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## Case Report

## Hemothorax from the stapled line after video-assisted thoracoscopic bullectomy

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## ABSTRACT

A 17-year-old man underwent video-assisted thoracoscopic (VATS) bullectomy because of recurrent, spontaneous pneumothorax of the left lung. However, 6 h later, gradually, 500 mL of bloody fluid was seen. The bloody fluid continued to drain, so we decided on an emergency reoperation. Continuous bleeding was present along a line consistent with the stapled line of the edge of segment 6. We performed a VATS wedge resection with the edge of segment 6 folded up. Postoperatively, recovery was uneventful. Some reports demonstrated that intrapulmonary bleeding occurred late, at the stapled line. However, to our knowledge there has been no previous report on hemothorax just after surgery. This is the first report of hemothorax at the stapled line, developing after VATS bullectomy.

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## 1. Introduction

Today, many thoracic surgeons use stapler devices in resecting the lung parenchyma. These devices are useful not only for air leakage but also for bleeding from the cut surface of the lung parenchyma. However, we found three reports on complications from the use of stapler devices: (1) hemoptysis one year after video-assisted thoracoscopic (VATS) bullectomy for spontaneous pneumothorax,<sup>1</sup> (2) bloody sputum, caused by hemorrhage around staple-lines five years after surgery,<sup>2</sup> and (3) intrapulmonary hematoma around the stapled line after VATS bullectomy for spontaneous pneumothorax.<sup>3</sup> All three reports demonstrated that intrapulmonary bleeding occurred late, at the stapled line. However, to our knowledge there has been no previous report on hemothorax just after surgery. This is the first report of hemothorax at the stapled line, developing after VATS bullectomy.

## 2. Clinical summary

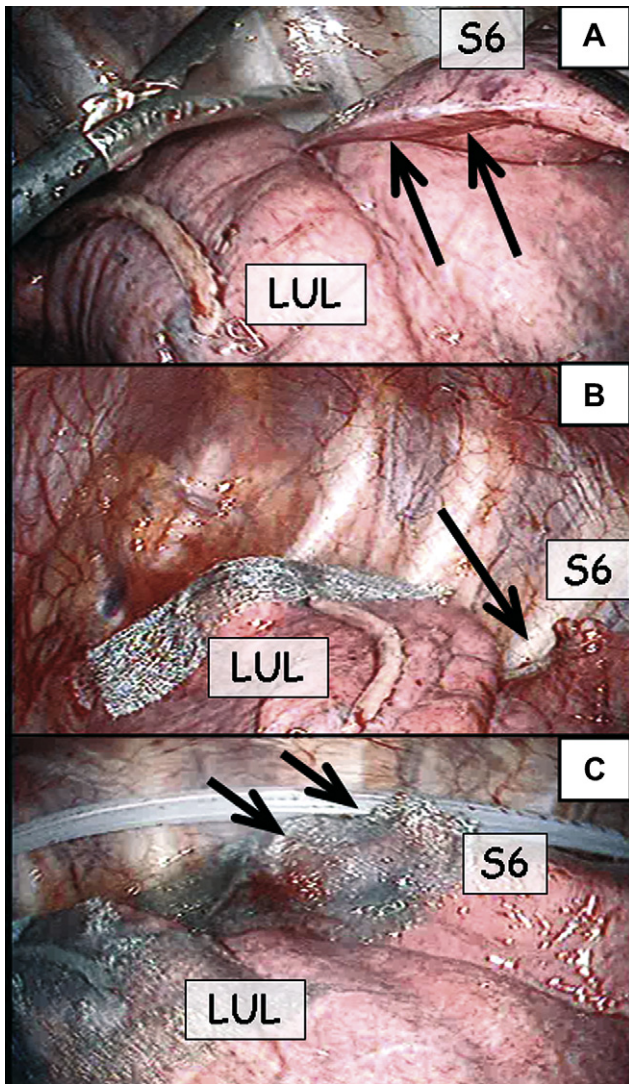
A 17-year-old man underwent VATS bullectomy because of recurrent, spontaneous pneumothorax of the left lung. He had a congenital heart condition, ventricular septal deficiency (VSD), and had undergone a radical operation one year earlier. No remarkable abnormal finding was seen. Blood clotting function was within the normal range. In the first operation, emphysematous bullae were found on segments 1 + 2 and the edge of segment 6,

and a VATS bullectomy was conducted with a stapler device, loaded with a 45-mm gray cartridge (Endo Gia™ Universal Reticulator™ 45-2.0, Tyco Healthcare Group LP, Norwalk, CT, USA). Finally, the stapled lines were covered with polyglycolic acid felt and fibrin glue to prevent recurrent pneumothorax; a 19 F Blake® drain (Ethicon, Somerville, NJ, USA) was placed in the pleural cavity (Fig. 1).

Immediately after the operation, no bloody fluid drained from the chest tube. However, 6 h later, gradually, 500 mL of bloody fluid was seen when the patient sat up in bed. A chest X-ray (CXR) showed a permeability loss in the left lung field. Vital signs were stable; however, bloody fluid continued to drain, so we decided on an emergency reoperation. During the operation, blood was seen in the pleural cavity, and we found that the bleeding point was around the resection stump of the left lower lobe. When the coagulation was removed, continuous bleeding was present along a line consistent with the stapled line of the edge of segment 6. We performed a VATS wedge resection with the edge of segment 6 folded up using a stapler device loaded a 45-mm gray cartridge (Fig. 2). Postoperatively, recovery was uneventful and the patient was discharged on POD 3. No blood transfusion was done. Histologically, the resected specimen of segment 6 did not reveal pulmonary hypertension change. There was no staple failure or tissue disruption along the suture line on the specimens.

The operation had been routinely video-recorded with a DVD recorder through the video-assisted thoracoscopic device. We reviewed the recorded videotape of the procedure; this revealed that at the end of the first operation, no bleeding was seen on the stapler line of segment 6.

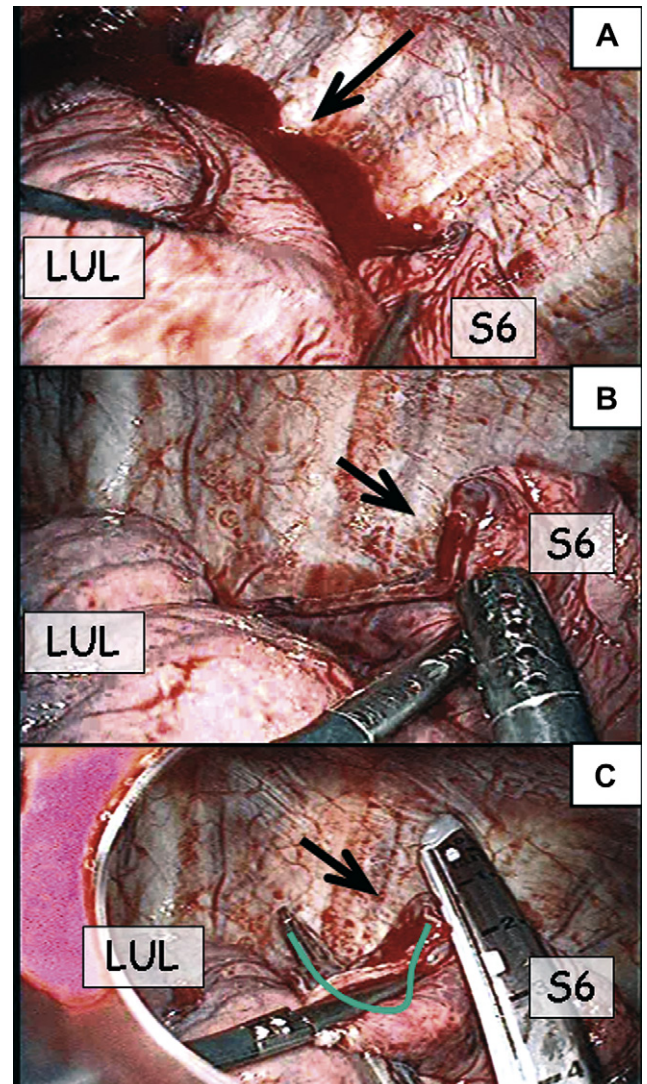
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**Fig. 1.** First operation findings. (A) Emphysematous bullae were found on segments 1+2 and 6 (arrows); (B) VATS bullectomy was performed with a stapler device (segment 6, arrow); (C) The stapled lines were covered with polyglycolic acid felt and fibrin glue to prevent recurrent pneumothorax, and a small Silastic chest tube was put in place. There was no bleeding from the stapled line (arrows). LUL, left lower lobe; S6, segment 6.

### 3. Discussion

Postoperative bleeding should be an avoidable complication. However, despite use of a stapler, with a gray cartridge, bleeding occurred. In general, the 2.0 mm cartridge (gray) should be used on tissue that can comfortably compress to 0.75–1.0 mm, such as thin walled blood vessels. The 2.5 mm cartridge (white) should be used on tissue that can comfortably compress to 1.0–1.5 mm, such as other blood vessels, thin bullae. The 3.5 mm cartridge (blue) should be used on tissue that can comfortably compress to 1.5–2.0 mm, such as most lung tissue. If we use the gray cartridge to close the lung parenchyma with usual thickness, it should cause the stapler failure or tissue cut, resulting in bleeding or air leakage. However, in case of the edge of segment 6, we select a stapler device loaded with a gray cartridge, the staple height of which is 2.0 mm because the edge of segment 6 is thinner than other segment. Why did postoperative bleeding occur from the stapler line? We suggest several reasons. First, the edge of segment 6 was actually thinner



**Fig. 2.** Second operation findings. (A) Blood was seen in the pleural cavity (arrow); (B) The bleeding site was present along a line consistent with the stapled line of segment 6 (arrow); (C) VATS wedge resection was performed with segment 6 folded up (arrow; the green curved line indicates the folding shape of segment 6). LUL, left lower lobe; S6, segment 6.

longitudinally. We had always cut the edge of segment 6 with a stapler device loaded with a gray cartridge. Second, the patient had congenital VSD, so there could be some persistent pulmonary hypertension changes. However, postoperatively, no pulmonary hypertension change was seen in histological specimens.

We believe that recording the surgical procedures on video is valuable. The intraoperative video recording of the operation allowed us, after the postoperative bleeding, to ensure that nothing had been left in the patient. Hoschitzky et al.<sup>4</sup> stated that recording procedures is of immense value for teaching and training surgeons, and locating missing equipment. We agree; there may be additional value as evidence, should there be any allegation of medical malpractice. We confirmed that the recorded videotape revealed no bleeding on the stapler line at the end of the first operation. It is likely that the bleeding was not present on the deflated lung, and begun with lung reinflation.

We recommend that extra care should be taken when performing even wedge resections. In wedge resections of the edge of segment 6, to prevent bleeding from a gap in the stapler line, we recommend:

- folding the lung parenchyma,
- using a stapler with a gray cartridge, the staple height of which is 2.0 mm, and
- cutting the lung parenchyma perpendicularly, to gain the thickness of the lung parenchyma.

#### Conflict of interest

The authors have no commercial associations or sources of support that may pose a conflict of interest. The authors also had full control of the production of this article. No financial support for this study was provided.

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