Original Study

Complete Thoracoscopic Lobectomy: A new era at the "G. Papanikolaou" Hospital

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SUMMARY. **Twenty years after the first announcement of its application, thoracoscopic lobectomy has become the gold standard for the treatment of early stage lung cancer in many large medical centres in other countries. This method appears to offer faster recovery and a lower rate of complications than the conventional open technique, but many thoracic surgeons, including those in the Greek national health care system, continue to argue against the effectiveness of the method in the management of primary lung cancer. Material and Methods Between March 2009 and October 2012, 17 patients with peripheral lung tumours and unrevealing bronchoscopy underwent fully thoracoscopic lobectomy. All the operations were performed under general anaesthesia, with one-lung ventilation and without the use of a rib spreader, through the creation of 3-4 ports in the ipsilateral hemithorax. Lymph node dissection or sampling was carried out in all patients, after completion of the lobectomy. Results Specifically 4 right upper, 1 middle, 2 lower right, 6 left upper and 4 left lower thoracoscopic lobectomies were performed. The mean duration of operation was 3 hours and the mean duration of hospital stay was 4 days. Conclusion Thoracoscopic lobectomy is a safe, and minimally traumatic procedure that offers faster recovery compared with the open method. The oncological results are comparable to those of the open thoracotomy technique, provided that the intraoperative principles of radical resection and lymphadenectomy are maintained.** ***Pneumon 2013, 26(2):157-161.***

INTRODUCTION

Thoracoscopic surgery has become the gold standard for the treatment of pneumothorax, for obtaining biopsies from the thoracic cavity and for performing wedge resections of peripheral lung tumours. Over the last 20 years an increasing number of thoracic surgeons have been using this technique for performing anatomical lobectomy in the early stage of lung cancer. The documented patient survival after thoracoscopic lobectomy is comparable to that of open thoracotomy. The thoracoscopic approach

appears to be superior to open surgery in terms of immediate postoperative factors and to provide equivalent oncological results. For these reasons, thoracoscopic lobectomy may be characterized as an evolution in thoracic surgery, in spite of which it has not been accepted by many centres, either abroad or in this country, even by surgeons who frequently use thoracoscopy for carrying out minor operations.

MATERIAL AND METHODS

Patients

In the Department of Cardiothoracic Surgery of the ''G. Papanikolaou'' General Hospital of Thessaloniki, between March 2009 and October 2012 17 patients with single peripheral lung tumours of ≤4 cm in diameter and unrevealing bronchoscopy were treated by thoracoscopic lobectomy. Of these patients, 11 were male and 6 were female, with a mean age of 57 years (range 46 to 77 years). The diagnosis of lung cancer had already been made in 6 patients after computed tomography (CT) guided biopsy, while 4 patients showed pathological uptake of the radiochemical in the lesion on positron emission tomography (PET)/CT scan. Table 1 shows the demographical and clinical characteristics of the patients. All patients were fully informed about the intention for endoscopic removal of the diseased lung lobe and the likelihood of conversion to open thoracotomy in the case of technical difficulties, and all provided written consent to the surgery.

Technique

In all the patients the lung cancer was assessed as clinical stage I after undergoing the standard preoperative staging for lung cancer, which consists of CT of the chest, brain and abdomen and bone scintigraphy. Bronchoscopy was also performed in all patients for exclusion of any endobronchial lesion. The surgery was performed under general anaesthesia, with selective ventilation of the contralateral lung and the patient in the lateral decubitus position. A 1.5 cm incision was initially performed in midaxillary line of the 8th intercostal space, and a 30° thoracoscope was introduced through a 10-mm trocar. After inspection of the thoracic cavity for the presence of adhesions, a second 2 cm incision was created in the 6th intercostal space of the midclavicular line. A 30 cm long Duval clamp was introduced from this portal, in order to move the lung backwards for better exposure of the pulmonary hilum[1]. Finally, a small main incision was performed opposite to the upper pulmonary vein for upper lobectomy, while for the lower resections, the incision was performed one intercostal space lower. This incision served as the working channel, starting from the anterior border of the latissimus dorsi muscle and extending anterior for a distance of 4 cm. In some cases, an additional 1.5 cm incision was performed on the acoustic triangle for moving the lung around during the lobectomy, or for passing the endoscopic stapler. All thoracoscopic lobectomies were performed by isolated dissection and excision of the vessels and bronchus of the defective lobe using endoscopic staplers (Figure 1). After completion of the lobectomy, the lobe was placed in a special endoscopic tissue collection bag and removed from the hemithorax through the working channel. The operation was completed with lymph node dissection or sampling. The remaining portion of the lung was re-expanded under thoracoscopic supervision, while the air-tightness of the bronchial stump was checked by immersion in saline infusion. One or two chest tubes were placed to drain the hemithorax and the chest incisions were closed in layers. Drains were removed if the chest X ray confirmed satisfactory lung expansion, and the 24 hour chest tube drainage was less than 200 ml, with no air leak (Figure 2).

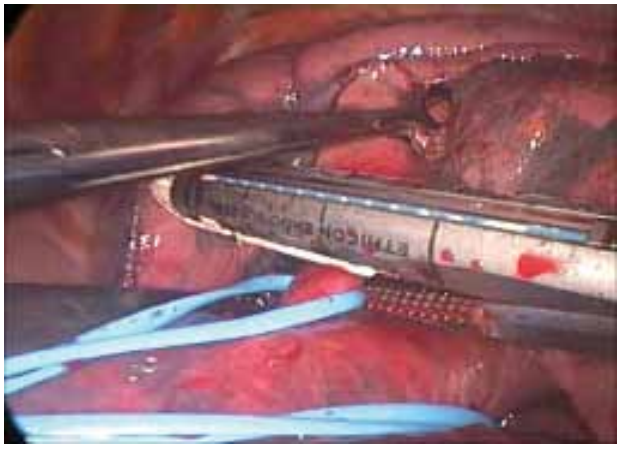

FIGURE 1. Thoracoscopic lobectomy: Thoracoscopic stapling of the pulmonary arterial vessels of the right lower pulmonary lobe.

RESULTS

In this series, 17 patients underwent thoracoscopic lobectomy: right upper lobectomy in 4, middle lobectomy

FIGURE 2. Thoracoscopic lobectomy: Postoperative incision scars in a patient who underwent thoracoscopic right upper lobectomy.

in 1, right lower lobectomy in 2, left upper lobectomy in 6, and left lower lobectomy in 4, as reported in table 1. On 11 of these patients diagnostic thoracoscopic wedge resection and frozen biopsy of the tumour was performed during the operation and before the lobectomy, for verification of the diagnosis of cancer. The duration of operation from the first incision to the skin closure ranged from 2½ to 4 hours, with an average of 3 hours. No intraoperative complications that led to open thoracotomy presented in any of these cases. In 7 of the cases, a single chest tube (No 32F) placement proved to offer adequate drainage, but in all other patients two chest drains were placed. Three patients needed further respiratory support after completion of surgery, with intubation in the intensive care unit for a period of from 2 to 7 hours. The drains were removed on the 3rd to the 6th postoperative day (4.8 days on average), and all patients were discharged on the day of their chest tube removal.

TABLE 1. Characteristics of patients undergoing complete thoracoscopic lobectomy for an isolated lung tumour

PREOPERATIVE	
Number of patients	17
Age in years, mean	57
Age range	(46-77)
Male/female	11:6
Histopathological diagnosis	
Squamous cell cancer	9
Adenocarcinoma	7
Metastatic cancer (gastrointestinal tract)	1
Staging of NSCLC	
Stage I (patients No.)	15
Stage IIA	1
Anatomical distribution	
Right upper lobectomy	4
Right middle lobectomy	1
Right lower lobectomy	2
Left upper lobectomy	6
Left lower lobectomy	4
POSTOPERATIVE	
Days in ICU	1
Hours of mechanical ventilation, range	2-7
Mean postoperative of stay	4.8 days
Postoperative complications	
Operative mortality	0
30-day mortality	0
Atrial fibrillation	3
Air leak > 5 days	0
Respiratory insufficiency	0
Postoperative bleeding	0

NSCLC = non-small cell lung cancer

DISCUSSION

The first cases of successful thoracoscopic anatomical lobectomy were reported in 1993 by Kirby and Rice, and by Walker and colleagues[2,3]. Almost 20 years later, many published series have demonstrated thoracoscopic lobectomy to be an acceptable, safe and effective method for the treatment of early-stage of non-small cell lung cancer (NSCLC)[4-12]. Although the survival curves after this procedure are extremely encouraging, they cannot conclusively verify its superiority comparison with the conventional open technique for the treatment of stage I of lung cancer, despite the data being undoubtedly the best obtained after those of conventional surgery[13-16]. The advantages of the method over the open surgery technique derive principally from the smaller size of the

chest wall trauma, the reduced postoperative pain and therefore the maximum preservation of lung function, the faster chest tube removal and the shorter duration of hospitalization[17-22]. In addition, this method has enabled surgical treatment in specific groups of high-risk patients, such as the elderly and those with poor fitness and respiratory reserve[23,24].

Despite the encouraging messages from the proponents of the method, many thoracic surgeons are still reluctant to use it, because of the intraoperative safety offered by the conventional open method. Another significant point of controversy is the comparative oncological efficacy of the two methods. There are now reports of several studies demonstrating that radical excision can be obtained with thoracoscopy with the precision of that of open thoracotomy, provided that the internationally recognized oncological standards are maintained[25]. It is of note that in the 1990s, in the United States, where the largest series were reported and where the method is widely accepted, only 5% of lobectomies were performed thoracoscopically, while the corresponding figure for the United Kingdom was only 2.3%, with more than 45% of these performed by a single surgeon[4,26]. This indicates that despite the apparent acceptance of this procedure for selected patients, it was performed in only a few centres around the world. In contrast, in 2008 the percentage of thoracoscopic lobectomy in the United States, according to the database of the American Thoracic Society (ATS) reached 16%[27]. In Greece, 20 years after the first description of thoracoscopic lobectomy, there has still been no report of the procedure or of a series of patients that have undergone lobectomy via the endoscopic approach.

Thoracoscopic lung resection is undoubtedly more technically demanding than the same operation performed under direct vision through open thoracotomy. It should be clarified that the term "totally thoracoscopic lobectomy" refers to the surgical technique of lobe resection where visual contact with the surgical field depends entirely on the display of the monitor of the thoracoscopic tower, and with no use of rib spreaders[28-30]. Any other hybrid operation, which may include use of smaller rib spreaders, or direct vision of the surgical field in conjunction with thoracoscopy, may be referred to as "video-assisted thoracotomy" (VAT)[31]. The whole operation should be based on the maintainance of basic oncological principles, which comprise the individual ligation of pulmonary vessels of the dependent lobe, clear anatomical resection limits, complete lymph node dissection of the hilum and appropriate management of the mediastinal lymph nodes[32]. Any surgical difficulty which may lead to compromise of oncological principles should lead to conversion of the endoscopic procedure to open thoracotomy. The series presented here included only patients who underwent fully thoracoscopic lobectomy. It should be emphasized that in order to simulate the operation as closely as possible to that of the open thoracotomy, the conventional surgical instruments used in the open lobectomy method were used in the first operations. Later in the process, similar and longer (30 cm approximately) surgical instruments were acquired[33]. This greatly alleviated any concerns about "risky" dissection of anatomical elements, because of the familiarity with the instruments which rendered dissection of the vessels more secure. Creating a channel of 4-6 cm opposite the pulmonary hilum allows entry of the conventional tools as in the open thoracotomy, facilitating the dissection of the interlobular pulmonary vessels, in a more secure manner. The most dangerous complication of the endoscopic technique is uncontrollable intraoperative bleeding and according to the published reports, the rate of this does not exceed 1%[34]. The unintentional injury of a lobar vessel or lung parenchyma that can sometimes occur is difficult to control or repair through the working channel and is an indication for conversion to open thoracotomy. In the present series, in order to avoid any catastrophic situation, forceps loaded with a gauze swab were always available for retention of bleeding by compressing the vessel until conversion of the working channel to an open thoracotomy could be accomplished.

The experience of the authors with this small series of thoracoscopic lobectomy taught us that learning requires dedication but that the technique can be applied safely when carefully designed and implemented without oncological compromise. The early results of this experience confirm the benefits already documented in many reports and large case series and support the belief that thoracoscopic lobectomy is a safe alternative for early stage lung cancer, with many advantages over open thoracotomy. This technique results in reduced perioperative morbidity and faster recovery, which are significant benefits for patients and also for the healthcare system.

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