Video-assisted thoracoscopic surgery for the treatment of primary pneumothorax: talc pleurodesis or pleural abrasion? Retrospective multicentre study

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Abstract

In the treatment of primary spontaneous pneumothorax (PSP) the latest guidelines recommend video-assisted thoracoscopy, but do not specify the best technique for performing pleurodesis. Indeed, there are no clinical trials comparing the effectiveness of talc pleurodesis, mechanical pleurodesis and pleurectomy. Our objective was to compare outcomes in patients who underwent surgery for primary pneumothorax with the talc procedure or with pleural abrasion using dry gauze. Patients undergoing video-assisted thoracoscopic surgery for PSP in two hospitals were retrospectively recruited between 2007 and 2008, and followed-up until December 2010. The variables measured to compare the outcomes were: recurrence, complications, and mortality, as well as the duration of air leaks and of drainage and the length of postoperative hospital stay (in days). Statistical analysis: The two groups were compared using the Chi square test for qualitative variables and non-parametric tests for continuous variables. A total of 106 interventions were carried out in 104 patients (74 in group A: pleural abrasion with dry gauze; 32 in group B: chemical pleurodesis with talc), with a mean age of 28 years (median 25) and 85.6% were male. Complications were observed in nine patients (8.5%) and there were no deaths in the 30 days after surgery; there were, however, four cases of recurrence (3.8%). The mean air leak duration was 0.78 days (median 0), the mean drainage duration 1.95 days (median 1) and the mean length of postoperative hospital stay 2.68 days (median 2). In 74 cases (69.8%), mechanical pleurodesis was performed, while 32 cases were treated with talc (30.2%). Comparing the two groups, we did not find statistically significant differences in recurrence (4.1% vs 3.1%, P=0.82), complications (6.8% vs 12.5%, P=0.45) or mortality (no cases of death). On the other hand, the mean postoperative hospital stay was lower in the mechanical pleurodesis group than in the talc group (2.2 *vs* 3.8 days, P=0.005). Video-assisted surgery in the treatment of PSP is a safe technique. In the mechanical pleurodesis group, we observed the same rate of recurrence, half the number of complications and a shorter hospital stay. We consider it necessary that well-designed multicentre clinical trials be carried out to compare these techniques and determine which produces the best outcomes, providing stronger scientific evidence given that the data available to date are not conclusive.

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Introduction

The treatment of pneumothorax is based on two key elements: resolution of the acute event and prevention of recurrences. There are different approaches to the resolution of acute events:[1,2] observation, puncture and aspiration, and pleural drainage. To prevent recurrences, apart from changing unhealthy habits such smoking, there are cases in which surgery is indicated. Internationally accepted indications for surgery include: recurrence (on the same or the other side), prolonged air leaks, presence of haemopneumothorax, tension pneumothorax and being in an at-risk group (air pilot, diver, etc.).[3,4] Some authors recommend surgery in patients with pneumothorax and bullae more than 2 cm in diameter,[5] and there are even groups that operate after the first episode when patients have not responded well to puncture and aspiration.[6] After various publications discussing the best surgical approach, thoracotomy versus video-assisted thoracoscopic surgery (VATS),[7-9] current guidelines[1,3,4] agree on recommending the use of VATS. These recommendations are based on several recent meta-analyses,[7,9] which conclude that VATS is the best available therapeutic option, despite a slightly higher rate of recurrence (4% for VATs compared to 1% for thoracotomy), as it is less invasive and associated with a smaller decrease in lung capacity and better air exchange, leaving the use of thoractomy for cases of recurrence after VATS.

The objectives of VATS include, on the one hand, stapling the subpleural blebs and bullae at the apex of the lung, and on the other hand, performing pleurodesis to achieve adhesion of the visceral and parietal pleura in order to prevent recurrence. To date there is no consensus on which should be the technique of choice for this second part, to achieve the best outcome.[10-12] Our objective was to analyze outcomes in patients undergoing surgery for primary spontaneous pneumothorax (PSP), comparing chemical pleurodesis with talc and mechanical pleurodesis involving pleural abrasion with dry gauze.

Materials and Methods

All the patients who underwent VATS for primary pneumothorax in two hospitals were retrospectively recruited between January 2007 and December 2008, and then followed-up until December 2010. This study was approved by our Institutional Review Board. At Hospital A (Group A) all patients were treated with pleural abrasion with dry gauze and Hospital B (Group B) all patients underwent chemical pleurodesis with talc. The following variables were collected to determine the degree of similarity of the two groups: age, gender, laterality, reason for surgery, and smoking status. The variables collected to compare the outcomes were: recurrence, complications, and mortality, as well as duration of air leaks and of drainage and length of postoperative hospital stay (in days). In Hospital A, 74 (69.8%) surgical interventions were performed, all patients being treated by mechanical pleurodesis, that is, pleural abrasion with dry gauze. In Hospital B, 32 (30.2%) surgical interventions were carried out, all patients being treated by chemical pleurodesis with talc. Table 1 shows the baseline characteristics of the patients in both groups.

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Statistical analysis

The variables were described using the most appropriate test given their nature: mean, median, and range for quantitative variables, and absolute and relative frequencies (%) for qualitative variables. The two groups were compared using the Chi square test for qualitative variables and non-parametric tests for continuous variables. A level of significance of 0.05 was selected for all the statistical tests.

Results

A total of 106 surgical interventions were carried out during the study period on 104 patients, of which 89 (85.6%) were male, with a mean age of 28.6 years (median 25; range 11-64) (Table 1). After surgery, patients were followed-up for a mean of 36.8 months (median 38; range 24-47). Table 2 lists the treatments administered in first and second episodes of PSP, while Table 3 indicates the reasons for surgery.

Postoperative air leaks lasted a mean of 0.78 days (median 0; range 0-10), the mean drainage duration was 1.95 days (median 1; range 1-12), and the mean hospital stay was 2.68 days (median 2, range 1-13). Complications were observed in nine patients (8.5%): two cases of haemothorax (1.9%), three of persistent air leaks (air leak more than 6 days) (2.8%), two of atelectasis (1.9%), one of empyema (0.9%), and one of encapsulated pleural effusion (0.9%). These complications were treated by surgical intervention in three cases (2.8%) (one due to haemothorax and two to persistent air leaks), by flexible bronchoscopy (atelectasis) in two (1.9%), and by pleural drainage in four (3.8%). There were no deaths within the first 30 days after surgery. During the follow-up period, pneumothorax recurred in four patients (3.8%).

The number of patients who smoked was 68 (65.3%) prior to the first PSP and this fell to 22 (21.1%) after surgery, that is, 46 individuals (67.6%) had given up smoking.

Comparison between groups

In group A, 74 (69.8%) surgical interventions were performed and in group B, 32 (30.2%) surgical interventions were carried out. There was no statistically significant difference between the baseline characteristics between the two groups (Table 1). Table 4 show the intra-operative findings in both groups. Comparing the outcomes between in the two groups, we did not find any statistically significant differences in recurrence (three patients (4.1%) in group A, and one in group B (3.1%) P=0.82). Complications were observed in nine patients: five (6.76%) in group A and four (12.5%) in group B (p=0.45). However, none of the patients died within the first 30 days after surgery. The mean air leak duration was 0.84 days (median 0.00, range 0-8) in group A vs. 0.65 days (median 0; range 0-10) (P=0.62) in group B and the drainage duration was 1.81 days (median 1; range 1-8) in group A vs. 2.28 days (median 1, range 1-12) (P=0.301) in group B. On the other hand, the mean length of postoperative stay in groups A and B were 2.2 days (median 1, range 1-13) and 3.8 (median 3; range 2-13) (P=0.005) respectively.

Three patients (2.8%) underwent further surgery: two in group A (2.7%) and one in group B (3.1%) (P=1.0). In addition, four patients (3.8%) were treated with pleural drainage during the postoperative period: two in group A (2.7%) and two in group B (6.3%) (P=0.58). Finally, eight patients (7.5%) were readmitted in the first 30 days after surgery: seven in group A (9.5%) and one in group B (3.1%) (P=0.43).

Table 1. Baseline characteristics of the patients in both groups.

Variable	Total N (%)	Group A N (%)	Group B N (%)	P
Laterality (right side)	64 (61.5%)	40 (55.6%)	24 (75%)	0.05
Gender (male)	89 (85.6%)	60 (83.3%)	29 (90.6%)	0.26
Mean age (years)	28.06	26.7	31.1	0.10
Number of smokers	68 (65.3%)	46 (63.9%)	22 (68.8%)	0.66

Table 2. Treatments administered in first and second episodes of primary spontaneous pneumothorax.

Treatment: 1st surgery for PSP	Group A (72 patients)	Group B (32 patients)	Total
Observation	12 (16.7%)	1 (3.1%)	13 (12.5%)
Puncture-aspiration	3 (4.2%)	0 (0.0%)	3 (2.9%)
Pleurocath	35 (48.6%)	18 (56.3%)	53 (50.9%)
Pleural drainage (14F)	5 (6.9%)	7 (21.9%)	12 (11.5%)
Surgery	17 (23.6)	6 (18.8%)	23 (22.1%)
Treatment: 2nd surgery for PSP	**(46 pac)**	**(26 pac)**	**(72 pac)**
Observation	14 (30.4%)	0 (0.0%)	14 (19.4%)
Puncture-aspiration	0 (0.0%)	0 (0.0%)	0 (0.0%)
Pleurocath	23 (50.0%)	11 (42.3%)	34 (47.2%)
Pleural drainage (>14F)	6 (13.0%)	9 (34.6%)	17 (23.6%)
Surgery	3 (6.5%)	6 (23.0%)	9 (12.5%)

Table 3. Indications for surgery in each group.

Reason for surgery	Group A (72 patients)	Group B (32 patients)	Total
Ipsilateral recurrence	35 (47.3%)	14 (43.8%)	49 (46.2%)
Contralateral recurrence	9 (12.2%)	6 (18.8%)	15 (14.2%)
Persistent air leaks	16 (21.6%)	12 (37.5%)	28 (26.4%)
Bilateral pneumothorax	2 (2.7%)	0	2 (1.9%)
Tension pneumothorax	3 (4.1%)	0	3 (2.8%)
Bullae > 2 cm	7 (9.7%)	0	7 (6.6%)

Table 4. Intraoperative findings in both groups.

Intraoperative findings*	Group A (72 patients)	Group B (32 patients)	Total (104 patients)
I	14 (18.9%)	0	14 (13.59%)
II	9 (12.2%)	6 (18.8%)	15 (14.6%)
III	29 (39.2%)	24 (75%)	53 (51.5%)
IV	19 (25.7%)	2 (6.3%)	21 (20.4%)

*Vanderschueren Classification: stage I: no endoscopic abnormalities; stage II: pleuropulmonary adhesions; stage III: blebs/bullae less than 2 cm; stage IV: bullae more than 2 cm.

Conclusions

Video-assisted thoracoscopic surgery has been shown to be a safe and effective technique for the treatment of pneumothorax.[7-9] It is a relatively unaggressive technique (on average patients are discharged 2 or 3 days after surgery), with few complications (8.5% of the surgical interventions) and good outcomes (rate of recurrence of 3.8%). The primary outcome measure in our study was the rate of recurrence after surgery: the overall rate was 3.8%, similar to figures published in recent years by other authors,[5,7,10] which range between 1.8% and 6.2%. Comparing the groups, we did not find statistically a significant difference between the rate of recurrence of patients who were treated using mechanical pleurodesis (4.1%) and those treated by talc pleurodesis (3.1%).

We confirm that VATS is a safe technique for the treatment of pneumothorax, since in our series no patients died and we observed complications in only nine patients (7.5%). Moreover, most of the complications seen were mild, requiring further surgery in three cases, treatment with flexible bronchoscopy in two and pleural drainage in four. Comparing the two groups, we found a higher rate of complications in the group treated with talc pleurodesis (6.8%) than among those treated using mechanical pleurodesis (12.5%), but these differences were not statistically significant (P=0.45).

The duration of air leaks and of drainage were also similar in the two groups (P=0.622 and P=0.301 respectively). On the other hand, the mean hospital stay was shorter in the mechanical pleurodesis group (2.2 days) than the talc group (3.8) (P=0.005). If we consider this information independently from the previous data, we could attribute this to the lower rate of complications in group A, and in turn deduce that the use of mechanical pleurodesis is associated with earlier discharge. However, the two techniques have similar results with regards to the duration of air leaks and of the drainage, and the explanation lies in the different criteria for discharge the two institutions: in group A patients are discharged on the day pleural drains are removed and in group B they are discharged the day after drains are removed. The differences observed between the groups can be attributed to this difference of one day and not the technique used. Indeed, we observed a higher rate of readmissions in group A (9.5% *vs* 3.1%; P=0.430) due to air blebs and pain, possibly related to their early discharge policy.

There are three main techniques for performing pleurodesis using VATS:[10,12,13] mechanical pleurodesis (pleural abrasion with dry gauze), chemical pleurodesis (with asbestos-free talc) and pleurectomy.[13] At the first Conference of the Spanish Society for Thoracic Surgery (SECT) (Malaga, May 2010), findings were presented from a national survey sent all the Thoracic Surgery units in Spain (30 hospitals replied). This report highlighted the variety of techniques used: 60% of the responding units use mechanical abrasion, 27% chemical pleurodesis (with talc) and 7% parietal pleurectomy. In 2008, the results a randomized clinical trial comparing mechanical pleurodesis and pleurectomy were published,[13] the authors concluding that pleural abrasion was a safer technique and had a similar rate of recurrence to pleurectomy.

We carried out a search on PubMed using the following terms:(Pneumothorax or VATS or video assisted thoracoscopic surgery or pleurectomy or pleura) AND (Talc or pleural talcage or talc instillation or chemical pleurodesis or talc pleurodesis or pleural abrasion) and we did not find any randomised studies comparing chemical pleurodesis (with talc) and mechanical pleurodesis (pleural abrasion with dry gauze). Additionally, we performed a search in the following clinical trial registries: Cochrane Central Register of Controlled Trials, Clinicaltrials.gov, current controlled trials (mRCT)-active registers, and WHO International Clinical Trials Registry Platform (ICTRP), and found no ongoing clinical trials in this field. Given this, and the fact that our study was observational and could be biased, we consider it necessary that a randomized double-blind clinical trial should be undertaken to provide stronger scientific evidence with regards to which is the best technique to achieve pleurodesis in patients undergoing treatment of pneumothorax by video-assisted thoracoscopic surgery.

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