

ORIGINAL ARTICLE

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Characteristics of patients who underwent simultaneous bilateral tube thoracostomy **Halil Ciftci***Thoracic Surgery Clinic, University of Health Sciences, Umraniye Training and Research Hospital, Istanbul, Turkey*

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**Abstract**

Simultaneous bilateral tube thoracostomy is the application of tube thoracostomy to both hemithorax during the same procedure. Our aim in conducting this study is to examine the demographic data and indications of patients who underwent simultaneous bilateral tube thoracostomy. This is a retrospective observational cohort study conducted in a Training and Research Hospital Thoracic Surgery clinic between January 2010 and January 2020. All patients with simultaneous bilateral tube thoracostomy were included in the study. Patients were grouped according to the etiology of tube thoracostomy into two groups: group 1 (simultaneous bilateral tube thoracostomy due to trauma) and group 2 (non-traumatic simultaneous bilateral tube thoracostomy). Age and gender between groups were compared and indications were examined. Group 1 included 14 patients (mean age: 32.1 ± 14.1 years, 42.9% female) and group 2 included 12 patients (mean age: 74.1 ± 8.4 years, 66.7% female). There was no statistically significant difference between the groups in terms of gender ($p > 0.05$). However, age of patients in group 1 was statistically significantly lower than group 2 ($p < 0.001$). Bilateral pneumothorax was the most common indication in group 1, while bilateral massive effusion was predominantly detected in group 2. Thoracotomy was performed only in 2 patients. Our study supports that tube thoracostomy may be preferred as the first choice in bilateral pleural pathologies that may cause respiratory failure.

Keywords: Simultaneous bilateral tube thoracostomy, indication, traumatic, non-traumatic**Introduction**

Tube thoracostomy (TT) is the most common method of evacuation of air or fluid from the pleural cavity in order to reduce lung expansion [1,2]. TT, which can be performed with local or sedo analgesia, is used in the treatment of hemopneumothorax due to thoracic trauma, spontaneous or tension pneumothorax, pleural effusion (malign effusion, parapneumonic effusion, chylothorax, hydrothorax, pyothorax) [3]. It was first described by Hippocrates in the 5th century BC [4]. In 1876, Hewett described the closed underwater drainage system for the treatment of empyema [5]. TT also known as chest tube is a flexible tube that can be inserted into the pleural space between the ribs after the layers of the chest wall are passed [6]. Thoracostomy tubes are usually made of polyvinyl chloride (PVC) or silicone in sizes from 6 to 40 French. The closed water bottom drainage system allows the air or fluid in the pleural cavity to be evacuated by a one-way valve system [7-9].

In TT procedure place of application, position of the tube (kink, malposition) and various complications related to infection can be encountered [10, 11]. Simultaneous bilateral tube thoracostomy (SBTT) is the simultaneous application of TT to both hemithorax.

Studies on SBTT are generally in the form of case reports. In our study, we aimed to retrospectively examine the demographic data, indications of patients who underwent SBTT.

Material and Methods**Study Design and Study Population**

This retrospective clinical study was conducted in the Thoracic Surgery Clinic between January 2010 and January 2020. Data of 562 patients who underwent TT were analyzed retrospectively and 26 who underwent SBTT were included in the study. Patients were grouped according to the etiology of tube thoracostomy into two groups: group 1 (simultaneous bilateral tube thoracostomy due to trauma) and group 2 (non-traumatic simultaneous bilateral tube thoracostomy). Group 1 consisted of 14 patients; group 2 consisted of 12 patients. Inclusion criteria were: patients undergoing SBTT.

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The exclusion criteria are as follows: Unilateral more than one TT, bilateral tube thoracostomy (BTT) performed at different times in the same hospitalization. The study flow chart is shown in Figure 1.

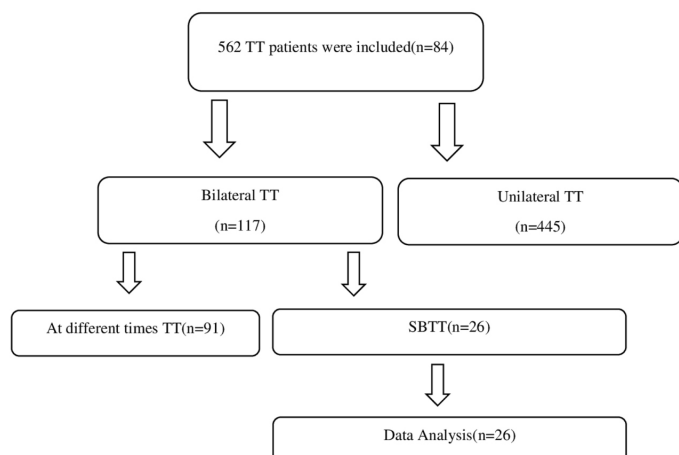


Figure 1. Study flow chart

Due to the retrospective nature of this study, we did not obtain patients' consent for our study; however, during hospital procedure, all treatment and medication were done after obtaining informed consent of the patients. The study protocol was approved by the Local Ethics Committee (19/12/2019 54132726-000-26642). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Outcome Measurements

The demographic characteristics of group 1 and group 2 patients who underwent SBTT were compared and their indications were examined.

Interventions

SBTT was performed in all patients. While the patient is in a semi-sitting position on the bed, the arm on the side where the tube will be attached is raised to the head level. Aseptic technique should be used to prevent site infection or secondary empyema. Full sterile technique is usually unnecessary, the use of sterile gloves, gowns and equipment is sufficient. Effective skin cleansing should be done using iodine or chlorhexidine. The ideal location for TT is the mid axillary line. After determining the place where the tube will be placed with thoracentesis, local anesthesia is applied to the skin, subcutaneous, intercostal muscles and pleural surface with a needle. After the tube size (16-36Fr) is determined, the tube is inserted by entering the thorax with blunt dissection. Usually, after the tube is fixed with two stitches, it is connected to the closed underwater drainage system [12]. The same procedure was done for the other hemithorax.

Statistical Analysis

The data were analyzed using spss 25.0 package program. It was observed that the distribution of data was normally distributed with the Kolmogorov Smirnov test. While evaluating the study data, besides descriptive statistical methods (mean, standard deviation, frequency), chi-square and Student T tests were used for parametric data. And significance was evaluated at $p < 0.05$ levels for all values.

Results

Of the 26 patients included in the study, 15 of them were referred from the intensive care unit, and 11 of them were referred from the emergency department. Twenty-four of 26 patients were intubated due to respiratory failure. Two patients who underwent SBTT due to bilateral pneumothorax were not intubated because respiratory failure did not develop. The demographic characteristics of the patients are shown in Table 1. There was no statistically significant difference between the groups in terms of gender ($p > 0.05$). However, age of patients in group 1 was statistically significantly lower than group 2 ($p < 0.001$). Bilateral pneumothorax (figure 2) was the most common indication in group 1, while bilateral massive effusion (figure 3) was predominantly detected in group 2. Group 1 indication and mechanism of occurrence are shown in Table 2, and group 2 indication and underlying co morbidities are shown in Table 3.

Thoracotomy was performed in 2 patients in Group 1 to control bleeding after SBTT. All patients were followed up in the intensive care unit.



Figure 2. Simultaneous bilateral pneumothorax

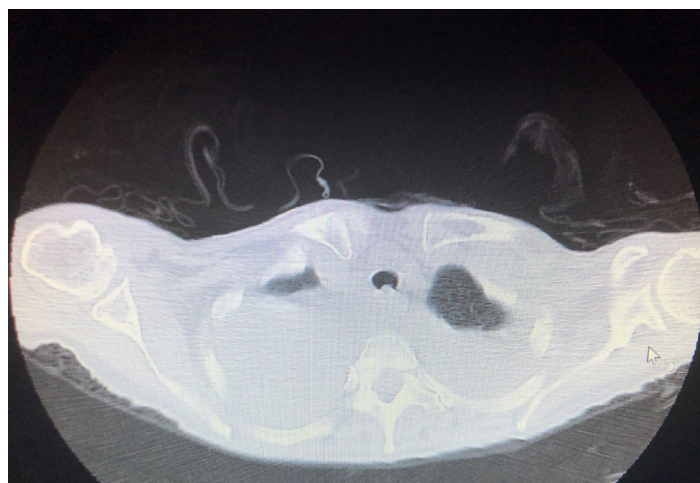


Figure 3. Simultaneous bilateral massive pleural effusion

Table 1. Demographic characteristics of patients

		Traumatic group	Non traumatic group	
		N:14	N: 12	(inter-group) p
Gender	Male	8(%57.1)	4(%33.3)	0.267**
	Female	6(%42.9)	8(%66.7)	
Age (mean $\pm$SD)		32.1 $\pm$ 14.1	74.1 $\pm$ 8.4	0.000*

* Student T test ** Chi Square Test p<0.05

Table 2. Traumatic group information

Referring clinic	Emergency	7 Patient (%50)
	Intensive care unit	7 Patient (%50)
Cause of occurrence	Falling from high	8 Patient (%57.2)
	Traffic accident	2 Patient (%14.2)
	Penetrating injury	2 Patient (%14.2)
	Gunshot injury	1 Patient (%0.07)
	Assault	1 Patient (%0.07)
Indication	Bilateral pneumothorax	11 Patient (%78.6)
	Bilateral hemopneumothorax	3 Patient (%21.4)

Table 3. Non traumatic group information

Referring clinic	Emergency	4 Patient (%33.3)
	Intensive care unit	8 Patient (%66.7)
Additional disease	Heart failure	5 Patient (%41.6)
	Heart and kidney failure	2 Patient (%16.7)
	Malignancy	3 Patient (%25.0)
Indication	Chronic obstructive pulmonary disease	2 Patient (%16.7)
	Bilateral massive effusion	5 Patient (%41.6)
	Bilateral pneumothorax	3 Patient (%25.0)
	Bilateral malign effusion	2 Patient (%16.7)
	Bilateral hydropneumothorax	2 Patient (%16.7)

Discussion

Many studies have been conducted on TT indications, contraindications, complications, and tube diameters. There are very limited studies examining SBTT in current literature. As far as we have reviewed, there is no study comparing the etiology, indications and features of SBTT. This study is the first to examine the properties of this invasive but life-saving application for patients. In our study, we found significant differences according to age and etiology in patients who underwent SBTT.

Chest trauma is accepted as an effective source of morbidity and mortality in various age groups [13]. In the series of Cho et al., which included 130 cases of severe chest trauma, the mean age of patients with bilateral thoracic trauma was given as 35 [14]. Özdil et al. reported the mean age as 36 years in their study consisting of 181 patients and performed BTT in 27 patients [15]. In our study, the mean age of the patients who underwent SBTT due to trauma was 32.1 years.

Congestive heart failure is the most common cause of bilateral pleural effusion [16]. In 60% of malignant pleural effusions, the underlying disease is lung and breast cancer [17]. The underlying diseases in most of the patients who underwent SBTT for non-traumatic reasons are heart and kidney failure. The main purpose of the treatment of pleural pathologies is to provide complete lung expansion and relieve respiratory distress. In patients without respiratory failure, treatment should be initiated with minimally invasive intervention, in case of inadequate treatment, more invasive procedures should be initiated. Needle aspiration percutaneous catheter drainage, tube thoracostomy, video-assisted thoracoscopic surgery (VATS) and thoracotomy. Tube thoracostomy should be the first option in patients with severe respiratory distress. In cases where tube thoracostomy is insufficient, VATS or thoracotomy should be tried. Even et al. Ohara et al. performed bilateral tube thoracostomy in patients with simultaneous bilateral spontaneous pneumothorax and then thoracotomy if necessary [18,19].

Unfortunately, there were some limitations in our article. Using

more effective assessment methods in a larger patient population could increase the power of the research. Since SBTT is a rarely applied surgical treatment option, multi-center studies are needed.

Conclusion

As a result, the mean age of patients who underwent simultaneous bilateral tube thoracostomy for traumatic reasons was found to be lower. The most common indication in the traumatic group was bilateral pneumothorax, while in the atraumatic group it was massive bilateral effusion. Our study supports that tube thoracostomy may be preferred as the first choice in bilateral pleural pathologies that may cause respiratory failure.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

All authors declare no financial support.

Ethical approval

The study protocol was approved by the Local Ethics Committee (19/12/2019 54132726-000-26642). The study was conducted in accordance with the principles of the Declaration of Helsinki.

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