



Long-term follow-up of thoracoscopic talc pleurodesis for primary spontaneous pneumothorax

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ABSTRACT: The aim of the present study was to evaluate the long-term outcome of patients with primary spontaneous pneumothorax treated with talc pleurodesis.

A follow-up study was undertaken in all patients with primary spontaneous pneumothorax who underwent talc pleurodesis for prolonged air leak or recurrence using thoracoscopy.

In total, 112 patients underwent pleurodesis and follow-up data was obtained in 63 (56%) patients: 45 patients were available for clinical follow-up, 14 for telephone follow-up and four were dead. The causes of death were unrelated to the pleurodesis. There were no episodes of acute respiratory failure following pleurodesis. A total of 56 (95%) out of the cohort of 59 patients had a successful pleurodesis. Surgical pleurectomy was required in three (5%) patients for persistent air leak. Median duration of follow-up after talc pleurodesis was 118 months. Long-term success was observed in 53 (95%) out of 56 patients. Recurrent pneumothorax was observed in three (5%) out of 56 patients. Patients with successful talc pleurodesis had a median forced vital capacity (FVC) of 102% and median total lung capacity of 99% at follow-up. Comparing smokers and nonsmokers, the forced expiratory volume in one second (FEV₁) was significantly lower in smokers and there was a tendency for the FEV₁/FVC ratio to be lower in smokers.

Talc pleurodesis in patients with primary spontaneous pneumothorax *via* thoracoscopy is an effective procedure associated with normal lung function in patients who do not smoke.

KEYWORDS: Pneumothorax, talc, thoracoscopy

The incidence of spontaneous pneumothorax has been reported to be 16.7 cases·yr⁻¹ and 5.8 cases·yr⁻¹ per 100,000 individuals for males and females, respectively [1]. The reported incidence for primary spontaneous pneumothorax is 7.4 cases·yr⁻¹ and 1.2 cases·yr⁻¹ per 100,000 individuals for males and females, respectively [2]. Since primary spontaneous pneumothorax mostly affects young individuals it also represents a significant economic burden [3]. Guidelines for treatment of primary spontaneous pneumothorax exist from the British Thoracic Society and the American College of Chest Physicians, but are not followed uniformly since treatment protocols vary amongst various institutions [4–6]. Thoracoscopic talc pleurodesis under local anaesthetic has been shown to be safe, cost-effective and superior to conservative treatment by chest tube drainage in primary spontaneous pneumothorax that fail simple aspiration [7–9]. A previous report from the University Hospital Basel (Basel, Switzerland)

showed that when an air leak persists for >48 h, the probability of spontaneous resolution of the pneumothorax is low [10]. Therefore, the present authors advocate an invasive procedure when chest tube drainage has failed for >48 h in patients with primary spontaneous pneumothorax. Administration of a sclerosant agent *via* a chest tube has been suggested as an acceptable approach for pneumothorax prevention in patients wishing to avoid surgery and for those patients with increased surgical risk (*e.g.* severe comorbidity or uncontrollable bleeding diathesis) [5, 11, 12]. Success rates using tetracycline, minocycline, doxycycline and talc slurry are intermediate between those obtained with chest tube drainage alone and thoracoscopic treatment [11, 13, 14]. Medical thoracoscopy is performed in spontaneous pneumothorax as it allows talc poudrage and may reveal adhesions, blebs or bullae [15]. A recent Cochrane review on pleurodesis for malignant pleural effusions has revealed that the available evidence supports the need for chemical sclerosants for successful pleurodesis, the use of talc as the sclerosant of choice and

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thoracoscopic pleurodesis as the preferred technique for pleurodesis based on efficacy [16]. There was no evidence for an increase in mortality following talc pleurodesis [16].

There are very limited data about the effects of talc pleurodesis on lung function [15, 17]. LANGE *et al.* [17] have reported mild restrictive impairment and pleural thickening following talc pleurodesis for primary spontaneous pneumothorax. However, the talc pleurodesis technique, the type of talc used and the method of radiological quantification of pleural involvement are not described. Furthermore, the smoking status of the patients studied is unknown [17]. Therefore, the current follow-up study was undertaken in patients who had undergone talc pleurodesis *via* thoracoscopy under local anaesthetic and sedation for primary spontaneous pneumothorax who failed to resolve with chest tube drainage for >48 h or had a recurrence. The aim of the present study was to evaluate the long-term outcome, including symptoms, recurrence rate and lung function, in patients with primary spontaneous pneumothorax treated with talc pleurodesis.

PATIENTS AND METHODS

A follow-up study was undertaken to prospectively review all patients with primary spontaneous pneumothorax who underwent talc pleurodesis for prolonged air leak (>48 h) or recurrence using medical thoracoscopy at the University Hospital Basel over a 15-yr period. Contact was attempted with all patients by phone and/or letter. A questionnaire was administered, which included episodes of pneumothorax prior to talc pleurodesis, recurrence of pneumothorax after talc pleurodesis, smoking habits and a 10-point visual analogue scale for chronic chest pain. Plethysmography (Jaeger, Hoechberg, Germany) was performed in all patients who came for a clinical follow-up.

Talc pleurodesis was performed *via* single-port medical thoracoscopy under local anaesthetic and sedation with midazolam and analgesia with fentanyl or pethidine [18]. Talc pleurodesis was achieved by insufflating French sterile, asbestos-free graded talc (50% particles >10 µm). At the end of the procedure an intercostal drainage tube was inserted and suction was applied (-20 cmH₂O) for ≥48 h. Post-procedure analgesia consisted of opioids and/or nonsteroidal anti-inflammatory drugs.

Statistical analysis

Simple descriptive statistics were used [19]. The Mann-Whitney U-test was used to compare two continuous variables and the Chi-squared test for categorical variables. Data are presented as median (range). Lung function data in patients who underwent pleurectomy are presented separately to avoid potential influence to the study of the effect of talc pleurodesis.

RESULTS

In total, 112 patients underwent talc pleurodesis for recurrent primary spontaneous pneumothorax or for persistent air leak for >48 h with chest tube drainage during the study period. A follow-up could be obtained in 63 (56%) out of 112 patients. Four patients had died of unrelated causes. Contact could not be established in 49 patients due to geographical movement. A total of 14 patients only agreed for a telephone follow-up as they felt completely healthy and did not agree to come to the

hospital for lung function testing. The remaining 45 patients came for a follow-up clinic visit, completed a questionnaire and underwent a lung function test (fig. 1).

The median age at talc pleurodesis in contacted patients (n=59) was 29 (17–68) yrs and 45 patients were male. Talc pleurodesis was performed for recurrent pneumothorax in 40 (68%) patients, for persistent air leakage in 17 (29%) patients and in two (3%) patients wishing an immediate intervention for their first episode of primary spontaneous pneumothorax.

Small blebs/bullae <2 cm (Vanderschueren's classification type III or less) were found in 12 (20%) out of 59 patients [20]. These patients were treated with electrocoagulation in only four cases during the same thoracoscopy procedure (based on physician preference) coupled with talc pleurodesis. There were no episodes of acute respiratory failure following talc pleurodesis. A total of 56 (95%) patients had a successful pleurodesis and could be discharged without any further treatment. Surgical pleurectomy was needed in the remaining three (5%) patients for persistent air leak due to failed talc pleurodesis.

The median duration of follow-up after talc pleurodesis was 118 (15–192) months. Four patients died during the follow-up period due to unrelated causes (myocardial infarction, cardiac arrest, bronchogenic carcinoma in a smoker and AIDS). One patient developed seminoma, which was cured. In the 56 patients successfully treated with talc pleurodesis, long-term success was observed in 53 (95%) patients. Recurrent pneumothorax was observed in three patients at 2 and 12 months and 10 yrs, respectively, after talc pleurodesis and treated with surgical pleurectomy. All three patients were persistent smokers. One of these patients was diagnosed with catamenial pneumothorax.

Two out of the six patients who had either an unsuccessful talc pleurodesis or recurrent pneumothorax had presence of blebs/bullae, as visualised at thoracoscopy, compared with 10 out of the 53 patients with successful long-term talc pleurodesis

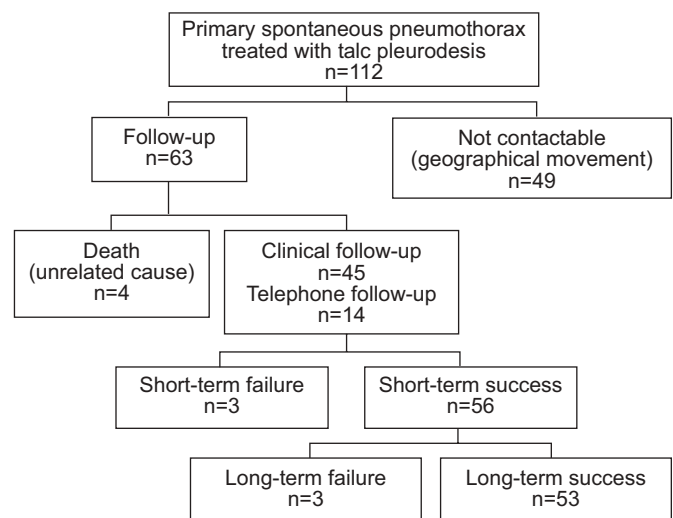


FIGURE 1. Analysis of patients with primary spontaneous pneumothorax treated with talc pleurodesis.

($p=0.696$). At follow-up, seven (12%) out of 59 patients were reported as having a pneumothorax on both sides during their lives. All these patients were treated with thoracoscopic talc pleurodesis in one lung. In the other lung the treatment modalities were thoracoscopic talc pleurodesis ($n=5$), pleurectomy ($n=1$) and intercostal drainage tube insertion ($n=1$).

Amongst the 38 patients who only underwent talc pleurodesis, 27 (71%) patients did not have any chronic chest pain (visual analogue scale (VAS) score 1), eight (21%) patients had a score of 2 and a VAS score of 3, 4 and 5 was present, respectively, in one patient each. In the remaining seven patients who underwent an additional pleurectomy, three patients did not have any chest pain, two patients had a score of 5, and a score of 4 and 7 were present, respectively, in one patient each. The seven patients who underwent surgical pleurectomy were all smokers.

Lung function data in patients with successful talc pleurodesis and those undergoing pleurectomy are presented in table 1. A total of 33 (73%) patients were smokers at the time of pneumothorax and 28 (62%) patients at the time of follow-up. Seven patients had stopped smoking and two nonsmokers at the time of pneumothorax had started to smoke. At follow-up, the median (range) smoking was 14 (1–80) pack-yrs. The comparison of lung function values amongst smokers and nonsmokers excluding patients with pleurectomy are presented in table 2. There was a significant reduction in forced expiratory volume in one second (FEV₁) in smokers. Two patients (smokers) had a mild reduction in total lung capacity (TLC) to 79%. Seven patients, who were all smokers (30 (12–80) pack-yrs), had a reduction in diffusing capacity of the lung for carbon monoxide to <80%.

DISCUSSION

The findings of the present study show that thoracoscopic pleurodesis using graded talc for the management of primary spontaneous pneumothorax is associated with a good long-term success rate not affecting lung function in nonsmokers.

Pneumothorax recurrence prevention procedures are typically used for the second episode of pneumothorax or for patients with persistent air leaks following chest tube drainage [5]. All patients in the current study presented these indications,

TABLE 1 Lung function parameters in patients with successful talc pleurodesis and pleurectomy

	Talc pleurodesis	Pleurectomy
Subjects n	38	7
FEV₁ %	99 (68–126)	95 (68–120)
FVC %	102 (73–137)	95 (62–127)
FEV₁/FVC	77 (47–95)	80 (62–89)
TLC %	99 (79–134)	94 (81–113)
DL_{CO} %	99 (49–148)	102 (47–149)

Data are presented as median (range), unless otherwise stated. FEV₁: forced expiratory volume in one second; FVC: forced vital capacity; TLC: total lung capacity; DL_{CO}: diffusing capacity of the lung for carbon monoxide.

TABLE 2 Comparison of lung function parameters in smokers and nonsmokers at follow-up

	Smokers	Never-smokers	p-value
Subjects n	28	10	
FEV₁ %	95 (68–126)	108 (77–123)	0.0324
FVC %	101 (79–137)	100 (73–135)	0.9104
FEV₁/FVC	74 (47–95)	84 (68–92)	0.0853
TLC %	101 (79–134)	96 (83–122)	0.3966
DL_{CO} %	96 (47–148)	104 (83–140)	0.2738

Data are presented as median (range), unless otherwise stated. FEV₁: forced expiratory volume in one second; FVC: forced vital capacity; TLC: total lung capacity; DL_{CO}: diffusing capacity of the lung for carbon monoxide.

except in two cases where the patients preferred to have thoracoscopic talc pleurodesis for their first un-complicating episode of pneumothorax [10]. There is very good consensus for thoracoscopy to be used as the preferred intervention for preventing pneumothorax recurrence [5]. In the present study, the long-term success rate in preventing pneumothorax recurrence after a successful thoracoscopic talc pleurodesis was 95% at a median follow-up of 10 yrs. Pneumothorax recurrence after thoracoscopic talc pleurodesis was observed in only three patients, all of whom were smokers. One of these patients was diagnosed to have catamennial pneumothorax [21]. Increased pleural fibrinolytic activity after talc pleurodesis has been reported to be associated with failure of pleurodesis [22]. However, this was not assessed in the present study. If there are blebs or bullae >2 cm, then these are best treated with surgical resection. However, recurrent pneumothorax after talc pleurodesis was not associated with the presence of blebs or bullae <2 cm, as visualised at thoracoscopy. All three patients with pneumothorax recurrence after talc pleurodesis were successfully treated with surgical pleurectomy. Hence, surgical pleurectomy should be considered for patients with recurrent pneumothorax after talc pleurodesis.

Mild restrictive impairment of lung function has been reported in patients with primary spontaneous pneumothorax treated with talc poudrage with a mean TLC of 89% [17]. In another study, which comprised both primary and secondary spontaneous pneumothorax, mild restriction was reported in the early months following talc pleurodesis but this improved 12 months post-procedure [23]. In the present study, patients who only received talc pleurodesis had a median forced vital capacity (FVC) of 102% and median TLC of 99% at the follow-up study visit. Comparing smokers and nonsmokers, FEV₁ was significantly lower in smokers and there was a tendency for FEV₁/FVC ratio to be lower in smokers (table 1). These findings clearly show that patients treated with thoracoscopic talc pleurodesis who are not smokers have normal lung function at a median follow-up of 10 yrs (table 1).

In conclusion, talc pleurodesis in patients with primary spontaneous pneumothorax using graded asbestos-free talc *via* thoracoscopy under local anaesthetic and sedation is an effective procedure associated with normal lung function in patients who do not smoke.

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