Case report of using curved tip electrothermal bipolar coagulation to improve hilar dissection in VATS lobectomy

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A B S T R A C T

INTRODUCTION: Thoracoscopic lobectomy has gained a pivotal role in the resection of lung cancer. To facilitate the minimally invasive approach, new surgical devices have been developed to help improve the feasibility of performing complex cases. Recently, we adopted the use of a 5 mm curved tip electrothermal bipolar sealing device.

PRESENTATION OF CASE: We highlight two patients with different type of hilum during VATS lobectomy. First patient had a peripheral lung cancer with simple hilum while second patient had bronchiectasis with very complex hilum. In both cases, use of 5 mm curved tip electrothermal bipolar sealing device helped in successful completion of video-assisted thoracoscopic lobectomy.

DISCUSSION: In these two cases, we were able to take advantage of the 5 mm curved tip electrothermal bipolar sealing device in completion of the hilar dissection.

CONCLUSION: Curved tip electrothermal bipolar sealing device allows complete dissection of hilar structures more easily during a lobectomy for simple and complex hilum. Use of this device may lead to more efficient VATS lobectomy.

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1. Introduction

Video-assisted thoracic surgery (VATS) has revolutionized the treatment of both benign and malignant lung disease. Compared to an open approach, it has been shown to be associated with fewer complications without extending operative time [1]. The development of VATS specific surgical instrumentation and different surgical approaches has improved operative times. Alternative energy sources such as the ultrasonic device (Harmonic®, Ethicon, Sommerville, NJ) the electrothermal bipolar sealing device (LigaSure™, Medtronic, Minneapolis, MN) have been used in VATS lobectomy, but their use has been limited to the division of minor (3–4 mm) pulmonary artery vessels and lymphadenectomy [2–4]. Here we present our experience performing VATS lobectomy using the 5-mm curved tip (Maryland) LigaSure™ device. We believe that the short blunt curved tip facilitates hilar dissection of both simple and complex hilum and allowing for coagulation of tiny hilar vessels, which results in safe and efficient surgery.

2. Presentation of case

We report this case series in line with the CARE criteria [5]. The study has been approved by Institutional Review Board at Houston Methodist Research Institute.

Case 1. Lobectomy for lung cancer in a patient with a simple hilum.

A 68-year-old woman had incidentally found 1.3 cm peripheral right lower lobe adenocarcinoma of the lung. A positron emission tomography-computed tomography (PET-CT) scan showed [18F] fluorodeoxyglucose avidity only in the area of the lung without any signs of mediastinal or distant metastatic disease. The patient was recommended to undergo VATS right lower lobectomy and mediastinal lymph node dissection.

2.1. Description of technique

2.1.1. Thoracoscopic port placement

A three-incision technique was used to perform VATS lobectomy. One cm thoracoscopic ports were placed in the 7th intercostal space posterior to the vertical line corresponding to the anterior superior iliac spine and in the 6th intercostal space in the mid-axillary line. A 4 cm utility incision was placed in the 4th intercostal space in the mid-axillary line.
Fig. 1. VATS right lower lobectomy. (A) Inferior pulmonary ligament of right lower lobe. (B) Division of inferior pulmonary ligament. (C) Division of the posterior pleural portion of inferior pulmonary ligament. (D) Division of posterior hilum in the prevascular plane dissecting the inferior pulmonary vein.

Fig. 2. VATS right lower lobectomy. (A) Dissection of posterior hilum to azygous vein. (B) Dissection of the inferior pulmonary vein. (C) Dissection of the right lower lobe bronchus. (D) Division of right lower lobe basilar pulmonary artery.

2.1.2. Resection of the inferior pulmonary ligament

A camera was placed in the posterior inferior port and the tumor was identified in the right lower lobe. A Foerster clamp was placed through the utility incision to retract the lung to expose the inferior pulmonary ligament (Fig. 1A). A 5-mm Maryland LigaSure™ was placed in the anterior inferior port. After initial division of the pulmonary ligament (Fig. 1B), the two layers of the pulmonary ligament were identified and separated from each other (Fig. 1C). The posterior pleura was divided until the inferior pulmonary vein was identified. This dissection allowed for exposure of the prevascular posterior layer of the inferior pulmonary vein (Fig. 1D). The posterior hilar dissection was then carried out to expose the supe-
The camera was then placed in the inferior posterior port and LigaSure™ was used to dissect around the superior portion of the inferior pulmonary ligament (Fig. 1B). Once the vein was mobilized (Fig. 2A), an Endo GIA™ (Medtronic, Minneapolis, MN) gray load (2 mm) stapler was used to divide the vein. Next, we dissected the lower lobe bronchus away from the pulmonary artery using the LigaSure™ (Fig. 2C) and divided the bronchus with an Endo GIA™ purple load (3–4 mm) stapler. Finally, basilar and superior segmental branches of the pulmonary artery were divided with an Endo GIA™ tan load (2–3 mm) stapler (Fig. 2D). The patient then underwent mediastinal lymph node dissection. The total operative time was 60 min with an estimated blood loss of 20cc. The patient’s final pathology was stage I adenocarcinoma.

**Case 2. Lobectomy in a patient with bronchiectasis and a complex hilum.**

A 37-year-old woman with a distant history of tuberculosis who presented with an 18-year history of recurrent episodes of pneumonia that resulted in bronchiectasis causing chronic cough and infections. A CT scan of the chest showed collapse of the lower lobe with bronchiectasis (Fig. 3A). The patient underwent a VATS lower lobectomy. She had dense adhesions due to chronic infections, and the entire lower lobe was adherent to the aorta and the posterior chest wall. We performed lysis of dense adhesions to free the lower lobe from the posterior chest wall using the LigaSure™ (Fig. 3B). Next, we turned our attention to the inferior pulmonary ligament (Fig. 3C). Using a similar technique to the one described above using LigaSure™, we were able to identify the inferior pulmonary vein and find the prevascular plane in the dense adhesions (Fig. 3D). We then mobilized and divided the inferior pulmonary vein, left lower lobe bronchus and the superior segmental and basilar pulmonary artery using the appropriate staplers. The patient’s symptoms resolved after the resection.

**3. Discussion**

Thoracoscopic approach to benign and malignant lung lesions has significantly improved lung surgery outcomes. As demonstrated by several studies, VATS has been found to be associated with fewer postoperative complications and decreased postoperative pain when compared to an open approach [1]. Many different techniques have been developed to facilitate VATS as well as surgical instrumentation, which have resulted in improved workflow and safety of the procedure. Hansen et al. published their experience for VATS lobectomy where they describe their surgical technique using blunt dissection and an electrocautery hook blade to dissect the pleura and hilar structures [4]. Although monopolar energy is widely used in thoracoscopic lung resections, bipolar energy has been shown to have better hemostatic potential with minimal thermal spread. LigaSure™ in VATS lobectomy has mostly been used for division of small pulmonary arteries and performing mediastinal lymph node dissection.

**4. Conclusion**

To our knowledge, this is the first report of the use of the 5-mm Maryland LigaSure™ in VATS lobectomy for hilar dissection. For patients undergoing lobectomy with a simple hilum, the use of the 5 mm Maryland LigaSure™ allowed for efficient and safe operation. This has been supported by a recent study by Martucci et al. who showed that compared to monopolar electrocautery, LigaSure™ was associated with significantly shorter duration of mediastinal node dissection and cumulative chest tube drainage in open lobec-
Overall, the use of the 5-mm Maryland LigaSure™ with careful dissection of inferior pulmonary ligament can help in facilitate VATS lobectomy and allow for safe and efficient surgery.

Conflicts of interest
None.

Sources of funding
None.

Ethical approval
Approved by Houston Methodist Research Institute Institutional Review Board.

Consent
Consent has been waived with IRB approval.

Author contribution
V.F. and M.P.K. contributed to draft of the manuscript. V.F., P.G., E.Y.C. and M.P.K. participated in the design of the study, acquisition of data, critical editing of the manuscript.

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