Original Article

Need for chest tube after Video Assisted Thoracoscopic (VATS) Lung Biopsy

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Objective: To observe the effects of early removal of chest tube drain after video assisted thoracoscopic (VATS) lung biopsy.

Material & Methods: We prospectively evaluated the removal of chest tube drain at six hours or 24 hours after the VATS-lung biopsy in fifty consecutive patients with no evidence of air leak after the lung biopsy.

Results: Our results show that removal of chest tube drain at 6 hours was not associated with complications such pneumothorax, atelectasis or pleural effusion as compared to the 24 hours removal of the drain($p>0.05$).

Conclusion: Early removal of chest tube drain is safe in patients where air leak has been documented to be absent. Since it was a non-randomized evaluation, further randomized study in our population is needed to confirm these findings.

Keywords: Chest tube drain, VATS, pneumothorax.

Introduction

Video-assisted thoracoscopic surgery (VATS) is well-established technique for lung biopsy. It is safe, causes minimal discomfort for patients postoperatively, and offers a good cosmetic result.[1,2] A chest tube is usually inserted into the pleural cavity after wedge resection of the lung and left in place until there is no evidence of air leakage and fluid drainage is minimal. Devices and instruments used in video-assisted thoracoscopic surgery (VATS) have been improved greatly in recent years. Although air leaks from needle holes have sometimes been observed immediately after suturing with an atraumatic needle, air leaks from the staple line are uncommon except in patients with bullous and/or emphysematous changes of the lung or when the stapling instrument has been inappropriately used.[3] The routine placement of an intercostal chest drain has been an established part of VATS lung biopsy, although evidence for its use is lacking.[4] Sienel et al. found that early removal of the intercostal chest drain after VATS lung biopsy reduced pain without an increase in postoperative complications.[5] In the present non-randomized prospective study we evaluated the removal of chest tube drain 6 hours or 24 hours after the VATS with lung biopsy in fifty patients. This was based on our internal audit showing on average hospital stay of 3 days for patients requiring CT drain. Since our patient population usually presents late with increasing chances of fibrosis and parenchymal damage, we were apprehensive in removing drains before 48 hours.

Material & Methods

Fifty patients undergoing VATS lung biopsy were included in the study after fulfilling the inclusion criteria, between December 2009 to February 2012. Approval of the study was obtained from the institutional ethics committee. The surgical procedure was performed under general anesthesia with a double-lumen endotracheal tube. VATS was performed following standard procedures. Briefly, patient was put in the lateral decubitus position; three port sites, including one for a 10-mm videothoracoscope were used and one wedge resection biopsy following the CT and the direct view of the lung were performed. All wedge resections were performed using endostaplers. The lung was grasped once with a lung endo-clamp and a stapled wedge resection biopsy was done with a linear stapler. Buttressing of the staple line was not done since bioglue was not available. After the biopsy, the lung was tested for air leak. Air leak was tested as follows: after lung biopsy, the lung was re-expanded with sustained inflation to an airway pressure of 30 cm H_2O by the anesthetist for 1 min. An air leak was diagnosed by persistent bubbling down an 8-mm Ryle's nasogastric tube placed in the posterior pleural

into a small water-filled container. If an air leak was observed, then a chest drain was used and the patient was excluded from this study. In 5 patients air leak was observed and were excluded from this study. Patients in whom no air leak was detected were included in the study group. Chest tube was placed in all patients through camera port at the end of procedure.

The criteria for chest tube removal was set as; no air leaks in postoperative period, complete expansion of lungs on chest X-ray , drainage <50ml/h. On the basis of these criteria patients were divided in 2 groups, Group A: Drain removed within 6 hours post-operatively, Group B: Drain removed within 24 hours postoperatively. Each group had 25 patients.

The primary end points for the study were the incidence of clinically significant pneumothorax and in-hospital length of stay. The incidence of pneumothorax (detected radiologically with and without clinical effects) was recorded 4 hours post-operatively, prior to & after extubation of chest drain, at 24 h postoperatively, prior to discharge and at follow-up 6 weeks after the procedure. The clinical significance of post removal of chest drain pneumothorax and requirement for re-chest intubation for the pneumothorax was also recorded. Preoperative data collected included age, sex and side of VATS lung biopsy. Postoperative data included incidence of pneumothorax on radiograph and its clinical significance 6 hrs, 24 hrs and 6 weeks post-operatively in addition to the need for insertion of an intercostal chest drain postoperatively; other morbidity and mortality were also recorded The final lung histology was also recorded.

Statistical analysis

Data was provided as mean along with standard deviation. Student t test was utilized for the comparison of means between the groups and chi square test was used for categorical data. P value of less than 0.05 was taken as significant.

Results

Five patients undergoing VATS lung biopsy at our institution had a proven intra-operative air leak and were therefore excluded from this analysis. The remaining 50 patients were included as no air leak was demonstrated during testing during surgery. Patients characteristics are shown in **table 1**. The length of stay was not statistically different in between the two groups. Group B patients had more frequently used steroids preoperatively and also more likely to be treated for tuberculosis. The two groups were not different in outcome in terms of pneumothorax postoperatively or after removal of the drain **(Table 2)**.

The final histologic diagnosis was as follows: in the Group A ; emphysema (7 patients), metastatic lung disease (4 patients), squamous cell carcinoma (3), adenocarcinoma (3), spindal cell neoplasm (2), pulmonary tuberculosis (2), sarcoidosis (1), Hodgkin's disease (1), teratoma (1) and synovial tumor (1); in the Group B; Interstitial lung disease (10 patients), pulmonary tuberculosis (5), emphysema (3), bronchiolitis obliterans organizing pneumonia (3), alveolar proteinosis(1), alveolar microlithiasis (1), atypical carcinoid tumor (1) and sarcoidosis (1 patient).

Follow-up

At 6 weeks to 6 months follow-up, all the patients had fully expanded lungs bilaterally.

Table-1: Pre-operative demographics and stay at hospital.

Variable	Group A (n-25)	Group B (n=25)
Mean age (SD), years	45.5± (17.3)	33.4±(12.4)
Male (%)	16 (64%)	14 (56%)
Right side biopsy (%)	48	88
Mean length of stay (days)	3.17± 1.97	3.25±1.22 (p=0.83)
Pre-operative steroids	06	14 (p=0.04)
Pre-operative chemotherapy	5	0 (p=0.03)
Pre-operative radiotherapy	02	0
On anti tuberculosis drugs preoperatively	04	7 (p>0.05)

Table-2: Postoperative course of patients in groups 1 and 2.

Variable	Group A (n-25)	Group B (N=25)
Post chest extubation		
Partial pneumothorax not requiring chest drainage	4	3 (0.6*)
Post chest extubation		
Pneumothorax requiring chest drainage	1	2 (0.5*)
Postoperative ventilator support	0	1
Basal atelectasis not requiring bronchoscopy	1	3 (0.6*)
Pneumonia	0	1
Wound infection	1	2
Mortality	Nil	Nil
Pneumothax at follow up minimum 5 weeks and 2 years	Nil	Nil

**p value by Chi Square test*

Discussion

The need for routine placement of an intercostal chest drain during VATS lung biopsy is controversial. A chest tube is frequently placed in the pleural cavity after wedge resection by open thoracotomy to monitor and treat any air leaks and to remove any blood or pleural fluid that collects. Several methods for management of chest tubes have been reported. Some surgeons believe that leaving the chest tube in place for 1 or 2 days after lung resection provides a safety net and will reduce the incidence of early postoperative complications such as pneumothorax or retained hemothorax. Although wedge resection by VATS has some advantages such as less pain, smaller incisions and less trauma, many general thoracic surgeons have managed chest tubes after wedge resection by VATS the same as after that by open thoracotomy. Because of remarkable improvements in recent years in instruments and devices used in VATS, there should be very few air leaks and little bleeding from the stapler line if instruments are used correctly.[3] Blewett and colleagues reported on their experience with an outpatient procedure. They suggested, testing the biopsied lung for air leak before deciding on the usage of an intercostal chest drain.[9] Russo et al in their study reported that early chest drain removal after lung biopsy is safe, reduces length of stay and is less painful compared to traditional management.[10] Chang et al, retrospectively reviewed 62 ambulatory patients who underwent outpatient VATS lung biopsy. Chest tubes were removed once no air leak was present and no residual pneumothorax on postoperative chest X-ray. Forty-five (72.5%) were discharged within 8 h, 14 (22.5%) within 23 h and 3 (5%) were admitted for >23 h. They concluded that it is safe and effective procedure to perform on outpatient basis.[11] Fibla et al, concluded in their study of 146 patients that in the absence of postoperative air-leak, early chest drain removal is safe, reduces hospital stay and allows outpatient procedure in selected cases.[12]Satherley et al, retrospectively studied 175 patients who did not have an intra-operative air leak during VATS lung biopsy: 82 received a chest drain while 93 did not. There were no significant differences in the rate of radiologically detected pneumothoraces immed-iately, on day 1 or at follow-up (46 weeks) visit between those with a chest drain and those without, none of which were clinically significant. Patients who received a drain had a median stay of three (range 24) days while those without a drain had a median stay of two (range 13) ($p<0.001$).[4]Satherley et al in their study also reported that approximately one in five patients had a pneumothorax post-operatively. However, these are radiologically reported chest radiographs and these pneumo-thoraces were relatively small in size (less than 5%) and were evident in both groups equally. The vast majority of pneumothoraces were clinically insignificant and only one patient in the 'no drain' group required insertion of a chest drain 24 h postoperatively for a clinically significant pneumothorax.[4] We also observed in our study that 4 patients from group A and 3 patients from group B developed small in size pneumothoraces (less than 5%), which were treated conservatively. T. Koc et al. in their study concluded that in patients undergoing lung biopsy, it is observed that those without air leak intra-operatively where measured or early post-operatively where a drain is inserted can safely go without chest drain insertion or have chest drain

removed on the same day. This policy is safe, may reduce postoperative pain, does not increase the risk of pneumothorax or other complications and reduces length of stay. Where possible, an intra-operative air leak check should be performed and chest drain avoided if possible in order to discharge patients earlier.[13] We were able to show in our patients that chest tube drain can be safely removed after 6 hours when absence of air leak has been confirmed intra-operatively. This improved our confidence for early chest drain removal considering the adverse conditions prevailing in our patients. Prolonged hospital stay is a double edged sword with increase in cost and chances of higher morbidity with hospital acquired infections with drains and tubes. The major weakness in our study is the non randomization; this was necessary to build our confidence for further study [already initiated] in a more randomized manner. Many of our patients with interstitial lung disease required biopsy and based on our gut feeling of possibility of complications decided to prolong the chest drain for 24 hours. We are more confident now to proceed with a randomized controlled trial for the evaluation of removal of chest drains at 6 hours and no drain at all post procedure.

Conclusion

In conclusion, our non randomized prospective study in 50 patients does support the idea of early removal of chest drain after confirmation of absence of air leak. Further randomized trial to confirm these results are needed.

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