Talc pleurodesis: Comparison of talc slurry instillation with thoracoscopic talc insufflation for malignant pleural effusions

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Summary

**Purpose:** Pleurodesis can relieve dyspnea in patients with malignant pleural effusions. We retrospectively compared the success rate of talc slurry instillation pleurodesis with thoracoscopic talc powder insufflation pleurodesis.

**Patients and methods:** From 2000 to 2005, two methods of talc pleurodesis were performed in 71 patients with symptomatic massive malignant pleural effusions: a) through the pleural drain (24F), 50 ml of a slurry containing 4-5 g of Luzenac talc in saline with 20 ml 1% lidocaine were instilled. The drain was clamped for 1 h; b) insufflation of 3-5 g of talc powder was performed via videothoracoscope using local anaesthesia. The drain was left in the pleural space until the daily secretion of pleural fluid was under 100 ml.

Pleurodesis was considered successful when the patient was without dyspnea and did not need pleural fluid evacuation and the pleural fluid did not re-accumulate in the 1st month after pleurodesis.

**Results:** The success rate of talc slurry pleurodesis was 78% (38/49). Excluding 8 patients who died in the first month, the success rate increased to 93% (38/41). Thoracoscopic pleurodesis was successful in 77% (17/22) of patients. Excluding one patient who died in the first month, the success rate increased to 81% (17/21) (intergroup difference non significant). Complications were observed in 41% (20/49) vs. 73% (16/22) of patients in the talc slurry group and thoracoscopic group, respectively (p=0.013).

**Conclusion:** Pleurodesis with instillation of talc slurry and with insufflation of talc during thoracoscopy were equally successful in patients with massive malignant pleural effusions. However, thoracoscopic pleurodesis is accompanied with considerably more complications, rather as a result of the thoracoscopy itself and not as a consequence of pleurodesis.

**Key words:** diagnostic thoracoscopy, massive malignant pleural effusion, pleurodesis, talc slurry

Introduction

Pleurodesis is carried out to achieve symphysis between the visceral and parietal pleural surfaces in dyspneic patients with massive, usually malignant pleural effusions. Relief of dyspnea is its primary indication [1].

Pleurodesis is indicated in patients with malignant pleural effusion without other therapeutic possibilities or when other therapies are contraindicated or unsuccessful.

The clinical indication for pleurodesis is dyspnea, rapid accumulation of pleural effusion and frequent thoracocenteses (more than one per week). Patients should be in relatively good general health status with expected survival greater than 3 months.

A trapped lung should be excluded [2]. Lung cannot expand because of extensive malignant or inflammatory changes in the pleura. In patients with bronchial carcinoma, central tumor with extensive atelectasis should be excluded [3]. In these conditions, pleural therapeutic thoracocentesis can result in lack of lung re-expansion and development of a fluid pneumothorax.

The application of thoracocentesis in some pa-
tients with abundant malignant pleural effusion and dyspnea because of trapped lung is therapeutic. A high success rate with low morbidity and mortality has been reported in patients with good general health status and surgical implantation of pleuro-peritoneal shunts [4].

Before pleurodesis after therapeutic thoracocentesis, it is necessary to confirm dyspneic relief. Chest X-ray should confirm appropriate re-expansion of the lung and substantial decrease of the pleural effusion without pneumothorax.

There are over 30 different sclerosing agents. Among them, the most frequently used are: talc, tetracycline hydrochloride, nitrogen mustard, bleomycin, doxorubicin, 5-fluorouracil, thiopeta, quinacrine, corynebacterium parvum, interferon gamma, silver nitrate and sodium hydroxide. The best rate of success has been reported with talc pleurodesis [5].

Talc slurry can be applied through a pleural drain or talc powder insufflation through thoracoscope. Before pleurodesis as much as possible pleural fluid should be removed. An in prospective randomised trial pleurodesis with talc slurry and talc poudrage had similar efficiency [6].

Thoracotomy with parietal pleurectomy, though effective, should not be used without careful consideration because of considerable mortality [7]. In patients with good general health status video-assisted thoracic surgery (VATS) with partial pleurectomy or abrasion of the parietal pleura can be applied.

In patients with poor general condition and a short expected survival (less than 3 months), an indwelling pleural catheter connected to a bottle or a bag is the method of choice. A series of patients treated with an indwelling catheter (PleurX Denver Biomedical) with a valve preventing the uncontrolled movement of air and fluid was reported. Patients used catheters for 1-6 months with 70-80% symptomatic relief. This method is convenient because patients generally need no hospitalisation [8]. With the same method, dyspnea was controlled in 100% and pleurodesis was achieved in 58% of patients [9].

When the patient’s general health status is poor and expected survival is short, repeated therapeutic thoracocenteses can be an acceptable choice. The important shortcoming of repeated thoracocenteses is discomfort, deterioration of quality of life and depletion of proteins and electrolytes.

### Patients and methods

From 2000 to 2005, we performed pleurodesis in 71 patients with massive malignant, quickly accumulating pleural effusion. Their average age was 62.2 ± 12.2 years. Because of massive pleural effusion all patients were dyspneic. Before pleurodesis, they had 3-10 therapeutic thoracocenteses with 1-3.5 L of fluid removed at each procedure. The patients' coagulation parameters were within normal limits and they experienced no respiratory insufficiency. Two patients had bilateral pleural effusions.

Talc slurry pleurodesis was performed in patients with known malignant pleural effusion confirmed cytologically. Before pleurodesis, a pleural drain was inserted. The place for introduction was chosen according to clinical, chest X-ray and ultrasound examination (usually in the 6th intercostal space in the mid-axillary line). After local anaesthesia with 10-20 ml of 1% lidocaine, a 24 F plastic drain was inserted through the incision into the pleural space. The drain was fixed with suture to the skin. Before talc slurry instillation, all pleural effusions were evacuated. For each procedure, 3-5 g of sterile talc (Luzenac, Toulouse, France) were used. Talc was mixed in a 50 ml syringe with 20 ml of 1% lidocaine and 30 ml of 0.9% saline solution. The syringe was vigorously agitated to achieve an even distribution of talc. The talc slurry was instilled and the drain was clamped for 1 h. The drain was connected to the underwater seal drainage system Ocean (Atrium Medical Corporation, USA), with negative pressure of −20 cm of water. Tramadol hydrochloride 100 mg b.i.d and, in case of pain, tramadol hydrochloride 50 mg or fentanyl 0.1 mg intravenously were administered.

Diagnostic thoracoscopy was performed in patients with suspicion for malignant pleural effusion in whom 3 cytological examinations of pleural fluid were negative for malignant cells. We used Olympus videothoracoscope A5252A. Patients were pre-medicated with 1 mg of atropine sulphate subcutaneously. Local anaesthesia was administered with 30 ml of 1% lidocaine and fentanyl 0.1 mg was given intravenously. Before the introduction of the thoracoscope, a pneumothorax with a Veress needle and Erka pneumothorax apparatus was created under chest X-ray control (Phillips BV 29). The extention of the pneumothorax was controlled with a needle. We used 1 port in the 6th intercostal space in the mid-axillary line. The pleural fluid was completely aspirated to achieve better visualisation of the pleural surfaces. Forceps biopsies (11±4) were performed from the macroscopically pathological pleural sites. Samples were imprinted on slides for cytological examination and sent to the histological laboratory in 10% formalin. In patients with abundant pleural effusion and macroscopically malignant changes, pleurodesis was performed with insufflation of 3-5 g of talc under optical control with
a 26492 TH insufflator (Karel Storz Tuttlingen, Germany). At the end of the procedure a 24 F drain was inserted, fixed with a suture to the skin and connected to the underwater seal drainage system.

The drain was left intrapleurally until the daily exudate was under 100 ml. In 11 patients, a talc slurry of 3-5 g was instilled twice because the daily exudation did not fall under 100 ml.

Pleurodesis was considered successful when, in the first month after the procedure, the patient was not dyspneic, did not need therapeutic thoracocentesis and chest X-ray showed total or partial (≥50%) resolution of the previous pleural effusion.

The success of pleurodesis in the two groups was compared by Pearson Chi-Square test. A p-value less than 0.05 was considered statistically significant.

Results

Pleurodesis was performed unilaterally on the right and left sides in 35 patients; bilateral pleurodesis was performed in 1 patient.

Talc slurry pleurodesis was performed in 49 patients and thoracoscopic talc insufflation pleurodesis in 22 patients.

Diagnoses of the group of patients with talc slurry pleurodesis are shown in Table 1. Diagnoses of the patients in the group with talc instillation are presented in Table 2.

Overall success was achieved in 77% (55/71) of the patients. In the first month, 9 patients died because of progressive malignant diseases: 8 in the group with talc slurry pleurodesis and 1 in the group with thoracoscopic talc insufflation. Excluding the patients that died in the first month, the success rate increased to 89% (55/62).

In the group of patients with talc slurry pleurodesis, success was achieved in 78% (38/49) of them.

Excluding the dead patients, the success rate was 93% (38/41). The drain was left in place for 4.8 ± 3.5 days. In one patient, the drain was left permanently connected to the disposable bag. The success of pleurodesis in each group according to cancer types is presented in Tables 3 and 4.

The success rate of talc powder insufflation was 77% (17/22) (Figure 1). Excluding the dead patient,

![Figure 1. Thoracoscopic image after insufflation of 4 g of talc in a patient with epitheloid mesothelioma.](image)

<p>| Table 1. Types of malignant disease in 49 patients with talc slurry instillation pleurodesis |</p>
<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Patients, n (%)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lung cancer</td>
<td>13 (26.5)</td>
<td>Ovarian cancer</td>
<td>2 (4)</td>
</tr>
<tr>
<td>adenocarcinoma</td>
<td>10 (20.5)</td>
<td>Large bowel adenocarcinoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>squamous cell</td>
<td>1 (2)</td>
<td>Renal cell carcinoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>small cell</td>
<td>1 (2)</td>
<td>Pancreatic adenocarcinoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>unspecified</td>
<td>1 (2)</td>
<td>Malignant thymoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Adenocarcinoma of unknown origin</td>
<td>11 (22)</td>
<td>Testicular seminoma/teratoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>9 (18.5)</td>
<td>Salivary gland adenocarcinoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>8 (16.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Types of malignant disease in 22 patients with thoracoscopic talc insufflation pleurodesis

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Patients, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesothelioma</td>
<td>16 (73)</td>
</tr>
<tr>
<td>Adenocarcinoma of unknown origin</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Osteosarcoma of tibia</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Lung adenocarcinoma</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Pancreatic adenocarcinoma</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Renal cell carcinoma</td>
<td>1 (4.5)</td>
</tr>
</tbody>
</table>
Table 3. Success of pleurodesis in 49 patients with talc slurry instillation

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Patients/success n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung cancer</td>
<td>13/10 (77)</td>
</tr>
<tr>
<td>Adenocarcinoma of unknown origin</td>
<td>11/9 (82)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>9/8 (89)</td>
</tr>
<tr>
<td>Other extrapulmonary tumors</td>
<td>8/4 (50)</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>8/7 (88)</td>
</tr>
</tbody>
</table>

Table 4. Success of pleurodesis in 22 patients with thoracoscopic talc powder insufflation

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Patients/success n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesothelioma</td>
<td>16/12 (75)</td>
</tr>
<tr>
<td>Extrapulmonary tumors</td>
<td>3/3 (100)</td>
</tr>
<tr>
<td>Adenocarcinoma of unknown origin</td>
<td>2/2 (100)</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>1/0 (0)</td>
</tr>
</tbody>
</table>

the success rate was 81% (17/21). The drain was left in place for 5.1 ± 4.3 days.

Comparison of the success rate of talc slurry (38/49 and 38/41) and thoracoscopic talc powder insufflation pleurodesis (17/22 and 17/21), showed a non-significant difference (p=0.979 and p=0.167, respectively). Repeated talc slurry pleurodesis was successful in 55% (6/11) of the patients.

During thoracoscopy we did not perform pleurodesis with talc insufflation in 12 patients, but 2-4 days after thoracoscopy we performed talc slurry pleurodesis through the drain because of abundant exudation (greater than 100 ml per day). These patients were included into the group of talc slurry pleurodesis. In 2 of them, pleurodesis was not successful.

Two breast cancer patients had bilateral pleural fluid. In one of them, talc slurry pleurodesis was performed bilaterally. Her pleural effusions dropped to less than 50% of the initial amount, so the patient did not need additional therapeutic thoracocentesis. However, she became hypoxemic and needed long-term oxygen therapy. The second patient had talc slurry pleurodesis performed on the right side and therapeutic thoracocentesis performed on the left side. She also had carcinomatous pericarditis and died within the first month after pleurodesis.

After talc slurry pleurodesis complications were observed in 41% (20/49) of the patients: pain (7), fever (6), pneumothorax (3), pleural empyema (2), subcutaneous emphysema (1), and confusion (1). Complications of thoracoscopic pleurodesis were observed in 73% (16/22) of the patients: pain (5), fever (4), pneumothorax (3), subcutaneous emphysema (1), pulmonary oedema (1), pleural empyema (1), and hypotension with respiratory insufficiency (1). Complications were significantly more frequent in the group with thoracoscopic pleurodesis (p=0.013).

Discussion

The success rate of pleurodesis in our group of patients is comparable to the success of pleurodesis observed in our patients performed in earlier years when thoracoscopic pleurodesis with talc insufflation was the only method used [10,11]. According to data from the literature, talc slurry pleurodesis is as efficient as thoracoscopic talc insufflation [12]. In a randomised study, researchers observed a lower success rate of talc slurry instillation relative to talc powder insufflation [13]. Results of another randomised study [6] and our present study do not support these findings.

We did not randomly place patients into talc slurry and thoracoscopic pleurodesis groups. We selected patients with known diagnosis of malignant pleural disease for talc slurry pleurodesis and patients with suspicion for malignant pleural disease for thoracoscopy. The malignant infiltration of the pleura was more extensive in patients with known diagnosis in the talc slurry group relative to patients with 3 negative cytological examinations of pleural effusion in the thoracoscopic group. This could explain why more patients died in the first month in the talc slurry group. Shorter survival and lower success rates of pleurodesis can be expected in patients with more extensive malignant pleural infiltration. The other explanation could be that in the talc insufflation group more patients had mesotheliomas. The median survival of mesothelioma patients is more favorable (6 months) than patients with pleural carcinomatosis (2.3-5 months, depending on the origin of malignancy) [14].

It seems that the decision for pleurodesis should be made early, when the pleural effusion is not localized and the pleura is not thickened because of inflammation or malignant tissue, which subsequently prevents the appropriate re-expansion of the lung, resulting in a trapped lung.

Although we wanted to select patients with an expected survival of 2-3 months, 9 patients died in the first month because of malignant disease. It is obvious that it is difficult to predict prognosis in a group of very frail patients with malignant infiltration of the pleura.

The Consensus Statement of the American Thoracic Society and European Respiratory Society [15] defines pleurodesis as successful when it relieves dyspnea due to pleural effusion and when the fluid does not
re-accumulate until the patient’s death. Success should be evaluated with and without the inclusion of patients who die within the first month after pleurodesis.

It is possible that in the non-dyspeenic patient who does not experience pleural fluid re-accumulation, success can be of short duration because of early death of the patient. We think that the time interval without dyspea, without therapeutic thoracentesis and without pleural fluid re-accumulation should be defined. Similar to other authors, we delineated an one-month interval [6,16].

Complications in our patients were similar with those described by other authors. Complications were more frequent in the group with thoroscopic talc pleurodesis, possibly because pain, fever, pneumothorax and subcutaneous emphysema are additional complications of thoracoscopy itself and not a consequence of pleurodesis.

We never observed acute respiratory distress, as some other authors did [17]. This complication is supposedly connected with advanced malignant disease, chronic obstructive lung disease, great quantity of applied talc, the use of non-sterile talc, talc with small particles or pleural abrasion or numerous thorascopic pleural biopsies [18]. To prevent the possibility of acute respiratory distress, we used sterile Lusenac talc, with large particles (> 30 microns) and we never used more than 10 g of talc. Nine of our patients who died in the first month had advanced malignant disease and 34 patients had 11 pleural forceps biopsies and none of them had acute respiratory distress. Our observation does not support advanced malignant disease or numerous thorascopic pleural biopsies as the etiology of acute respiratory distress after talc pleurodesis.

In conclusion, talc pleurodesis is a successful procedure in patients with abundant malignant pleural effusion. Pleurodesis with thoroscopic talc insufflation has a similar success rate as pleurodesis with talc slurry instillation.

Thorascopic insufflation of talc under direct optical control is the best diagnostic and therapeutic method in patients with suspicious massive malignant pleural effusions or without a definitive diagnosis. In patients with known malignant infiltration of the pleura, talc slurry instillation can be applied.

Serious complications are rare. Patients selected for pleurodesis should be in relatively good general condition with an expected survival duration greater than 2-3 months.

References