Video-assisted thoracoscopic management of recurrent primary spontaneous pneumothorax after prior talc pleurodesis: a feasible, safe and efficient treatment option

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Abstract

Objective: To assess the role of video-assisted thoracoscopic surgery (VATS) in the management of a recurrent primary spontaneous pneumothorax after a prior talc pleurodesis. Methods: From 1996 to 2002, we retrospectively reviewed all patients who were treated for a recurrent primary spontaneous pneumothorax after a previous talc pleurodesis. Data on the talc procedure and the recurrent pneumothorax, delay between both, and operative features were studied. Conversion rate to a thoracotomy and postoperative complications as well as long-term outcome were reported. Results: We collected 39 patients (28 male) with a median age of 25 years (15–41 years). The initial procedure consisted of thoracoscopic talc poudrage in all cases. The median delay between the talc procedure and the recurrence was 23 months [10 days–13 years]. Size of recurrence involved 10–80% of the hemithorax. The VATS procedure was successfully achieved in 27 patients (69%) while 12 required conversion to a thoracotomy. The main cause for conversion was the presence of dense pleural adhesion at the mediastinal part of the pleural cavity. Postoperative morbidity was limited to pleural complications in the VATS group (6; 22%). Median follow-up was 26 months [10–38 months]. One patient treated by VATS developed a partial recurrent pneumothorax at 12 months with a favorable outcome without further surgery. Conclusions: Feasibility, safety and efficacy of VATS for management of recurrent primary spontaneous pneumothorax following thoracoscopic talc poudrage are strongly suggested.

Keywords: Video-assisted thoracoscopic; Talc poudrage; Pneumothorax; Recurrence; Thoracotomy

1. Introduction

Talc poudrage by medical thoracoscopy through a single chest port under local anesthesia and sedation, is a safe and cost-effective alternative technique to surgery for preventing recurrences in the case of primary spontaneous pneumothorax [1]. This method pioneered a minimally invasive approach of this benign condition, with a success rate of approximately 97%, and a recurrence rate of 5–9% in the long-term follow-up [2].

There is still a debate on the best surgical approach to treat pneumothorax, but minithoracotomy with pleurectomy remains the gold standard in terms of efficiency, with a substantial morbidity however [3]. Video-assisted thoracoscopic surgery (VATS) with multiple chest ports allows wide visualization of the pleural space for the resection of bullae and pleurodesis, and is thus used liberally since the early 90’. In clinical practice, VATS tends to challenge medical thoracoscopy, with which it shared a similar rate of failure at the beginning of the experience with recurrence rates of about 5% [3–6].
Due to the widespread availability and acceptance of minimal-access technology, both endoscopic methods have become the most used procedures in the treatment of spontaneous pneumothorax with time. However, few data exist on whether patients suffering from failures should undergo an open or thoracoscopic redo procedure [7,8]. In one hand, adhesions are well known and sometimes firm limitations to any endocavitary surgery. On the other hand, morbidity of thoracotomy, especially in the setting of a benign condition, leads to consider a less invasive procedure. The present study focuses on the role of VATS for the management of recurrent spontaneous primary pneumothorax following a prior talc poudrage performed under medical thoracoscopy.

2. Materials and methods

From January 1996 to June 2002, 51 patients were admitted at our department of thoracic surgery for a recurrent spontaneous primary pneumothorax following talc pleurodesis. It was not possible to report the exact rate of recurrence during the same period because patients were referred from different institutions. However pneumologists from our institution published a 5% rate in 1995 [9]. Three presented with a partial pneumothorax that was successfully managed with chest tube drainage, and those patients did not receive further pleurodesis. At the beginning of the study period, 9 patients underwent a thoracotomy as the primary surgical option, with the belief that pleural adhesions due to talc pleurodesis would represent a firm technical obstacle to a minimally invasive approach. Intraoperative findings at open surgery suggested that VATS would have been applicable in some of these patients. The material of this study consists of the further 39 patients in whom a primary VATS management was attempted routinely. We looked at the characteristics of the previous talc pleurodesis, the delay between the talc procedure and the recurrence and the size of recurrence. The size was established accordingly the Light index (i.e. \( [1 - \frac{L^3}{H^2}] \times 100 \)) [10].

All VATS procedures were performed under general anesthesia using single lung ventilation. Complete adhesiolysis, careful lung inspection and air leak detection were systematically carried out. Air leak treatment and blebs or bullae resection were performed with the use of endoscopic staplers. Pleural abrasion or parietal pleurectomy always completed the procedure. Both of these technique were designed to obliterate the pleural space by creating symphysis between the two pleural layers or between the visceral pleural and subpleural plane, in the case of parietal pleurectomy. Finally, leaking areas were checked out with saline immersion and two 28F-chest tubes were inserted.

Needs for a conversion to a thoracotomy, perioperative morbidity and mortality and patients follow-up were noted. All patient data were reviewed retrospectively. Patients were followed at the outpatient clinic, with a physical examination and a chest X-ray. A complete follow-up was achieved and no patient was lost to follow-up.

For the statistical analysis, the chi-square test was always used because all expected frequencies were greater than or equal to 5.

3. Results

Thirty-nine patients were operated on using VATS for a recurrent primary spontaneous pneumothorax following talc pleurodesis. Twenty-eight patients were male (72%) and 11 were female (28%), with a median age of 25 years (ranging from 15 to 41 years).

The management of previous talc procedure was always performed by a pulmonologist, in patient under general anesthesia with spontaneous breathing, and consisted of talc poudrage. Asbestos-free calibrated talc was used and the dosages of insufflated talc ranged from 1.5 to 3 g. Neither bullae ligation, coagulation, or excision nor pleural abrasion were done at that time. It was not possible to have precisely information concerning the initial staging of pneumothorax after medical thoracoscopy (Vanderschureen classification).

The median delay between talc pleurodesis and recurrent pneumothorax was 23 months (ranging from 10 days to 13 years). Light indexes of recurrent pneumothoraces ranged from 10 to 80% of the hemithorax (mean 50%). VATS procedure was successfully completed in 27 patients (69%) while 12 patients (21%) needed a conversion to open thoracotomy. All these conversions occurred in the early phase of the study. Mean operative time was 82 ± 25 min (range 55–150) for VATS population and 91 ± 14 min (range 7–120) for converted VATS thoracotomy population (including the duration of VATS as the primary surgical option). The review of the operative reports identified dense pleural fusion at the level of the mediastinum as the main cause of conversion. Surgical details are given in Table 1. A pleurectomy was preferentially used when we had to free the lung in the subpleural plane relating to the presence of dense pleural fusion between the pulmonary parenchyma and the parietal pleura. Moreover talc poudrage procedure was added in few cases. Each time the application of this procedure concerned the lower part of the pleural cavity for

<table>
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<th>Surgical techniques with surgical approaches</th>
<th>VATS, ( n = 27 ) (69%)</th>
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<td>Plural abrasion (blebs or bullae stapling)</td>
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<td>4 (4)</td>
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VATS, video-assisted thoracoscopic surgery.
patients in whom the recurrent pneumothorax occurred exclusively at this location.

Macroscopic staging at surgery carried out 31 patients with blebs or bullae. All were resected using lung staplers, whatever their size. It was not possible to determine the causes of recurrences. The feasibility of VATS was not influenced by the delay between the two interventions (less [76%] versus more than 3 years [57%]; \( P = 0.2 \)) or the size of recurrence (less [65%] versus more than 50% [73%]; \( P = 0.5 \)). There was no operative complication. Postoperative complications are summarized in Table 2. Among the 2 patients who developed a hemothorax following VATS, 1 required reoperation performed through an open thoracotomy whereas a conservative treatment was successfully performed in the other case. One patient required blood transfusion (3 packs). Patients who experienced prolonged air leak or partial recurrence after chest tube removal did not need further surgery. Mean duration of hospital stay from the operation was 8.3 days, compared to 5.1 days for patients in whom the recurrent pneumothorax occurred exclusively at this location.

The feasibility of VATS was not influenced by the delay between the two interventions, nor by the size of recurrence. Whether or not, blebs or bullae present at the time of the talc poudrage, and their presence might have been involved in the pathogenesis of spontaneous pneumothorax occurring without any underlying lung disease remains unclear, and there is no proof that the air leak leading to air escape into the visceral pleura is located in blebs or bullae visualized during the procedure. Therefore we do not have any evidence that blebs or small bullae cauterization or resection adds any further benefit to pleurodesis. However, as surgeons, we do continue to resect such lesions, at least because it gives the occasion to perform a lung biopsy and to disclose pathologically an underlying lung disease in nearly 8% of the cases.

4. Discussion

Recent published data allow to estimate at 8% the recurrence rate following talc pleurodesis for spontaneous pneumothorax [1,2,11]. These patients are usually referred to the surgeon, anticipating that open surgery will be unavoidable.

In this study we demonstrate that VATS redo pleurodesis following thoracoscopic talcage is feasible in nearly 70% of the cases, and can achieve good short- and long-term results with no intraoperative hazards and a low postoperative complication rate.

To the best of our knowledge, only one previous study dealt specifically with that issue. Cardillo et al. reported on 19 patients with a recurrent spontaneous pneumothorax following various VATS pleurodesis procedures performed at their institution, and having required a surgical management. Recurrences were treated by redo-VATS in 15 patients, and standard thoracotomy in four patients. Four additional redo-VATS were performed in four patients previously operated on in other institutions that their own. Among these 19 cumulated patients, 18 (94.7%) were successfully treated with VATS without complication or recurrence [8]. In contrast, our conversion rate to standard thoracotomy was 31%. One of the possible explanations of that discrepancy may be the fact that only 6 of their patients had a talc pleurodesis as primary treatment. Indeed, Cardillo et al. stated that the rate of pleural adhesions was higher following talc poudrage than pleurectomy in their series. In our experience, the main technical limitation was the presence of dense pleural adhesions between the lung and the mediastinal pleura, with the inherent fear to injury the heart, great vessels or phrenic nerves. The other relevant feature was related to the learning curve. Most conversions, especially those due to pleural fusion between the lung and the parietal pleura, occurred at the beginning of our experience. With time, we learnt to free the lung in the subpleural plane thoracoscopically, as it is customarily done through an open approach.

Other variables did not seem to have any clinical relevance. The incidence of dense adhesions was not influenced by the delay between the two procedures, nor by the size of the recurrence.

In our study, 31 of 39 patients underwent blebs or bullae stapling. It was not possible to state how many patients had blebs or bullae present at the time of the talc poudrage, and if their presence might have been involved in the pathophysiology of the recurrence. Whether or not, blebs and bullae should be removed at the time of the primary treatment remains an unresolved issue. Indeed, pathogenesis of spontaneous pneumothorax occurring without any underlying lung disease remains unclear, and there is no proof that the air leak leading to air escape into the visceral pleura is located in blebs or bullae visualized during the procedure. Therefore we do not have any evidence that blebs or small bullae cauterization or resection adds any further benefit to pleurodesis. However, as surgeons, we do continue to resect such lesions, at least because it gives the occasion to perform a lung biopsy and to disclose pathologically an underlying lung disease in nearly 8% of the cases [12].

Finally, postoperative complication rate after VATS for recurrent primary spontaneous pneumothorax following talc pleurodesis reached 22% in the present study, a higher rate than previously reported [4–6,8]. Any relevant comparison remains hazardous since publications dealing with VATS and recurrent spontaneous primary pneumothorax available to date, report none or only few patients with a prior talc pleurodesis. Most of these complications were minor, but hemorrhage dominated the spectrum of possible major complications, whatever the surgical approach. This last feature is of concern regarding the potential risks of transmitted infectious disease when blood transfusions are required.
Thus, our study strongly suggests that VATS is feasible in the management of recurrent primary spontaneous pneumothorax following thoracoscopic talcage. In turn, VATS should not be systematically denied any longer in that setting, because it provides an effective treatment in up to two third of patients. Such minimally invasive carries the hope of shortened hospital stay, cosmetic benefits, reduction of chronic pain and perhaps costs as it has been widely demonstrated for the primary management of spontaneous pneumothoraces [3,4,6,13]. Obviously, these aspects could not be addressed because of the retrospective design of our study. The most stringent finding relied to the main cause for conversion of the VATS procedure in an open one, that bring some new information for pneumologists using talc pleurodesis: the mediastinal aspect of the pleural cavity ought to be spared from talc poudrage.

References