

Using technique of Video-Assistant Thoracic Surgery (VATS) and small incision for diagnosis and treatment of pleura-pulmonary diseases under local anesthesia

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Abstract

Background. Thoracotomy is one of the hardest surgical incisions to deal with and easy leading to atelectasis or pneumonia. Investigation of minimally invasive techniques has been the major concern for surgeons. To explore the feasibility of local anesthesia in thoracotomy including minithoracotomy and Video-Assistant Thoracic Surgery (VATS) for diagnosis and treatment of Pleura-pulmonary diseases is demonstrated in this article. **Methods.** Forty patients under local anesthesia in surgery were divided into performing thoracotomy and non-thoracotomy as two major groups. Thoracotomy group contains two sub-group including minithoracotomy and VATS, where minithoracotomy was performed on both open and closed pneumothorax for diagnosis and treatment of pleura-pulmonary diseases. In the meantime, performing non-thoracotomy was only for local wrapped pleura diseases and chest wall diseases. **Results.** In minithoracotomy group, biopsy of pleura for thirteen patients were performed. Ten of them were diagnosed as metastasis, one was amyloidosis and two were proliferation of pleura. Biopsy of three of patients of diffuse pulmonary diseases resulted two cases of interstitial fibrosis and one pulmonary tuberculosis II. In the VATS group, except one patient had serious pleural adhesion with performing minithoracotomy under general anesthesia, all other cases were performed biopsy bullarectomy for recurrent pneumothorax and pleurodesis for intractable pleural effusion under local anesthesia. Performing diagnostic thoracoscope under local anesthesia revealed four cases of pleural effusion and one case of liver-related pleural effusion. Meanwhile, ten patients under remedial thoracoscope revealed eight cases of malignant pleural effusion with undergoing pleurodesis and two cases of recurrent pneumothorax with undergoing bullarectomy and pleurodesis as well. In the non-thoracotomy group, five cases of thoracic tuberculosis were investigated, three cases of local wrapped empyema and two cases of benign tumor of rib were found. None of severe complications and death were seen. **Conclusion.** Minithoracotomy and VATS under local anesthesia can be performed safely for pleural-plumony disease and chest wall lesions, which is less cost procedure for clinical applications. [Life Science Journal. 2009; 6(2): 83 – 87] (ISSN: 1097 – 8135).

Keywords: Local anesthesia; Video-Assistant Thoracoscopic Surgery

1 Introduction

Open thoracic biopsy must be considered for diagnosis of pleural-plumony diseases, pulmonary sarcoidosis and primary plerual thickening. However, this operation is usually with general anesthesia in high risk for patie-

nts. In Clinical, a novel method with less traumatic and lower cost diagnosis and treatment is demonstrated in this article.

2 Patients and Methods

2.1 Patients

40 patients aged between 30 and 77 years old were

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studied, 26 of male, 14 female. Patients were divided into two groups, one for thoracotomy which includes minithoracotomy and Video-Assisted thoracic surgery group respectively, and another one non-thoracotomy group. In thoracotomy group, 16 cases of the minithoracotomy group, three of them was found diffuse pulmonary diseases underwent biopsy at local anesthesia, 2 cases of interstitial fibrosis, one case of pulmonary tuberculosis. 13 patients with Biopsy of pleura under local anesthesia revealed different degrees of pleural thickening by chest X-ray, 10 cases were diffused and 3 cases were localized uneven. All cases occurred unilaterally with 7 left and 6 right. All 13 patients had performed B-ultrasound-guided or CT-guided biopsy of pleura check in one year, no positive results were obtained with pleural effusion pathological examination; Video-Assisted Thoracic Surgery was performed on 14 cases in thoracotomy group, 4 cases was diagnosed as malignant pleural effusion by diagnostic thoracoscope, 1 was found liver-related pleural effusion. Meanwhile, 10 cases was performed by remedial thoracoscope with 8 cases malignant pleural effusion being done for pleurodesis, 2 cases of recurrent pneumothorax for bullarectomy and pleurodesis. There are 10 cases in the non-thoracotomy group including 5 cases of thoracic tuberculosis, 3 cases of local wrapped empyema, 2 cases of benign tumor of rib. Diagnosis and treatment of the above cases were performed all under Local anesthesia.

2.2 Methods

2.2.1 Thoracotomy group

2.2.1.1 Minithoracotomy group. In order to understand the location of pleura lesion and determine the coverage of pleural thickening, the fluoroscopy, X-ray and B-ultrasonography of chest were in examination routinely before operation. 5% double diluted Lidocaine (stock solution was not exceed 20 ml) was injected into the rib periosteum and its surroundings as infiltration anesthesia after routine sterilization and bespreading on skin of diseased region.

Biopsy of pleura: About 3 cm long incision was made firstly, the skin, subcutaneous tissues were cut in turn, the direction of the rib with felt and based on that the muscles of chest wall were cut until to the rib periosteum, ribs were adequately exposed and infiltration anesthesia was performed there, then the periosteum was stripped about 2 cm and the exposed rib was cut (Figure 1).

Abnormal pleural located under the cut ribs, compared with the normal pleural which was felt soft and pink in color, it was felt a little hard, and was in dark color, After

the diseased region was confirmed, infiltration anesthesia was performed on the pleura to be removed, meanwhile the aspiration was tried to observe if there was any liquid or gas, a few anesthetic drugs was injected into thoracic cavity to lessen the response of pleural to gas after chest open, the depth of cut was also estimated.



Figure 1. Biopsy of pleura.

Open pneumothorax formed after a piece of full-thickening pleural was cut. The leak was blocked interruptedly with fingers, and patients were asked to hold breath after deep inspiration, and the changes were observed to decide tube intubation. The patients who had pleural fluid was aspirated slowly with aspirator.

Biopsy of diffused pulmonary diseases: the incision was chosen according to chest CT examination, the length of incision was about 5cm, the skin, subcutaneous tissue, muscle of chest wall were cut in turn along intercostal direction, the thoracic cavity was open after middle intercostal muscles were cut, the bleeding was stopped and intercostal muscles were sutured without knot. A small-sized army navy retractor was used to open thoracic cavity, lung was pulled out with ring forceps, the biopsy site was found and resected about 2 cm × 2 cm × 1 cm, then the incompleated lung surface was sutured and intercostal muscles were ligated with the last knot completed at the time of long inflation, no chest tube was placed. Antiphlogistic, analgesic and antibiotics were administered after operation.

2.2.1.2 Video-assisted thoracoscope group. The patients were asked to fast for 4 h, empty bladder before operation. They were performed on continuous electrocardiogram and oxygen saturation monitoring, 50 mg dolantin, 25 mg diprozin and 10 mg codeine were in-

tramuscular injected. After then the patients were let lie on the operating table at lateral position on healthy side, ventilated with oxygen, sterilized and bespreaded as routine.

5% double diluted Lidocaine was injected into the seventh intercostal space between middle and posterior axillary line of the diseased side for local infiltration anesthesia, about 1cm incision was made, a channel into the cavitas pleuralis was made with straight blood vessel forcep, following with a canula (diameter was 105 mm) insertion, after that the inner core of which was pulled out and the opening was blocked by a cotton pad.

Ensuring the saturation of blood oxygen did not decrease obviously, cotton pad was open interruptedly, letting gas enter into thoracic cavity slowly, kept diseased lung collapse. The finger part of latex glove with a small opening at the end was used to cover canula, and Video-Assistanted thoracoscope was inserted to observe around the canula. Another 2 incisions were made according to the diseased region under the monitoring and guide of thoracoscope. The canulas were inserted with the same anesthesia, and were covered with latex gloves. Pleura adhesion was treated as follows: if it was a small streak adhesion, it could be fulgurized and cut by endoscopic scissor; if it was a small membranous puff adhesion, it could be bluntly dissected by thoracoscopic grasper; if the area of adhesion was large and difficult to separate, it was converted to general anesthesia.

Diagnostic thoracoscope: the chest fluid of those patients who had pleural effusion should be aspirated completely, then the pleura, diaphragm, cervical pleura were observed, but pericardium was hard to observe. If nodules were found in the pleura, local infiltration anesthesia was applied and the nodule was cut for biopsy.

Remedial thoracoscope: the patients who were diagnosed definitely with malignant pleural effusion or recurrent pneumothorax could take pleurodesis induced by talc, if the lung expand was ascertained preoperatively. The method was the same as pleurodesis under general anesthesia. When no active bleeding was proved, a thoracic drainage tube was placed with thoracoscope.

The patients were asked to cough or were given oxygen with mask, letting lung expand gradually. During the operation, the saturation of blood oxygen should be cared, when it was low the operation could be stopped and ask patients to cough, or supply oxygen with mask, reoperated until it was back to normal.

2.2.2 Non-thoracotomy group. Preoperative preparation has shown that location was the most important concern, especially those patients with multiple localized encapsulated pleural effusion, such as tuberculoma or nodular

of pleura, pleural endotheliomas, etc. CT examination was performed before the operation to fix the lesion area of the patient roughly, then B-Ultrasonic localization was used to mark the incision. The incision we adopted is open and close on diseased chest wall so that the movement of upper extremities could influence the location of incision mark. The best choice for patient's body position in operation may keep similar as that in B-Ultrasonic examination. 2 – 3 incisions were designed according to different diseased regions found by B-Ultrasonic examination. It's easy to locate the thoracic tuberculosis so did other chest wall masses. It's easier to locate fluid lesion than soft-tissue masses like tuberculosis granulation tissue. Sufficient anaesthesia was performed on the superior, inferior margin and internal, external surface of ribs during the operation to relieve patients' painful feeling. The operation in localized encapsulated pleural effusion was the same to routine surgery. Pleura should not be injured to cause pneumothorax and infection, notably the cut of ribs and whether changed to localiz thoracic surgery relying on the size of lesions. The thoracic tuberculosis was treated as conventional operation.

3 Results

In thoracotomy group, three patients of diffuse pulmonary diseases were done for minithoracotomy, two of them had interstitial fibrosis, one had pulmonary tuberculosis II. Biopsy of pleura were performed on thirteen patients, ten of them had pleural metastasis, one had amyloidosis and two had proliferation of pleura. No complications and death were seen. The removed pleura lesion was about from 0.5 cm × 0.5 cm × 0.3 cm to 1.5 cm × 1 cm × 0.5 cm, the thickest of which was 1.5 cm. Little effect of open pneumothorax on patients' respiration was found in 10 cases of diffused pleural thickening after thoracotomy, another 3 cases of localized partial pleural thickening were found with slight cough after thoracotomy.

One patient was misdiagnosed as tuberculosis of pleura for not performing full pleurotomy, exploratory surgery was done again to confirm the pleural metastasis of the lung cancer. Intrathoracic drain tube and the open pneumothorax should not be detained more than 5 days and 2 – 5 min respectively. In VATS group, except one patient was converted to general anesthesia due to serious pleural adhesion, other patients were performed under local anesthesia.

Pleural metastatic nodules were found in 4 cases of malignant pleural effusion by diagnostic thoracoscope,

the final diagnosis was made after biopsy. 1 case of liver-related pleural effusion were found with diffuse pleura edema by video-assisted thoracoscope, but with no pleural nodule, it was diagnosed as liver-related pleural effusion considering the patient history. 3 cases of malignant pleural effusion by remedial thoracoscope were confirmed by pathological examination after thoracentesis.

7 patients of malignant pleural effusion and 1 patient of liver-related pleural effusion in VATS group were given pleurodesis induced by talc under local anesthesia. In 2 patients who had recurrent pneumothorax, one had pneumoconiosis complicated with pneumothorax, another had simple lung bullae. Their bullarectomy were dissected by disposable slit and stitching instrument, and received pleurodesis induced by talc.

In non-thoracotomy group, the patients with thoracic tuberculosis achieved the same effects as general anesthesia operation, with no surgery-related complications. The inward depressed shadow was found in the chest X-ray film of those the patients had localized encapsulated pleural effusion, however, the patients felt all right like chest distress, the shadow fade away after operation. All the patients in this group got out of bed on the 1st day postoperatively, and recovered quickly compared with the patients treated with trachea-cathetered general anesthesia. In 10 patients, one case of rib benign tumor complained the pain, but finished the course of operation. During the operation, blood pressure, pulse and saturation of blood oxygen of patients in both groups were all at normal range, one patient was administered anesthetic sedative, others were administered with antiphlogistic and analgesic to relieve pain after operation. No complication and death was seen in perioperative period. No long-term complications were found following up in one to six months.

4 Discussion

In our study, thoracic operation in artificial pneumothorax (open and closed pneumothorax) under local anesthesia can be performed for completing the diagnosis and treatment of pleural-pulmonary diseases if the stability of mediastinum being kept. Because the lung keeps blood oxygen saturation at normal range through its functional self-regulation of hypoxic pulmonary vasoconstriction, the safety coefficient increases patient's operation in open pneumothorax and closed pneumothorax. No significant influence on heart, lung and mediastinum when patients closed pneumothorax without pleural thickening. Same condition can be seen in patients open pneumotho-

rax with pleural thickening specially with partial pleural thickening. Moreover, using VATS to remove peripheral pulmonary nodules is also an alternate method in clinical practice with advantages in comparison with routine thoracotomy^[1-5]. The medical cost for treating with wedge resection of lung by VATS is about one fifth less than general anesthesia.

In 1997, Nezu^[8] completed 34 cases of pulmonary bulla marginal resection for spontaneous pneumothorax with special apparatus of VATS by straight slit and stitching instrument under local anesthesia and sedative were reported in Japan. Hemodynamics was stable in operation and post operation. Blood-gas analysis revealed normal. Three cases of them had slight complication of air leak, the cure rate was 91%. Also, less complications, shorter hospitalization time compared with general anesthesia were reported.

In 1998, Mukaida^[9] treated 4 patients who had high-risk complicated spontaneous pneumothorax under local anesthesia and epidural anesthesia. The ages of these 4 patients were 67, 72, 76 and 77 years old respectively, blood oxygen saturation before operation were 64.3 mmHg, 74.6 mmHg, 52.0 mmHg and 47.5 mmHg respectively, and the preoperative diagnosis of them were bullous emphysema and bilateral bullae of lung respectively. No significant change of PaO₂ was found after operation, which suggested that it was feasible to do thoracotomy under local anesthesia^[6,7].

Keeping the mediastinum stabilizing in surgery is necessitated in our study. The minithoracotomy thoracic surgery was performed on the patients who had diffused pulmonary diseases and increased pleural disease. No mediastinal oscillation during thoracotomy was found. But for biopsy of the patients with localized pleural thickening and diffuse pulmonary diseases, mediastinal oscillation in the condition of open pneumothorax was observed. Our method is to interruptedly open and close thoracic cavity in surgery, let patients gradually adapted, then rapidly cutting pleura and lung lesions, close thoracic cavity at the time of lung inflation through mask ventilation. In diagnostic and remedial thoracoscope, we adopted to put colatus gas into thoracic cavity slowly, seal incision and prevent gas out, forming closed pneumothorax to operate in a stable mediastinal state. Under the illumination of video-assisted thoracoscope in closed pneumothorax, those canous nodus protruded to the surface of pleuras have high diagnostic positive ratio. Accurate location before surgery is more important for localized pleural biopsy in open pneumothorax. Traditional B ultrasound localization has some advantages and can visually prove the coverage of pleural lesions

and provide marks even more accurate than CT localization, especially in those patient with localized pleural thickening. 15 patients out of 16 with thickening pleural disease and diffuse pulmonary diseases got the definite diagnosis, the accurate rate was 94%, if the full-thickness pleural lesions could be obtained in one misdiagnosed case, the accurate rate reached 100%. In comparison with open lung biopsy under general anesthesia, the accurate ratio is much higher. According to our statistical analysis in 2004, 500 patients received percutaneous puncture biopsy of lung, 30 patients received biopsy of pleura, the positive ratio were 90% and 85% respectively, which were far less than pleural biopsy under local anesthesia (94%). For diffused pulmonary diseases, percutaneous puncture biopsy of lung has higher risk and complication, lower positive ratio. Our experience is that those thickening pleural disease and diffuse pulmonary diseases having no positive results with percutaneous puncture biopsy of lung and pleura are the better indications for thoracotomy under local anesthesia.

No report on the removal and biopsy of local wrapped pleura diseases such as localized encapsulated effusion and tuberculosis under local anesthesia without thoracotomy can be found so far. Actually, the surgery we made was kind of localized extrapleural modified thoracic surgery, which was under local anesthesia. The patients who had tuberculous pleuritis or tuberculoma of pleura received in 1 year regular treatment were always found effusion by ultrasonography exploration and then, need to undergo puncture and administration of corticosteroids and urokinase repeatedly. However, drugs could not be absorbed easily and increased the mental burden of patients. The common operation weakened patients, so it's necessary to treat the disease of pleura like pleural endotheliomas removing the foci at more safe and microin-

vasive surgery. In our study, such surgery was performed on 10 patients, the effects of which were found similar as routine surgery but with lower cost (80RMB for local anesthesia, 1000RMB for general anesthesia according to the health care charge standards in Henan province). Therefore, the surgery was welcomed by our patients and was consisted with economic condition of our country. In short, the biopsy of lung and pleura under local anesthesia is economic and microinvasive, having low anesthesia requirement but high positive rate, therefore can be widely applied in clinic.

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