

Video assisted thoracoscopic management of primary spontaneous pneumothorax

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Abstract

Objective: To analyze the outcome of Video assisted Thoracoscopy (Vats) in Primary Spontaneous Pneumothorax (PSP).

Methods: This case series was carried out from Jan 2010 to Jan 2017 in Department of Thoracic Surgery CMH Rawalpindi and Lahore. A total of 98 patients underwent Video-assisted thoracoscopic for PSP. Inclusion criteria were physiologically fit patients with PSP for recurrent attacks, occupational hazards and prolonged air leak. Exclusion criteria included secondary spontaneous pneumothorax, previous pleurodesis and physiologically unfit patient for general anaesthesia. Vanderschueren's thoracoscopic classification was used for macroscopic staging. A 3-port technique was used for apical stapling with partial pleurectomy up to 6th rib. Parietal pleura and diaphragm was also abraded.

Results: Occupational hazard was the commonest indication for surgery, n= 39 (39.7%). This was followed by recurrent pneumothorax 37 (37.7%), persistent air leak 19 (19.38%) and contra lateral pneumothorax n=4 (4.08%). Mean age was 22.8 ± 6.5 years. Majority of the cases, 69(70.4%) were in stage 3 of Vanderschueren's classification. Stage 4 were (18.5%) and stage 2 were 7 (7.14%). Mean operative time was 51 ± 14. 4 minutes. Postoperative prolonged air leak occurred in 3 patients and post-operative neuralgia occurred in 8 patients. Mean follow-up was 22 ±5.5 months, range 5-24 months for all patients. One had generalized recurrence and 2 patients had subpulmonic trapping of air.

Conclusions: Video-assisted thoracoscopic stapling and pleurectomy is an effective definitive treatment for primary spontaneous pneumothorax when indicated with minimal recurrence.

Keywords: Video-assisted thoracoscopy, blebs, pneumothorax. (JPMA 71: 210; 2021)

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Introduction

Primary spontaneous pneumothorax (PSP) is defined as the presence of air in the pleural space which causes lung collapse. It is believed that this is due to the rupture of a sub pleural bleb or bulla. Vanderschueren's classification of primary spontaneous pneumothorax,¹ also used in our study, classifies bullae according to their thoracoscopic appearance. Treatment options may vary for the management of PSP, including simple observation, chest intubation, open thoracotomy and Video assisted Thoracoscopy (Vats), but main concern is for recurrence. The indications for surgical treatment may include persistent air leak, recurrent PSP, contralateral PSP, and PSP in high-risk occupations. It is

an excellent substitute to thoracotomy which has got its own limitations and morbidity. Opinions may vary once a specific treatment option/operative technique is considered. In last decade, Vats has been used as an alternative to thoracotomy in the treatment of recurrent or persistent PSP to avoid morbidity associated with thoracotomy. In experienced hands VATS is cost effective, with less morbidity and a very acceptable form of treatment for patients with pneumothorax.¹ Primary spontaneous pneumothorax is a disease of thin males who are young.² It is very rare in older age groups. In Pakistan, Vats has started to evolve as the preferred treatment option in the management of spontaneous pneumothorax; however very limited data has been published on this topic in our part of the world. Comparison of our data with international studies will improve our understanding of Vats in the treatment of PSP. There are some modifications/improvements in operative technique which would be discussed in detail in the discussion below.

Methods

The case series was conducted at CMH Rawalpindi and

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CMH Lahore from January 2010 to January 2017. Patients with PSP were included in the study and those with secondary spontaneous pneumothorax were excluded from the study. A total of 98 consecutive PSP patients with persistent /recurrent or occupational hazard were treated by VATS. A total of 130 patients with diagnosis of pneumothorax presented in our thoracic surgical department during the study period; hence a population size of 98 was selected using online calculator with confidence level of 95% and margin of error 5%. Consecutive non-probability sampling technique was used. Detailed history and clinical examination was performed. Besides baseline, HRCT was done in all patients. Vanderschueren's Thoracoscopic classification of primary spontaneous pneumothorax for Gross Macroscopic staging used in our study is shown in Table-1.

Under general anaesthesia and single lung ventilation, 10-mm trocar was introduced through a 1.5-cm skin incision in the eighth intercostal space at the midaxillary line for insertion of a 30° video telescope. Two additional ports were then inserted under direct vision: a 12-mm trocar through the fifth intercostal space on the anterior axillary line and a 5-mm posterior trocar through the 5th/6th intercostal space near the tip of the scapula, as shown in Figure-1. Bullae or blebs were identified and held with a grasper and apical stapling /apicectomy was done. When no blebs were visible, a small portion of the apical upper lobe was resected. The excision was done by using an Endo-GIA stapling devices. This was followed by apical pleurectomy extending till 5th-6th rib, from the angle of rib posteriorly to near internal mammary anteriorly. Rest of the pleura and diaphragm were abraded. Air leak was checked after completion of the procedure with saline and inflation of lung and addressed if required to ensure pneumostasis. A 32-F chest tube was inserted through the camera port and connected to underwater seal. Surgical specimen was also sent for histopathology.

All patients once recovered were transferred to the thoracic surgery ward. An analgesic Paracetamol IV was administered every 8 hours for first 24 hours. And then, oral paracetamol was given as needed from next day onwards. Chest tube was removed once lung expansion was achieved clinically and confirmed on X-ray and there was no air leak.

Data were expressed as mean \pm SD; data analyses were made using SPSS software windows version 20 package (SPSS, Chicago, IL, USA). Data included operative findings, operative time, and duration of pleural drainage, hospital

stay, postoperative air leak, pathologic findings and recurrences. The follow-up was with chest radiography done at intervals of 1 week, 1 month and 3 months. Patients were later followed up for 2 years with a telephone communication, clinical and radiological lung expansion.

Results

This series included 88 (89.7%) male and 8(8.1%) female patients. Mean age was 22.8 ± 6.59 years, (range, 11-38 years) less than 20 (n=50), from 20 to 30 (n=32) and age greater than 30 (n=16). Thirty-nine (39.7%) patients had professional hazard (combat soldiers), which was the main indication of surgery in our study. Thirty-seven (37.7%) patients were operated after a recurrent episode of PSP. In 17 (17.3%) patients, Vats was done because of persistent air leak for more than 5 days. Five (5.1%) cases of contralateral recurrence were also operated. Vats was unilateral in all cases with right side in 50 (51%) cases and on the left side in 48 (49%) cases. Smoking history was positive in 59 (60.2%) patients. All patients were successfully treated using the Vats technique. The mean operative time was 51 ± 14.7 min (range, 33-120 min). In all patients with blebs/bullae confirmed on thoracoscopy (n = 87) had bullae identified histologically and showed emphysematous lung parenchyma. Sixty-nine

Table-1: Vanderschueren's classification of primary spontaneous pneumothorax.

Stage I	No endoscopic abnormalities
Stage II	Pleuropulmonary adhesion
Stage III	Blebs/bullae of <2 cm in greatest diameter
Stage IV	Bullae of >2 cm in greatest diameter

Table2: Complications n=98.

Complication	Number of patients	Percentage
Recurrence generalized	1	0.98%
Sub pulmonic air trapping localized	2	1.96%
Prolong air leak requiring prolong chest tube drainage	3	2.94%
Port site infection	2	1.96%
Post op neuralgia	8	7.84%
Bleeding	3	2.94%
Mortality	0	0

Table-3: Chest tube drainage.

Number of days of chest tube drainage	Number of patients	Percentage
1	62	63.2%
2	22	22.4%
3	11	11.2%
>3Prolonged drainage	3	3%

(70.4%) patients had blebs whereas 18(18.3%) patients had bullae. Pleuropulmonary adhesions were noted in 7(7.1%) and there was no finding in 4 (4%) patients. At thoracoscopy, air leaks were identified in 23 (23.4%)



Excised pleura.



Excised bulla.



Figure-1: Port site.

patients. Majority of the cases were in stage 3 of Vanderschueren's classification¹ n= 69 (70.4%), stage 4 were n= 18 (18.36%) and stage 2 were n=7 (7.14). Eight (8.1%) patients needed Vats decortication as an added procedure. Eighty-six (87.7%) patients had single chest tube while 12 (12.2%) required two chest tubes at the end of the procedure. All patients in this study were followed up regularly for 2 years. Mean Chest tube Drainage time was 1.7 ± 1.56 days. Table 3 shows the chest tube drainage time. Three patients who needed prolonged drainage responded well with blood pleurodesis and continuous low suction for two weeks. Four (4%) patients operated in 2017 have not shown any recurrence to date. Overall complication rate was 19 (19.3%), main complication was post-operative neuralgia in 8 (8.1%) patients, while there was no mortality. Postoperative prolonged air leak occurred in 3 patients, port site infection in 2 patients. Mean follow-up was 24 ± 6.68 months (range, 23-48 months) for all patients. One patient had generalized recurrence and 2 patients had sub-pulmonic trapping of air as shown in Table-2. Overall incidence of recurrence was 1% for generalized and for localized sub-pulmonic 2.0%.

Discussion

It is said that primary spontaneous pneumothorax may be related to some congenital disorder syndrome or environmental triggers like smoking.³ In our study 59 of the patients were smokers. Factors like emotional changes and changing atmospheric pressures might also be involved.⁴ PSP usually occurs at rest. Recurrences are also common. It is recommended that for recurrent episodes, Vats should be done early as it is considered a better modality of treatment.

Previously it was thought that open procedures have a better outcome in terms of avoiding recurrence but now it is gold standard that Vats has a low recurrence and the results of vats bullae/blebectomy, pleuerectomy are equally effective as open procedures. Vats has low invasiveness and cosmetic advantage at the same time. Vats, therefore, appears to be superior to open thoracotomy in management of spontaneous pneumothorax.⁵

It is universally accepted that PSP results from spontaneous rupture of sub pleural bleb or bulla but many a times there is no obvious pathology.⁶ In our study, most of the blebs and bullae were located in upper lobe. Generally chest X-ray is used for initial assessment but there are limitations since it might not show presence of small blebs or bullae. CT scan helps in pre-operative evaluation of such patients for planning and exact site of

bulla/blebs. In comparison to chest X-ray, CT definitely has proved to be better in the assessment of bullae or blebs.⁶

The first episode of primary spontaneous pneumothorax has remained a controversial issue. It is generally treated by conservative approach except for a few indications. Our study was somewhat unique as majority of patients were treated by early Vats on account of occupational hazard being combat soldiers. There are some studies that recommend Vats as first line treatment in the management of spontaneous pneumothorax.⁶ A total of 183 papers on this topic concluded that Vats was a superior choice in terms of less recurrence as compared to conservative management with chest tube only. Similarly decreased duration of chest tube and mean hospital stay was noted. In addition, such treatment was also found to be cost effective since length of hospital stay was reduced. Contrary to this, there are numerous studies, which still recommend conservative approach on first presentation.⁷ Our policy is to manage the first episode conservatively. We have cost issues in our setup since most of the patients were not affording. So if there is no indication, we felt confident to manage the first episode conservatively. The consensus still remains to manage the first episode with chest intubation.⁸

Literature review also suggested that Vats has very low morbidity and many of the complications like air leak, pleural effusions, haemorrhage, wound infection, atelectasis or pneumonia incidence was low.⁷ Studies have proved that the recurrence rate was also less with Vats. We have found excellent results with our technique with acceptable morbidity and no mortality. In our study, overall incidence of recurrence was 1% for generalized and for localized subpulmonic 2.0%.

Our results with mechanical pleurodesis were also acceptable. Some might argue that mechanical pleurodesis has a risk of bleeding both at the time of procedure and post operatively as well, but we found this technique quite safe and bleeding was not a concern. Studies also showed that it is equally effective as compared to chemical pleurodesis.⁸ Similarly, once combined with bullectomy, results of abrasion and poudrage did not significantly differ from pleurectomy.⁹ We encountered bleeding in three of our patients and apparently were due to parietal pleurectomy, however, no morbidity was noted in these three cases and bleeding stopped in the post-operative period within 24 hours. Chest tubes were removed next day.

We have compared our complications with study

performed by Luh SP et al.¹⁰ Most of the complications like air leak, recurrence, residual pneumothorax, surgical site infection were comparable, however post-operative neuralgia was more common in our study (8.1%). A study conducted by Solaini et al,¹¹ reported low incidence of port site intercostal neuralgia (1.3%), but at the same time, author has noted more frequency of chronic chest wall pain and attributed this to the parietal pleurectomy performed. It is now universally accepted that, post-operative pain is a general complication of Vats. Younger patients are considered more sensitive to pain and one of the recommendations to reduce morbidity due to pain is to perform uniportal vats if possible.

Sub pleural blebs or bullae, (ELCs), are seen in 75-100% of patients with PSP even in non-smoking PSP patients.¹² In our study, this figure was (88.7%). Histopathology in all these patients confirmed the findings of bulla/blebs with emphysematous lung changes ELC. No malignancy or chronic inflammatory changes were reported. Understanding the exact pathophysiology of PSP is essential because recurrence prevention treatment might vary accordingly. The recurrence prevention aimed to find lung abnormalities such as blebs/bulla or treatment of pleura. Therefore, in stage III and IV cases, Vats bleb-/bullectomy plus apical pleurectomy or pleurodesis is considered reasonably effective.¹²

Conclusions

Video-assisted thoracoscopic stapling and pleurectomy is an effective definitive treatment for treating primary spontaneous pneumothorax when indicated with minimal recurrence. Our technique of vats apical stapling and mechanical pleurodesis has shown results which are comparable to international studies.

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Conflict of Interest: None to declare.

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