A case that underwent bilateral video-assisted thoracoscopic surgical biopsy combined with left pneumonectomy

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Abstract: *A case that underwent bilateral video-assisted thoracoscopic surgical (VATS) biopsy combined with pneumonectomy is presented. The patient developed hypoxia during the contralateral VATS biopsy. His hypoxia was treated with positive expiratory pressure (PEEP) to the dependent lung and apneic oxygen insufflation to the operative lung. The cause was probably airway obstruction due to his intraluminal tumor plus secretions. This case report contains interesting aspects in the anesthetic management.*

Keywords: *Video-assisted thoracoscopic surgical (VATS) biopsy, Anesthesia, Staging*

Introduction

Mediastinoscopy is the most widely used mediastinal lymph node biopsy technique[1,2], however, its use is limited in patients with bilateral paratracheal and subcarinal lymph node enlargement.[3] In those cases, video-assisted thoracoscopic surgery (VATS) is recommended for mediastinal and hilar lymph nodal biopsy.[3] Thus, bilateral mediastinal and hilar lymph node biopsy by VATS is possibly required for certain selected cases. In this short article, we would like to report a case that underwent bilateral VATS biopsy combined with a pneumonectomy.

Case presentation

A 50 year-old man, whose height and weight were 166cm and 75kg respectively, showed an abnormal shadow on his chest X-ray at his routine health check-up. At the time he realized that he had been coughing more sputum than previously. Bronchoscopy revealed the presence of a squamous cell carcinoma at the left upper lobe orifice. A computed tomographic scan of the chest indicated that the tumor was resectable by means of a left pneumonectomy. He had a non-specific medical history, although he had smoked 60 cigars per day for 30 years. Preoperative bronchospirometry showed a mild obstructive pattern. The % predicted value of forced expiratory volume in 1 second was 63%, which was probably due to his long-term smoking. A preoperative lung ventilation/perfusion scan did not show clinically significant disproportion. All other hematologic, biochemical,and physiological investigations were normal. He was initially scheduled for a mediastinoscopic biopsy in order to determine surgical staging. This was to be followed by a left pneumonectomy. However, the decision of the pneumonectomy was postponed until intraoperative bilateral mediastinal lymph nodal biopsy by VATS had been performed, as lymph node (N) staging was questionable by means of a mediastinoscopy.

He was premedicated with roxatidine (an H2 blocker) 75 mg orally 2 h preoperatively. Before induction of anaesthesia, an epidural catheter was inserted at the 6-7th thoracic interspace. After the intravenous administration of atropine 0.5 mg, general anaesthesia was induced with propofol 120 mg, fentanyl 150 µg and vecuronium 10 mg. The trachea and bronchus were intubated with a right sided double lumen tube (DLT) . DLT placement was confirmed using a fibroptic bronchoscope. A Siemens servo 900 C ventilator was used for controlled ventilation of the lungs. Pressure controlled mode was used, with the inspiration/expiration ratio being set at 1 : 1.9; (25% of a cycle for inspiratory phase and 10% for pause phase). Anaesthesia was maintained with 100% oxygen, 3-5 mg kg^{-1} h^{-1} of propofol , and an epidural bolus injection of 6 -10 ml of 1% lidocaine, followed by a continuous infusion of 4 - 8 ml h^{-1}. In addition to routine monitoring, the continuous intra-arterial blood gas monitoring system (Paratrend 7^{TN}) was used to achieve continuous intra-arterial blood gas parameters and an arterial pressure wave. In addition, blood was taken for intermittent blood gas determination. After induction of anaesthesia, he was placed in the left lateral position for VATS biopsy. After positioning the patient, the DLT position was reconfirmed and corrected using a fibroptic bronchoscope. One lung ventilation (OLV) was commenced just before the pleura was opened. The inspiratory pressure was set at 20 cmH2O the rate at 15-20 breaths per minute. However, it was difficult to achieve a sufficient tidal volume, and the PaO_2 value of the Paratrend 7^{TN} rapidly decreased. The PaO_2 dropped rapidly to 50 mmHg, and the oxygen saturation to 80% . At that time the pH was 7.2, with a PaCO2 of 75 mmHg. Collapse of the right non-dependent lung was successfully maintained. Immediately after checking the DLT

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position it was suctioned, using a fibroptic bronchoscope; 5 cmH_2O of positive expiratory pressure (PEEP) was applied to the dependent lung, with 5 L/min of apneic oxygen insufflation to the operative lung. The reason why we did not apply continuous positive airway pressure (CPAP) is that CPAP might have resulted in worsening conditions of the operative field under VATS, making execution of the surgery impossible. The DLT was placed correctly, but a lot of secretions were seen. After application of PEEP and apneic oxygen insufflation, the hypoxia improved slightly, with the pH, $PaCO_2$ and, PaO_2 values of the Paratrend 7™ of approximately 7.3, 50-60 mmHg, and 60 -70 mmHg, respectively. Several intermittent arterial blood gas analyses showed similar values. Further improvement was not observed until the biopsy of the right side was completed. During the left side VATS biopsy, anesthetic management was fairly uneventful and adequate gas exchange was achieved. After the intraoperative pathological diagnosis had been made, we proceeded to a left pneumonectomy via a thoracotomy. This was performed based on the staging T2,N1,M0 (Stage IIB). His intraoperative and postoperative course from then on was totally uneventful.

Discussion

The final aim of surgical treatment for bronchogenic carcinoma originating from non-small cell lung cancer is complete resection.[4] Therefore, systematic lymph node dissection seems to be one of the most important tasks in order to achieve this once the primary pathogenic diagnosis of lung cancer has been made. Moreover, it will provide more precise N staging.[5] Thus mediastinal lymph nodal metastases, including ipsilateral and contralateral paratracheal or hilar lymph nodes, is one of the determinants in the indications for surgery for bronchogenic carcinoma, although this remains a matter for debate.[4,6] Thus, we need to be prepared for the cases that undergo bilateral biopsy by VATS[3], who may immediately proceed to tumor resection, as happened in our patient.

There are two issues pertaining to our patient that are important to highlight. Firstly was the severe hypoxemia that occurred during the contralateral VATS lymph node biopsy. It would appear that this occurred due to a combination of excessive secretions, aggravated by obstruction by the intraluminal tumor, despite our confidence in the position of the right sided DLT.[7] Furthermore, we are concerned that under certain circumstances this intraluminal tumor may develop a ball-valve in the airway.[8] In addition, VATS usually requires OLV. Therefore one has to have alternative plans to treat hypoxia during VATS biopsy, on a case by case basis.

Secondly one should take into consideration the potential for contralateral VATS related problems during ipsilateral surgery. The lung which was collapsed for surgery might have sustained some damage, even though the surgery did not include lung parenchymal procedures. But, for instance, re-expansion pulmonary edema[9], massive air leakage, or tension pneumothorax[10] might accidentally occur. These complications could be life-threatening as well as make the scheduled operation impossible, necessitation the possibility of utilizing extra-corporeal lung assist devices.

There is a trend towards more detailed preoperative and intraoperative nodal staging, including VATS biopsy.[11] It is true that improvements in surgical and anesthetic procedures have encouraged surgeons to challenge advanced stage lung cancer and establish more precise staging. This article may contain no new suggestions on how to handle these situations, as there are no established protocols; however, we believe that we successfully provided an opportunity to consider and discuss this new trend in the field of surgery and anesthesia.

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