

Management of Different Types of Pneumothorax at Dhulikhel Hospital, Kathmandu University Hospital

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ABSTRACT

Background

Pneumothorax is defined as the presence of air in the pleural cavity. Pneumothorax can be classified as Spontaneous and Traumatic according to the etiology. Spontaneous pneumothorax is further classified as Primary and Secondary.

Objective

This study was conducted to know the management of different types of pneumothorax at Dhulikhel Hospital, Kathmandu University Hospital.

Method

This was a hospital based retrospective study conducted at Dhulikhel Hospital, Kathmandu University Hospital. Patients admitted in Surgery Ward with diagnosis of Pneumothorax from January 2018 to December 2019 were included in this study.

Result

This study included 144 patients with pneumothorax age ranging from 14 years to 94 years. Most of the patients were male with male:female ratio of 3.8:1. Eighty-four (58.03%) patients had Traumatic pneumothorax followed by Secondary spontaneous pneumothorax in 53(36.08%) patients and Primary spontaneous pneumothorax in seven (4.86%) patients. Among 144 patients, chest tube drain was required in 135 patients and nine patients were managed conservatively. One patient underwent Video Assisted Thoracoscopic Surgery (VATS) with Bullectomy and mechanical pleurodesis. Sixteen patients had persistent pneumothorax, among which six patients required chemical pleurodesis, two patients required negative suction therapy and five patients required both chemical pleurodesis and negative suction therapy.

Conclusion

This study showed pneumothorax to be more common in male population. Traumatic pneumothorax was the most common type followed by Secondary spontaneous pneumothorax and Primary spontaneous pneumothorax.

KEY WORDS

Chest tube drainage, Pleurodesis, Pneumothorax, Video assisted thoracoscopic surgery

INTRODUCTION

Pneumothorax is defined as the presence of air in the pleural cavity causing collapse of the lung i.e. the space between the chest wall and the lung itself.^{1,2} Pneumothorax can be classified as spontaneous and traumatic according to etiology. Spontaneous pneumothorax is further classified into primary and secondary.³ Among the tall, thin adolescent men (male:female ratio 6:1), Primary spontaneous pneumothorax (PSP) is more common.^{1,4} Smoking has been found to be a risk factor for development of pneumothorax in healthy smoking men.⁵ It has been found that the relative risk of pneumothorax is 100 times higher in heavy smokers (more than 20 cigarettes/day) than in nonsmokers.⁶ Rupture of sub pleural blebs or bullae are believed to be the cause of Primary spontaneous pneumothorax.⁷ Secondary spontaneous pneumothorax (SSP) occurs in patients with known underlying lung disease, usually after the age of 60. Lung diseases like chronic obstructive pulmonary disease (COPD), bronchial asthma, cystic fibrosis, tuberculosis, lung abscess, interstitial lung disease, rheumatoid arthritis, scleroderma, bronchial cancer etc can cause secondary spontaneous pneumothorax.⁸ Traumatic pneumothorax may result from either blunt trauma or penetrating injury to the chest wall. Thoracic trauma comprises 10-15% of all trauma cases.⁹ Other cause of pneumothorax is iatrogenic pneumothorax, accidental puncture to the lung during surgery or medical procedure.

Therapeutic possibilities in clinical practice include observation, aspiration – exsufflation and tube thoracostomy according to the severity of lung collapse and type of pneumothorax. Chemical pleurodesis or surgical management and mechanical pleurodesis can be done to prevent recurrent pneumothorax.¹

Knowing the epidemiology, clinical profile in our context help in deciding high risk groups and also identify the spectrum of treatment options required. However there is very limited data in our hospital setup.

The primary objective of this study was to identify the management of different types of Pneumothorax at Dhulikhel Hospital.

METHODS

This was a hospital based retrospective study conducted at Department of Surgery, Dhulikhel Hospital, Kathmandu University Hospital from January 1st, 2018 to December 31st, 2019. One hundred thirty nine sample size was calculated with estimated proportion of pneumothorax case of 10% in thoracic unit with 99% confidence interval. Ethical clearance from Institutional Review Committee was obtained. Retrospective analysis of medical record of patients was done. One hundred forty four patients admitted in surgery ward with diagnosis of Pneumothorax during the study period were included in the study. Patients

who developed pneumothorax secondary to endotracheal intubation and positive pressure ventilation were excluded from the study. All the patients were seen by the same team of surgeons following locally practiced protocol. In case of spontaneous pneumothorax CECT chest was done to identify the possible cause. Patients were treated with analgesics with aim of having Visual Analogue Scale (VAS) less than 4. Decisions on chest tube insertion, removal, pleurodesis and surgical procedure were done as per the locally followed protocol for pneumothorax.

SPSS 20.0 (SPSS Inc., Chicago, IL, USA) was used for data analysis. Frequency analysis was done for scalar and ordinal variables. For nominal variables, descriptive analysis was performed with calculation of mean, range, standard deviation. Independent sample t-test was used for comparison of parametric scalar variables between two groups. For non-parametric categorical variables, Chi square test was used. The p value of less than 0.05 was considered significant.

RESULTS

This study included 144 patients with pneumothorax. In this study, 114 patients were male and 30 patients were female with male:female ratio 3.8:1. Mean age of the patients was 51.51±18.48 years. The age of patients ranged from 14 years to 94 years. The average age of male patients was 52.44 ± 18.01 years and female patients was 47.96 ± 20.08 years. Difference between the mean age among male and female patients was not statistically significant ($p > 0.05$). Most of the patients had chest pain and shortness of breath in 101 (70.1%) followed by shortness of breath only in 29 (20.1%), chest pain only in 9 (6.3%) and asymptomatic were 5 (3.5%) patients. According to side of Pneumothorax, right side was the most common in 86 (59.7%), left in 51 (35.4%) and bilateral in 7 (4.9%) patients in our study.

As shown in table 1, Traumatic pneumothorax was the most common type in 84 (58.3%) followed by Secondary spontaneous pneumothorax in 53 (36.8%) but no significant difference was noted in the pattern of pneumothorax among male and female patients ($p=0.82$).

Table 1. Distribution of patients according to Sex and Type of Pneumothorax.

Type of pneumothorax	Male	Female	Number of patients	p
Primary Spontaneous Pneumothorax	5	2	7 (4.9%)	0.82
Secondary Spontaneous Pneumothorax	43	10	53 (36.8%)	
Traumatic Pneumothorax	66	18	84 (58.3%)	

As shown in table 2, chronic obstructive pulmonary disease (COPD) is the most common cause among patients with Secondary spontaneous pneumothorax while pulmonary tuberculosis is the second leading cause.

Table 2. Distribution of patients according to underlying disease in Secondary Spontaneous Pneumothorax (n=53).

Underlying disease	Number of patients (%)
COPD	34 (64.2)
Post Pulmonary Tuberculosis	12 (22.6)
Pyopneumothorax(Empyema)	4 (7.5)
Lung Abscess	1 (1.9)
Eosinophilic Granulomatous Disease	1 (1.9)
Systemic Sclerosis	1 (1.9)

As shown in Table 3, most common mode of injury among patients with traumatic pneumothorax was Fall Injury followed by Road Traffic accident (RTA).

Table 3. Distribution of patients according to Mode of Injury in Traumatic Pneumothorax (n=84).

Mode of Injury	Number of patients (%)
Fall Injury	49 (58.3)
Road Traffic accident(RTA)	20 (23.8)
Physical Assault	6 (7.2)
Accidental Hit by Object	5 (5.9)
Iatrogenic	4 (4.8)

Among the patients with traumatic pneumothorax, associated systemic injuries included Splenic injury in three patients. Liver injury in three patients, clavicle fracture in three patients, femur fracture in 1 patient, vertebral fracture 1 patient, humerus fracture in two patients, radius fracture in one patient and forearm both bone fracture in one patient. Other thoracic injuries among traumatic pneumothorax patients were subcutaneous emphysema in 16 patients, Hemothorax in 13 patients and lung contusion in 6 patients.

Table 4. Distribution of patients according to Pain management.

Pain management	Number of patients (%)
NSAID	54 (37.5)
NSAID and Opioid	85 (59.0)
Epidural Analgesia	5 (3.5)

As shown in table 4, most patients required Non Steroidal Anti-inflammatory Drug (NSAID), Opioid and epidural analgesia for pain management in our study.

Among 144 patients, chest tube drain was required in 135 patients and 9 patients were managed conservatively. One patient underwent Video Assisted Thoracoscopic Surgery (VATS) with Bullectomy and mechanical pleurodesis. Among the patients managed with chest tube drainage, mean duration of chest tube drainage was 6.05 ± 3.65 days (Range: 2 days to 28 days). Among all patients, mean duration of hospital admission was 6.95 ± 4.25 days (Range: 1 day to 30 days). Eleven patients (7.6%) required admission in

Intensive Care Unit (ICU) for management. Sixteen patients had persistent pneumothorax, among which six patients required chemical pleurodesis, two patients required negative suction therapy and five patients required both chemical pleurodesis and negative suction therapy.

DISCUSSION

Patients of pneumothorax usually presents with shortness of breath, chest pain and requires prompt diagnosis and treatment. Common classification used to classify pneumothorax include Primary Spontaneous Pneumothorax (PSP), Secondary Spontaneous Pneumothorax (SSP) and Traumatic Pneumothorax. In this study, pneumothorax was found to be more common in male patients with male:female ratio of 3.8:1. Studies have found that pneumothorax is more common in male population similar to our finding.¹⁰⁻¹²

Most of the patients in our study were aged more than 40 years with mean age of 51.51 years. Fifty two patients (36.1%) belonged to age group 40-59 years and 53 patients (36.8 %) belonged to age group > 60 years. This distribution with more patients in age group 40-59 years and > 60 years in our study could be because of more cases of Secondary spontaneous pneumothorax and Traumatic pneumothorax in physically active population aged > 40 years. Secondary spontaneous pneumothorax usually occurs after the age of 60.^{8,12}

Among the patients with Secondary spontaneous pneumothorax, COPD and post pulmonary tuberculosis status were found to be the most common causes of secondary spontaneous pneumothorax in our study. In a review study, COPD was found to be the most common cause of secondary spontaneous pneumothorax which is similar to our findings.¹

Tubercular pneumothorax is rare in severe form of tuberculosis. However, our study has shown post pulmonary tuberculosis as the second most common cause of Secondary spontaneous pneumothorax. This could be due to high prevalence of pulmonary tuberculosis in our country.¹³

In our study, among the patients with traumatic pneumothorax, most common mode of injury was found to be fall injury 58.3% followed by Road Traffic accident (RTA) 23.8%. Fall from tree was one of the common causes of fall injury in our region. The reason for this was due to common practice of cattle rearing in our community for which people had to climb trees for collecting necessary supplies for feeding the cattle. Similar study on chest trauma has shown 68.2% cases of chest trauma was due to fall from height.¹⁴ Number of Road traffic accidents is also no rise due to hilly topographical distribution of most of the area of our country with difficult roads, poor quality of roads, increased traffic load and over speeding. Similar

study from India has reported RTA as the most common mode of injury among patients with chest injuries 56.8%.¹⁰ Another study from Bangladesh has also found RTA as the most common mode of injury in chest trauma patients 45% followed by fall from height in 29% patients.¹⁵

In our study, 135 patients (93.8%) were managed with chest tube drainage. Small number of patients required additional modalities of management including Chemical pleurodesis; negative suction therapy, Video Assisted Thoracoscopic Surgery (VATS). Similar management protocol has been reported by Sharma et al. in which 93.6% of patients were managed with chest tube drainage.¹⁰

This study was conducted in single institution with limited sample size. Data of long term follow-up of the patients were not included in this study.

CONCLUSION

Pneumothorax is a major health issue because of its associated morbidity and mortality. Physically active group of population, mainly male patients are found to suffer more from pneumothorax. COPD and pulmonary tuberculosis are the major causes of secondary pneumothorax in our population. Fall injury is the leading cause of traumatic pneumothorax while RTA is the second most common cause of traumatic pneumothorax in our part of the Country.

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