

Original Research Article

Profile of tuberculous pneumothorax and comparison with pulmonary tuberculosis without pneumothorax

Gayatri D. Yellapu¹, Surya K. Vipparthi^{1*}, Rohini K. Vangara²

¹Department of Pulmonary Medicine, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

²Department of Statistics, Government College, Ananthapuram, Andhra Pradesh, India

Received: 15 November 2018

Revised: 07 December 2018

Accepted: 14 February 2019

*Correspondence:

Dr. Surya K. Vipparthi,

E-mail: Psuryasatish@gmail.com

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ABSTRACT

Background: Tuberculosis is the most common cause of secondary spontaneous pneumothorax (SSP) in India. The prevalence of SSP in patients with pulmonary tuberculosis (PTB) is between 1- 3%. There were only few studies in the literature that specifically analyze tuberculous PNTX. In a study from this hospital, author found PTB was the most common cause of SSP. Now, author aimed at studying the clinical profile of tuberculosis associated PNTX cases and compared with pulmonary tuberculosis cases without PNTX.

Methods: This was a single centre prospective observational case control study done at a tertiary care hospital. Fifty patients of tuberculous pneumothorax as cases, and 100 patients of pulmonary tuberculosis without pneumothorax were taken as control. The demographic data, clinical presentation, and radiologic presentation, outcomes after treatment were recorded in both the groups. The data was analyzed using statistical software (SPSS) using appropriate statistical tools.

Results: The mean age of patients in the PNTX group was 38.18±14.132, where as in the control group it was 45.29±14.89 (p-value of 0.0052). Past history of tuberculosis was present in 27 (54%) cases of PNTX group and in 41 (41%) cases in the control group (p-value of 0.091). The mean duration of length of hospital stay in PNTX group was 16.5±11.865 days and in non-pneumothorax group was 6.2±2.54 days (p-value was 0.0001).

Conclusions: Tuberculous pneumothorax was more common between 30-40 yrs age group. Gender and smoking have no association with PNTX. Tuberculous pneumothorax was more common in previously treated cases of TB. Patients with tuberculous PNTX have prolonged hospital stay and complications resulting in increased morbidity, financial burden and mortality.

Keywords: Intercostal chest tube, Pulmonary tuberculosis, Secondary spontaneous pneumothorax, Tube thoracostomy

INTRODUCTION

In 1990, the WHO declared tuberculosis (TB) a global emergency and in response developed the DOTS, promising to “STOP TB” by case finding and treating the infectious cases in resource limiting settings.^{1,2} Since

2004, although TB incidence is falling globally, TB remains a leading cause of global infectious mortality second only to HIV infection.^{3,4} Moreover, many TB deaths occur in young, previously healthy adults and as such, TB is a top 10 cause of lost disease adjusted life years (DALYS).²

TB is a long-recognized and well-documented cause of secondary spontaneous pneumothorax (SSP).^{5,6} The prevalence of SSP in patients with pulmonary TB is between 1-3%.⁷ In various western studies TB was the second leading cause of SSP after COPD but in various Indian studies.⁸⁻¹⁵ TB was the leading cause of SSP. Pneumothorax (PNTX) secondary to TB usually associated with extensive involvement of the lung parenchyma by the infectious process. Pleural infection results from rupture of sub pleural caseous lesions, resulting in accumulation of a chronic empyema. A bronchopleural fistula (BPF) may occur spontaneously during the natural history of the disease, though it is more frequently caused by trauma or attempted surgical intervention. Both chronic empyema and BPF may result in spontaneous PNTX.¹⁶⁻¹⁸ It persists for more than a few days and is a serious condition with reported mortality of 23.1% mostly due to aspiration and its complications.^{19,20}

Almost all patients with PNTX secondary to TB should be treated with tube thoracostomy, in conjunction with appropriate pharmacologic management of TB and other infections.¹⁶⁻¹⁸ Once chest tubes are placed in such patients a long period of chest tube drainage is required. It ranged from 5 days to 6 months with mean duration of 56 days in one series.⁷

There were only few studies in the literature that specifically analyze tuberculous PNTX.²¹⁻²⁶ At govt. hospital for chest and communicable diseases a tertiary care hospital attached to Andhra medical college at Visakhapatnam, Andhra Pradesh, we are admitting many cases of PNTX. In a study “clinical profile of secondary spontaneous pneumothorax” from authors’ hospital, we found TB was the most common cause of SSP.¹⁵ Now we aimed at studying the clinical profile of tuberculosis associated PNTX cases and compared with pulmonary tuberculosis cases without PNTX.

METHODS

This was a single centre prospective observational case control study done at a tertiary care hospital, Govt Hospital for chest and communicable diseases attached to a medical college in Andhra Pradesh, where cases from various other districts will be referred. Patients with PNTX, hydro pneumothorax or pyo pneumothorax who were admitted in the hospital were subjected to specific investigations to find out the etiology of PNTX such as sputum for AFB two samples spot and early morning, chest X-ray, Computer Tomography of chest, pleural fluid or pleural pus for AFB staining, gram staining and culture sensitivity.

About 50 cases of pneumothorax, hydro or pyo pneumothorax, which were proved to be caused by TB etiology by either sputum AFB testing or imageology were included in the study. About 100 cases of pulmonary tuberculosis cases confirmed by sputum AFB

testing or chest X- ray without PNTX were taken as control group.

Institutional ethics committee approval was taken. Patients consent was taken. The demographic data, clinical presentation, and radiologic presentation were recorded in both the groups for comparison. Treatment was started in both the groups with anti-tubercular treatment and tube thoracostomy for pleural drainage in patients with PNTX. Duration of pleural drainage, Length of hospital stay and outcomes were recorded in both the groups for comparison.

Statistical analysis

The data was analyzed using statistical software (SPSS). A descriptive analysis of the data was performed, estimating the frequency and the corresponding percentages in the case of categorical variables and the Mean±SD. For categorical variables Chi-squared test and for numerical variables unpaired t-tests were applied in order to compare measurements between the two groups. P - Value of <0.05 was taken as statistically significant.

RESULTS

Out of 50 cases of tuberculous pneumothorax 41 (82%) were males and 9(18%) were females.

Table 1: Demographic data.

Demographic data	With PNTX (N=50)	With out PNTX (N=100)	P-value
Males	41 (82%)	75 (75%)	0.576
Females	9 (18%)	25(25%)	0.665
Age	38.18±14.132	45.29±14.89	0.0057
H/O Smoking	32 (64%)	65 (65%)	0.091
HIV+ve cases	9 (18%)	21(21%)	0.665
BMI	22.36±2.27	24.52±2.14	0.0001
PAST H/O PTB	27 (54%)	41 (41%)	0.132

In the control group out of 100 cases of pulmonary tuberculosis without PNTX 75 (75%) were males and 25 (25%) were females with a p- value of 0.576. The mean age of patients in the PNTX group was 38.18±14.132, where as in the control group it was 45.29±14.89 with a p-value of 0.0052 which was statistically significant. In patients with tuberculous pneumothorax 32 (64%) were active smokers and in patients with pulmonary tuberculosis without PNTX 65 (65%) were smokers with a p- value of 0.091.

Past history of tuberculosis was present in 27 (54%) cases of pneumothorax group and in 41 (41%) cases in the control group with a p-value of 0.132. The mean body mass index (BMI) of the PNTX group was 22.36±2.27 and for control group was 24.5 2±2.14 with a p- value of

0.0001 which has great statistical significance. Among PNTX group 9(18%) cases were HIV +ve and in control group 21 (21%) cases were HIV +ve with p-value of 0.665 (Table 1).

Table 2: Clinical characteristics.

Clinical characteristics	PTB with PNTX (n= 50)	PTB without PNTX (n= 100)	p-value
Patient type			
New	23 (46%)	59 (59%)	0.089
Defaulter	12 (24%)	26 (26%)	
Relapse	15 (30%)	15 (15%)	
Disease type			
Smear positive	29 (58%)	92 (92%)	0.000
Smear negative	21 (42%)	8 (8%)	
Clinical features			
Cough	31.74±28.62	38.14±33.75	0.2272
Expectoration	31.74±28.62	35.77±33.88	0.4468
Chest pain	50(100%)	18(18%)	0.000
Sob	26.56±25.67	28.98±22.90	0.2922
Haemoptysis	31 (62%)	18 (18%)	0.000
fever	23.8±20.942	33.43±14.72	0.0013

Among the PNTX group 23 (46%) patients were new cases, 15(30%) were relapse cases and 12 (24%) cases were defaulters. Among the control group 59 (59%) were new cases, 15 (15%) were relapses and 26 (26%) cases were defaulters with a p-value of 0.089. In PNTX group 29 (58%) patients were sputum positive and 21 (42%) were sputum negative. Among non PNTX group 92 (92%) were sputum positive and only 8(8%) were sputum negative with a p-value of 0.000. The mean duration of cough in days was 31.74±28.62 and 38.14±33.75 in PNTX and control groups respectively (p-value 0.2271). The mean duration of expectoration in days was 31.74±28.62 and 35.77±33.88 in PNTX and control groups respectively (p-value 0.446). All the cases of PNTX group have chest pain as common presentation but in the control group only 18 (18%) of cases has chest pain, (P-value 0.000). The mean duration of shortness of breath in days was 26.56±25.67 and 28.98 22.90 in PNTX and control groups respectively (p-value 0.2922). Hemoptysis was present in 31 (62%) patients in the PNTX group and 18(18%) patients in the control group (p-value 0.000). The mean duration of fever in days was 23.8±20.94 and 33.43±14.72 in the case and control groups respectively (p-value 0.0013) (Table 2).

Cavitations were present in 43 (86%) and in 77 (77%) patients in the PNTX and control groups respectively (p-value 0.194). Infiltrations were present in 45 (90%) patients in PNTX group and in 86 (86%) patients in control group (p-value 0.484). Consolidations- 28 (56%) and Tree in bud patterns-17 (34%) were more common in PNTX group, than in patients of control group- 30 (30%) and 15 (15%) with p-values 0.002 and 0.007. Bronchiectatic changes were seen in 26 (52%) patients of

PNTX group and 24 (24%) patients of control group with a p-value of 0.001. Fibro destructive changes were seen in 23 (46%) and 62 (62%) patients in PNTX and control groups respectively with a p- value of 0.062. Emphysematous changes were seen in 15 (30%) and in 23 (23%) patients in PNTX and control groups respectively with a p-value of 0.353. Pleural effusions and pleural thickenings were more common 33 (66%), 28 (56%) in patients of PNTX group than in patients of control group 13 (13%), 34 (34%) with p-values of 0.000 and 0.010 (Table 3).

Table 3: Imaging features.

Radiological appearance	PTB with PNTX (n= 50)	PTB without PNTX (n=100)	P-value
Cavitations	43 (86%)	77 (77%)	0.194
Infiltration	45 (90%)	86 (86%)	0.487
Consolidation	28 (56%)	30 (30%)	0.002
TIBs	17 (34%)	15 (15%)	0.007
Bronchiectasis	26 (52%)	24 (24%)	0.001
Fibro destructive changes	23 (46%)	62 (62%)	0.062
Emphysema	15 (30%)	23 (2%)	0.353
PLEF	33 (66%)	13 (13%)	0.00
Pleural thickening	28 (56%)	34 (34%)	0.010

Table 4: Outcome characteristics.

Outcome characteristics	PTB with PNTX	PTB without PNTX	P-value
LOH (mean±SD) in days	16.5±11.865	6.2±2.54	0.001
Lung expanded	31/50 (62%)	Not applicable	-
Unexpanded lung	17/50 (34%)		
Died	2/50 (4%)		
Cured		83/100	
Defaulters	Not applicable	12/100	
Relapses		5/100	

All the patients in the PNTX group underwent tube thoracostomy along with ATT. In 31 cases lung has expanded and intercostals tube (ICT) was removed with a mean duration of ICT drainage of 14.4±12.32 days. Rest of the 19 cases lung not expanded due to either bronchopleural fistula or multiple loculations and pleural organization. 17 cases were referred to cardio thoracic surgery department for either BPF closure or decortications. Two patients died due to poor cardiopulmonary reserve and poor nutritional status. PTB cases without PNTX were treated with ATT alone and their outcomes were as follows. 83 cases cured, 12 cases lost to follow up and 5 cases relapses. The mean duration of length of hospital stay in PNTX group was

16.5±11.865 days and in non-pneumothorax group was 6.2±2.54 days (p-value was 0.0001) (Table 4).

DISCUSSION

SSP due to tuberculosis causes increased morbidity and also mortality. The complications associated are bronchopleural fistula, prolonged ICT drainage, chronic hydro or pyopneumothorax, cardiopulmonary compromise, post-operative morbidity and sometimes aspirations leading to death.

In the present study, author have compared the clinical profile and outcomes of tuberculosis pneumothorax patients with pulmonary tuberculosis patients without PNTX. In the present study males were more than females in both the groups which was similar to other study by Shamaei M et al.²⁶ The mean age (38 years) of tuberculous pneumothorax group of patients was 10 years less than patients without PNTX (45 yrs) showing a significant statistical difference. This observation was in agreement with the study by Shamaei M et al, but in other study by Freixinet JL et al, it was 46.6±15.6 yrs.^{25,26} The present study suggesting that there was no association between smoking habit and occurrence of PNTX unlike in primary spontaneous PNTX.²⁷

Although tuberculous pneumothorax was more common in patients with a past history of TB compared to the non-pneumothorax group it was not statistically significant. This was in agreement with the study by Shamaei M et al.²⁶ In the present study the mean BMI of patients with PNTX group was significantly low when compared to patients without PNTX (p-value 0.001). This might be because of the severe disease-causing poor appetite and poor nutritional status.

In present study 46% (23/50) of patients were new TB cases presented with PNTX. Both relapse and defaulter cases constitute 54% (27/50). Though PNTX was more with relapse and defaulter cases there was no statistically significant association. These findings were in agreement with other studies by Yagi et al, and Shamaei et al.^{26,28} Sputum smear positivity was observed more (92%) in TB patients without PNTX. This might be because of selection bias. Presentation of cough, expectoration and shortness of breath there was no significant difference between the two groups. But chest pain, fever and hemoptysis were more common with the PNTX group with a significant statistical difference (p-value 0.000, 0.0013, 0.000). Fever and hemoptysis might be because of secondary infections and extensive destruction of lung parenchyma respectively.

Though cavitations were slightly more (86%) common in patients of PNTX group, consolidation, tree in bud pattern, bronchiectasis, pleural effusions and pleural thickening were more common in patients with pneumothorax with significant statistical difference. This was in contrast to the study done by Shamaei et al, where

cavitations were the predominant finding with a significant statistical difference.²⁶

Among the PNTX group in 62% (31/50) patients lung expanded and drain was removed with a mean duration of 14.4±12.2, which was in agreement with a study by Freixinet JL et al.²⁵ In about 38% (19/50) of patients in the PNTX group lung not expanded and among them 34% (17/50) were referred to surgery for either BPF repair or decortications. The remaining two cases were died due to poor cardiopulmonary reserve and poor nutritional status. These findings were similar to observations in other studies like Yagi et al, and Shamaei M et al, except with few differences like few patients were not given pleural drainage and treated with either observation or simple aspirations along with ATT.^{26,28} The length of hospital stay was more in PNTX group (p value-0.0001). This was because of prolonged ICT in situ.

CONCLUSION

Tuberculous pneumothorax was more common in younger people than tuberculosis without pneumothorax group. Gender and smoking have no association with PNTX. Tuberculous pneumothorax was more common in patients with a past history TB, though statistically not significant. BMI was significantly low in pneumothorax group of patients. Chest pain, fever and hemoptysis were more common presentations with PNTX group. Consolidation, TIBs, bronchiectasis and pleural organizations were more common radiological presentations in PNTX group. In 38% (19/50) of PNTX cases lung not expanded and 34% (17/50) were referred for BPF repair or decortication. Two patients among them were died, might be due to poor cardiopulmonary reserve and poor general condition.

More than 1/3rd patients of PNTX group have prolonged ICT in situ, prolonged hospital stay and post-operative complications resulting in increased morbidity, financial burden and increased loss of DALYS. Therefore, decreasing the relapse and defaulter rates and improving the nutritional status of patients in new TB cases will decrease the prevalence of tuberculous pneumothorax and associated morbidity and mortality. Limitations in current study includes cases that were referred to cardio thoracic surgery department for BPF repair or decortication were not followed up. Studies with larger cohorts are required from different centers to derive significant conclusions.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Yellapu GD, Vipparthi SK, Vangara RK. Profile of tuberculous pneumothorax and comparison with pulmonary tuberculosis without pneumothorax. *Int J Res Med Sci* 2019;7:658-62.