CASE REPORTS

"DEVICELESS" VIDEO-ASSISTED THORACOSCOPIC LOBECTOMY: IS IT FEASIBLE?

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Abstract

We demonstrate that performing anatomical pulmonary resection by video-assisted thoracoscopic surgery without staplers or energy devices is feasible. This technique is an alternative for surgeons with limited access to expensive technologies.

Keywords: *Thoracic Surgery, Video-Assisted; Carcinoma, Non-Small-Cell Lung; Lung Abscess*

BACKGROUND

Over the past 25 years, video-assisted thoracic surgery (VATS) has been received with enthusiasm globally. Although the benefits of small incisions and shorter hospital stays are clear, the impact on health care costs has been addressed less frequently. Many VATS devices are expensive and, if used injudiciously, can raise operative costs.[1] A common perspective in Europe and the United States that the equipment's cost is counterbalanced by the cost savings of a shorter hospital stay. However, this is not the case in developing countries where hospital costs are much lower.[2] To reduce costs, we developed a VATS lobectomy procedure that does not rely on staplers or energy devices. One more issue, and no less important, is a sustainable idea, without producing hospital waste, in order to cause less impact on the environment.

PROCEDURE

Conventional coaxial VATS surgical instruments were introduced directly through the 4-6 cm incision in the fourth intercostal space along the anterior axillary line. When access was needed to increase visibility, the endoscope (the only device requiring a trocar) was placed through a reusable trocar. To dissect and coagulate vessels inside the chest cavity, we preferred an electrocautery with the tip curved 90° to form a hook. The tip was also used to dissect bronchi and lymph nodes. This low-cost device is reusable. The tip of the suction tube was also used for blunt dissection.

Thorough dissection is essential for success. Whenever possible, two hands were used—one to lift and the other to dissect the tissue. Using blunt dissection, we exposed the pulmonary vessels from their root to their respective segments, leaving the vascular stump largely exposed. After the vessels were cleared circumferentially, each was encircled with 2-0 or 3-0silk suture. The sutures were either tied directly through the incision or tied extracorporeally and cinched inside the thoracic cavity using a knot pusher. (Figure 1) For the proximal stump, we placed an additional transfixing stitch with polypropylene 4-0 suture and then divided the vessel with curved scissors. (Figure 1) After dissection of the bronchus using

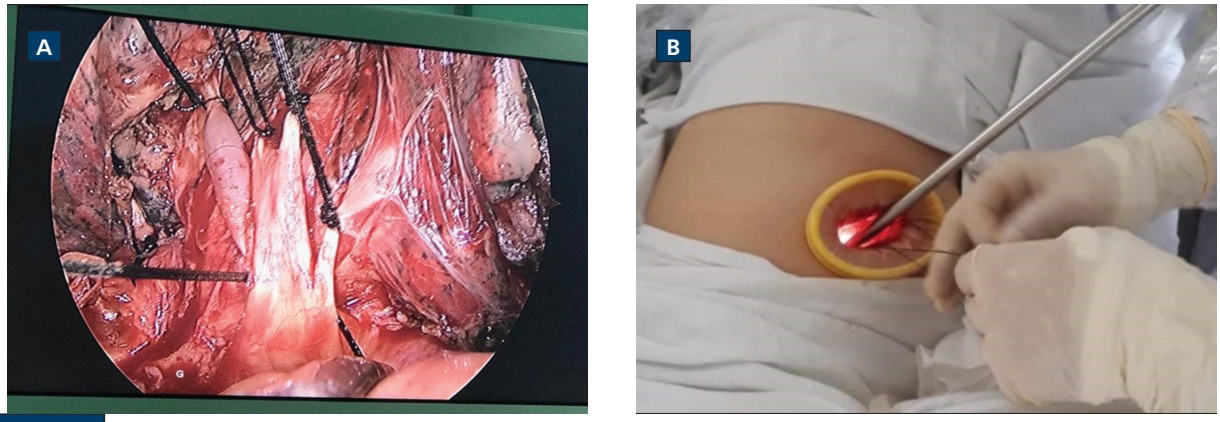

Figure 1 *"Deviceless" ligation. A. Ligated tributaries vein of the upper left lobe and arterial branches (A1-3, arrow). B. Extra-corporeal knot preparation by uniportal access.*

Table 1 **"Deviceless" VATS patient characteristics**

	Gender	Age	Indication	Lobe	Surgical time	Complications	Discharge	Adendum	Portal
1	F	65	Malignant Nodule	Left S6	190min	No	3 days		Uni
2	F	40	Bronquectasis and Pericardial cyst	Middle	105min	No	3 days		Uni
3	M	71	Abscess	Right Upper	290min	Air escape	10 days	Extrapleural release	bi
4	M	60	Bronquectasis	Left Lower	250min	Air escape	8 days		bi
5	M	55	Malignant tumor	Right upper	230min	Air escape	20 days	Venous haemorrage from vein well controlled	bi
6	F	70	Malignant tumor	Left Lower	310min	No	4 days		bi
7	M	62	Abscess	Left Upper	330min	No	6 days		uni
8	M	71	Malignant tumor	Left upper	270	No	5 days		bi
9	F	46	Bronquectasis	Left Lower	220min	Difficult do extra-pleural release	5 days	Difficult do extra-pleural release - Thoracotomy	thoracotomy
10	F	54	Bronchectasis	Lingula	60	No	2 days		uni
11	M	67	Fibroatelectasis	Left Lower	330	No	4 days	Extrapleural release	bi
12	M	68	Malignant tumor	Middle	130	No	2 days		Bi
13	F	79	Malignant tumor	Left Upper	160	No	2 days		tri
14	M	66	Criptococus	Left Basal Pyramid	180	No	2 days		Bi
15	F	54	MNT	Right Upper + S6	210	Air scape	5 days		Bi
16	M	73	Malignant tumor	Left lower	160	Air scape	7 days		Bi
17	M	70	Malignant tumor	Right lower	150	No	2 day		Bi
18	F	63	Malignant tumor	Right upper	.....	Huge tumor (6,5cm)	15 days	Short arterial stump: thoracotomy	thoracotomy
19	F	36	Fungus Ball	Left lower	120	No	3 days		Bi
20	F	37	Criptococcus	Right lower	140	No	2 days		Bi
21	M	53	Metastasis	Left basal pyramid	150	No	3 days		Bi
22	F	49	Metastasis	Left S6	90	No	2 days		Bi

an electrocautery, we sectioned the bronchus using along-handled scalpel, occasionally assisted by curved scissors. We closed the bronchial stump with 4-0 sutures with separate double stitches.

When the fissure was still incomplete, the most demanding part of the procedure, we used vascular clamps to delimit the incision site and divided the lobular tissue with an electrocautery. We repaired areas with air leakage or bleeding with conventional suturing using a coaxial needle holder. When required, we ligated the final bridge of tissue with a handmade loop and then divided it with scissors. We removed the surgical specimen in a sterile glove, placed a 28F to 32F thoracic drain tube, and closed the incision.

RESULTS

From February 2018 to December 2023, 22 patients with pulmonary inflammatory disease and malignant tumors underwent "deviceless" VATS resection (Table 1). We successfully completed the lobectomy using VATS in 20 patients. We converted two procedure to thoracotomy, because we could not safely access the vessels using VATS. Persistent air leakage was the most common complication. One patient bled from a vein in the right upper lobe, but this was easily controlled thoracoscopically using clamps.

DISCUSSION

We developed basic strategies for VATS using low-cost surgical equipment to perform an effective lobectomy. This "deviceless" VATS is based on established surgical techniques of dissection, suture, hemostasis, and tissue approximation with minimal invasion of the chest cavity.

Understanding the 3-dimensional anatomy while making decisions within a 2-dimensional space is important to master "deviceless" VATS. Surgeons are often trained in minimally invasive surgery in well-equipped facilities with staplers and energy devices, but training in minimally invasive manual skills may be limited. Extensive practice is required to adapt the maneuvers of open surgery to a restricted space. McKenna and colleagues[3] suggested that at least 50 VATS lobectomies should be performed to achieve proficiency in video surgery.

The cost of VATS can decrease with proper patient selection and refined surgical techniques.[1,2] Brazilian surgeons face several issues implementing minimally invasive thoracic surgery, and the high cost of consumables has deterred many Brazilian public hospitals from widely adopting VATS. Nevertheless, thoracic surgeons have overcome these challenges,[4] and cost-containment strategies have been put in place in some regions, including the northeast region.

CONCLUSION

We experienced difficulties in adopting VATS lobectomy due to high costs, so we developed a technique for VATS pulmonary resection without staplers and energy devices. To validate this surgical technique, more cases and more institutions are needed.

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