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Thoracoscopic Apical Pleurectomy for Persisting or Recurring Pneumothorax

Regardless of its origin, the treatment of persisting or recurring spontaneous pneumothorax (SP) is classically surgical. To assess the contribution of thoracoscopy in the management of SP 100 consecutive patients with persistent or recurrent pneumothorax were treated at our unit by endoscopic procedure between 1992 and 1997 to obtain permanent pleurodesis and to treat the lung lesion responsible for the leak. There were 90 men and 10 women ranging in age from 16 to 60 years (mean age 28±12 years). The technique includes electrocoagulation of pleural blebs and thoracoscopic apical pleurectomy. All patients were subjected to physical examination and plain x-ray at 1 and 3 months and 1 year postoperatively. After completion of the procedure, air leaks disappeared in 90 cases, while 5 cases air leak ceased 5 to 7 days postoperatively. The remaining 5 cases were converted to an open procedure. The mean length of follow-up was 3 years. No patient required transfusion and there were no operative deaths. No recurrence of pneumothorax occurred and no major complications encountered. Video-assisted thoracoscopic pleurectomy for the treatment of pneumothorax is concluded to be that safe and efficacious. It shortens the hospital stay, requires less amount of postoperative narcotic analgesia.

Key Words : *Thoracoscopy; Pneumothorax; Pleurodesis; Pleurectomy*

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* Video-assisted thoracoscopy for spontaneous pneumothorax

INTRODUCTION

Spontaneous pneumothorax (SP) commonly occurs in young, tall, thin young adults without apparent underlying lung disease and in elderly patients with chronic lung disease (1). Primary spontaneous pneumothorax is a relatively uncommon disease with an estimated incidence of 5 to 10 per 100,000. A male-to-female ratio of 6:1 and peak prevalence in the 16-to 24-year-old age group (2). Recurrent spontaneous pneumothorax occurs in 4.3: 100,000 patients per year with a male to female ratio of 5:1 (3). In patients with pneumothorax, goals of the ideal treatment are to restore pulmonary function as soon as possible and to try to minimize the chance of recurrence pneumothorax and avoidance of the tension type (6). The aim of this retrospective study was to evaluate the efficacy and complications of thoracoscopy as a new therapeutic modality for persisting or recurring spontaneous pneumothorax.

PATIENTS AND METHODS

From January 1992 to January 1997, a total of 100 consecutive patients with persistent or recurrent pneumothorax have been treated at the surgical thoracic section, Department of General Surgery, Jordan University Hospital by thoracoscopy. No patient was operated on for first-time uncomplicated pneumothorax. Ninety patients were males, and 10 were females. There were 55 right sided pneumothoraces, 44 on the left and 1 bilaterally (Table 1). There were 92 smokers (92%), 2 ex-smokers and the remaining 6 were non-smokers. The mean age was 28±12 years. The presenting symptoms and signs included dyspnea, chest pain, cough, hemoptysis, cyanosis and fever. Previous treatment was chest drainage in 90, and bed rest in 10. Twelve patients with recurrent ipsilateral spontaneous pneumothorax (SP) had also had a previous contralateral SP. Ten (10%) patients had known associated lung diseases. Six patients were known to have COPD. Pneumothorax was slightly more common on the right side (56%) than the left, as it is in the reported literature. Fifty patients were examined preoperatively by computed tomographic scanning. Regardless of the size of the pneumothorax, clinical symptoms, the recurrence rate, the presence of continued air leak and evidence of tension type; all patients in this study underwent thoracoscopy for the treatment of their pneumothorax.

Table 1. Summary of all cases of spontaneous pneumothorax

Characteristics	VATS	Thoracotomy
No. of patients	95	05
Male-to-female ratio	87:9	04:1
Age (years)	28 (15-60)	45 (25-60)
Operating time (min)	40 (30-90)	42 (35-85)
12-hour postop pethedine use (mg)	180 (120-240)	240 (180-300)
72-hour decrease in FEV1 (%)	27 (5-40)	40 (20-60)
Chest drainage (days)	5±2	5 (4-10)
Post-op stay (days)	5 (4-7)	5 (4-11)
Follow-up (years)	3 (0.5-6)	3 (0.5-6)
Recurrent pneumothorax	0	0
Operative death	0	0

VATS: Video-assisted thoracoscopic surgery

Thoracoscopy was done under general anesthesia with the patient in a lateral decubitus position. To allow the lung to fall down, the operation table was placed in anti-Trendelenburg position. A double lumen tube was inserted to allow deflation of one lung. The thoracoscope was introduced through a 1-cm incision in the anterior axillary line of the fifth intercostal space with two additional ports located at the axilla, third intercostal space and the second in the midclavicular line, fifth intercostal space respectively. The latter entry sites are used for the introduction of grasping and electrocoagulation instruments. After inspection of the whole thoracic cavity with the Valsalva maneuver including the apices of the upper lobes, apical pleural adhesions, if present, were cut with endoscopic scissors. A biopsy was taken from the pleura and the lung as indicated. Then, the blebs which are generally located at the apices of the upper lobes are electrocoagulated. If apical blebs could not be visualized, electrocoagulation of the whole apices was routinely done. The apical pleural strip begins by marking the posterior, anterior and inferior limits of the dissection with scissors. The grasping forceps is used to lift and steady the pleura while it is bluntly stripped off the inner chest wall with a pledget introduced through the 11-mm cannula within a reducing tube. The upper two-thirds of the pleura can be rapidly dissected in this way. The lower pleura is destroyed by contact with a monopolar diathermy probe. The visceral pleura is scratched from the apex to the diaphragm. At the conclusion of the video-assisted thoracoscopic pleurectomy, two chest tubes were inserted through the entry sites. After full expansion of the lung and absence of air leakage for 24 hours, the chest tubes were removed. All patients were subjected to physical examination and plain chest x-ray at 1 and 3 months and 1 year postoperatively. After that, the follow-up was done on clinical basis.

RESULTS

The endoscopic pleura was either inflammatory and/or edematous (30%) or showed adhesions (40%), blebs (20 %) or bullae (10%). The thoracoscopy was converted to an open thoracotomy in 5 patients. The bilateral pneumothorax was treated in one session. Five patients had previously undergone transaxillary thoracotomy for a contralateral spontaneous pneumothorax. The pneumothorax was primary in 80 patients. The causes of secondary spontaneous in the remaining 20 patients included emphysema (n=17), tuberculosis (n=2) and 1 case of Marfan syndrome. Seventy-five patients were operated on after a second episode of pneumothorax and 25 patients were operated after three or more episodes. No patient required transfusion and there were no operative deaths. The mean duration of chest drainage in this series was 5 (±2) days. The mean length of hospital stay was 5 (4-7) days. On 10 patients, painful sensation was noted at the VATS entry site.

The mean length of follow-up was 3 (6 months to 6 years) years. In spite of our learning curve, operative mortality was nil, no recurrence of pneumothorax occurred and no complications encountered. Persistent air leak for more than 5 days was observed in 5 patients, one of whom required a successful poudrage of tetracycline but no patient required re-operation.

DISCUSSION

Pneumothrax is a surgical emergency that requires prompt and appropriate therapy. Patients with pneumothorax are exposed to the following serious complications: tension pneumothorax, associated hemothorax and respiratory failure. Therapeutic goals for the pneumothorax are the following: rapid restoration of lung expansion by promoting adequate pleural symphysis, avoidance of pneumothorax recurrence, decreased post operative pain, short hospital stay and early return to normal activity.

In 1910, Jacobaeus performed the first thoracoscopy when he used a cystoscope to examine the pleural cavity in a patient with pleuritis (6). Following the advances made by the general surgeons performing laparoscopic cholecystectomy and moving those techniques above the diaphragm, video-assisted thoracoscopic surgery (VATS) has recently been applied to a wide variety of intrathoracic disorders and found its best application in the treatment of pneumothorax. The rate of recurrence of spontaneous pneumothorax differs in published reports, varying from 40% to 50% after the first episode and about 80% after the third episode (7). The rate of recur-

rence of spontaneous pneumothorax is also greater in secondary than in idiopathic pneumothorax, but figures vary (from 20% to 50%) in reported series depending on the selection of patients (8). Twenty two per cent of patients with first episode of pneumothorax had bullae or adhesions and the thoracoscopic appearance was almost the same between cases of first and recurrent pneumothorax (9). Consequently, operative thoracoscopy for the first time of pneumothorax is therefore not justified (10).

Regardless of its type, the aim of the operative technique is to identify the source of air leakage and deal with it appropriately. In about 85% of cases of recurrent pneumothorax, the blebs are located at the apex of the upper lobe (11).

Our findings of a single bullous lesion in the upper lobe in 80% of cases are similar to that reported by Ferguson et al. (12) who found apical bullous disease in 89% of the surgical patients. Other authors, have also reported 52-72% apical bullous disease (13). In our series, only 5% (5 patients) had diffuse bullous disease of the lung, which is less than the 12% reported by Askew (14). As many authors do, routine electrocoagulation of the apex of the upper and lower lobes was carried routinely whether blebs has been identified or not at these sites (15). However, we believe that electrocoagulation alone is not an appropriate way to deal with blebs due to its associated highly unacceptable rate of recurrence. This is why it should be routinely combined with apical pleurectomy and rubbing of the visceral pleura.

Although surgical pleurodesis does not seem to protect the patient from a relapse of pneumothorax, its combination with electrocoagulation and rubbing of the visceral pleura can achieve excellent and lasting results. On the other hand, we strongly believe that the presence of diffuse bullous disease is best managed by open technique which was done in 5 patients of the present report.

Several forms of pleurodesis were described in literature. Comparison between these methods is difficult because the groups of patients were small, and criteria for selection were different. The ideal technique for establishing pleural symphysis has not been found yet. Pleurodesis with talc is no longer used in our institution due to its reputed and excessive reactional granulomatosis and fear of over asbestos contamination. Long-term results with tetracycline pleurodesis have been reported in spontaneous pneumothorax and showed that this method was an effective technique to induce a chemical pleurodesis in whose pulmonary function impairment precludes definitive surgical treatment (16). However, with chemical pleurodesis, the underlying anatomic cause remains untreated and further treatment for recurrent pneumothorax may be hindered by the presence of patchy but dense adhesions.

Our conversion rate to an open procedure of 5% is comparable to other series that have been reported (17). The high conversion rate to an open procedure is necessary to keep morbidity low; this approach should be implemented for the safety of the patient and should not be viewed as a failure. Consequently, the decision to use VATS before thoracotomy must be individualized. In this regard the preoperative chest computed tomography is a reliable test for the detection of early emphysematous changes, blebs and bullae but such an expensive test cannot be recommended for routine use (18).

The success rate in the present study of combined apical pleurectomy, and electro-coagulation of apical blebs was 95%. Our results have confirmed those achieved by Liu et al. who treated 82 patients with a mean follow-up of 22 months after surgery without any recurrence (19). Recurrence following standard surgical approaches to pneumothorax have resulted in long term recurrence of less than 5% (20) and reoperation was also required in less than 1% of patients (21). Causes of recurrence following VATS are mainly due to failure of identification of pulmonary blebs or some blebs have not been dealt with.

With regard to the frequency of persistent post operative air leaks, it appears to be similar following VATS and open techniques. Prolonged air leak is always behind

Table 2. Results of thoracoscopic surgical treatment of pneumothorax

Reference	Year	No. of patients	Morbidity (%)	Mortality (%)	Recurrence (%)	Follow-up months
Linder et al. (8)	1993	94	8.5	8.5	1.1	NS
Hazelrigg et al. (17)	1993	26	0	0	0	8
Waller et al. (20)	1994	30	NS	6.7	6.7	NS
Liu et al. (19)	1995	82	7.3	0	0	22
Naunhein et al. (15)	1995	113	8	NS	4.1	13.1 (1-34)
Yim and Ho (11)	1995	100	8	NS	3	17 (8-14)
Cole et al. (21)	1995	30	7	NS	17	NS
Al-Qudah	1998	95	0	0	0	36 (6-72)

NS: Not stated

the lengthy hospital stay and makes VATS equal to open methods in term of duration of hospitalization. The median discharge time for patients with VATS was 5 days in 84% of cases while it was about 4 days after an axillary thoracotomy (22, 23). However, open pleurectomy was criticized by many authors because postoperative bleeding might occur and it made subsequent thoracotomy exceedingly difficult (24). On the other hand, recurrence rate following intrapleural instillation of tetracycline and without resection of bullae, is about 3%. We believe that recurrence should occur but its percentage should be minimized. The absence of recurrence in this series was due to the summation of the following advantages: apical pleurectomy and coagulation of blebs as if they were done in open thoracotomy, absence of pleural blebs exceeding 2 cm in diameter, and meticulous hemostasis because it was the beginning of a new method of treatment.

Needless to say that VATS has markedly changed the management of recurrent and persistent pneumothorax. VATS constitutes the therapeutic modality of choice for the treatment of pneumothorax when the surgical decision is made and thoracotomy is no longer the routine approach for the surgical treatment of bullae, partial pleurectomy, or various methods of pleurodesis.

We conclude that the immediate and long-term results show thoracoscopic apical pleurectomy to be a safe and effective method for treatment of patients with persistent or recurrent pneumothorax. The results of VATS have been shown to produce short and long term results comparable to those obtained following open thoracotomy with shorter hospital stay, and lower morbidity. Furthermore, it seems that the VATS is a valid alternative to open thoracotomy for the management of primary spontaneous pneumothorax but it should be used cautiously for the management of secondary spontaneous pneumothorax and conversion of VATS to an open procedure should not be viewed as a failure but as a safety precaution (25, 26).

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