Long-term lung function following videothoracoscopic talc poudrage for primary spontaneous recurrent pneumothorax

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Abstract

Objective: Some concern still exists regarding long-term lung function following videothoracoscopic talc poudrage for primary spontaneous pneumothorax (PSP). We evaluated lung function at 5 years in a series of 100 patients surgically treated for PSP.

Methods: Out of 1065 patients treated for PSP by means of videothoracoscopic talc poudrage from September 1995 to January 2006, we consecutively enrolled 50 patients (33 males, 17 females, mean age: 24.22 years, median age: 24 years; range: 13—40 years) (group A) with no recurrence for functional evaluation with measurement of static and dynamic volumes (FEV1—FVC—TLC—RV), and DLCO at 60 months after surgery. Fifty patients (35 males, 15 females, mean age: 23.56 years; median age: 22.5 years; range: 16—37 years) underwent same pulmonary function tests 5 years after simple drainage for recurrent PSP because of refusal of surgery (group B).

Results: Pulmonary function tests showed (mean % value ± SD for group A vs group B): FEV1 93 ± 6.6 versus 95.4 ± 6.4; FVC 98 ± 6.5 versus 100.1 ± 6.9; TLC 91.7 ± 7.7 versus 94.36 ± 5.8; RV 97 ± 7 versus 99.2 ± 4.9; DLCO 91.4 ± 2.8 versus 91.98 ± 4.2. No patient in both groups showed FEV1 < 80%. Analysis of mean difference of pulmonary function values was computed between group A and group B patients.

Conclusions: No statistically significant differences in long-term lung function have been found between patients treated with pleural drainage only versus patients treated with videothoracoscopic talc poudrage for PSP. Lung function is not impaired by videothoracoscopic talc poudrage.

Keywords: Spontaneous pneumothorax; Talc poudrage; Lung function; Videothoracoscopy

1. Introduction

In the treatment of primary spontaneous pneumothorax (PSP) videothoracoscopic talc poudrage shows a very high success rate with a low morbidity rate, a short in hospital stay, a fast recovery and an excellent cosmetic result [1—5]. Some concern still exists regarding long-term lung function following videothoracoscopic talc poudrage for recurrent PSP even if there are no scientific data confirming such attitude. We evaluated lung function at 5 years in a series of 50 patients surgically treated for recurrent PSP by videothoracoscopic talc poudrage and compared such results with a series of 50 patients treated by simple chest drainage for the same disease.

2. Materials and methods

From September 1995 to January 2006 1065 patients were treated for recurrent PSP by means of videothoracoscopic talc poudrage at the Unit of Thoracic Surgery, Carlo Forlanini Hospital in Rome. Out of these we consecutively enrolled 50 patients (33 males, 17 females, mean age: 24.22 years, median age: 24 years; range: 13—40 years) (group A) with no postoperative recurrence in order to submit them to functional evaluation with measurement of static and dynamic volumes (FEV1—FVC—TLC—RV), and DLCO at 60 months after surgery. Additional 50 patients (35 males, 15 females, mean age: 23.56 years, median age: 22.5 years; range: 16—37 years), treated in the same period by means of simple chest drainage for recurrent PSP because of refusal of surgery, underwent same pulmonary function tests at 60 months after drainage (group B). In both groups patient’s selection was based on the following clinical features: (1) non-smokers, (2) aged less than 40 years old and (3) no evidence of cardiovascular disease. Patients’ data are shown in Table 1. Indications for surgery are shown in Table 2.
Table 1

<table>
<thead>
<tr>
<th>Patients characteristics</th>
<th>Group A</th>
<th>Group B</th>
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<tr>
<td>Sex</td>
<td>Male</td>
<td>33</td>
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<tr>
<td></td>
<td>Female</td>
<td>17</td>
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<tr>
<td>Age (years)</td>
<td>Mean</td>
<td>24.22</td>
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<td></td>
<td>Median</td>
<td>24</td>
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<td></td>
<td>Range</td>
<td>13—40</td>
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<td>Total patients</td>
<td></td>
<td>50</td>
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Table 2

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<tr>
<th>Indications for surgical treatment</th>
<th>Group A</th>
<th>Group B</th>
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<tr>
<td>2nd episode</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td>3rd episode</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>1st episode with prolonged air leak</td>
<td>7</td>
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All operations in group A were performed with the patient under general anaesthesia using double-lumen endotracheal Carlens tube and one-lung ventilation. The patient was placed and prepared as for a posterolateral thoracotomy. The first incision was always placed below the tip of the scapula in the fifth or sixth intercostal space. A 0-degree, 10 mm/5 mm videothoracoscope was introduced through a thoracoport. One or two other thoracoports were placed under endoscopic guidance. Carbon dioxide was never necessary to enlarge the spontaneous pneumothorax. The lung was inspected during gentle ventilation with saline in the pleural cavity to detect blebs/bullae and air leaks.

Blebs/bullae were treated by minimal wedge resection with the endoscopic stapler (SCB 45, Ethicon Endosurgery, Cincinnati, Ohio). In case of minimal air leak or bleeding along the suture line, fibrin glue was used (Tissucol; Baxter, Deerfield, Mass). Talc poudrage was accomplished by nebulization in the pleural cavity of 2 g of asbestos-free sterilized talc, according to the Italian standards (Farmacopea Italiana Ufficiale): length of fibers <50 μm.

All procedures in group B were performed under local anaesthesia.

The research was approved by the Institutional Review Board of Carlo Forlanini Hospital and informed consent was obtained from each patient.

All data were collected prospectively. Data were reported as mean ± standard deviation for each sample. For comparison of mean difference two-sided Student’s t-test was performed by using NCSS 2004 software programme (Number Cruncher Statistical Systems, Kaysville, Utah). We have also computed 95% CI for mean differences. A p value of 0.05 was considered to be significant.

3. Results

There were no postoperative (30 days) deaths in both groups. No intraoperative complications were reported. No patient required blood transfusion.

In group A videothoracoscopic findings showed: 22 patients (44%) with no endoscopic abnormalities (stage I of Vanderschueren’s classification [6]), 19 (38%) patients with pleuropulmonary adhesions without blebs/bullae (stage II of Vanderschueren’s classification), and 9 patients (18%) with blebs or bullae less than 2 cm (stage III of Vanderschueren’s classification). According to our previously published protocol in Vanderschueren’s stages I and II (41 patients) a videothoracoscopic talc poudrage only was performed; stage III patients (9 cases) underwent stapling of the bullae plus talc poudrage. Complication rate was null in group A, and 22% (11/50 cases) in group B: all 11 patients experienced prolonged air leak (>5 days). Mean time to removal of chest tube was 4.4 days (4—9 days) in group A and 6.5 days (6—11 days) in group B. Mean hospital stay was 5.2 days (4—11 days) in group A and 7.1 days (6—14 days) in group B.

All patients in both groups were included in the follow-up. Follow-up was based on clinical examination, chest radiogram at 1, 3 and each 12 months from surgery and pulmonary function tests at 60 months after surgery. Mean follow-up time was 68.06 months (median: 66.5 months, range: 60—108 months). No patient experienced recurrence of pneumothorax in group A. In group B (simple drainage), six patients experienced recurrence of pneumothorax and underwent redo-drainage (four patients) and bed rest (two patients). Pulmonary tests are presented in Table 3. No patient in both groups showed FEV1 <80%.

4. Discussion

Primary spontaneous pneumothorax is a benign disease occurring mostly in young males. There is no consensus on the treatment. Most of authors [7] prefer simple drainage in case of first episode of PSP and reserve surgery for recurrent PSP. Among the choice of surgical procedure, the great majority of the last reported papers [2,3,8—10] favour the minimally invasive VATS approach, even if comparing randomized trials [11—13], VATS can only be associated with shorter length of hospital stay or use of pain medication than thoracotomy with a comparable complication profile and success rate [14]. An obvious better cosmetic result has also been claimed by

Table 3

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<th>Pulmonary function mean values ± SD and statistical analysis of means differences with 95% confidence intervals between group A and group B</th>
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<td>Mean ± SD, Group A</td>
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<tr>
<td>FEV 1</td>
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<tr>
<td>FVC</td>
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<td>TLC</td>
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<td>DLCO</td>
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most authors [15]. In the light of our previous reported experiences [5,15,16] we believe VATS to be an excellent technique for the treatment of recurrent and complicated PSP, with a high success rate (98.27%) and a very low morbidity rate (3.36%), and talc poudrage to be the preferred tool for inducing pleurodesis. Some authors [17] have claimed concern regarding the use of talc in young patients. As regards as the risk of ARDS, our large reported experience [4] (861 patients treated in a 9-year period) has not reported such complication and very few cases have been reported in the world literature. As regards as the possibility of empyema, with the use of sterile talc the risk should approach zero as long as aseptic technique is employed [1]. The functional outcome of patients treated by talc poudrage up to now has been only addressed in an old paper by Lange [19]: the authors reported only a long-term (22—35 years) mild restrictive respiratory impairment.

In the present experience we have compared long-term (5 years) respiratory function in a series of 100 patients with primary spontaneous recurrent pneumothorax treated with videothoracoscopic talc poudrage (50 patients, group A) or with simple chest drainage (50 patients, group B). The different treatment was only due to refusal of surgery. Patients characteristics (sex, age, smoking habits) were identical in both groups.

The overall functional status was excellent in all patients: no single patient showed FEV1 less than 80%, and the mean values were over 90% in all tests (Table 2, Fig. 1). The homogeneity of the series is guaranteed by the same surgical outcome of the two groups. The difference between group A and group B (p value): FEV1 (p: 0.07), FVC (p: 0.1), TLC (p: 0.06), RV (p: 0.07) and DLCO (p: 0.4). These statistical results have also been confirmed by 95% CI for mean differences: FEV1 (−5.0; 0.20), FVC (−4.8; 0.52), TLC (−5.3; 0.13), RV (−4.6; 0.22), DLCO (−1.9; 0.89). The long-term functional results stress the safety of talc poudrage compared with a simple chest drainage. Most of the reported concern against talc in spontaneous pneumothorax is anecdotal and not based on a clinical evidence.

In conclusion no statistically significant differences in long-term lung function have been found between patients treated with pleural drainage only versus patients treated with videothoracoscopic talc poudrage for PSP. Lung function is not impaired by videothoracoscopic talc poudrage.

References

Appendix A. Conference discussion

Dr A. Oliaro (Torino, Italy): In our institution we like pleural abrasion in pneumothorax recurrence. We don’t like talc poudrage. We like talc poudrage only in neoplastic effusion. What do you think about this problem?

Dr Cardillo: I understand your concern, but when you deal with young people, you should only offer to the patient clinical data which is evidence-based data. Regarding talc poudrage only an attitude against talc has been found in the literature: There is no scientific data. If you compare pleural abrasion, it’s a very good operation, I’m sure, but if you read the abstract by Rena et al. which has been printed in September 2006 issue of Interactive Cardiovascular and Thoracic Surgery, around 2–3% hemothorax is found after pleural abrasion, and it’s not a light complication, but if you compare with pleurectomy, the hemothorax goes up to around 10%. I think this is a complication. If you have a concern regarding reentering the chest after talc poudrage, as many people say, in our experience, and we have a large experience in our institution, we have successfully done rethoracoscopy following talc poudrage. It has been done and I think it is possible in experienced hands. I think that maybe you cannot be in agreement with me, and, of course, everybody has its own opinion, but you have to stress clinical-based data to the patient when you choose an operation. I offer talc poudrage to the patient and I say to the patient that we have no risk from an oncological point of view, from infection, from long-term lung function. I stress the data to my patients, and they say, ‘Yes’. Some surgeons offer pleural abrasion. There are no randomized trials comparing these two techniques, but the data I have got, and we have a good experience, favour talc poudrage. So I prefer this technique. Of course you can use pleural abrasion, a lot of surgeons use it, but I want to stress that there is no clinical evidence-based data against talc poudrage.

Dr T. Grodzki (Szczecin, Poland): This is an excellent study, but I have some doubts. First of all, there are relevant data, even in the journal published by Dr Oliaro, regarding long-term function following pleurectomy, not the talc poudrage, but I’m doubtful about your methodology, because if you measure it only once 60 months after surgery, you have no point of comparison. You should measure it 1 month after surgery, 12 months after surgery, and so on, otherwise single-measure spirometric values are useless.

Dr Cardillo: In doing our follow-up protocol, we follow up patients at 1, 3 and 6 months after surgery with clinical interview and chest X-ray. Your question is why we don’t perform functional tests at 1, 3, 6, 12. First of all, you deal with young people and you have to push these people to do spirometry. Furthermore, in an unpublished study, we have seen that afterwards, following surgery, in the first months following talc poudrage, there is a high inflammatory response to talc poudrage that has been confirmed by scintigraphy. We have chosen to do spirometry after 5 years, and we have not found the inflammatory response that’s very high short after the operation and we have the long-term results, what we need to know. In the first months following surgery, of course there is some inflammatory reaction, but we want to know the long-term situation.

Dr O. Linchevsky (Kiev, Ukraine): I suppose it would be more correct to compare different types of induction of pleurodesis, for example, talc poudrage and the use of biological glues or other chemical agents. What do you think about this?

Dr Cardillo: This is a good idea, but we have only done this study with talc poudrage. We have not performed added trials with glue or with chemical agents. We have no experience with glue as pleurodesis.

Dr W. Klepetko (Vienna, Austria): I have a word of concern about the broad recommended use of talcum. This is based on experiences in our own department. We have seen one patient with malignant effusion who received talcum poudrage and on the same day went into multiple organ failure. The reason was found at autopsy, where talcum was found in almost all of the parenchymal organs. So there is definitely room for talcum entering into the vascular system and getting spread all over the organs. The second observation that we had was in patients with a combination of lymphangioliomyomatosis who had received talcum poudrage before, and I have to tell you that at the time of transplantation there were enormous adhesions with an enormous amount of vessels growing into the lung itself, raising enormous difficulties for the surgery. So I think you should be very careful in using that in that kind of patient.

I have two short questions. How did you select 50 patients out of the 1050 patients all together? What were the criteria? Secondly, have you looked at the diaphragmatic function? It is well-known that talcum, especially on the diaphragm, can result in disturbances in the movement. Can you tell us something about that?

Dr Cardillo: The first question is regarding why we chose 50 patients out of 1065. It represents 5%. If you go to the paper, we have selected nonsmoking patients. Most of the patients with pneumothorax are smokers. We have selected nonsmoking. Why? Because some people after pneumothorax stop smoking and other people do not stop smoking, and it can have a role, a bias for the recurrence rate. Some people did not accept doing our spirometry. So the selection was due to random criteria; it was a difficult task to find 50 people able to come back and do spirometry. Regarding the diaphragmatic movement, we have not done any study.

Dr E. Rendina (Rome, Italy): My comment partially echoes the one from Walter Klepetko. There certainly must be a bias if you tested only 50 patients out of 1000. I understand how difficult it is to convince patients to come back to have this spirometry, especially if they are healthy patients in the young age group, but certainly you must consider that there is a bias in this age group. And another thing, I know about the study that the pneumonologists are running about talc poudrage, but we have to consider that study with a lot of suspicion because they do talc poudrage and they don’t do pleural abrasion or pleurectomy, so we have to be very careful about the results that will come from that study.