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Video-assisted thoracoscopic surgery for first-time primary spontaneous pneumothorax: Three years single center experience

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Abstract
The purpose of this study is to investigate if initial occurrences of primary spontaneous pneumothorax (PSP) should be included in the indication for video-assisted thoracoscopic surgery (VATS) for their treatment. The goal of this study was to compile our findings in order to determine whether VATS is appropriate at the beginning of a new PSP.
Methods: This retrospective comparison cohort study included 67 patients consecutive with newly diagnosed PSP. Patients were separated into two groups in this study according to the therapeutic intervention they underwent. While the second group (33 patients) underwent VATS, the first group (34 patients) underwent pleural drainage. The following variables were examined: (1) lengthy air leaks (>48 hours); (2) pleural drainage time; (3) length of hospital stay; and (4) recurrences.
Results: Both groups did not have any postoperative complications, with the exception of protracted air leaks, which occurred in eight (23.5%) of the first group's patients and one (3%) of the second group's patients. In comparison to 3.5 0.1 and 4.3 0.2 days in the second group, the mean SD time for drainage and hospitalization in the first group was 6.4 0.2 and 8.2 0.6 days, respectively. During follow-up (median 13.2 months), recurrences occurred in 15 patients (44.1%) in the first group, but just one (3.3%) in the second. In contrast, all metrics showed statistically significant differences between the two groups (P 0.05).
As evidenced by its safety, shorter hospital stay, and extremely low recurrence rate, the use of VATS for first-time PSP is justified.

Keywords: terms include thoracoscopy and pneumothorax

Introduction

Primary spontaneous pneumothorax (PSP) is a disease that frequently affects young, otherwise healthy individuals. There is debate among surgical schools all around the world about how to treat this benign pathology [1-4]. Using video-assisted thoracoscopic surgery (VATS) to treat spontaneous pneumothorax is a revolutionary surgical technique (SP). It is now being discussed more and more whether the indication for operational treatment of PSP should encompass first-time episodes without waiting for a relapse because it is a safe, dependable procedure that delivers outstanding results with a very low relapse rate [5]. According to certain authors who advocate this approach, a benign sickness like SP demands a sure and long-lasting cure [1, 2]. Other writers contend that a little therapeutic intervention (pleural drainage) is usually sufficient [6, 7].
By examining some metrics validated in two patient groups treated with pleural drainage and VATS, respectively, this study intends to represent our experience and contribute to the justification of utilizing VATS on first-time PSP patients.

Patients and methodes

This retrospective comparison cohort study, over the course of a 36-month period (September 2019 - August 2022), included 67 consecutive patients with first-time PSP. All patients were admitted to and received treatment at the Thoracic Surgery Unit, Department of Surgery, King Fahd Specialty Hospital, Buraydah, Saudi Arabia. This study was conducted at our hospital with ethical board permission and signed informed consent from the participants.

Two groups of patients were created. Pleural drainage was performed on the first group of patients (n = 34; mean age: 24.1 years; 32 males; 2 females); VATS was performed on the second group of patients (n = 33; mean age: 25.7 years; 32 males; 1 female). Between the two groups, there was no statistically significant age difference (P>0.05).
The second group of patients was chosen in accordance with the following criteria: if a recurrence was deemed unacceptable, such as in people who live in remote areas without access to adequate medical care, people who frequently fly, people who exercise while diving, and people who drive, if there was radiological evidence of lung bullae (CXR or CT chest), and based on patient preference after discussing the options with them.
We did not include in our research cases those who got VATS after initially receiving pleural drainage treatment for an air leak that persisted for longer than seven days. We were unable to include these instances in any group in the study since they were treated with two modalities and required a lengthy hospital stay.
Following roentgenographic confirmation of a pneumothorax in both groups, pleural drainage was carried out using a plastic chest tube of size 28F or 32F (depending on the physical makeup of the patients) in the fifth intercostal gap at the midaxillary line while under local anesthetic.
The second group of patients underwent surgery 24 to 48 hours after being admitted. The patients were put in the lateral decubitus position and underwent VATS while receiving general endotracheal anesthesia through a double-lumen endotracheal tube. In order to simulate an open operation, the patients were draped. Before preparing and

draping, the chest tube was taken out, and the first port was inserted into its opening. Other 2 incisions were made on the chest wall under visual supervision in a triangular pattern after the thoracic cavity was examined to allow the insertion of endoscopic trocars and endoscopic tools. We looked for a bleb or bulla that was actively leaking on the lung's surface. An Endo-GIA endostapling device stapler was placed through one trocar and shot across the base of the leak, bleb, or bulla after finding it. There were no symptoms of blood or air leakage after a careful inspection of the staple line. If aberrant zones could not be found, an apical wedge resection was performed. The pleura was then abraded and pleural adhesions were achieved using a pleurodesis procedure employing Marlex mesh through one of the wounds. After the procedure, to achieve continuous and complete re-expansion of the lung, a chest tube (28F) was placed through the inferior incision and connected to a negative pressure underwater seal suction suction of 20 cm H2O. Every other incisional wound was stitched up. A chest x-ray (CXR) film taken right away after the surgery demonstrated complete lung re-expansion. The chest tube was withdrawn 48–72 hours after the treatment, and patients were released if there were no postoperative air leaks and a CXR showed that the lung had fully recovered its original size.

In order to obtain a follow-up in our outpatient clinic, a clinical examination and CXR were used.

Statistical analysis

In order to compare the parameters of the two groups, we employed the student's t-test, which expresses descriptive statistics as mean S.D. A -value of less than 0.05 was used to indicate statistical significance. A statistical software program that is available commercially was used for all calculations (SPSS for Windows).

Results

In the second group, during surgery, blebs or bullae were found and subjected to stapler resection in 26 out of 33 operations (70.8%): in 21 cases, the parenchymal lesion was located at the upper lobes, in 3 cases, at the inferior lobes, and in 2 cases, bullous disease was found in two different sites of the lung and both were excised. The other patients (7 patients; 21.2%) had normal parenchyma in one case and a "micro-dystrophic" zone in six cases; these patients did not have air leakage following surgical repair. None of the VATS patients required conversion to an open thoracotomy. An average of 48.24.3 minutes were spent operating. Without using anaesthetic, an intervention typically lasted 25 minutes. In the intensive care unit, no patients required monitoring.

With the exception of air leaks, neither of the two groups experienced any issues right away after the procedure (placement of the pleural drainage and intervention by VATS), such as hemorrhage, pneumonia, incomplete re-expansion, empyema, or significant cutaneous or mediastinal emphysema.

When assessing the findings of this study, a number of variables that were present in both research groups were taken into consideration.

Because the analyzed parameters revealed some substantial differences between the two groups, each evaluated parameter is supplied separately: (more than 48 hours).

- Pleural drainage time; hospital stay time; and recurrences (follow-up).

1. Prolonged air leaks

Leaks were considered prolonged if they persisted for longer than 48 hours following surgical intervention; this complication was confirmed in eight patients in the first group (23.5%), who stopped within 4–7 days of tube insertion, and one patient in the second group (3%) who stopped on the fourth postoperative day. Statistics showed that the difference was significant (P0.05) (table1).

2. Pleural drainage period

For patients in the first group, pleural drainage took an average of 6.4 0.2 days, whereas it took 3.5 0.1 days for patients in the second group. Statistics showed that the difference was significant (P0.05) (table1).

3. Hospital stay duration

Patients in the first group stayed an average of 8.2 0.6 days, whereas those in the second group stayed an average of 4.3 0.2 days.

Statistics showed that the difference was significant (P0.05) (table1).

4. Recurrences

Recurrences happened in 15 of 34 patients in the first group (44.1%) between one week and five months following pleural drainage implantation over the follow-up period (median 13.2 months, ranged from 6 to 25 months). Every single one of these patients underwent VATS. About 15 days after VATS, one of the 33 patients (3%) in the second group experienced recurrence. This patient underwent pleural drainage and chemical pleurodesis for treatment. Statistics showed that the difference was significant (P0.001) (table1).

Discussion

Many young adults suffer from primary spontaneous pneumothorax (PSP), a medical disorder [1]. Consistent and quick lung reexpansion and long-term recurrence avoidance must be the two main objectives of PSP treatment. In addition to lowering patient discomfort and morbidity, meeting these goals will ultimately result in lower costs [7].

There isn't a totally standardized approach of treating PSP as of yet. Despite the advent of VATS, the majority of authors oppose its immediate application. In patients of first-time PSP, delaying treatments till recurrence and choosing classic pleural drainage [6]. Additionally, some surgeons think that this course of action is not the ideal one to take in order to cure this benign pathology, instead choosing to employ different surgical techniques like an axillary mini-thoracotomy [4].

Although simple aspiration and chest tube drainage are currently the most often used treatments for PSP, especially the first episode, these techniques have considerable disadvantages. According to prospective studies, re-expansion of the collapsed lung occurs in roughly 60% to 70% of patients after aspiration and in 75% to 95% of patients after chest tube drainage. However, 18% of patients who received chest tube drainage experienced persistent air leakage for more than 48 hours, necessitating surgical intervention. These treatments also had unacceptably high recurrence rates of 50% or greater, necessitating surgical intervention [5-10]. In our study, protracted air leaks occurred in 8 patients (23.5%) and recurrences in 15 patients (44.1%) in the first group of patients who received pleural drainage.

In addition, therapy for recurrence results in a net cost increase, not to mention the morbidity and discomfort the patient must experience during recurrence [7]. Recurrence rates are also significant.

With long-term recurrence rates ranging from 0% to 5%, thoracotomy with bullectomy and pleurectomy is regarded as the gold standard in recurrence prevention [11]. This method may, however, lead to severe postoperative morbidity due to the significant sequelae that are associated with it, including lingering discomfort, altered muscular function, deformity, and compromised respiratory function [12, 13].

Since the initial introduction of VATS Levi and colleagues' initial report was published in 1990. [14] on its use in surgical treatment of SP, numerous studies have reported on its efficacy, low morbidity, cost-effectiveness, and short- or long-term treatment results, making it possible to treat SP episodes successfully as well as adequately provide recurrence prevention [7, 15–20].

The use of this technology as a more aggressive strategy in the treatment of first-time PSP was examined in the current study, along with the treatment of PSP by VATS. Our findings demonstrated that the treatment is a quick, safe, and effective way to quickly expand a collapsed lung.

In addition to these factors, it is evident that VATS requires the administration of anesthesia and involves a surgical risk that the patient does not experience when choosing pleural drainage treatment. It should be noted, though, that the use of endoscopic instruments is at an advanced stage of development, and surgeons have decades of experience using this technique, which allows for a quick execution of the intervention and, as a result, a reduced use of anesthetic (an average of 30 minutes with low doses of drugs that wear off quickly). Combining each of these elements with the absence of intraoperative and postoperative problems substantially lowers risk [18].

No significant postoperative problems were seen in our patients after VATS. 3% of patients in the second group had postoperative air leakage that persisted. However, all investigations revealed that the main postoperative issue following VATS was a persistent postoperative air leak [7, 18].

The time spent in the hospital was much less in the VATS group than in the tube group, according to other research [8–25].

One instance out of 33 patients (3%) experienced recurrence over the study's median follow-up length of 13.2 months (range, 6 to 25 months), which began 15 days after VATS. The management of recurrent emphysematous alterations in the lung after VATS accounts for the low recurrence rate [7].

We identified pulmonary blebs or bullae in 78.8% of patients with first-time PSP on VATS. This finding is consistent with the findings of several other studies, which found that patients undergoing VATS for their first episodes had a high incidence (up to 80%) of blebs or bullae [5, 18–20].

In our investigation, a "micro-dystrophic" zone was seen in six of the remaining individuals (seven patients; 21.2%) and normal parenchyma was found in one patient.

Our research demonstrates that VATS treatment of first-time PSP strikes a reasonable balance between the three requirements of a brief hospital stay, a minimally invasive surgical approach, and definitive treatment when compared to the other groups.

Patients who have had VATS can also feel secure in the fact that the procedure is both final and conclusive and that they will soon be able to resume their regular social lives. One could contend that regardless of the procedure's cost-effectiveness, this final "psycho-social" incentive by itself could prove to be a convincing case in favor of treating first-degree relatives. VATS PSP [18]. With better clinical satisfaction and psychosocial outcomes, earlier return to normal daily life, lower ipsilateral recurrence rates, and shorter hospital stays than traditional chest tube drainage, VATS can be an efficient and alluring substitute [18–25].

In conclusion, the use of VATS for first-time PSP is a recognized and justified procedure, as shown by its safety, shorter hospital stay, and incredibly low recurrence rate, in light of the aforementioned.

Table 1: Evaluated parameters

Parameter	Pleural drainage (34 patients)	VATS (33patients)	P-Value
Prolonged air leaks	8 patients (23.5 %)	1 patient (3 %)	<0.05
Time of pleural drainage (main)	6.4 ± 0.2 days	3.5 ± 0.1 days	<0.05
Time of hospital stay (main)	8.2 ± 0.6 days	4.3 ± 0.2 days	<0.05
Recurrences	15 patients (44.1%)	1 patient (3 %)	<0.001

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