

Video-Assisted Thoracoscopic Surgery for the Treatment of First-Time Spontaneous Pneumothorax versus Conservative Treatment

Majed Al-Mourgi, FRCS, FCCP, FACS; Dr. Fahad Alshehri

Abstract

Background and aim of the work: Recent studies have shown that video-assisted thoracoscopy (VATS) is safe and beneficial as first time treatment for patients presenting with primary spontaneous pneumothorax (PSP). In this study we will compare the outcome of patients presenting with first time PSP treated by VATS with those treated conservatively.

Material and methods: This was a prospective double-blind, randomized clinical trial conducted at our hospital, Forty one patients, presented to the hospital with first attack PSP from January 2010 to January 2013, were randomized to be treated by chest tube drainage (conservative group, group 1) or by primary video-assisted thoracoscopy (VATS group, group 2). Outcomes were; duration of intercostal tube drainage, mean hospital stay, and recurrence rates of pneumothorax during the period of follow up.

Results: There was no significant difference in both groups regarding demographic data. The mean durations of removal of intercostal tube and hospital stay were significantly higher in conservative group than in VATS group. The recurrence rate in conservative group was 40.9% versus 0% in VATS group (highly significant).

Conclusions: Initial VATS is considered an efficient treatment modality for PSP as it has a shorter hospital stay and lower recurrence than conservative treatment, which if occurs, requires re-hospitalization with needs for VATS or surgery.

Keywords: Primary spontaneous pneumothorax – VATS – Conservative treatment

Corresponding author:

Dr Majed Al Mourgi

Department of Surgery,
College of Medicine and Medical Sciences,
Taif University, PO Box 888, Taif 21947,
Kingdom of Saudi Arabia
Telephone: 00966559956781
Email: mourgi@hotmail.com

Introduction

A primary spontaneous pneumothorax (PSP) occurs in persons with apparently normal lung; however, it was found that in most of cases it is due to rupture of a subpleural bleb(s) with unrecognized lung disease. ⁽¹⁻³⁾PSP is more common in men than in women. ⁽²⁻⁵⁾ The recurrence is more common to occur in the first year specially in females and tall thin males with higher incidence in smokers than in non smokers. ^(3,4,7) Initial management of PSP includes observation with oxygen supplementation if the chest x-rays or CT scan show that the pneumothorax rim is less than 3 cm between the chest wall and the lung; however, if the rim of air is more than 3 cm, needle aspiration of air from the pleural cavity is tried first and its failure indicates insertion of chest tube. ⁽⁸⁻¹⁰⁾ Open thoracotomy or the more preferred, VATS are indicated by most of the investigators if there is a persistent air leak for more than 7 days or if the lung fails to re-expand or both after insertion of chest tube, in addition, other indications of surgical interference include; synchronous bilateral pneumothorax, hemopneumothorax, tension pneumothorax, and recurrence. ⁽¹⁰⁻¹⁸⁾ Recent studies verified that VATS is effective as primary treatment of PSP, though it has increased cost, but this is toned down by the decreased hospital stay, low complications, and significant reduction in recurrence rate. ⁽¹⁹⁻²³⁾ In this study we will compare the outcomes of patients with PSP treated by primary VATS with those treated conservatively.

Material and methods

This was a prospective double-blind, randomized clinical trial conducted at our hospital after approval of the ethical board and taking written informed consents from the enrolled patients. Forty one patients with first time PSP, presented to the hospital with PSP from January 2010 to January 2013, were randomized to be treated by chest tube drainage (conservative group, group 1) or by primary video-assisted thoracoscopy (VATS group, group 2). **In VATS group surgery is done in the first 24 hours after initial preparation of the patient.** The VATS procedure involved identification and resection of the apical blebs using GIA

endostapler, apical pleurectomy was also done extending from the 4th rib level up to the apex of the pleural cavity anteriorly, laterally, and posteriorly. Chest tube was inserted at the camera port and connected to continuous suction. Patients with persistent air leak for more than 7 days or if the lung fails to re-expand after insertion of chest tube, synchronous bilateral pneumothorax, hemopneumothorax, tension pneumothorax, and those with recurrence were excluded from the study.

Outcomes were duration of intercostal tube drainage, mean hospital stay, and recurrence rates of pneumothorax during the period of follow up. **Follow up is done at outpatient clinic every 3 month; however, the patient was informed that on recurrence of symptoms he must attend the hospital for full examination and investigations.** Statistical analysis was done using SPSS program version 18.0. Qualitative data were expressed as number, percentage and mean \pm standard deviation. Mc Nemar test was used to compare paired categorical data. The degree of significance was taken at P value which is considered significant if < 0.05 and non significant if higher.

Results

Table 1 shows that, there was no significant difference between both groups in their demographic findings. All patients presented by chest pain and shortness in breath and diagnosis was confirmed by plain radiography and chest CT scan. Ten / 22 patients (45.5%) of group one were smokers vs. 9 / 19 patients (47.7%) in group 2. VATS stapled blebectomy with apical pleurectomy was done in all patients of group 2. Multiple blebs were detected during operation in 9/19 patients (47.4%). No conversion to open thoracotomy was required. Table 2 shows the postoperative findings; the time to remove the intercostal was significantly shorter in VATS group than in conservative group, the mean hospital stay in the conservative group was significantly longer in conservative group than in the VATS group. No mortality was recorded in both groups. The mean follow up was 32.4 ± 7.9 months (range, 24-60 months).

A highly significant recurrence was recorded in conservative group, vs. no recurrence in VATS group (Table 2).

Recurrence involved two females (100% of the females in this group) and in 8 males

(36.4% of the males in group 1), seven of the recurrent cases were smokers (77.8%).

Table 1. Demographic data in both groups

	Group 1 (Conservative)	Group 2 (VATS)	P value	Significance
Total number	22	19	0.057	NS
Males (%)	20 (90.9%)	18 (94.7%)	0.053	NS
Females (%)	2 (9.1%)	1 (5.3%)	0.051	NS
Mean age (years)	22.6±4.8 years	23.8±5.3 years	0.065	NS
Mean BMI	18.9 ± 4.2 kg/m ²	19 ± 4.4 kg/m ²	0.078	NS

NS; Non Significant

Table 2. Postoperative findings

Removal of chest tube (Mean)	Group 1 (Conservative)	Group 2 (VATS)	P value	Significance
Mean hospital stay	6.6 ± 1.6 days	3.9±0.9 days	0.044	S
Recurrence	40.9%	0%	0.001	HS

S; Significant, HS; Highly Significant

Discussion

The incidence of PSP ranges between 7-18 per 100,000 population per year in males and from 1-6 per 100,000 population per year in females. (2-5) The actual incidence in KSA is not known and a national based study is required. The disease is more common in men than in women, (1-3) which is accordance with the findings in this study.

The disease tends to occur in thin and tall males below 30 years and rarely to occur above forty. (3,4) In the present study the mean age of patients was less than 30 years and the mean BMI was 19.1 which was in agreement with other studies.

Smoking increases the risk of PSP about 7 times (in light smokers) to 100 times in heavy smokers. (5, 6) Cheng et al. (6) found in their study a higher recurrence rate of PSP occurred in smokers. In the present study over 40% of the enrolled patients and 77.8% of the recurrent cases were smokers.

In agreement with other studies, (7-9) all patients of the present series presented with

sudden onset of chest pain with shortness in breath. Noppen and de Keukeleire, (10) recorded that in the majority of cases pain usually resolves within one day even though pneumothorax still exists with signs indicating free air in the pleural space, a finding which was not recorded in our study.

Diagnosis of primary spontaneous pneumothorax is confirmed in most of the cases by chest x-rays, where the rim of air between the chest wall and the lung can be determined and used to assess accurately the pneumothorax size. (8-10) If the patient has a small pneumothorax chest CT can be used to confirm diagnosis along with detection of amount of air in pleural cavity, any blebs, or fluid collection. (11) In this study diagnosis was confirmed by chest x-rays and CT and in the conservative group, cases which proved to have rim of air less than 3 cms were treated by bed rest, oxygen supplementation, and aspiration, however, failure of aspiration or larger pneumothoraces indicated insertion of

chest tube. Shields et al. ⁽¹²⁾ verified that oxygen inhalation accelerates pleural air reabsorption. Chambers and Scarci, ⁽¹³⁾ Wakai et al, ⁽¹⁴⁾ Zehtabchi and Rios, ⁽¹⁵⁾ found no significant difference in outcome between chest tube drainage and simple aspiration regarding the success or failure rates.

Most of the investigators reported that recurrence in non-surgically treated patients is more common to occur in the first year especially in females and tall thin males with higher incidence in smokers than non smokers. ^(3, 4, 7) The recurrent cases in our study involved; the 2 females in this group, males with mean BMI < 18.5 kg/m², and 77.8% of them failed to stop smoking after the first attack.

In the present study no recurrence was detected in the VATS group, while a highly significant recurrence (40.9%) was recorded in the conservative group, which was in accordance with other studies, where, the risk of recurrence was estimated to be 20%–50% in conservatively treated patients (aspiration or chest tube drainage). ^(4, 9, 13)

Many authors verified that, video-assisted thoracoscopy (VATS) can be effectively used in the treatment of PSP, where pleurodesis is created by a partial parietal pleurectomy; and the bullae can be resected by endostapler. ^(5, 16-18)

In the video assisted thoracoscopy group of the present series, resections of the apical blebs, with apical pleurectomy were done.

The mean time to remove the intercostal tube as well as the mean hospital stay were significantly lower than that in conservative group. Chen et al. ⁽¹⁹⁾ found in their study that VATS, although more expensive than chest tube drainage but superior to it as a salvage technique with lower complication rates, shorter hospital stay and significantly less recurrence.

Chou et al. ⁽²⁰⁾, Sawada et al., ⁽²¹⁾ and Margolis et al. ⁽²²⁾ found that about 90% of their patients treated by video assisted thoracoscopy had blebs concluding that, this was a likely cause of recurrence if treated conservatively. In our study, multiple blebs were detected during operation in 47.4% of cases which was much lower than that in the previous studies, probably, due to limited number of cases in our series.

To conclude: Initial VATS is considered an efficient treatment modality for PSP as it has a shorter hospital stay and lower recurrence than conservative treatment, which if occurs, requires re-hospitalization with needs for VATS or surgery.

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