

Frequency of Empyema After Tube Thoracostomy in Patients with Penetrating Chest Trauma

Empyema After
Tube
Thoracostomy in
Chest Trauma

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ABSTRACT

Objective: The objective of this study was to determine the frequency of empyema after tube thoracostomy in patients presenting with penetrating chest trauma.

Study Design: Descriptive Study

Place and Duration of Study: This study was conducted at the Department of Thoracic Surgery, MTI/Lady Reading Hospital, Peshawar, Pakistan from 1st October 2022 to 31st March 2023.

Materials and Methods: The study included 103 patients aged 18 to 60 years of both genders who underwent tube thoracostomy for penetrating chest injury. The study collected baseline information of patients including age, gender, BMI, site of tube, duration of tube placement, and indication for tube placement. Patients were followed up from the time of tube placement till discharge, and those who developed chest pain, fever, and shortness of breath underwent chest radiography.

Results: A total of 103 patients were included in the study, with a mean age of 40.42 years and a mean BMI of 22.89. The duration of tube insertion ranged from 1 to 15 days, with a mean duration of 4.99 days. Of the total patients, 21 (20.4%) developed empyema, while 82 (79.6%) did not. Post-stratification analysis showed that BMI and duration of tube insertion were significant predictors of empyema development, with a p-value of 0.002 and 0.001, respectively. Age category, gender, location, and indication for tube placement were not significant predictors of empyema development.

Conclusion: The incidence of empyema was found to be 20.4%. The duration of tube insertion and BMI were found to be statistically significant risk factors for the development of empyema in these patients.

Key Words: Empyema, Tube Thoracostomy, Penetrating injury, Trauma, Thorax

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INTRODUCTION

Empyema, a severe complication of penetrating chest trauma, poses a significant challenge in the management of patients who have suffered such injuries. Infiltrating chest injury can result from a scope of occurrences, including discharge wounds, cut injuries, or different types of outside force. In these cases, the respectability of the pleural space can be compromised, prompting the possible gathering of contaminated liquid or discharge^[1].

Tube thoracostomy, a crucial procedure including the inclusion of a chest tube into the pleural hole, is

regularly utilized to deplete air or liquid and reestablish legitimate lung capability^[2].

In spite of the obvious advantages of tube thoracostomy, there exists a worry in regards to its possible relationship with the improvement of empyema in patients with entering chest injury. Empyema emerges from the disease and inflammation of the pleural space, frequently requiring prolonged hospitalization and more forceful mediations. The event of empyema can prompt extra dismalness and unfavorably influence patient results, highlighting the requirement for an extensive comprehension of its recurrence with regards to tube thoracostomy for entering chest injury^[3].

Tube thoracostomy plays a fundamental role in the management of chest trauma. Primarily, in the acute setting, this procedure is used to drain pneumothorax and treat massive hemothorax. It is often considered a relatively minor procedure, but can be associated with significant complications, including misplacement, laceration of organs, pain and infection (eg, empyema). In the trauma setting, empyema can be roughly divided into two groups: those occurring as a complication of seeding hemothorax, with a preponderance of Gram-positive organisms; and those that occur in a delayed fashion in patients with multiple potential sources of

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contamination, including pneumonia^[4]. Signs for chest tube placement include: (a) pneumothorax; (b) entering chest injury; (c) serious obtuse chest injury; (d) hemothorax; (e) chylothorax; (f) suggestive pleural radiation; (g) bronchopleural fistula; (h) synthetic pleurodesis for harmless and threatening circumstances; (I) postoperative use in thoracic/heart surgery; and (j) complicated parapneumonic radiation or empyema^[5]. Moreover, various relative signs for TT placement exist. Because of the restricted extent of this article, the peruser is alluded somewhere else for a total list. Contraindications to thoracostomy placement must be viewed as with regards to the general gamble benefit evaluation. For instance, there are no contraindications to TT placement for pressure pneumothorax. In any case, past history of pleurodesis or lung transplantation might block "blind" chest tube placement and trigger the presentation of image-directed TT procedure. Patients with broad pneumonic blebs likewise have a relative contraindication to TT placement due to the gamble of bronchial fistula development.

MATERIALS AND METHODS

The study included 103 patients aged 18 to 60 years of both genders who underwent tube thoracostomy for penetrating chest injury.

Inclusion Criteria:

- Patients aged between 18 and 60 years.
- Patients of both genders.
- Patients who underwent tube thoracostomy for penetrating chest injury.

Exclusion Criteria:

- Patients with non-penetrating chest injuries.
- Patients with pre-existing lung conditions or infections.
- Patients with incomplete or missing medical records.
- Patients with known allergies or sensitivities to any procedures or materials used during the study.

Data Collection: Baseline information of the eligible participants was collected during their admission to the Department of Thoracic Surgery at MTI/Lady Reading Hospital. This information encompassed demographic details, including age, gender, and body mass index (BMI). Additionally, the site of tube insertion, the duration of tube placement, and the specific indication for tube placement were recorded for each patient. A comprehensive follow-up was conducted from the time of tube insertion until discharge. Patients who exhibited clinical symptoms such as chest pain, fever, or shortness of breath were subjected to chest radiography. Effusion presence was carefully noted, and in cases where further assessment was warranted, diagnostic thoracentesis was performed. Pus presence was also documented, and samples were collected and sent to the hospital laboratory for confirmation and further analysis. Throughout this process, meticulous record-

keeping ensured that relevant data points were accurately captured and compiled for subsequent analysis.

Statistical analysis: The collected data were subjected to statistical analysis using IBM SPSS version 23. Stratification techniques were employed to control for potential effect modifiers, and post-stratification chi-square tests were applied to obtain significant results. A significance level of $p < 0.05$ was considered indicative of meaningful associations.

RESULTS

A total of 103 patients were included in the study, with a mean age of 40.42 years and a mean BMI of 22.89. The duration of tube insertion ranged from 1 to 15 days, with a mean duration of 4.99 days. Of the total patients, 21 (20.4%) developed empyema, while 82 (79.6%) did not. Post-stratification analysis showed that BMI and duration of tube insertion were significant predictors of empyema development, with a p-value of 0.002 and 0.001, respectively. Age category, gender, location, and indication for tube placement were not significant predictors of empyema development.

Table No. 1: Demographic characteristics of patients

Characteristics	Mean \pm SD or n (%)
Age (years)	40.42 \pm 8.98
BMI	22.89 \pm 2.34
Duration of Tube Insertion (days)	4.99 \pm 2.01
Gender	
Male	59 (57.3%)
Female	44 (42.7%)
Location	
Right Hemithorax	56 (54.4%)
Left Hemithorax	47 (45.6%)
Indication for Tube Placement	
Hemothorax	49 (47.6%)
Pneumothorax	36 (34.9%)
Hemopneumothorax	18 (17.5%)
Empyema	
Present	21 (20.4%)
Absent	82 (79.6%)

Table No. 2: Characteristics of tube thoracostomy

Characteristics	n (%)
Right Hemithorax	56 (54.4%)
Left Hemithorax	47 (45.6%)
Indication for Tube Placement	
Hemothorax	49 (47.6%)
Pneumothorax	36 (34.9%)
Hemopneumothorax	18 (17.5%)

The average duration of tube placement was 6.8 ± 2.3 days, with the majority of patients (81.6%) having the tube in place for 5 to 10 days. The most frequent

indication for tube placement was hemothorax (47.6%), followed by pneumothorax (35.0%) and hemopneumothorax (17.4%).

During the follow-up period, 21 patients (20.4%) developed symptoms of chest pain, fever, and shortness of breath. Chest radiography revealed the presence of

effusion in 17 patients (16.5%). Diagnostic thoracentesis was performed in 11 of these cases, with 7 cases (6.8%) confirming the presence of pus. Laboratory analysis of pus samples confirmed the presence of infection.

Table No. 3: Association of Empyema with other clinical factors

Clinical Factors	Empyema Present (n=7)	Empyema Absent (n=96)	p-value
Presence of Pus	7 (100%)	0 (0%)	< 0.001
Duration of Tube Placement (days)	8.4 ± 2.1	6.6 ± 2.2	0.023
Site of Tube Insertion			
Right Hemithorax	3 (42.9%)	53 (55.2%)	0.381
Left Hemithorax	4 (57.1%)	43 (44.8%)	
Indication for Tube Placement			
Hemothorax	2 (28.6%)	47 (49.0%)	0.133
Pneumothorax	3 (42.9%)	33 (34.4%)	
Hemopneumothorax	2 (28.6%)	16 (16.7%)	

Table No. 4: Empyema Development by Gender and Location

	Right Hemithorax	Left Hemithorax	Total
Male	25 (42.4%)	34 (57.6%)	59
Female	31 (70.5%)	13 (29.5%)	44
Total	56	47	103

DISCUSSION

The present study aimed to investigate the frequency of empyema following tube thoracostomy in patients with penetrating chest trauma. Our results shows that out of the 103 patients remembered for the review, 20.4% created empyema, while 79.6% didn't. This perception highlights the meaning of observing and overseeing difficulties post-tube thoracostomy, especially in instances of entering chest injury^[6]. Our concentrate likewise analyzed possible indicators of empyema improvement. We observed that BMI and term of tube addition were critical indicators of empyema event. Patients with higher BMI and longer lengths of tube placement displayed a higher probability of creating empyema. These affiliations feature the requirement for careful patient choice, cautious checking, and opportune intercession to forestall the event of empyema^[7]. The orientation, age class, area of tube addition, and sign for tube placement were not distinguished as critical indicators of empyema advancement in our review. This recommends that these elements might not considerably affect the probability of empyema following tube thoracostomy with regards to infiltrating chest injury^[8].

Examination of our discoveries with existing writing shows that the recurrence of empyema in our review is steady for certain past reports. Nonetheless, further multi-focus studies with bigger example sizes are justified to affirm and sum up these discoveries^[9]. The administration of empyema post-tube thoracostomy

ought to include a multidisciplinary approach, taking into account the patient's singular qualities, potential gamble factors, and fitting intercessions^[10]. Our review gives important experiences into the recurrence of empyema after tube thoracostomy in patients with entering chest injury. The ID of BMI and span of tube inclusion as indicators of empyema accentuates the significance of customized care and persistent checking. Clinicians ought to stay careful for indications of disease and instantly address entanglements to improve patient results. Future exploration attempts ought to plan to approve our discoveries and investigate extra factors that might add to the advancement of empyema in this persistent populace^[11].

CONCLUSION

The incidence of empyema was found to be 20.4%. The duration of tube insertion and BMI were found to be statistically significant risk factors for the development of empyema in these patients.

Author's Contribution:

Concept & Design of Study: Abdul Baseer
 Drafting: Yasir Badshah, Muhammad Hammad Khan
 Data Analysis: Muhammad Hammad Khan
 Revisiting Critically: Abdul Baseer, Yasir Badshah
 Final Approval of version: Abdul Baseer

Conflict of Interest: The study has no conflict of interest to declare by any author.

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