Thoracoscopic Management of Malignant Pleural Effusions*

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Malignant pleural effusion is a common condition and often presents a challenge for treatment. We report our experience from a single institution with the use of video-assisted thoroscopic surgery (VATS) in the management of malignant effusions. From September 1992 to April 1995, 69 patients (31 men, 38 women; age range, 38 to 76 years) underwent diagnosis and/or treatment of malignant effusions; these included 46 pleural biopsies, 34 talc insufflations, and 16 limited decortications. There was no mortality and there were no intraoperative complications. Postoperative complications occurred in seven patients (10%). Specific histologic diagnoses were obtained in all but 6 patients (87%). Malignant effusion was confirmed in 25 of 46 cases (54%). Thoracoscopic talc insufflation with or without additional decortication was successful in 32 of 34 cases (94%) in controlling recurrence of effusion after a mean follow-up of 6 months among the survivors (22 patients died during the follow-up period without effusion reaccumulation). We conclude that VATS not only provides an accurate diagnosis but also allows effective therapeutic procedures to be performed for malignant effusions that are associated with an acceptable morbidity. (CHEST 1996; 109:1234-38)

Key words: malignant pleural effusion; thoracoscopic talc insufflation; video-assisted thoracoscopy surgery

Abbreviation: VATS=video-assisted thoracoscopic surgery

Manuscript presents that these different techniques, in essence, represent different approaches altogether, and grouping two different techniques together in reporting (for example with or without video assistance) makes interpretation of results difficult. This is a report on our experience with the use of video-assisted thoroscopic surgery (VATS) in the management of malignant pleural effusions from a single institution using a unified technique.

Management of pleural disease remains the oldest indication of thoracoscopy. Jacoebaen,1 over 80 years ago, first used thoracoscopy to lyse pleural adhesions to collapse the lung in the treatment of tuberculosis. For a long time since then, thoracoscopy has been used sporadically, mainly as a diagnostic modality,2 until its recent revival. There is now a wealth of literature on thoracoscopic management of pleural disease. Differences in the literature on patient selections, results, and complications can be explained to an extent by differences in the techniques used and the operators who perform the procedures. Thoracoscopy is not a unified approach and can be performed using flexible3 or rigid scopes4 with or without5 the aid of a Hopkins rod lens, with or without video assistance6 under local,3 regional,7 or general anesthesia with8,9 or without selective one-lung ventilation.10 Furthermore, there are few procedures like thoracoscopy that are practiced by pulmonologists, general surgeons, pediatric surgeons, and thoracic surgeons.

The author believes that these different techniques, in essence, represent different approaches altogether, and grouping two different techniques together in reporting (for example with or without video assistance) makes interpretation of results difficult.12 This is a report on our experience with the use of video-assisted thoroscopic surgery (VATS) in the management of malignant pleural effusions from a single institution using a unified technique.

Materials and Methods

From September 1992 to April 1995, 69 patients with suspected or established malignant pleural effusions were referred to the Cardiothoracic Unit for treatment. There were 31 male and 38 female patients with ages from 38 to 76 years. There were 46 patients with indeterminate pleural effusions despite thoracentesis with or without blind pleural biopsy for diagnosis; more than one third of the patients had a history of malignancy (17 cases). In addition, there were 23 patients with established symptomatic malignant effusions for VATS treatment.

Indeterminate Pleural Effusions

These patients had indeterminate pleural effusions despite prior thoracentesis with or without blind pleural biopsies. The procedure was performed under general anesthesia with selective one-lung ventilation with the patient in the lateral decubitus position and the table flexed at 30°. The skin was prepared and draped as for a thoracotomy.13 In adult patients, we routinely use a 10-mm operat-
Procedures to undertake the video-assisted thoracoscopic procedure included thoracentesis, pleural biopsy, and talc insufflation. We preferred to perform thoracentesis for patients with recurrent dyspnea or a thoracentesis history, as previously described for video-assisted thoracoscopic talc insufflation for management of recurrent pleural effusion.22 Thoracentesis was readily performed through existing chest tubes or by using a percutaneous route. Thoracentesis was performed in all patients during the study period, and the fluid was visually guided during thoracoscopic surgery. The latter step-up is simple and is readily available in most hospitals. Two 28F chest tubes were left in situ (placement of which was visually guided) and connected to a 15-cm H2O suction. The lung was confirmed thoracoscopically to be fully reexpanded prior to withdrawal of the scope. The drains were removed when the total output was less than 50 mL in 24 h. Patients were followed-up radiologically in the outpatient clinic and by telephone at monthly intervals.

Results

The patient profile and results are shown in Table 1. There was no mortality and there were no intraoperative complications. For the indeterminate pleural effusion group, histologic diagnosis was obtained in all cases. Malignancy was the most common cause and represented just over half of the cases (Table 2). In those with newly diagnosed pleural metastases, 8 (32%) had no other clinical features of malignancy. However, a history of malignancy is a strong predictor for a malignant effusion (Table 3).

Of the 34 cases of malignant pleural effusions treated by talc insufflation, postoperative low-grade fever attributable to talc was observed in less than half of the patients (14 cases). Limited decortication was performed in 16 patients to achieve full lung reexpansion. Relief was obtained in all patients who presented with symptomatic effusions. Twenty-two patients died during the follow-up period without evidence of fluid reaccumulation. Recurrence of effusion was observed in 2 patients among the survivors after a mean follow-up of 6 months (range, 1 to 13 months): 1 was at 1 month and the other at 2 months after the procedure. In both cases, the effusions were only moderate and the patient remained asymptomatic, so no further treatment was given. One patient subsequently died; 8 months postoperatively, the other patient is without further evidence of increasing fluid accumulation.

Complications occurred in 7 of 69 patients (10%)

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Table 1—VATS Management of Pleural Effusions—Patient Profile and Results

<table>
<thead>
<tr>
<th>Pleural Effusion</th>
<th>Indeterminate</th>
<th>Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>46</td>
<td>23</td>
</tr>
<tr>
<td>Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performed</td>
<td>Pleural biopsy (46)</td>
<td>Talc insufflation (23)</td>
</tr>
<tr>
<td></td>
<td>Talc insufflation* (11)</td>
<td>Decortication* (16)</td>
</tr>
<tr>
<td>Postoperative</td>
<td>1.0±0.3</td>
<td>5.1±3.4</td>
</tr>
<tr>
<td>chest tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>duration, d*</td>
<td>2.9±0.9</td>
<td>6.2±2.7</td>
</tr>
</tbody>
</table>

*Values are mean±SD.

*These were performed with another procedure during the same anesthesia setting.

Table 2—Final Histologic Diagnosis of Indeterminate Pleural Effusions

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of cases</td>
<td>46</td>
</tr>
<tr>
<td>Malignancy</td>
<td></td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>11</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>8</td>
</tr>
<tr>
<td>Poorly differentiated carcinoma</td>
<td>6</td>
</tr>
<tr>
<td>Benign</td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>15</td>
</tr>
<tr>
<td>Nonspecific inflammation*</td>
<td>6</td>
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</tbody>
</table>

*No clinical evidence of malignancy after a mean follow-up of 11 months.

Table 3—Correlation of Malignancy History With Pathologic Outcome in the 46 Cases of Indeterminate Effusions

<table>
<thead>
<tr>
<th>Pathologic diagnosis</th>
<th>Present</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Benign</td>
<td>0</td>
<td>21</td>
</tr>
</tbody>
</table>

while dense fibrous adhesions were selectively divided. In 16 cases, limited decortication to remove the encasing visceral pleura was performed. By performing adhesiolysis with or without additional decortication, complete reexpansion of the lung was achieved in all cases. Some air leak was inevitable but we found as long as the lung could fully reexpand, air leak was seldom a lasting problem. Five grams of purified talc (Halewood Chemicals; Middlesex, UK) sterilized by dry heat was then insufflated into the chest to evenly cover the entire visceral and parietal surfaces. Initially we used a special talc atomizer (K. Storz, Culver City, Calif.), but we now prefer using a mucus extractor (UnoPlast, Hundested, Denmark) connected to a 50-mL syringe. The latter set-up is simple and is readily available in most hospitals. Two 28F chest tubes were left in situ (placement of which was visually guided) and connected to 15-cm H2O suction. The lung was confirmed thoracoscopically to be fully reexpanded prior to withdrawal of the scope. The drains were removed when the total output was less than 50 mL in 24 h. Patients were followed-up radiologically in the outpatient clinic and by telephone at monthly intervals.
and consisted of persistent air leak over 7 days and wound infection in the same patient, bleeding requiring transfusion (2), reexpansion pulmonary edema (1), deep vein thrombosis (1), cerebrovascular accident (1), and port site recurrence (1). Both persistent air leak and bleeding from decortication stopped spontaneously without the need for reoperation. The port site recurrence occurred in an elderly patient with metastatic adenocarcinoma and symptomatic malignant pleural effusion who underwent successful thorascopic talc insufflation for control. She was noted to have an asymptomatic 2.5-cm subcutaneous nodule over the instrument port scar 3 months after the procedure. As she remained asymptomatic, no specific treatment was offered and she died 3 months later.

**DISCUSSION**

There are few procedures like thorascopy that have been practiced for so long using so many different techniques by so many different medical specialists. VATS using general anesthesia with selective one-lung ventilation is the authors’ preferred technique, which has several distinct advantages over the others. Firstly, a magnified panoramic view of the hemithorax with high resolution for details is obtained. Secondly, collapse of the ipsilateral lung gives rise to plenty of room for maneuverability of the telescope and instruments. This not only allows adequate biopsy specimens for histologic, and possibly immunocytoologic and electron microscopic study, but also gives the option for therapeutic procedures to be performed like decortication, pleurectomy, mechanical pleurodesis, talc insufflation, and last but not least, visual directed placement of chest drains. Thirdly, the nursing and anesthetic staff can now observe the operation as it goes and the assistant can take up a more active role. Fourthly, general anesthesia is certainly more comfortable for the patients and in this era, the overall risk of general anesthesia is small. Therapeutic maneuvers under local anesthesia are at best, difficult, and at worst, dangerous in a sedated patient who could move without warning and whose lungs are ventilating.

There is little consensus in the literature regarding when thorascopy should be undertaken for indeterminate effusions. From various reports, positive cytology can be identified on thoracentesis from 45 to 80% of all malignant effusions even though the yield is much lower (20%) with mesothelioma. Repeated thoracentesis will only marginally increase the yield. Likewise, Prakash reported that the addition of a closed pleural biopsy will not significantly increase the yield for malignancy and again especially for lymphoma or mesothelioma. This is not surprising as Canto et al pointed out that a significant portion of the pleural metastases are located at sites (like the costophrenic angle and the diaphragmatic surface) that are inaccessible to the blind percutaneous approach. In our institution, we therefore recommend to proceed directly to video-assisted thorascopic biopsy for diagnosis if the initial cytologic study and culture are negative, the patient is not clinically suspected of having tuberculosis, and the patient can tolerate general anesthesia.

In practice, the main goal of diagnostic thorascopy is to identify patients with pleural metastasis (or tuberculosis) for further management. Our data are in agreement with others that malignancy is by far the most common cause accounting for approximately one half of the indeterminate effusions. We have not encountered mesothelioma in our series compared to others that showed it to be the most common malignant diagnosis. The reason for this is unclear and it may truly reflect a low incidence in our locality (or underdiagnosis by our pathologists). Besides diagnosis, VATS offers an option for treatment once pleural metastasis is confirmed. We have encountered no recurrence in our 11 patients in whom talc insufflation was administered after pleural metastasis had been confirmed on frozen section. VATS is therefore our preferred approach and we reserve flexible pleuroscopic biopsy for those patients who cannot otherwise tolerate general anesthesia.

Malignant pleural effusion is a common clinical condition that is often disabling and could be very difficult to treat. It represents a terminal condition with short median survival (in terms of months) and the goal of treatment is palliation. Systemic chemotherapy is occasionally useful for breast and small cell lung carcinoma, but local therapy remains the mainstay of treatment. Options include repeated therapeutic thoracentesis, tube thoracostomy and sclerotherapy, thorascopic talc insufflation, mechanical pleurodesis, pleuroperitoneal shunt, and pleurectomy. We reserve repeated thoracentesis only for those who are severely disabled and require continuous hospitalization (Karnofsky score below 30%) as rapid reaccumulation, protein depletion, and risk of empyema occur with this treatment. However, pleurectomy carries with it substantial morbidity and mortality and is hard to justify for a palliative procedure. Pleuroperitoneal shunt has been shown to be effective but it requires a very compliant patient who needs to manually pump 400 times a day. Moreover, there is a risk of shunt occlusion by blood clots or fibrin debris. We therefore have reserved this approach for patients with severely (

>25% pneumothorax) trapped lung. Of all the sclerosants available, talc is considered the agent of choice because of its good track record (>90% success rate), wide availability, and low cost. The possible harmful long-term effects of talc, if any, seem academic in this group of patients with limited survival. Acute respira-
tory failure and death have been anecdotaly reported with talc “slurry” or insufflation. The exact underlying mechanism remains unclear even though it may be dose-related. Kennedy and Sahn recommended a 5-g dose, which is what we use, and so far we have not experienced any talc-related respiratory complications with VATS insufflation. Patients with diffuse pleural metastasis are at risk of developing tumor seeding at thoracoscopy port sites. Fortunately, this is uncommon: 6 of 215 patients described by Boutin et al., 2 of 30 patients described by Davidson et al., and 1 patient described by us. We recommend observation if the port site recurrence is asymptomatic in view of the patient’s short life expectancy; otherwise, local irradiation has been shown to provide good palliation.4

The preferred route of administration of talc to achieve pleurodesis (“dusting,” “slurry” through a chest tube, “poudrage” or insufflation through chest drains, or thoracoscopy) remains unclear. Recent laboratory study showed that talc insufflation is as effective as mechanical techniques and superior to laser, cautery, or tetracycline pleurodesis.37

We report our experience with video-assisted thoracoscopic talc insufflation, which is effective in controlling malignant effusion and associated with an acceptable morbidity. We believe the important ingredient for success with sclerotherapy is to achieve full lung reexpansion to allow close approximation between the lung and the chest wall. Inability to achieve this has been shown to be associated with treatment failures.24 We suspect the two failures we have in our series were due to inadequate decortication in our early experience.

In conclusion, we have shown that VATS is a safe and effective approach in the management of malignant effusions. Recent advances in video camera technology, refined instrumentation, and improved anesthetic techniques have allowed therapeutic maneuvers like limited decortication or talc insufflation to be safely and effectively carried out. Three areas deserve further investigation. Firstly, although talc insufflation is effective, definite improvement in a patient’s quality of life has not been scientifically documented. We have encountered problems in using standard questionnaires for our patients: they require translation into Chinese; self-evaluation and visual linear analogue pose difficulties to those with a low level of education and/or low performance status; functional status is closely influenced by social and psychological factors that are difficult to quantify; and the questionnaires have not been externally validated. Secondly, although we believe that talc insufflation at the time of thoracoscopic diagnosis carries a high chance of success with little additional surgical manuevering, the efficacy and cost effectiveness of this approach remain to be documented. Thirdly, talc insufflation vs other approaches like talc slurry, in the management of malignant effusions remains to be evaluated in a prospective randomized trial. These issues are currently under study.

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