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COMPLICATIONS AND PITFALLS OF TUBE THORACOSTOMY AT A TERTIARY CARE HOSPITAL

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Abstract

Background: A tube thoracostomy is an essential life-saving technique for the treatment of pneumonia, hemotopneumothorax, and hemopneumothorax arising from trauma to the chest

Objective; the aim of the study was to determine the Complications and pitfalls of Tube Thoracostomy at a Tertiary Care Hospital

Method and materials; this cross-sectional study was carried out at the department of Pulmonology, GMMMC hospital Sukkur. The study duration was six months From January 2023 to June 2023 after taking approval from the ethical committee of the institute. A total of 304 individuals were enrolled in this study who experienced a drainage technique of the pleural cavity by a thoracostomy chest tube. Chest tubes that were implanted at the cardiac center were excluded from the study. A chest X-ray was done after the tube was inserted, daily thereafter, and after it was removed. Done a CT scan of the chest if necessary. The thoracic surgical team monitored the chest tubes and their drainage system every day until the day of their removal. Any issues pertaining to the chest tube's insertion as well as any inaccuracies made in the maintenance and handling of the tube and its system were noted. The statistical analysis was carried out with SPSS 27.0 and the variable were expressed in the form of mean ± SD and percentages.

Results: A total of 304 individuals whose age was from 20-60 years were included in this study. Out of which 187 were male and 117 were females. 174 (57.2%) thoracostomy tubes were inserted in the operating room following thoracoscopic or open surgery; 92 (30.2%) went into the surgical and critical care units; 42 (13.8%) went into the emergency room. The most prevalent indication of thoracostomy tube insertion was post thoracotomy (52.9%).Tube insertion complications were 8.5%. The most common complication was iatrogenic lung injuries 4.6% followed by diaphragmatic injury 1.6% and injury of intercostal vessel 1.3% correspondingly. A total 126 (41.4%) pitfalls were detected, amongst which the most prevalent was clamping the chest tube 30 (9.8%), tailed by intrathoracic malposition 23 (7.5%), loose fixation 19 (6.2%),

inappropriate handling of suction system 16 (5.2%), vent covering 13 (4.2%), inappropriate filling of the bottle 10 (3.2%), subcutaneous position 7(2. 6%) ,inappropriate insertion site 8 (2.6%) correspondingly**.**

Conclusion: The majority of the complications were brought on by the trocar-inserted chest tube. Therefore, inexperienced consultants ought to avoid from employing chest tubes with trocars.

Key words: Complications; pitfalls; Tube Thoracostomy

Introduction

As catastrophic chest injuries are becoming more prevalent, doctors are treating a lot of patients in emergency rooms. A tube thoracostomy is an essential life-saving technique for the treatment of pneumonia, hemotopneumothorax, and hemopneumothorax arising from trauma to the chest(1,2). Managing lung ventilation is essential to making sure that body tissues receive enough oxygen during chest trauma. Chest decompression is necessary for this because it reduces intrapleural pressure and permits the lungs to completely expand.(3) Many therapeutic approaches, such as clinical observation, t horaco - centesis, t u be thoracostomy, a n d open thoracotomy, have been observed in published works for the treatment of thoracic injuries.(4,5). Chest tube decompression is the most successful of all, with a thirty percent probability of complications. Considering the severity of its consequences, this surgery carries a considerable risk of preventable morbidity (6,7).They are classified as insertional, positional, or infectious in general. Level of experience has been identified as one of the key factors in the development of these complications, even though a number of risk factors, such as tube size, insertion technique and approach, operator experience, and prehospital tube placement, also contribute to these complications (8, 9). Hewitt was the first who used a totally closed intercostal drainage device in 1876, but tube thoracostomy never became common in the treatment of injured patients until World War II (10). This life-saving treatment must be carried out by medical professionals with practically all surgical specialisations, intensivists, and emergency physicians.(11).the current study was carried out to explore the Complications and pitfalls of Tube Thoracostomy at a Tertiary Care Hospital.

Material and methods

This cross-sectional study was carried out at the department of Pulmonology, GMMMC hospital Sukkur. The study duration was six months From January 2023 to June 2023 after taking approval from the ethical committee of the institute. A total of 304 individuals were enrolled in this study who experienced a drainage technique of the pleural cavity by a thoracostomy chest tube. Several physicians from various specialisations, comprising thoracic surgeon, general surgeons, and general surgery residents, carried out the process. Chest tubes that were implanted at the cardiac center were excluded from the study. Tubes were introduced either with or without trocars. For most patients, the location of insertion was in the lateral chest wall, which extended from the posterior to the anterior axillary line and from the third to the seventh intercostal gap. The tubes were attached to a negative suction system or an underwater seal system on a chest bottle. A chest X-ray was done after the tube was inserted, daily thereafter, and after it was removed. Done a CT scan of the chest if necessary. The thoracic surgical team monitored the chest tubes and their drainage system every day until the day of their removal. Any issues pertaining to the chest tube's insertion as well as any inaccuracies made in the maintenance and handling of the tube and its system were noted.

Statistical analysis

The statistical analysis was carried out with SPSS 27.0 and the variable were expressed in the form of mean ± SD and percentages.

Results

A total of 304 individuals whose age was from 20-60 years were included in this study. Out of which 187 were male and 117 were females. 174 (57.2%) thoracostomy tubes were inserted in the operating room following thoracoscopic or open surgery; 92 (30.2%) went into the surgical and critical care units; 42 (13.8%) went into the emergency room. (Figure i)

The most prevalent indication of thoracostomy tube insertion was post thoracotomy or thoracoscopic surgery 161 (52.9%), following Trauma 61 (20.0%), pleural effusion 41 (13.4%), empyema 14 (4.6%), pneumothorax 12 (3.9%),post cardiac surgery wounds 9(2.9%) and pleural effusion 6(1.9%) correspondingly as described in table 1.

Tube insertion complications were 26(8.5%). The most common complication was iatrogenic lung injuries 14(4.6%) followed by diaphragmatic injury 5(1.6%), injury of intercostal vessel 4(1.3%) and liver injury 3(0.98%) correspondingly as shown in figure 2.

There were total 126 (41.4%) pitfalls were detected, amongst which the most prevalent was clamping the chest tube 30 (9.8%), tailed by intrathoracic malposition 23 (7.5%), loose fixation 19 (6.2%), inappropriate handling of suction system 16 (5.2%), vent covering 13 (4.2%), inappropriate filling of the bottle 10 (3.2%), subcutaneous position 7(2. 6%) ,inappropriate insertion site 8 (2.6%) correspondingly as displayed in **table 2.**

Discussion

A chest tube thoracostomy is an invasive procedure that commonly results in problems due to inadequate tube thoracostomy drainage. Early consequences may include lung perforation, perforation of the right atria or right or left ventricle, stenosis of the subclavian artery, damage to the inferior vena cava, Horner's syndrome, intra-abdominal malposition, kinking, clogging, dislodging and damage to an intercostal artery, vein (12). Other risks that have been described include damage to the phrenic nerve, the heart, the esophagus, the mediastinum, induction of a contralateral the pneumothorax and an arterio-venous fistula (13, 14). Since the chest tubes were all positioned and placed under vision, our study found no issues related to inserting and positioning intraoperative chest tubes in the operating room after thoracotomy. Comparable to the results of Dural K et al & S.F. Monaghan et al, who found that every chest tube-related issue occurred when an emergency department or critical care unit visit was necessary(15,16). There were no issues with our research while using the open technique for the insertion. Yet, all issues resulted from the trocar-assisted chest tube implantation. This is a factor that may occur with inexperienced young physicians, therefore this observation should be concerning.

Injury to the lungs most often stemmed from emergency chest tube implantation (17), as demonstrated by our findings. According to Tang A, the most common complication associated with the insertion was intercostal artery laceration.(18) However, Fulbrook et al. thought that the tube's improper location was the primary cause of complications(19). Malpositioning was better categorized as one of the pitfalls. According to our findings, the most frequent pitfall made when moving patients from one department to another was clamping the chest tube. Patient risk factors for doing this procedure include the possibility of tension pneumothorax and air buildup in the pleural cavity. The majority of the residents and nurses carried out this procedure. In a research concerning nurses' understanding of chest drain management, Lehwaldt et al. were made aware to this frequent pitfalls by the paramedical staff (20).

Both residents and nurses were using the chest bottle with little knowledge of the suction apparatus connected to it. We discovered a risky pitfalls wherein the chest bottle was connected to a thoracostomy tube without being filled with saline. This led to an instantaneous tension pneumothorax and cardiac arrest.

Conclusion

The majority of the complications were brought on by the trocar-inserted chest tube. Therefore, inexperienced consultants ought to avoid from employing chest tubes with trocars. Because of their

limited training and experience, residents and nurses make the most mistakes when it comes to managing the thoracostomy tube and its system.

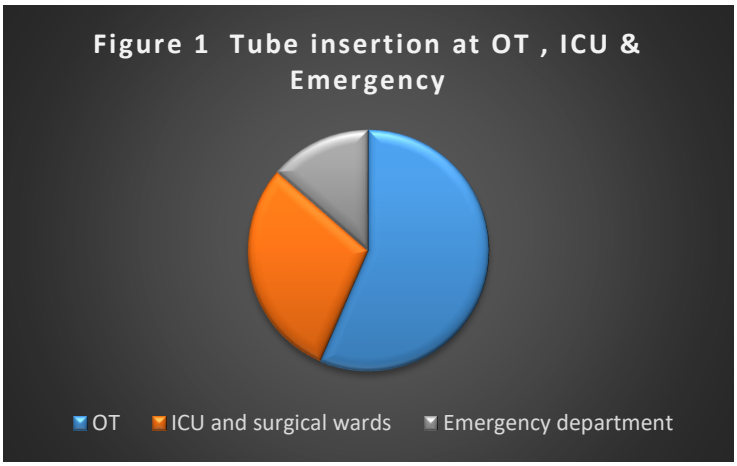

TABLE 1 INDICATIONS OF TUBE INSERTION	
INDICATION	N (%)
POST THORACOTOMY	161 (52.9)
TRAUMA	61 (20.0)
PLEURAL EFFUSION	41 (13.4)
EMPYEMA	14 (4.6)
POST CARDIAC SURGERY	9(2.9)
PNEUMOTHORAX	12(3.9)
PLEURAL EFFUSION	6(1.9

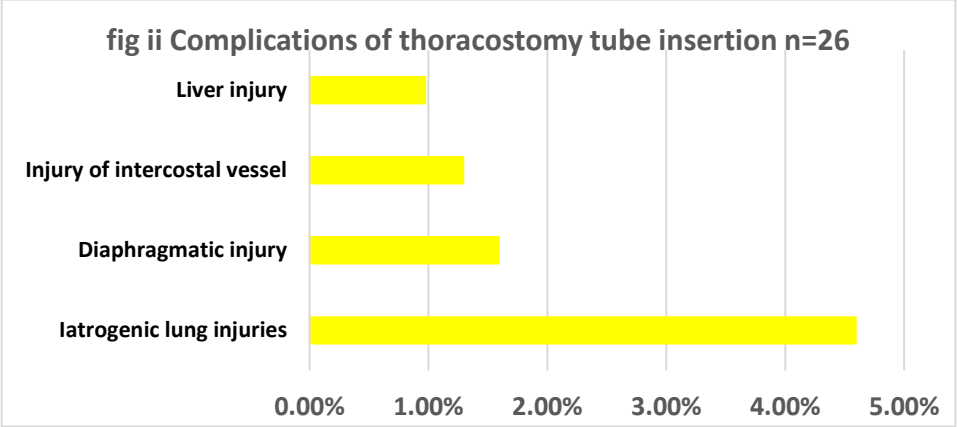

Table 2. . Pitfalls of thoracostomy tube insertion (n=126)	
Pitfall	N (%)
Clamping chest tube	30 (9.8)
Intrathoracic mal position	23 (7.5)
Loose fixation	19 (6.2)
Improper handling of suction system	16 (5.2)
Vent covering	13 (4.2)
Improper filling of bottle	10(3.2)
Subcutaneous position	7(2. 3%)
Improper insertion site	8 (2.6%)

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