Video-Assisted Thoracoscopic Pleurectomy in the Management of Malignant Pleural Effusion*

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Study objective: **To evaluate the outcome of pleurectomy using video-assisted thoracic surgery (VATS) for pleurodesis in patients with malignant pleural effusion.**
Design: **Cohort prospective study. Follow-up of patients from referral for thoracoscopy to death.**
Setting: **Regional Cardiothoracic Surgical Centre.**
Patients: **Nineteen patients (median age 63 years, range 51 to 84 years) with malignant pleural effusion, secondary to mesothelioma in 13 and metastatic adenocarcinoma in 6.**
Intervention: **Video-assisted parietal pleurectomy.**
Measurements and results: **Median operating time was 35 min (range 15 to 60 min). The median fall in hemoglobin concentration in the first 24 h postsurgery was 1.1 g/dL (0.3-2.5 g/dL). The median postoperative morphine requirement was 1.25 mg/h (0-6.2 mg/h) in the first 12 h postoperatively. All patients were successfully extubated in the operating room, without the need for reventilation, and all patients were successfully discharged from the hospital with a median postoperative stay of 5 days (range 2 to 20 days). At current median follow-up of 12 months (range 4 to 17 mon) 6 patients died of their underlying disease. In the remaining 13 patients, two have developed recurrent effusions.**
Conclusions: **Using VATS to perform parietal pleurectomy is a safe, effective method of obtaining palliative pleurodesis in patients with malignant effusions.**
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VATS=video-assisted thoracic surgery

Key words: malignant mesothelioma; pleural effusion; pleurectomy; video-assisted thoracic surgery

Malignancy is the most common cause of exudative pleural effusions in middle-aged or elderly patients.[1] These patients often develop symptoms of cough, pain, and dyspnea requiring relief of the effusion. Pleural drainage and the instillation of a sclerosing agent is the preferred treatment in most cases, and a wide variety of potential sclerosants exist. A more invasive approach is indicated in absence of an underlying diagnosis and when the effusion has recurred after attempted pleurodesis.[2]

For many years, thoracoscopic pleural biopsy has been used in the diagnosis of pleural effusions and has a high diagnostic yield.[3] It also may be used to facilitate instillation of sclerosants under vision into the pleural cavity.[4]

The use of thoracotomy in the management of malignant pleural effusions is less well accepted, although there are reports of effective palliation from open parietal pleurectomy in this condition with low recurrence.[5] Thoracotomy in these debilitated patients, however, is associated with a prohibitively high postoperative morbidity and mortality.

Developments in video-assisted thoracic surgery (VATS) have enabled procedures such as parietal pleurectomy to be performed without thoracotomy. We, therefore, have extended the use of VATS to palliative pleurectomy in patients with malignant pleural effusions and report our initial results.

Method

Patients

All patients were referred to us for surgical intervention by respiratory physicians. The referral population is about 3 million people with a large number of ex-shipyard workers. The indications for surgery were either a persistent pleural effusion of unknown cause or a malignant effusion, which had recurred after tube drainage and chemical pleurodesis.

Operative Technique

All procedures were performed with the patients receiving general anesthesia. Before surgery, a paravertebral regional anesthetic block between the levels T4 and T8 was administered using bupivacaine, 0.5%. In most patients, a double-lumen endobronchial tube and single-lung ventilation were used, although the procedure was successfully carried out with a single-lumen tube in two patients. Jet ventilation was used in two more patients.

VATS was performed via a 2-cm incision usually placed below the tip of the scapula in the sixth intercostal space. The position

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of this incision varied if there was evidence of a loculated effusion on preoperative investigations. After draining the effusion by suction and breaking down any loculations, a careful inspection was made of the pleural cavity. Parietal pleurectomy was performed only if the visceral pleura was not heavily involved in the malignant process, allowing full reexpansion of the underlying lung. This was confirmed by reventilation under vision if necessary. The operation was performed as has been previously described for spontaneous pneumothorax[5,6] by blunt dissection using curved artery forceps via two more 2-cm incisions. A near total parietal pleurectomy was performed sparing only the diaphragmatic surface and the central mediastinal pleura. Two intercostal drains were placed, one to the apex and one to the base of the pleural cavity; these were placed on high suction to 100 mm Hg.

Postoperative Care

The patients were extubated at the end of the procedure in the operating room and transferred to a high dependency unit for noninvasive blood pressure and pulse oximetry monitoring overnight. Intravenous morphine was administered via a patient-controlled analgesia system. Patients were discharged when mobile and when their pain could be controlled by oral medication.

Follow-up Data

Accurate follow-up data have been obtained from surgical outpatient follow-up visits and by communication with the respective general practitioners and respiratory physicians.

Results

Patient Characteristics

Pleurectomy was performed in 19 patients (13 men and 6 women), with a median age of 63 years (range, 51 to 84 years). Respiratory function was impaired; the median FEV_1 was 51% of predicted (range, 25 to 97%), and the median forced vital capacity was 56% of predicted (range, 34 to 83%). In all patients, pleural fluid had previously been aspirated for cytologic examination; ten patients also had had a closed pleural biopsy using the Abrams needle and seven patients had undergone thoracic computed tomography. Four patients previously had pleural cytologic examination alone. One patient had previously undergone pleural biopsy by VATS but had subsequently developed a persistent effusion. Surgery was performed for palliative pleurodesis in ten patients, in whom the diagnosis was already known, and for both diagnosis and therapy in the other nine patients.

Surgical Results

The median duration of the procedure was 35 min (range, 15 to 60 min). All patients were extubated in the operating room without the need for reventilation. Postoperative blood loss was not excessive with a median 24-h fall in hemoglobin concentration of 1.1 g/dL (range, 0.3 to 2.5 g/dL). Postoperative pain was not excessive with a median postoperative morphine requirement of 1.25 mg/h (range, 0 to 6.2 mg/h) for the first 12 h. Two patients suffered prolonged postoperative air leaks, but the median postoperative hospital stay was 5 days (range, 2 to 20 days). All patients were successfully discharged from hospital, and no patient died within 30 days of surgery.

Postoperative Histologic Studies

The median maximum specimen size was 27 cm^2 (range, 7 to 60 cm^2), providing a diagnostic sample in each case. Malignant mesothelioma was present in 13 patients; in the remaining 6 patients, metastatic adenocarcinoma was present (bronchial primary, 4; breast primary, 1; an unknown primary, 1).

Follow-up Data

At current median follow-up of 12 months (range, 4 to 17 months), six patients have died after discharge from the hospital at a median of 4 months (range, 2 to 8 months); four died from metastatic adenocarcinoma and two from mesothelioma. Tumor seeding at the cutaneous site of thoracoscopy developed in five patients (all with mesothelioma); two of these have since died. However, symptomatic recurrent pleural effusions after VATS developed in only three patients (one of whom has died).

Discussion

Surgical intervention in patients with malignant pleural effusions is unlikely to affect the course of the underlying disease. Many of these patients either die from the effects of the effusion, rather than the tumor itself, or suffer significant morbidity. Effective pleurodesis in these patients can improve their quality of life in the terminal stages of their disease.

Chemical pleurodesis via tube thoracostomy using tetracycline[7] or talc[8] has been used in this group of patients. This frequently, however, results in patchy adhesions, loculated fluid, and trapped lung. Surgical exploration, performed via thoracotomy, allows full mobilization of the lung and effective pleurodesis by parietal pleurectomy. Unfortunately, thoracotomy for malignant pleural effusion has a high associated mortality and morbidity.[5]

Thoracoscopy has been used for many years in the diagnosis of pleural effusions. The advent of VATS now enables procedures such as pleurectomy to be performed without thoracotomy. Furthermore, we have shown that VATS results in significantly less effect on postoperative pulmonary dysfunction than thoracotomy.[9] It is logical, therefore, to now perform as complete a parietal pleurectomy as possible rather than just pleural biopsy in patients with known or suspected malignancy.

There have been reservations about the postoperative complications of hemorrhage and respiratory failure after parietal pleurectomy in these patients.

We did not have these problems in our series. Bleeding has not proved to be a major problem, and no patient has required reexploration. No patient has developed respiratory failure after video-assisted pleurectomy, and all patients have been discharged from the hospital with clinical and radiographic improvement.

While we have had successful early results from this technique, we would stress the importance of careful patient selection. Video-assisted pleurectomy should not be attempted if the visceral pleura is heavily diseased and the underlying lung is trapped, when a pleuroperitoneal shunt may be more appropriate. With minor degrees of visceral pleural thickening, however, we have assessed the potential for lung reexpansion with thoracoscopy before proceeding to pleurectomy with satisfactory results in a number of cases. On initial examination, often the lung appears to be trapped but is found to expand after careful division of adhesions and loculi. However, from our initial results, we must question the value of video-assisted pleurectomy in patients with metastatic adenocarcinoma. As reported by Martini et al,[5] we also have found that the survival in these patients is limited by the underlying disease rather than pleural involvement. Video-assisted pleurectomy probably is best reserved for patients with effusions secondary to mesothelioma.

Thoracoscopic talc poudrage also has been used in this group of patients, resulting in a similar recurrent effusion rate as in our series.[4] In another small series of patients with effusions secondary to metastatic carcinoma, recurrence rates were higher, mostly in patients with pleural fluid pH values less than 7.2.[10] Furthermore, talc poudrage is not without potential respiratory complications, such as acute pneumonitis[11] and ARDS.[12] We believe another benefit of pleurectomy is the reduction in chest pain associated with mesothelioma and retardation of the underlying disease process, which we have observed in a number of patients. A prospective thoracoscopic trial of pleurectomy vs talc poudrage would be worthwhile to assess comparative effectiveness and morbidity.

In conclusion, we believe that there is a role for surgical palliation in selected patients with malignant pleural effusion. However, VATS offers a surgical alternative to thoracotomy with less operative morbidity. We consider the quality of life in these terminally ill patients to be better after video-assisted pleurectomy than the alternative of repeated admissions for thoracocentesis. VATS is a procedure which merits further assessment.

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