

Surgical Experience in the Management of Spontaneous Pneumothorax

A BILAL M S NABI M SALIM

Department of Cardiothoracic Surgery, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar.
Correspondence to Aamir Bilal, Associate Professor

Objective: To determine the efficacy and evaluate the results in terms of recurrence of Bullectomy and parietal pleurectomy in patients with spontaneous pneumothorax. **Design:** A prospective observational study. **Place and duration of study:** This study was conducted at the department of cardiothoracic surgery, postgraduate Medical Institute Lady Reading Hospital Peshawar from March 1998 to April 2001. **Patients and methods:** This prospective study included 110 patients; 82(75.5%) males and 28(25.4%) females. Male: female ratio was 2.5:1. The mean age of the patients was 38.5 years (range 10 to 50 years. Ninety percent of the patients complained of chest pain while 45% experienced dyspnea pain. Chest radiograph was obtained in all while C.T thorax was obtained in 20(18.1%) patients. The magnitude of pneumothorax and associated pathology was determined radiologically. Thirty-nine (35.4%) patients presented with first episode; 99(44.5%) had recurrent while 22(20%) had persistent pneumothorax. Tube thoracostomy was the initial line of management in 80(72.7%) of patients who presented with first episode of pneumothorax. Indications for surgery included recurrent pneumothorax, persistent air leak (>7 days), non expansion of the lung, complicated pneumothorax and suspicion of bulla on CxR or C.T thorax. Out of 110 patients, 28(25.4%) required surgery. **Result:** The mean operative time was 45(±15) minutes. Surgical indications included recurrences 18(66.6%), persistent air leak 5(18.5%) non expansion of the lung 3(11.1%) patients. Twenty-two (78.5%) patients under went bullectomy/wedge resection, over sewing and ligation was done in 6(21.4%) while pleurectomy was done in all these patients. There were no operative deaths. Over all 2(7.1%) patients had post operative air leak. The post operative hospital stay averaged 6.9 days. Our 18 months of follow up has shown no recurrence and no significant impairment of post operative pulmonary function tests. **Conclusion:** Pleurectomy with bullectomy or ligation of subpleural blebs is a safe and reliable procedure and gives excellent results.

Key words: Spontaneous pneumothorax , surgical management, outcome.

Pneumothorax is broadly classified etiologically into spontaneous and traumatic pneumothorax. Spontaneous pneumothorax (SP) has further been classified as primary spontaneous (or idiopathic) or secondary spontaneous due to localized or generalized underlying pulmonary disease. The mechanism of development of SP is thought to be a visceral pleural tear from rupture of sub pleural blebs (congenital bronchiolar obstruction resulting in a check-valve hyperinflation of the distal airways with subsequent ruptures. The most common pulmonary conditions associated with secondary spontaneous pneumothorax are chronic obstructive pulmonary disease (COPD) and advanced cavitary tuberculosis while occasionally sptaphylococcal pneumonia and lung abscess may be the underlying lung pathology¹.

The epidemiology of SP is of historical interest. Two time periods are of significance². The French era began in 1803 when Itrad, a student of Laennec, first coined the term pneumothorax in his doctoral thesis. Later Bidch reported in 1880 that 78% of 916 patients with SP had tuberculosis, emphasizing the importance of pleural plaques and cavitary lung disease in the etiology of SP. The Swedish era began in 1932 with Kjaergaard's study; emphasizing the primary importance of subpleural bleb disease³. Pneumothorax is one of the main complications of pulmonary tuberculosis. It may develop following rupture of subpleural focus or cavity⁴. Pulmonary tuberculosis still remains the commonest cause of secondary spontaneous pneumothorax in third world countries⁵, while chronic obstructive pulmonary disease

(COPD) is significant etiologically in the west⁶. Other causes include interstitial lung disease (IDL) and sptaphylococcal pneumonia. Small uncomplicated pneumothoraces may be observed. Tube thoracostomy is, however, the usual initial treatment in first episode and has been successful in most patients⁷. As many as 25% of patients may eventually require surgical treatment. The indications for surgical intervention have included recurrent pneumothorax, prolonged bronchopleural fistula and failure to reexpand the lung with chest tube drainage of the pleural space⁸. Standard surgical intervention has been by axillary or lateral thoracotomy through which bullectomy, and pleurectomy are performed and has demonstrated recurrence rate less than 3%. The purpose of our study was to evaluate the role of surgical intervention and outcome for spontaneous pneumothorax in our circumstances.

Patients and methods

From March 1998 to April 2001, we studied 110 patients with spontaneous pneumothorax. Patient under 10 years and those over 50 years of age were excluded. Only patients with no evidence of trauma or iatrogenic causes were included.

All these patients were admitted to the hospital and after immediate emergency management, history and examination was conducted. The diagnosis was made by plain chest radiographs in all instances. The extent of pneumothorax as estimated grossly from the radiographs, averaged 45%. Computerized tomography (C.T) was

performed on twenty patient who had suspicion of bulla on chest radiographs.

Asymptomatic stable patients with pneumothorax less than 20% of total lung capacity were treated with oxygen and observation. Patients with pneumothorax greater than 20% were initially treated with (32F) plastic intercostal tubes connected to an under water seal and suction. Complete lung expansion with an intercostal chest tube was a prerequisite for chemical pleurodesis. Indications for surgery were recurrence, persistent air leak for more than 7 days, inability to achieve an expanded lung, failure of chemical pleurodesis and complicated pneumothorax (hemothorax, empyema).

Operative technique: The operation was performed through a lateral thoracotomy. The skin incision was small, no more than 15 cm in length. Once the pleural space was entered, the whole of the lung was inspected. In younger patients; the most common abnormality was a group of small bullae, incorporated in thickened pleura at the apex. These were either oversewn using a fine suture material or ligated with a suture at the base. For multiple large bullae wedge resection of pulmonary parenchyma at the base of the bullae was accomplished. Parietal pleurectomy was performed in all patients. Starting at the margins of the incision a plane of cleavage was established between the parietal pleura and the inner chest wall. The pleura was then stripped off and excised from all areas except the mediastinum and diaphragm. Prior to closing the chest, the lung was ventilated, Ringer's solution was instilled into the pleural cavity and leaks were sought by dipping progressive lung portions under water. After thorough hemostasis and check for large parenchymal leaks, an air drain (F28) and a fluid drain (F32) were placed through separate incisions. The tips of the drains were placed towards the apex and into the costodiaphragmatic recess. Finally the pneumothorax was evacuated and the lung reexpanded gently by positive pressure ventilation and chest closed. Postoperative complications, analgesic requirement, duration of chest tube placement and length of hospitalization and follow up were all recorded.

Results

A total of 110 patients admitted for treatment of spontaneous pneumothorax were studied. There were 82 (79.5%) males and 28(25.4%) females with a male to female ratio of 2.5:1. Seventy-two percent of the patients were in their 3rd & 4th decade of life, the youngest being 10 years old the oldest being 50 (Table I). The presenting symptoms were chest pain (90%); 45% had shortness of breath and only three had a cough at the time of initial examination. An underlying cause for pneumothorax was sought. In 60(54.5%) tuberculosis, 28(25.5%) COPD and in 4(3.6%) patients history of sptaphylococcal pneumonia was obtained while 18(16.3%) had primary spontaneous pneumothorax (Table II). Tube thoracostmy was the initial line of management in 80(72.7%) patients who had >20%

premothorax at the first admission. The indications for surgery at our department are listed in table III. Out of 110 patients with spontaneous pneumothorax 28(25.4%) required surgical therapy for resolution. The indications were recurrence 18(66.6%); persistent air leak 5(18.5%) non expansion of the lung 3(11.1%), complicated pneumothorax 1(3.7%) and suspicion of a large bulla in 1(3.7%) patient. We were unable to achieve full reexpansion of the collapsed lung even with multiple chest tubes in three patients. The time to recurrence was noted, 52% of the recurrences happened 6 months from the previous episode and 72% presented within the first year.

A total of 28 parietal pleurectomies combined with either bullectomy or over sewing of bullae were carried out during this study period. (Table IV). We have found it be a relatively safe procedure with minimal complications In 2(7.1%) patients had an air leak postoperatively.

Table I, Incidence of spontaneous pneumothorax by age (n=110)

Age (years)	n=	%age
10-20	11	10
21-30	20	18.1
31-40	40	36.2
41-50	39	35.4

Table II Factors contributing to spontaneous pneumothorax (n=110)

Cause	n=	%age
Primary spontaneous	18	16.3
Tuberculosis	60	54.5
COPD	28	25.5
Infections	4	3.5

Table III Indications for surgery (n=28)

Condition	n=	%age
Recurrent pneumothorax	18	66.6
Persistent air leak (> 7 days)	5	18.5
Non expansion of the lung	3	11.1
Complicated pneumothorax	1	3.7
Suspicion of large bulla	1	3.7

Table IV. Surgical procedures (n=28)

Procedure	n=	%age
A. Oversewing/Ligation (subpleural blebs)	6	21.4
B: Bullectomy/Wedge resection	22	78.5
C: Pleurectomy combined with A & B	28	100

Discussion

The term spontaneous pneumothorax can be traced back to the French man Itard who described the phenomena of air leak into the pleural space without previous trauma in his dissertation in 1803¹⁰. After thorough histologic examination of more 100 specimens Masshoff and Hofer demonstrated in 1973 that subpleural pathomorphologic pulmonary changes were present in many of so called idiopathic or primary spontaneous pneumothorax.¹¹ Primary spontaneous pneumothorax is a disease of young adults the peak incidence is usually in the 3rd decade.¹² our

study shows that pneumothorax was primary only in 18(16.3%) cases while COPD was responsible for 25.5% and pulmonary tuberculosis as a cause of secondary spontaneous pneumothorax in 60 (54%) of cases(table II). Pulmonary tuberculosis still remains the commonest cause of secondary spontaneous pneumothorax.^{4,6} In our country secondary spontaneous pneumothorax specially due to underlying cavitory pulmonary tuberculosis and COPD is more common than primary spontaneous pneumothorax.⁶ The main presenting symptoms were chest pain, shortness of breath and cough and most patients were males. C.T thorax is often recommended in the preoperative workup of spontaneous pneumothorax.¹³ Computerized tomography was performed in twenty patients and showed apical pulmonary bullae in fifteen.

The objectives of treating spontaneous pneumothorax are relief of symptoms by rapidly reexpanding the affected lung and prevention of recurrences. Insertion of a chest tube is usually the first therapeutic step.¹⁴ In our series 80(72.2%) patients were treated with chest tube drainage who presented with first episode of pneumothorax. For the first event and the first ipsilateral relapse of spontaneous pneumothorax simple insertion of chest drain is generally recommended although the recurrence rates are still high (20%).¹⁵ However in patients with a contralateral or with higher-grade ipsilateral recurrences, an approach that is more invasive than tube thoracostomy is widely accepted.^{15,16} Knowledge of the time course of air leak and healing rates with simple suction therapy is necessary as when to intervene invasively.¹⁴ In our patients the chest tubes were in place for a maximum of seven days to allow for resolution of pneumothorax. If an air leak or pneumothorax persisted after 7 days, surgical intervention was undertaken (Table III). This is comparable to observation by others^{17,14} Surgery for recurrence was offered to 18 (66.6%) of our patients as shown in table III. The indications for chemical pleurodesis at our department were a second recurrence, persistent air leak or the underlying disease. Results for chemical pleurodesis vary but most investigators have reported failure rates that range from 10% to 20 %^{18, 19} surgical pleurodesis is now more useful and can be performed either as an open procedure or under thoracoscopic control by mechanical abrasion²⁰. Surgical pleurodesis has a significantly lower recurrence rate usually between 0% and 4%^{21,22}.

Thoracoscopic approach to primary spontaneous pneumothorax may offer a less invasive method of accomplishing the same surgical therapy performed presently via open thoracotomy⁸. The advantages of video assisted thoracic surgery (VATs) are avoidance of the scar of thoracotomy for cosmetic reasons; a shorter postoperative hospital stay and little need for postoperative narcotics^{23,24,25}. However, the cost of instruments and staplers is very high and needs to be considered. In our circumstances therefore; thoracotomy still remains a less expensive and very effective approach to these patients.

Twenty five percent of our patients ultimately required a thoracotomy (Table III & IV). In accordance with the others^{21,22} we believe that wedge resection (bullectomy) combined with parietal pleurectomy is sufficient therapy. The procedure was performed in 22(78.5%) of our patients table (IV). Both short term and long term morbidity were low.

The follow up period was between 13 and 18 months with an average of 15.5 months. During this interval no relapse of pneumothorax was observed and pulmonary function tests showed significant improvement.

Conclusion

Bullectomy and parietal pleurectomy is useful to reserve pulmonary function and gain necessary adhesion of the place where frequent bullae formation are observed. After performing parietal pleurectomy there is no recurrence. On the basis of our experience we advocate the use of apical pleurectomy and bullectomy for the younger age group with recurrent pneumothoraces and a full pleurectomy in the older age group who often have lung disease secondary to chronic obstructive lung disease which is not confined to the apex of the upper lobes.

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