

Implementation Of Thoracoscopic Surgery in Management of First Attack Primary Spontaneous Pneumothorax

Mohamed Sabry Abdelmotaleb^a, Ibrahim Mohamed Khalil^a, Ahmed Hatem Onsi^a

^aDepartment of Cardiothoracic surgery, Faculty of Medicine, Menoufia University. Shebin Elkoum, Menoufia, Egypt

Abstract

Background: Pneumothorax is defined as accumulation of air in the pleural space. Management of PSP conservatively have higher incidence of recurrence. Many studies now consider VATS is effective and safe procedure used for management and prevention of recurrence in the first attack PSP.

Objectives: we aimed to evaluate the efficacy of using VATS in management of first attack PSP. The results were compared to conservative management to identify the best modality with lower recurrence rate.

Patients and methods: This prospective randomized study was conducted in the department of Cardiothoracic Surgery, Menoufia University hospital included 60 patients with first attack PSP divided into two equal groups. Group A (VATS Group): 30 patients managed by VATS. Group B (conservative group): 30 patients managed conservatively.

Results: All participants were male, and both groups had similar mean ages (Group A: 23.97 ± 3.66 years; Group B: 23.60 ± 3.75 years) and BMI values (Group A: 19.71 ± 1.18 ; Group B: 19.77 ± 1.33). Significant differences were observed in clinical outcomes. Group A (VATS) had a shorter length of hospital stay (mean 3.07 ± 0.78 days vs. 6.63 ± 1.07 days; $p \leq 0.001$) and shorter chest tube duration (mean 2.07 ± 0.78 days vs. 5.87 ± 1.14 days; $p \leq 0.001$) compared to Group B (Conservative). Recurrence rates were also lower in Group A (6.7% vs. 33.3%; $p = 0.010$).

Conclusion: VATS is effective and safe method for management first attack PSP with significant reduction in recurrence rate and length of hospital stay.

Keywords: Conservative; Spontaneous pneumothorax; VATS.

DOI: 10.21608/svuijm.2025.436149.2308

***Correspondence:** m.sabry82@yahoo.com

Received: 28 September, 2025.

Revised: 28 October, 2025.

Accepted: 20 November, 2025.

Published: 21 November, 2025

Cite this article as Mohamed Sabry Abdelmotaleb, Ibrahim Mohamed Khalil, Ahmed Hatem Onsi. (2025). Implementation Of Thoracoscopic Surgery in Management of First Attack Primary Spontaneous Pneumothorax. *SVU-International Journal of Medical Sciences*. Vol.8, Issue 2, pp: 761-769.

Copyright: © Abdelmotaleb et al (2025) Immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge. Users have the right to Read, download, copy, distribute, print or share link to the full texts under a [Creative Commons BY-NC-SA 4.0 International License](https://creativecommons.org/licenses/by-nc-sa/4.0/)

Introduction

Pneumothorax is defined as accumulation of air in the pleural space between visceral and parietal pleural. Pneumothorax is classified according to etiology into traumatic and spontaneous pneumothorax (Kepka et al., 2016).

Spontaneous pneumothorax is either secondary to underlying lung diseases which are called secondary spontaneous pneumothorax or with underlying apparently healthy lung which is called primary spontaneous pneumothorax (PSP) (Hatz et al., 2000). The cause of PSP remains unclear, and the presence of bullae or macroscopic/microscopic pleural alterations (eg, "pleural porosity") are the most widely accepted causes currently. Most of patients with PSP are male, middle age, thin, tall and heavy smoker (Noppen et al., 2010).

PSP initial management depends on patient presentation and severity of pneumothorax in chest X ray (CXR). Asymptomatic patients with mild pneumothorax in CXR in which distance between chest wall and lung border is less than 3 cm are managed by observation and oxygen supplementation while symptomatic patients or significant amount of pneumothorax which distance between chest wall and lung border is more than 3 cm are managed initially by pleural drainage (Migliore et al., 2013). Pleural drainage can be done by needle aspiration, image guided or blind small caliber or pigtail drain (8F) and chest tube. Surgical management by video-assisted thoracoscopic surgery (VATS) is indicated for persistent air leak and for prevention of recurrence (Tschopp et al., 2006).

Management of PSP conservatively either by observation or pleural drainage has higher incidence of recurrence of pneumothorax. Many studies now consider VATS is effective

and safe procedure used for management and prevention of recurrence in the first attack PSP (Morimoto et al., 2002).

In this study, we aimed to evaluate the efficacy of using video-assisted thoracoscopic surgery (VATS) in management of first attack primary spontaneous pneumothorax. The results were compared to conservative management to identify the best modality with lower recurrence rate.

Patients and methods

This prospective randomized study was conducted in the department of Cardiothoracic Surgery, Menoufia University hospital. The study included 60 patients with first attack primary spontaneous pneumothorax presented to our hospital from May 2023 to January 2025 after approval from the local ethics committee of the Faculty of Medicine, Menoufia University

Inclusion criteria:

- All patients with first attack primary spontaneous pneumothorax

Exclusion criteria:

- All patients with recurrent primary spontaneous pneumothorax
- All patients with secondary spontaneous pneumothorax
- All patients with traumatic spontaneous pneumothorax

Data collection:

Patients fulfilled the above criteria, after taking informed consent, were subjected to:

- A. A thorough medical history** including symptoms, concomitant comorbid medical conditions, past medical and surgical

history and personal habits such as smoking

B. Complete clinical examination: including vital signs and general and local chest examination.

C. Investigations:

- **Laboratory investigations:** Routine laboratory works including complete blood count (CBC), coagulation profile, random blood sugar, liver and renal function tests were performed.
- **Radiological investigation:** Routine chest X-ray (PA-Lateral) and computed tomography (CT) of the chest.

Patients with first attack primary spontaneous pneumothorax were divided into two equal groups randomly by computer-generated randomization sequence.

Group A (VATS Group): 30 patients managed by VATS; surgery is done in the first 24 hours of admission as shown in (Fig.2).

Surgical procedure: (VATS apical bullectomy).

Anesthesia: General anesthesia, Double lumen endotracheal tube with fiberoptic bronchoscopic guidance

Position: lateral decubitus position healthy side down and operating side up

Steps: One lung ventilation and operated lung deflation was performed. Through 5-10 mm incision in the 7th intercostal space mid-axillary line camera was introduced. Another port through another incision in the 4th intercostal space anterior axillary line. lung was explored for presence apical small bullae as showed in (Fig.1). Using endo GIA stapler, the apical bullae were excised with small lung wedge. chest tube was inserted at the camera port and lung was inflated. Chest tube was fixed and wound was closed. Extubation was done at the end of procedure.

Group B (conservative group): 30 patients managed conservatively, conservative management done either by observation as showed in (Fig.4) or pleural drainage (thoracocentesis, pleural drain as showed in (Fig.3) or chest tube as shown in (Fig.5)).

Outpatient follow-up: Serial routine PA and lateral chest x-rays were performed during follow-up visits (1week, 1month, 3 months and 6 months) after discharge.

Ethical considerations

Menoufia University Faculty of Medicine Research Ethics Committee approval was obtained for prospective randomized study (4/2023 CARS 15-1) and getting patients consents for this study.

Statistical analysis

Data were analyzed using SPSS (version 25). Continuous variables were assessed for normality using the Shapiro–Wilk test and expressed as mean $\pm$ standard deviation (SD) and median (interquartile range, IQR), as appropriate. Categorical variables were presented as counts and percentages. Comparisons between Group A (VATS) and Group B (Conservative) were performed using the independent samples t-test for normally distributed continuous variables, the Mann–Whitney U test for non-normally distributed continuous variables, and the Chi-square test for categorical variables. Exact tests were applied when cell counts were low. Statistical significance was set at $p \leq 0.05$.

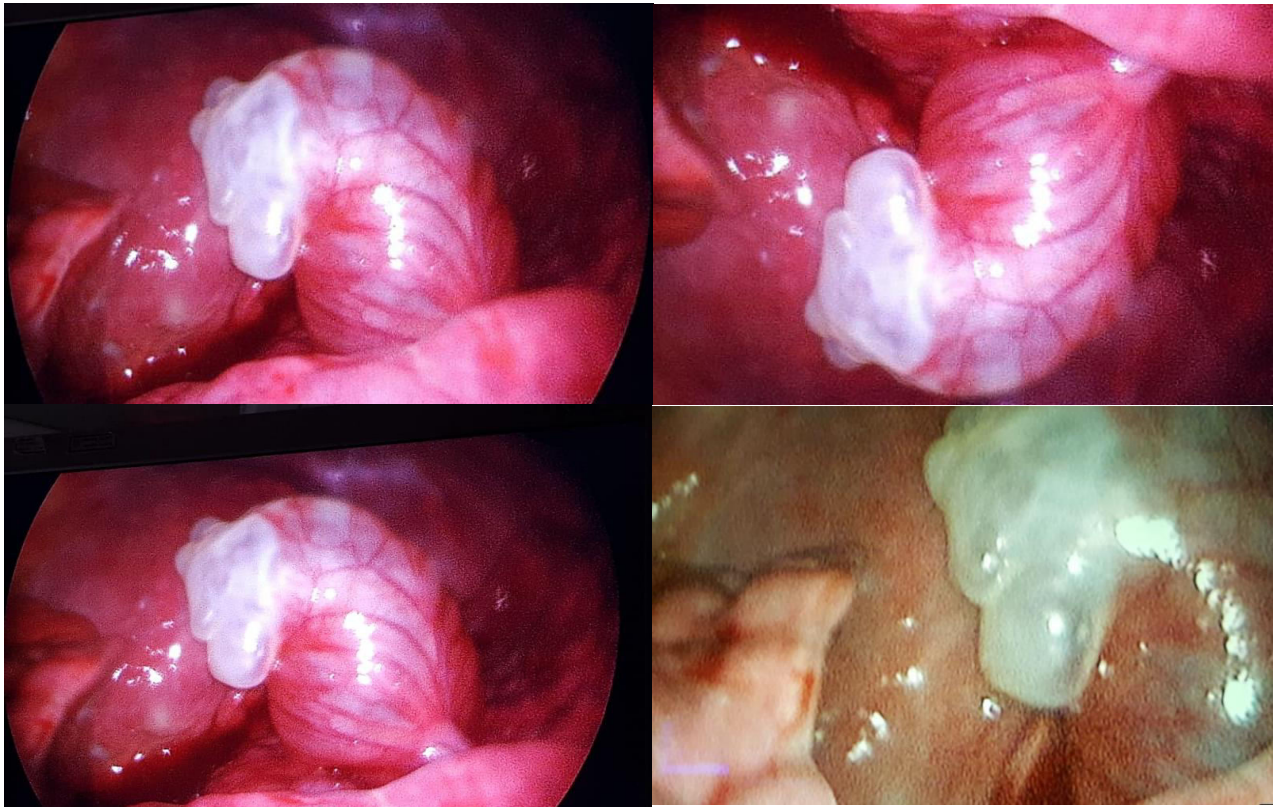


Fig.1. Intraoperative subpleural blebs

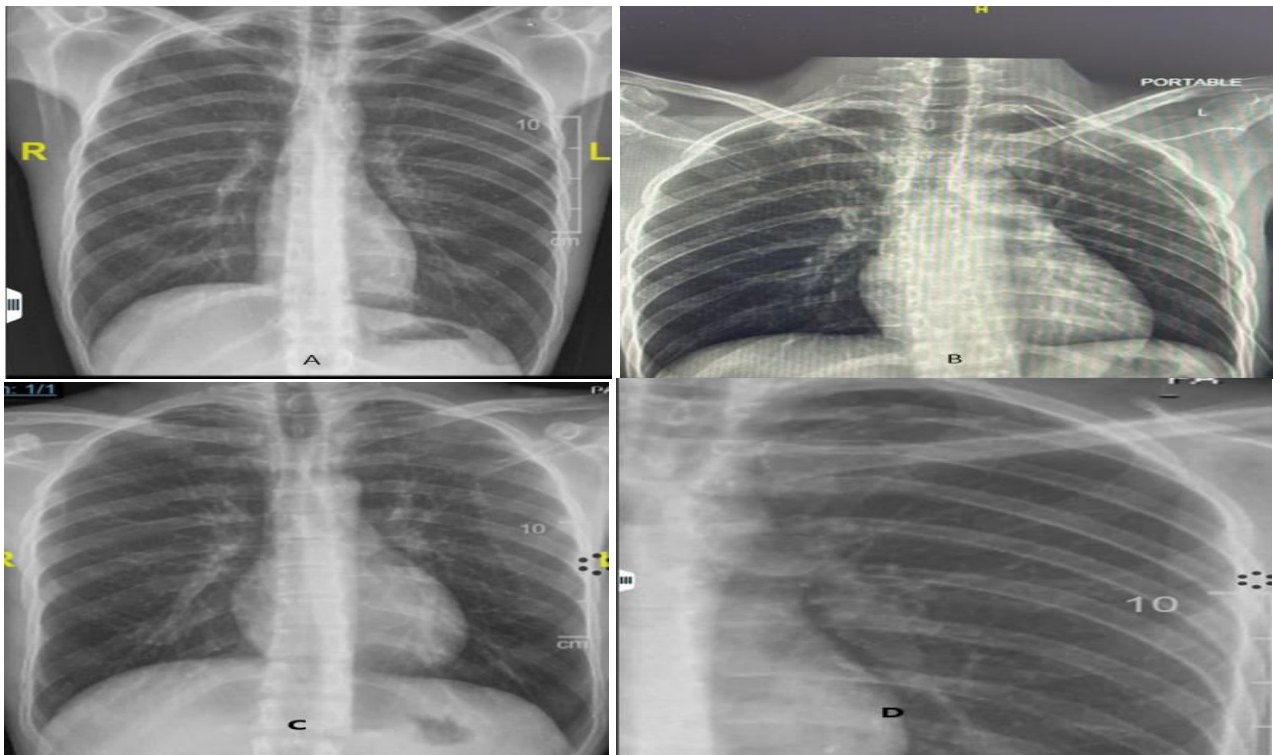


Fig.2. A case of left PSP managed by VATS: (A) chest x ray upon admission showed left pneumothorax (B) immediate post operative chest x ray (C) chest x ray upon discharge with fully inflated left lung (D) post operative chest x ray showed stapler line.

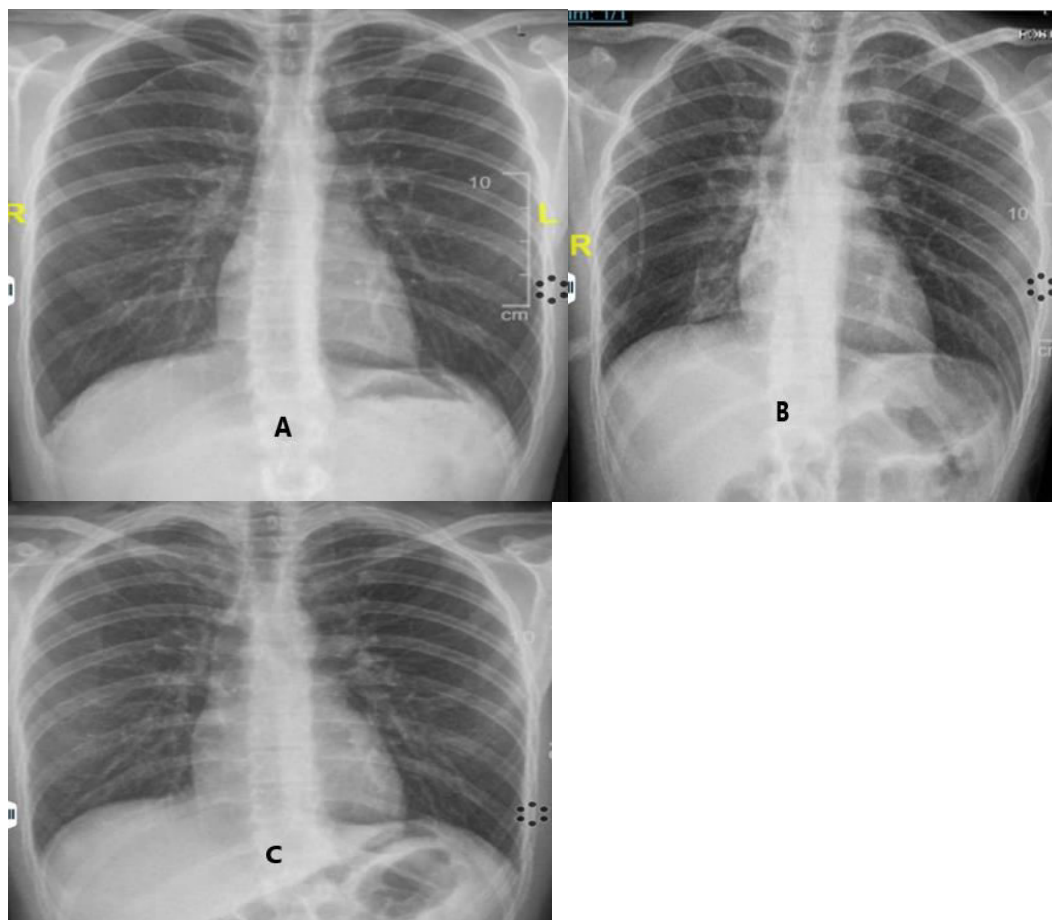


Fig.3. A case of right PSP managed by right 8 F pleural drain: (A) chest x ray upon admission showed right pneumothorax (B) immediate post pleural drain insertion chest x ray showed fully inflated right lung with presence of right pleural drain (C) chest x ray upon discharge with fully inflated right lung.

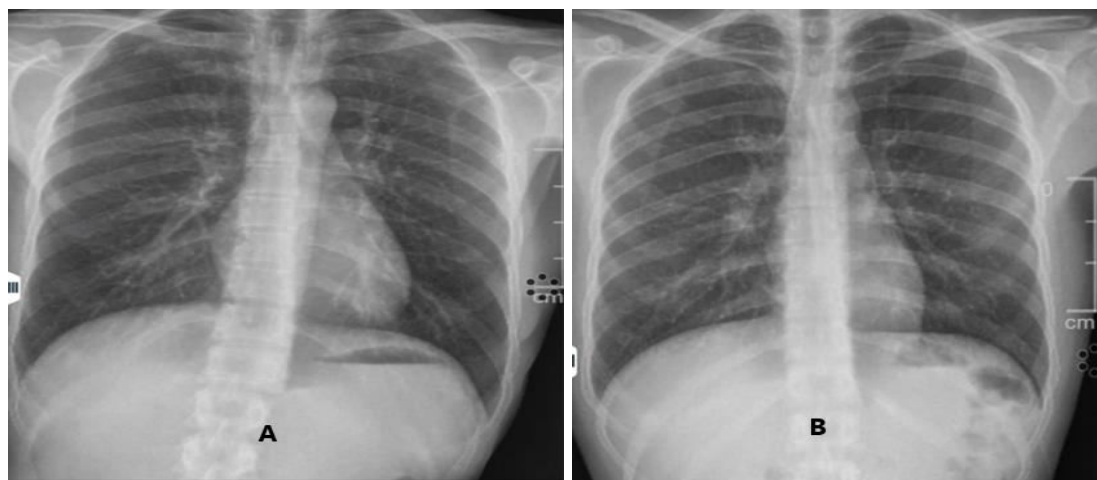


Fig.4. A case of right PSP managed by observation: (A) chest x ray upon admission showed right mild pneumothorax (B) chest x ray upon discharge with fully inflated right lung.

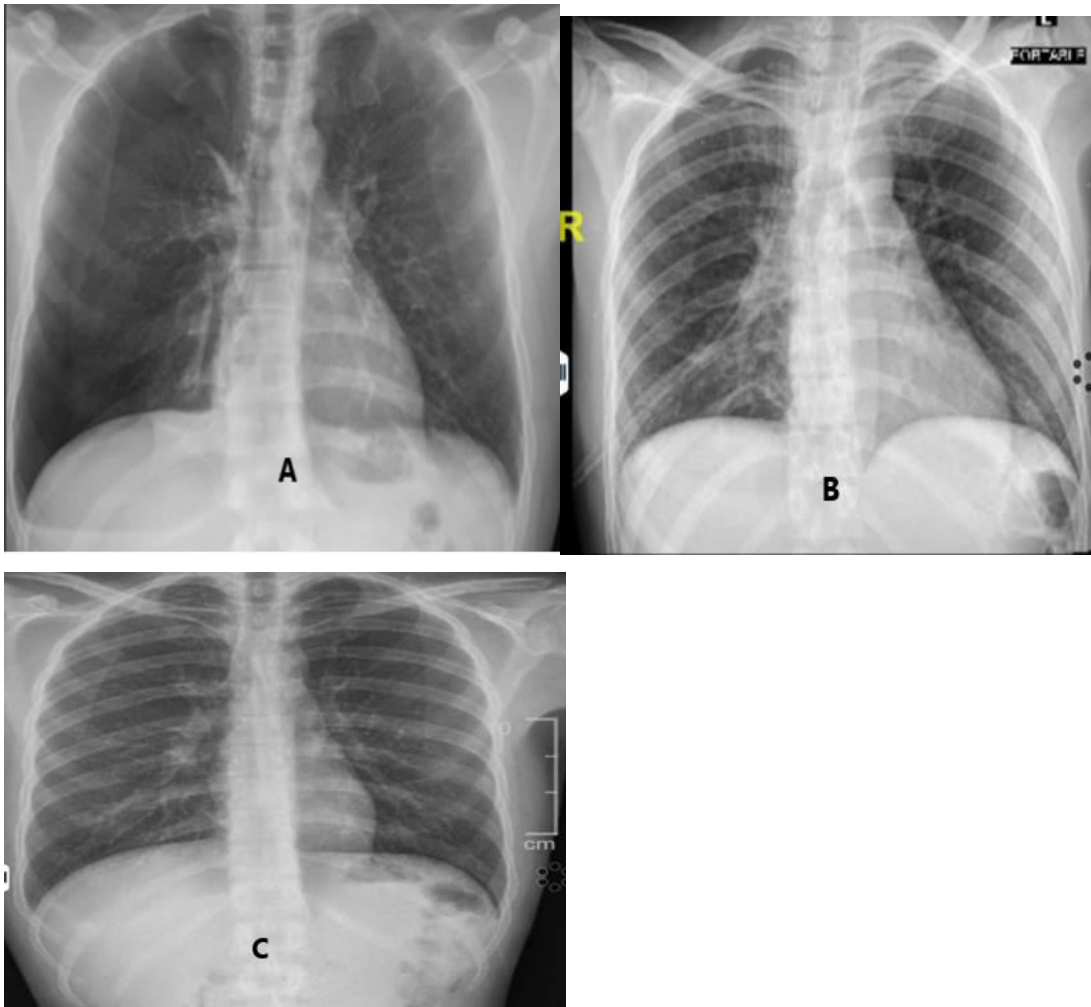


Fig.5. A case of right PSP managed by right chest tube insertion: (A) chest x ray upon admission showed right pneumothorax (B) immediate post chest tube insertion chest x ray showed fully inflated right lung with presence of right chest tube (C) chest x ray upon discharge with fully inflated right lung.

Results

The baseline characteristics of the two groups were comparable with respect to gender, age, BMI, and co-morbidities, with no statistically significant differences observed ($p > 0.05$). All participants were male, and both groups had similar mean ages (Group A: 23.97 ± 3.66 years; Group B: 23.60 ± 3.75 years) and BMI values (Group A: 19.71 ± 1.18 ; Group B: 19.77 ± 1.33). In contrast, significant differences were observed in clinical

outcomes. Group A (VATS) had a shorter length of hospital stay (mean 3.07 ± 0.78 days vs. 6.63 ± 1.07 days; $p \leq 0.001$) and shorter chest tube duration (mean 2.07 ± 0.78 days vs. 5.87 ± 1.14 days; $p \leq 0.001$) compared to Group B (Conservative). Recurrence rates were also lower in Group A (6.7% vs. 33.3%; $p = 0.010$). Smoking status was similar between groups ($p = 0.640$). These findings suggest that VATS is associated with faster recovery and lower recurrence compared to conservative management. (Table 1)

Table 1. Comparison of Demographic and Clinical Characteristics Between VATS and Conservative Groups

Variables	Group A /VATS	Group B /Conservative	Test of significance	P value
Gender (Male)	30 (100%)	30 (100%)	-	-
Age			$U=424.5$	0.705
Mean $\pm$ SD	23.97 $\pm$ 3.66	23.60 $\pm$ 3.75		
Median (IQR)	25 (21–27)	25 (20–27)		
BMI			$t=-0.195$	0.846
Mean $\pm$ SD	19.71 $\pm$ 1.18	19.77 $\pm$ 1.33		
Median (IQR)	19.7 (18.8–20.4)	19.7 (18.7–20.8)		
Co-morbidity	0 (0.00%)	0 (0.00%)	-	-
Length of hospital stay			$U=3.5$	≤ 0.001
Mean $\pm$ SD	3.07 $\pm$ 0.78	6.63 $\pm$ 1.07		
Median (IQR)	3 (3–4)	7 (6–7)		
Recurrence	2 (6.7%)	10 (33.3%)	$X^2=6.667$	0.010
Smoking	27 (90.0%)	28 (93.3%)	$X^2=0.218$	0.640
Chest tube duration			$U=2.0$	≤ 0.001
Mean $\pm$ SD	2.07 $\pm$ 0.78	5.87 $\pm$ 1.14		
Median (IQR)	2 (2–3)	6 (5–7)		

Mann–Whitney U test, t : Independent samples t-test, X^2 : Chi-square test, p-values ≤ 0.05 were considered statistically significant.

In Group A (VATS), no post-operative complications were observed, indicating a favorable short-term safety profile for the procedure. The mean operation time was 18.77 ± 19.37 minutes, with a range from 0 to

50 minutes, reflecting some variability likely related to individual patient anatomy or intraoperative factors. Overall, these findings suggest that VATS can be performed efficiently and safely in this study. (Table 2)

Table 2. Operative Time and Post-operative Complications in Group A (VATS)

Variable	Group A / VATS
Post-operative Complication (n, %)	0 (0%)
Operation Time (min)	18.77 $\pm$ 19.37 (0–50)

Discussion

The main goals of management of PSP are to get fully inflated lung restoring full respiratory function and to prevent future recurrence. These goals can be achieved either by conservative treatment (observation or pleural drainage) or surgery by VATS. Many recent studies now consider VATS is a good option for management PSP with low complication and high effectiveness (MacDuff et al., 2010).

In our study, all patients were middle-aged males. These results are consistent with previous studies, as it is known that PSP is common among middle-aged males (Ayed et al., 2006).

In our study, we had statistically significance reduction in chest tube duration and length of hospital stay among patients managed by VATS as well as great advantage of

statistically significance reduction in recurrence rate.

Al-Mourgi and Alshehri, F, (2015) conducted prospective study including 41 cases with first attack PSP were randomly divided into two groups (conservative group, group 1) and (VATS group, group 2). This study concluded that patients can be managed initially by VATS effectively as it has a shorter length of hospital stay and lower recurrence rate than conservative management.

Chou et al., (2003) studied 51 patients managed by VATS for first attack PSP during a period between 1997 to 2002. Their conclusion was that VATS for the first attack PSP is safe, effective, and cosmetically excellent with great advantage of reduction recurrence rate of PSP.

Schramel et al., (1996) retrospectively compared cost-effectiveness in management first attack or recurrent PSP by conservative therapy versus VATS. This study included 112 cases that were managed conservatively between 1985 to 1989 and 97 cases were managed by VATS between 1991 to 1994. Their conclusion was that VATS is more effective in management patients with first attack or recurrent PSP, with lower morbidity and less costs compared to conservative management.

Herrmann et al., (2016) conducted retrospective study for 10-year period between May 2003 and April 2012, 185 cases with first attack PSP were managed with VATS including wedge resection and parietal pleurectomy. This study concluded that VATS

for first attack PSP is a most curative way for management because of less complication and lower recurrence rates in addition to long-term follow-up for postoperative pain and patient satisfaction after VATS show good results and high patient acceptance.

Olesen et al., (2016) conducted a prospective cohort study over a 5-year period included patients who were admitted with first attack PSP and managed conservatively with a chest tube. The study concluded that their patients who were managed conservatively by chest tube insertion only had high recurrence rate and they recommended to consider VATS for management patients with first attack PSP.

From all these studies and after these results, VATS for first attack PSP can be considered a safe method with excellent results in reducing the recurrence rate and reducing the cost of treatment due to the shortened length of hospital stay.

Limitations: This is single center prospective study which included 60 patients for 6 months follow up period. We need more multicenter prospective studies including large numbers of patients with longer follow up periods to confirm our results and strength our conclusion.

Conclusions

VATS is effective and safe method for management first attack spontaneous pneumothorax. Patients with first attack spontaneous pneumothorax were managed by VATS had significant reduction in recurrence rate and length of hospital stay. **Study**

References

- **Al-Mourgi M, Alshehri F. (2015).** Video-Assisted Thoracoscopic Surgery for the Treatment of First-Time Spontaneous Pneumothorax versus Conservative Treatment. *International journal of health sciences*, 9(4):428–432.
- **Ayed AK, Chandrasekaran C, Sukumar M. (2006).** Video-assisted thoracoscopic surgery for primary spontaneous pneumothorax: clinicopathological correlation. *European Journal of Cardiothoracic Surgery*, 29:221–5.
- **Chou S, Cheng Y, Kao L. (2003).** Is video-assisted thoracic surgery indicated in the first

episode primary spontaneous pneumothorax?. Interactive cardiovascular and thoracic surgery, 2(4): 552–554.

- **Hatz R, Kaps M, Meimarakis G, Loehe F, Müller C, Fürst H. (2000).** Long-term results after video-assisted thoracoscopic surgery for first-time and recurrent spontaneous pneumothorax. The Annals of thoracic surgery, 70(1): 253–257.
- **Herrmann D, Klapdor B, Ewig S, Hecker E. (2016).** Initial management of primary spontaneous pneumothorax with video-assisted thoracoscopic surgery: a 10-year experience. European journal of cardio-thoracic surgery, 49(3): 854–859.
- **Kepka S, Dalphin J, Parmentier A, Pretalli J, Gantelet M, Bernard N, et al. (2017).** Primary Spontaneous Pneumothorax Admitted in Emergency Unit: Does First Episode Differ from Recurrence? A Cross-Sectional Study. Canadian respiratory journal, 2017, 2729548.
- **MacDuff A, Arnold A, Harvey J. (2010).** BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. Thorax, 65: ii18-ii31.
- **Migliore M, Maria G, Criscione A, Rassl D. (2013).** Clinico-pathological findings in stage-I primary spontaneous pneumothorax: analysis of 19 cases and literature review. The journal European Surgery, 45:83–6.
- **Morimoto T, Fukui T, Koyama H, Noguchi Y, Shimbo T. (2002).** Optimal strategy for the first episode of primary spontaneous pneumothorax in young men. A decision analysis. Journal of general internal medicine, 17(3): 193–202.
- **Noppen M. (2010).** Spontaneous pneumothorax: epidemiology, pathophysiology and cause. European respiratory review: an official journal of the European Respiratory Society, 19(117): 217–219.
- **Olesen W, Lindahl J, Katballe N, Sindby J, Titlestad I, Andersen P, et al. (2016).** Recurrent Primary Spontaneous

Pneumothorax is Common Following Chest Tube and Conservative Treatment. World journal of surgery, 40(9), 2163–2170.

- **Schramel F, Sutedja T, Braber J, Mourik , Postmus P. (1996).** Cost-effectiveness of video-assisted thoracoscopic surgery versus conservative treatment for first time or recurrent spontaneous pneumothorax. The European respiratory journal, 9(9): 1821–1825.
- **Tschopp J, Rami R, Noppen M, Astoul P. (2006).** Management of spontaneous pneumothorax: state of the art. The European respiratory journal, 28(3): 637–650.