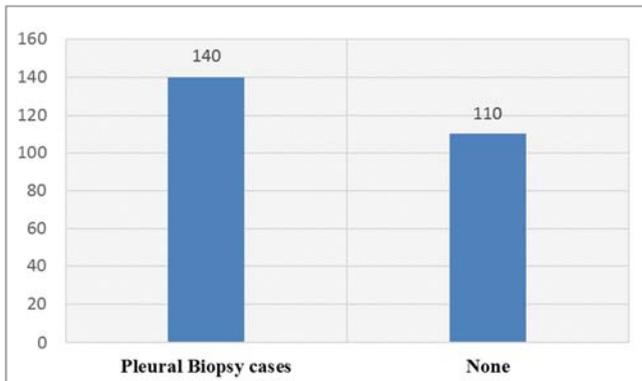


Figure 2. Number of Pleural Biopsy cases (n=140).

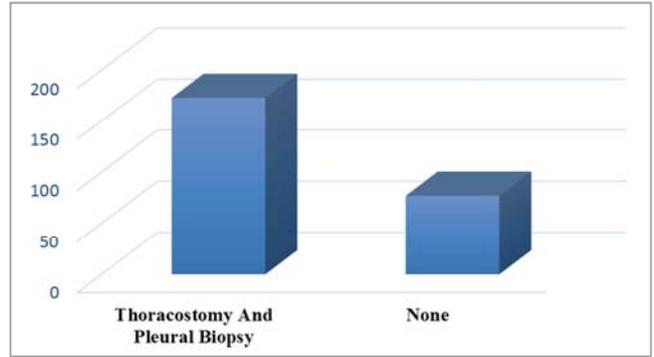


Figure 3. “Diagnosis confirmed” after tube thoracostomy and pleural biopsy (n=173).

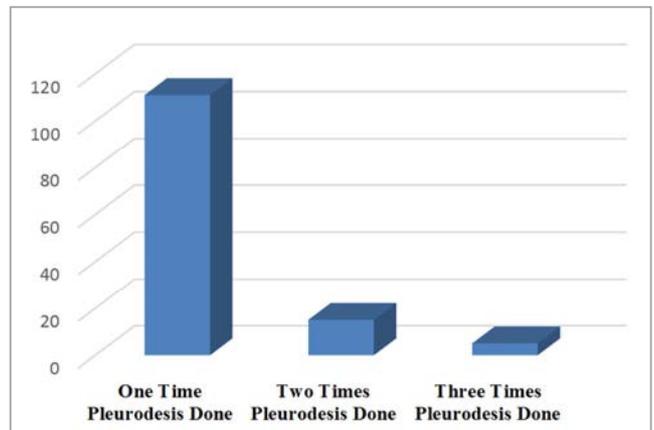


Figure 4. Number of pleurodesis done (n=131).

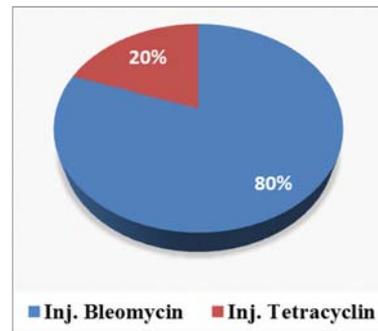


Figure 5. Pleurodesis done by Inj. (n=250).

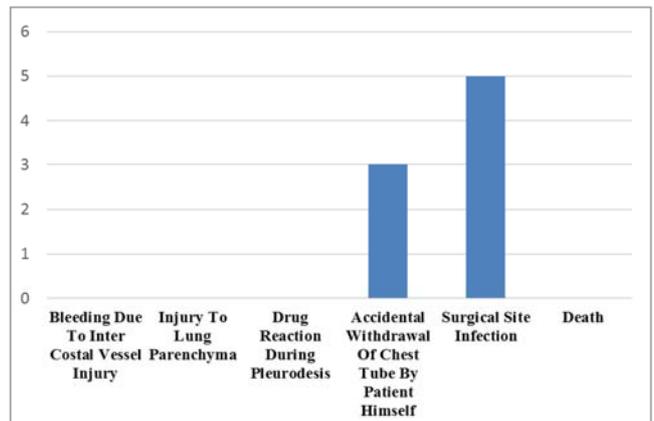


Figure 6. Complication after tube thoracostomy.

Table 3. Timing of removal of Chest drain tube (n=250).

Duration	N (%)
Within 2 days	17 (6.8%)
Within 3 to 7 days	123 (49.2%)
Within 7 to 10 days	45 (18.0%)
Within 11 to 14 days	36 (14.4%)
Within 15 to 21 days	17 (6.8%)
Within 22 to 30 days	5 (2.0%)
Within 31 to 45 days	7 (2.8%)

Chest tube insertion related complications were categorized into two groups. One is procedural complications and another one is postoperative complications. Procedural complications occurred in 8 (3.2%) patients. Postoperative complications were recognized in 8 patients in shows (Figure 6). It includes Surgical site infection in 5 (2.0%) patients with 5 (2.5%) patients and accidental withdrawal of chest tube by patient himself 3 (1.2%) had dislodged (Table 3). All cases 26.0% those required more than 10 days to remove the chest drain were cancer bearing patient. Chest drain tube was always given in “Safety triangle”. All cases were done by local anesthesia (2% lignocaine injection). Mean hospital staying was 15.5 days and the range was from 2 to 45 days.

4. Discussion

Chest tube insertion is a common procedure to performed throughout the world. In the western countries it is commonly performed on injured patients as shown in studies by, Aylwin CJ et al. [7], Chad GB et al. [12], Maritz D et al. [13], Bailey RC et al. [14] & by Omar HR et al [15]. While in our country this procedure is commonly performed for complicated medical illnesses. This study shows that the disease that required tube thoracostomy in more than half of the patients (141/250) is complicated with pulmonary effusion. In study by Khanzada TW and Samad A et al. [16] 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 (56.4%) for chest drain insertion. In our study most common indication of Chest tube insertion was Pleural effusion in 141 (56.4%) patients followed by 21 (11.6%) patients of pneumothorax (Table 1). Regarding the etiology for intubation, it was found that Shows in (Figure 2) Routine 219 cases 87.6% and Emergency 31 cases 12.4% (Due to chest trauma following road traffic accident, during CV catheterization, during lung biopsy), which includes 141 (56.4%) patients of pleural effusion, 29 (11.6%) patients of hydro pneumothorax, and 27 (10.8%) patients of empyema thoracis (Table 2). Other common diseases those lead to chest tube insertion in this study were patients of Pneumothorax, pneumonic empyema, Hemothorax, Empyema Thoracic and Hydropneumothorax. As an invasive procedure intercostals tube insertion is associated with some potential complications. Some of these complications are minor and required minimal intervention. Some practitioners including Al- Tarshihi et al. [17] may not classify them as complications as long-term morbidity related

to them is not known. In this study we divided complications into two groups. One is procedural complications and another is post-procedural complications. Only 8 patients of procedural complications after tube thoracostomy. Many other authors reported malpositioning of chest tube as common complication which includes studies by Chad GB et al. [12], Baldt M et al. [18] and Stark D et al. [19]. They found this complication in 3.2% patients of their series. Chad GB et al. [12] found intercostals laceration in 4/761 patients. In this study no patient sustained lung injury during intubation. Al- Tarshihi MI and colleagues, [17] found diaphragmatic injury in 0.3% patients. While in our study no diaphragmatic injury was noted. In study of Khanzada TW et al. [19] they found subcutaneous emphysema in 5/105 patients, which resolved spontaneously within few days. In study of Khanzada TW and colleagues, [16] they found superficial site infection in 1/105 patients. Our study in Surgical site infection in 5 (2.0%) patients with 5 (2.5%) patients and accidental withdrawal of chest tube by patient himself 3 (1.2%) had dislodged (Table 3). All cases 26.0% those required more than 10 days to remove the chest drain were cancer bearing patient. Chest drain tube was always given in “Safety triangle”. All cases were done by local anesthesia (2% lignocaine injection). Four patients of empyema thoracis required thoracotomy and were referred to proper health care facility. All these patients required reinsertion of chest tubes which were kept for longer periods. Most common indication for use of pleurodesis in our study was patients with malignant pleural effusion.

5. Conclusion

Chest tube supplement is the first line of treatment for variety of life-threatening chest diseases. It is a safe & effective procedure. Among the causes, commonest cause that leads to need of chest tube insertion in our part of the world is massive pleural effusion and it is 141 cases which is noted in 56.4% patients. Other Causes are empyema, pneumothorax, Hemothorax, Hydropneumothorax etc. Post procedural complications in 3.2% which are comparable to international data.

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