Comparison of video-assisted thoracoscopic talcage for recurrent primary versus persistent secondary spontaneous pneumothorax


ABSTRACT: Thoracoscopic talcage (TT) is a safe and effective prophylactic treatment for patients suffering from recurrent primary spontaneous pneumothorax (PSP). Empirically, TT is considered equally effective in the treatment of persistent secondary spontaneous pneumothorax (SSP), although this has not yet been proved.

In this study, the efficacy and safety of TT was prospectively evaluated in 28 patients (17 males and 11 females, mean age 27±8 yrs), with 31 episodes of recurrent PSP, and in 20 patients (13 males and 7 females, mean age 43±21 yrs) with persistent SSP.

TT proved to be equally effective in achieving pleurodesis in both groups: there were 6.5% recurrences in the PSP group and 8.7% in the SSP group during a mean follow up period of 18 months (p>0.05). In the SSP group, there were significantly more prolonged postoperative air leaks (26 vs 0%; p=0.004) and a longer postoperative chest tube drainage time (35.5±18 vs 24.9±3.2 hrs; p=0.002) was necessary. All air leaks, however, ceased spontaneously during drainage. Duration of hospitalization was significantly longer in the SSP group (4.7±2 vs 3.2±0.5 days; p<0.001). Postoperative pain (90 vs 43%; p=0.0001) and fever (65 vs 17%; p=0.001) were more frequent in the PSP group than in the SSP group.

There were no major peri- or postoperative complications in either group. We conclude that thoracoscopic talcage is as efficient and safe in achieving pleurodesis in persistent spontaneous pneumothorax as in recurrent primary spontaneous pneumothorax.

In contrast with PSP, SSP is often serious and sometimes life-threatening because of the underlying lung disease; the recurrence rates are probably higher in SSP [10, 11]. It is, therefore, recommended that all patients with SSP be treated with chest tube thoracotomy and be considered for pleurodesis [1]. In these patients also, however, no controlled studies on which sclerozing agent or technique to use are available. Furthermore, one may have to consider the effects of the sclerozing agent on a future lung transplant, which may be compromised or even refused due to increased technical difficulties [1].

Little information has been published about the thoracoscopic management of patients with SSP, and although, empirically, thoracoscopic talcage is thought to be equally effective in SSP as in PSP [5], no controlled studies on this subject are available. In this study, therefore, we prospectively evaluated and compared the efficacy of thoracoscopic talcage for achieving pleurodesis in recurrent primary versus persistent secondary spontaneous pneumothorax.

Materials and methods

Methods

Thoracoscopy

All procedures were performed in the operating room, under strict aseptic conditions, and using total intravenous anaesthesia (TIVA). Patients were intubated with a Hi-Lo single lumen endotracheal tube (Mallincrodt®, Northampton, UK). At the onset of the thoracoscopy, ventilation with oxygen enriched air (fraction of inspired oxygen \( F_{1O_{2}} = 0.5 \)) was switched from conventional volume-control mode (Siemens Elema 900C®; Siemens Elema AB, Solna, Sweden) to high-frequency jet ventilation (HFJV) mode (Acutronic®, Acutronic Medical Systems AG, Jona, Switzerland). At the time of intubation and the use of volume-controlled ventilation, all patients had a chest tube to avoid tension pneumothorax. End-tidal carbon dioxide tension (\( P_{ET,CO_{2}} \)) and arterial oxygen saturation (\( S_{aO_{2}} \)) were monitored continuously.

Patients

From January 1993 until December 1995, 48 patients with spontaneous pneumothorax (SP), primary and secondary, were included in the study.

PSP was defined as a SP in a patient with no known or apparent underlying lung disease. Indications for thoracoscopy were: a second (or more) episode of PSP, which was symptomatic (dyspnoea, chest pain or chest tightness, etc.), and with an estimated size of ≥30% according to the formula of Liort [1]. Twenty-eight patients (17 males and 11 females, mean age 27±8 yrs, range 16–56 yrs) with 31 episodes of PSP were treated (two recurrences, one contralateral episode). During the study period, 36 other patients with a first episode of PSP were treated with small-catheter aspiration or a small-sized chest tube thoracostomy (12 or 16 mm diameter) without injection of a sclerozing agent; five of these patients were seen with a recurrence, and were then included in the present study.

SSP was defined as a SP in a patient with known or apparent underlying lung disease. Twenty patients (13 males and 7 females, mean age 43±21 yrs, range 17–74 yrs) with 23 episodes of SP were studied. Thoracoscopy was indicated when an air leak persisted after five or more days of chest tube suctioning. The causes of underlying lung disease are listed in table 1. All patients were given detailed information on the procedures.

| Table 1. – Underlying diseases in the SPP group (n=20) |
|----------|--------|
| **n**    | **%**  |
| COPD     | 6      |
| CF       | 5      |
| ILD      | 3      |
| AIDS     | 2      |
| Pneumonia| 1      |
| Aspergillosis| 1 |
| Hodgkin’s disease | 1 |
| Bronchial carcinoma| 1 |

SPP: secondary spontaneous pneumothorax; COPD: chronic obstructive pulmonary disease; CF: cystic fibrosis; ILD: interstitial lung disease (including lymphangioleiomyomatosis, idiopathic pulmonary fibrosis, and dermatomyositis); AIDS: acquired immune deficiency syndrome.
which would compromise possible future lung transplantation, according to a technique described previously [12].

**Bleb ablation by electrocoagulation**

In 12 patients (11 with type IV PSP, one with SSP secondary to bullous emphysema) blebs and bullae with a diameter ranging 2–5 cm were thoracoscopically visualized. In six of these patients, one or more blebs clearly appeared ruptured. After thorough inspection and mapping of all the blebs, a thermocoagulation forceps was introduced through the second (insulated) trocar. The tip of the forceps was held at the base of each bleb, and short bursts of coagulation (power 40–60 W) were applied. After 10–50 bursts circumferentially around their base, shrinkage (and even complete ablation in 10 patients) of the blebs was obtained (figs. 1 and 2). Thereafter, talc poudrage was performed as described above.

At the end of the procedure, the telescope was switched to the second entry point. Thereafter, the first cannula was removed, and a 24 French chest tube was inserted through the same incision under videoscopic control, and directed at the lung apex. After removal of the thoracoscope and skin closure of the second entry point, the chest tube was connected to a 4-chamber aspiration system at a suction pressure of -20 cmH₂O. The following data were recorded: macroscopic thorascopic findings (allowing for classification of the PSP); duration of the procedure; perioperative complications (bleeding, rupture of a bulla, oxygen desaturation etc.); postoperative pain and fever; duration of chest tube drainage; hospital stay; and recurrence rate.

![Fig. 1. – Apical bullae: a) before; and b) after thermocoagulation.](image1.png)

![Fig. 2. – Small bullae located at the fissure of the right upper lobe: a) before; and b) after thermocoagulation.](image2.png)
Statistical analysis

Data are expressed as mean±SD. Baseline patient characteristics were compared using the unpaired two-tailed Student’s t-test and the Chi-squared or Fisher exact test. Study endpoints were compared between the two patient groups using the two-tailed Student’s t-test and the Chi-squared or Fisher exact test. Significance was accepted at p-values less than 0.05.

Results

Duration of the procedure

Mean±SD duration of the thoracoscopic procedure tended to be shorter in the PSP group (29±9 min) as compared to the SSP group (35±14 min), but the difference was not significant (p=0.06) (table 2).

Thoracoscopic findings

Macroscopic findings in the PSP group, according to the classification of VANDERSCHUEREN [2], are summarized in table 3. There were 10 (34%) type I cases (normal findings); two (7%) type II cases (pleuropulmonary adhesions); six (21%) type III cases (bullae/blebs less than 2 cm diameter); and 11 (38%) type IV cases (bullae >2 cm diameter). In the SSP group, one patient with chronic obstructive pulmonary disease (COPD) had bullosal apical malformation, and in the cystic fibrosis patients important deformations of the lung were observed. In one patient with lymphangioleiomyomatosis, numerous blebs were seen on the lung surface. No other lesions were observed.

Perioperative complications

All procedures were uneventful. There were no episodes of bleeding or lung laceration. There were no episodes of severe ventilatory (PETCO₂ >6 kPa (45 mmHg)) or oxygenation (SₐO₂ <90%) problems.

Table 2. – Results and complications of thoracoscopic talcage in PSP and SSP episodes

<table>
<thead>
<tr>
<th></th>
<th>PSP (n=31)</th>
<th>SSP (n=23)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of the procedure min</td>
<td>29±9</td>
<td>35±14</td>
<td>0.06</td>
</tr>
<tr>
<td>Immediate closure of air leaks n</td>
<td>29 (94)</td>
<td>17 (74)</td>
<td>0.06</td>
</tr>
<tr>
<td>Prolonged air leaks n</td>
<td>0 (0)</td>
<td>6 (26)</td>
<td>0.004</td>
</tr>
<tr>
<td>Duration of chest tube drainage</td>
<td>24.9±3.2</td>
<td>35.5±18</td>
<td>0.002</td>
</tr>
<tr>
<td>Pain n</td>
<td>28 (90)</td>
<td>10 (43)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Fever ≤38.5°C n</td>
<td>20 (65)</td>
<td>4 (17)</td>
<td>0.001</td>
</tr>
<tr>
<td>I.V. propacetamol n</td>
<td>28 (90)</td>
<td>10 (43)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Duration of hospitalization days</td>
<td>3.2±0.5</td>
<td>4.7±2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Follow-up months n</td>
<td>18.3±6.2</td>
<td>17.6±11.9</td>
<td>NS</td>
</tr>
<tr>
<td>Recurrence rate n</td>
<td>2 (6.5)</td>
<td>2 (8.7)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Values are presented as mean±SD, or as absolute number, and percentage in parenthesis, as appropriate. PSP: primary spontaneous pneumothorax; SSP: secondary spontaneous pneumothorax; NS: not significant.

Follow-up and recurrence rate

Mean follow-up was 18.3±11.6 months (range 2–36 months) in the PSP group, and 17.6±11.9 (range 2–36 months) in the SSP group (NS) (table 2). In two patients (a 20 year old male after 20 months, and a 25 year old female after 21 months), ipsilateral recurrence of PSP occurred (2 out of 31 episodes; 6.5%). At the second thoracoscopy, pleuropulmonary adhesions were present, preventing complete collapse of the lung (table 2). In two SSP episodes (8.7%) in one patient with lymphangioleiomyomatosis, early bilateral recurrences were seen after talcage.

Discussion

This prospective study compared the efficacy of thoracoscopic talc poudrage in patients with recurrent PSP and persistent SSP: talc poudrage, with electrocautery bleb coagulation when indicated, was equally efficient in achieving pleurodeses in both groups of patients. The mean overall recurrence rate in PSP after thoracoscopic talc poudrage is reported to be 7–9% [5, 8].
In some large series, recurrence rates even approach the results obtained by thoracotomy (2–5%) [5]. However, in most series, patients with PSP and SSP were included. In the (few) studies in which PSP patients only were included, no recurrences occurred after tacepoudrage [8]. Nevertheless, the recurrence rate of 6.5% in the present study in a purely PSP patient group can be considered equal to the data in the literature, taking into account the fact that these PSP patients probably had "more severe" disease, since only patients with recurrent SP were included. This is reflected in the macroscopic classification according to VANDERSCHUEREN [2]: although type I disease was equally present in the present group as compared to other series, we observed more type IV disease (38 versus 17–29%) [13]. In contrast with VANDERSCHUEREN [2], the type IV PSP patients in the present study were not older than the patients with PSP of other types.

Thoracoscopic talcage for the treatment of persistent SSP has been studied less than for PSP: in a few case reports and small retrospective series of "pure" SSP patients, thoracoscopic talcage appeared to be equally effective as in "pure" PSP series (recurrence rates 0 and 12%) [8]. Although no comparative studies are available, theoretically and empirically, thoracoscopic talc poudrage is considered to be safer as compared to more complicated (and time-consuming) thoracoscopic methods or thoracotomy for older patients with underlying lung disease and/or respiratory distress [5]. SSP, indeed, carries a significantly higher complication and mortality rate in patients suffering from underlying diseases, such as COPD and emphysema [14–16], tuberculosis [15, 17], cystic fibrosis [18], etc. as compared to PSP. Any pleurodesis technique, including thoracoscopic talcage should, therefore, be simple, effective, and free of major complications and side-effects.

The duration of the procedure was slightly, though not significantly, longer in the SSP group. The higher incidence of prolonged air leakage (26 vs 0%) and the longer postoperative chest tube drainage (and, therefore, hospital stay) can be explained by the more severe underlying pulmonary abnormalities in SSP patients. It is unclear, however, why SSP patients presented significantly less pain (43 vs 90%) and fever (17 vs 65%) requiring propacetamol as compared to PSP patients. Perhaps the longer presence of air and/or a chest tube in the pleural cavity in the SSP patients (at least 5 days, as compared to 1–2 days in the PSP group) may have reduced the sensitivity to pain of the parietal pleura, somewhat comparable to the lower incidence of pain that is observed after talcage for chronic pleural effusion [8].

The exact place of thoracoscopic talcage in the management of primary and secondary spontaneous pneumothorax remains to be determined by comparative, large scale, prospective studies in well-defined study populations. Efficacy, safety, cost, short-term and long-term complications, including the impact of talcage on subsequent thoracic surgery, are elements that should be included in such studies. However, when one considers pleurodesis in patients with persistent secondary spontaneous pneumothorax, this study provides ample evidence that thoracoscopic talcage is as effective and safe in secondary as in primary spontaneous pneumothorax patients.

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**References**