



Control of Mild Bleeding During VATS Lobectomy Resulting in Pulseless Electrical Activity - Proposed Mechanism

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Abstract

The feasibility and safety of VATS lobectomy for lung cancer is well established. Herein we describe a case of intraoperative PEA during VATS while controlling minor intraoperative bleeding from a pulmonary artery injury, most probably caused by direct pressure over the hilum resulting in tension pneumothorax like obstructive shock. Circulation was restored shortly after the pressure was relieved and substituted with a vascular clamp. This mechanism has not been described before.

Keywords: Lobectomy; Pulseless electrical activity; VATS surgery

Introduction

The feasibility and safety of video assisted thoracoscopic surgery (VATS) is well established. When performing lobectomy for lung cancer it carries lower morbidity and mortality compared to open thoracotomy [1]. We present a case of a 74 year-old woman who underwent VATS left lower lobectomy with injury to the pulmonary artery resulting in pulseless electrical activity (PEA) during conversion to thoracotomy with subsequent full recovery.

Case Presentation

A 74-year-old woman with recent history of breast cancer presented with an FDG avid 1.7 cm left lower lobe lesion and mediastinal adenopathy. Her past medical history was unremarkable besides well controlled hypertension, with no known coronary artery disease. Following a cervical mediastinoscopy which was negative, the patient underwent an uneventful VATS wedge resection of the lesion in the left lower lobe and dissection of lymph nodes stations 5 and 6. We do not routinely insufflate CO₂ during VATS procedures. Pathology was consistent with T1N0 poorly differentiated adenosquamous lung carcinoma. After recovery, the patient was scheduled for completion lobectomy. During VATS a bulky lymph node disease was encountered. The inferior pulmonary vein was dissected and divided using a stapler with a vascular load. The fissure was dissected next. Blunt dissection was used to develop a plane between the pulmonary artery (PA) and the fissure, which was then, divided using sequential firing of a stapler from medial to lateral. Attention was turned to dissection of the PA branches to the lower lobe. Fibrotic and bulky adenopathy made the dissection difficult, during which injury to the basilar trunk of the PA occurred. Immediate pressure was applied to the bleeding vessel using a sponge-stick which controlled the bleeding while converting to thoracotomy. During the conversion the patient developed pulse less electrical activity. The thoracotomy was rapidly completed and internal cardiac massage commenced while the sponge-stick was replaced with a vascular clamp across the hilum of the lobe. The heart felt completely empty at the onset of the internal massage but return of circulation occurred about one minute later. The lobectomy was completed taking the pulmonary artery branches and the bronchus with a single stapler firing. Total blood loss was 500 ml. During the procedure, no gas bubbles were noted within the lung vasculature, which could indicate pulmonary air embolism. No underlying medical reason was identified during the post-operative course that could contribute to the development of intra-operative PEA. No EKG changes were noted, nor were elevated Troponin levels.

The patient fully recovered and was discharged after 15 days with no sequelae. Final pathology was consistent with III a disease.

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Discussion

Overall VATS is considered safe with a low rate of morbidity and mortality [2]. Bleeding rate is reported between 0.9%-10% in various series [3]. Bleeding control can be achieved by manual pressure, direct suturing of the bleeding vessel or using tissue sealants. Igai et al. [4] reported of massive intraoperative bleeding during thoracoscopic anatomical lung resection in a single center. Among 240 patients who underwent anatomical lung resection, twenty-six were identified as having major bleeding. Among these 26 patients, 20 underwent lobectomies and 6 underwent segmentectomies, of which tissue sealants were mostly used (63%) for hemostasis. Hospital stay was similar among both patient groups. Yamashita et al. [5] reported similar results. Bleeding related conversion rate was 73%, with similar hospital stay and morbidity among groups.

Herein we describe a case of intraoperative PEA during VATS while controlling intraoperative bleeding. The amount of bleeding by itself does not explain the development of PEA in this case. The relatively rapid recuperation after relieving the pressure and applying a vascular clamp and before volume replacement took place calls for an explanation of the mechanism of this collapse. When the surgeon applies pressure to the hilum while standing in front of the patient with the patient in the right lateral decubitus position, the force vector is directed left to right across the mediastinum. We hypothesize that the pressure pushed the mediastinum to the contralateral side, and in combination with hypovolemia, resulted in obstructive shock, similar to the hemodynamic effect of left-sided tension pneumothorax. This mechanism has not been described before.

Conclusion

VATS bleeding can be managed successfully thoracoscopically in many cases. Usually direct pressure controls the bleeding and

allows the problem to be evaluated by the team. Blind clamping in a pool of blood is hazardous, and improving exposure is key. However, surgeons should bear in mind that forceful compression on the mediastinum medially to control bleeding while taking measures to improve exposure may lead to critical decompensation. Understanding this potential mechanism can prevent complications in similar situations.

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