# Intraoperative complications during VATS lobectomies from conversion to minimally-invasive "trouble-shooting"

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**Abstract:** The aim of this study was to explore intraoperative complications during video-assisted thoracoscopic surgery (VATS) lobectomy. Vascular and bronchial injuries, after a robust learning curve, can be sometimes successfully managed by VATS. During a VATS lobectomy, it is necessary: to be prepared in potentially dangerous situations; to think about strategies to handle intraoperative complications and to share these strategies with your own staff. Herein we present some videos showing cases where vascular injuries led to conversion and others where a minimally-invasive trouble shooting of intraoperative complications was achieved.

**Keywords:** Video-assisted thoracoscopic surgery lobectomy (VATS lobectomy); intraoperative complications; conversion

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## Introduction

Video-assisted thoracoscopic surgery (VATS) lobectomy has been used since the early nineties (1) and is now considered the gold standard treatment for early-stage non-small cell lung cancer (NSCLC) (2). Conversion-related factors and learning curve impacts, are described in the literature in some recent papers (3-5). We recently reviewed reasons for conversion and factors related with conversion in our own series of VATS lobectomy (6). From 2009 to October 2017, 610 patients underwent a VATS lobectomy; 32 (5.25%) cases experienced conversion from VATS to thoracotomy. We classified conversions as follows:

- Emergency/safety: due to vascular injury and intraoperative bleeding or bronchial injury;
- Oncologic: due to positive mediastinal lymph node, unexpected tumor extension into the mediastinum, chest wall or adjacent lobe infiltration;
- Technical: including presence of dense adhesions or inability to proceed due to space restrictions in

morbidly obese patients.

As experience grows, surgeons reach lower conversion rate (6) and can handle intraoperative complications as vascular or bronchial injuries by VATS.

Herein we present some videos showing cases where vascular injuries led to conversion and others where a minimally-invasive trouble shooting of intraoperative complications was achieved.

## **Surgical technique**

All VATS lobectomies were performed with an anterior triportal approach, as we previously described (6). In case of conversion, we performed an anterior thoracotomy extending the utility incision.

## **Patients description**

We herein describe the cases of six patients undergoing

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**Figure 1** Left upper VATS lobectomy: tear of the pulmonary artery requiring conversion in the early experience (7). VATS, video-assisted thoracoscopic surgery.

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Figure 2 Left upper VATS lobectomy: lesion of the pulmonary artery not manageable by VATS (8). VATS, video-assisted thoracoscopic surgery.

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VATS lobectomy for suspected or ascertained NSCLC. In two cases conversion was necessary, while in four cases the complications were successfully managed through VATS.

## Case number 1

The patient was scheduled to undergo left upper VATS lobectomy. Tear of the pulmonary artery occurred after stapling. It happened at the beginning of our experience, and the assistant surgeon handling the camera was not prepared to deal with a major vascular lesion. The first decision to retrieve the camera after the unexpected complication was wrong. Thereafter, safe conversion was



**Figure 3** Right upper VATS lobectomy: injury of the A2 pulmonary artery safely controlled by VATS with TachoSil (9). VATS, video-assisted thoracoscopic surgery.

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carried out while the injury was controlled by compression with a swab (*Figure 1*). Postoperative course was uneventful.

## Case number 2

The patient was scheduled to undergo left upper VATS lobectomy. Lesion of the pulmonary artery occurred during stapler positioning. Initial attempt to manage vascular injury by VATS failed. After safe conversion, while the injury was controlled by compression with a swab (*Figure 2*), vascular suture was performed and postoperative course was uneventful.

## Case number 3

The patient was scheduled to undergo right upper VATS lobectomy. Tear of the A2 pulmonary artery occurred during preparation-sealing with a high energy device. Bleeding was safely controlled by single hemostatic sponge application (TachoSil) (*Figure 3*). Postoperative course was uneventful.

## Case number 4

The patient was scheduled to undergo right upper VATS lobectomy. Injury of the anterior truncus occurred during smooth preparation and tunneling of the vessel. Bleeding was safely managed by peripheral compression with a swab, re-tunneling and central stapling (*Figure 4*). Postoperative course was uneventful.

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**Figure 4** Right upper VATS lobectomy: tear of the anterior truncus safely managed by VATS with compression and stapling (10). VATS, video-assisted thoracoscopic surgery.

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**Figure 5** Left upper VATS lobectomy: tear of the pulmonary artery successfully managed by VATS with compression and double Veriset application (11). VATS, video-assisted thoracoscopic surgery. Available online: http://asvidett.amegroups.com/article/view/22756

#### Case number 5

The patient was scheduled to undergo left upper VATS lobectomy. Hemorrhage due to tearing of staple line on a fragile wall of the pulmonary artery (A1–3). Hemostasis was successfully obtained after double sealing with a hemostatic sponge (Veriset) and compression with a swab (*Figure 5*). Postoperative course was uneventful.

## Case number 6

The patient was scheduled to undergo right lower VATS lobectomy. Tear of the middle lobe bronchus occurred. Airsealing was successfully achieved by thoracoscopic suture of



**Figure 6** Right lower VATS lobectomy: lesion of the middle lobe bronchus successfully treated by thoracoscopic suture (12). VATS, video-assisted thoracoscopic surgery.

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the fistula (Figure 6). Postoperative course was uneventful.

#### Conclusions

Conversion is not a failure, safety first. There is no increase in morbidity after conversion. As experience grows, surgeons reach lower conversion rates and more ability to manage intraoperative complications by VATS. During VATS lobectomies try to be aware and prepared for potentially dangerous situations; think in advance of strategies to handle intraoperative complications; share these strategies with your own staff (surgeons, anesthesiologist, scrub nurse).

#### Acknowledgements

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#### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Informed Consent:* The authors confirm that all videos are completely anonymized and in the text there is no personal information or data that could potentially be traced back to the patient.

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