Robotic left apicoposterior bisegmentectomy for non–small cell lung cancer

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Disclosures: Dr Wei has served as a moderator for a single resident educational session for Intuitive Surgical in the past but does not have any present financial relationship with the company. Kim reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Presented at the 68th annual meeting of the Southern Thoracic Surgical Association, November 3-6, 2021, Atlanta, Georgia.

Institutional Review Board approval: Our hospital's Institutional Review Board granted ethics approval of this study (surgical cases database: IRB-030403013).

Informed Consent Statement: Informed consent was obtained for the study.

Received for publication Dec 27, 2022; revisions received Feb 2, 2023; accepted for publication Feb 7, 2023; available ahead of print Feb 17, 2023.

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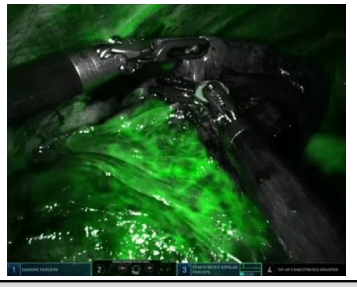
JTCVS Techniques 2023;18:148-50

2666-2507

https://doi.org/10.1016/j.xjtc.2023.02.009



Demarcation of segments after indocyanine green injection.

CENTRAL MESSAGE

Robotic segmentectomy is safe and effective for complete resection of early-stage non–small cell lung cancer.

Video clip is available online.

We present the case of a 57-year-old female patient with an 8-mm left upper lobe nodule. Robotic left upper lobe apicoposterior bisegmentectomy was performed. Informed consent was obtained for the publication of this study data (surgical cases database: IRB-030403013, September 29, 2022).

CASE REPORT

A 57-year-old female presented with an enlarging 8-mm left upper lobe pulmonary nodule. She had a history of vulvar cancer treated with resection and chemoradiation, and was a 40 pack-year smoker with an Eastern Cooperative Oncology Group Performance Status of 0. The baseline maximum standardized uptake value of the lesion seen on ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (CT) was 2.5. Chest CT scan revealed the lesion in the left upper lobe, approximately 2 cm deep from the pleural surface (Figure 1, Video 1). The patient's forced expiratory volume in 1 second (FEV1) was 78% of predicted, and carbon monoxide lung diffusion capacity (DLCO) was 63% of predicted. Postoperative predicted FEV1 and DLCO were judged to be satisfactory for left upper lobe apicoposterior bisegmentectomy, which was favored over wedge resection given the oncologic benefit of anatomic resection and anticipated difficulty with palpating the lesion given its depth from the surface. The CT scan was reviewed in axial, coronal, and sagittal reconstructions, which helped us determine that the nodule would be amenable to apicoposterior bisegmentectomy.

A 4-arm completely portal technique was used with the Davinci Xi surgical platform (Intuitive Surgical). The camera port was located in the seventh intercostal space, and 12-mm left and right robotic arm ports and an 8-mm accessory arm port were placed. After mediastinal lymph node dissection, the posterior ascending artery was dissected and divided with a robotic stapler (white load, 2.5 mm staple height) deployed via the left arm. The anterior and apical arteries were defined, and the latter was divided with a white load robotic stapler via the right robotic arm. The apicoposterior bronchus was then identified, running to the same location as the previously divided arteries. The anterior bronchus was visualized beneath the apicoposterior bronchus, traveling in an anterior direction, and preserved. The apicoposterior segmental bronchus was divided with a blue load stapler (3.5 mm staple height) via the left arm. After retracting the left upper lobe posteriorly, the upper division vein was dissected until reaching the bifurcation of the anterior and apicoposterior veins. The apicoposterior vein, the superiormost branch, was divided with a white

FIGURE 1. Chest computed tomography scan showing the nodule (*arrow*).

FIGURE 2. Demarcation of segments after indocyanine green injection.

load robotic stapler from the right arm. Then 10 mg of indocyanine green (ICG) was injected intravenously, demarcating the lung segments (Figure 2, Video 1). The surface boundary was electrocauterized to define the line of transection. Parenchymal transection was performed with robotic staple fires (green loads, 4.3 mm staple height) while ensuring that the divided hilar structures remained in the specimen. A polytetrafluorethylene bag was used for specimen removal, and a 24 Fr chest tube was inserted.

Pathology demonstrated a T1aN0 stage IA1, 9-mm, moderately differentiated acinar predominant (70%) and lepidic (30%) adenocarcinoma. The margin was 2.5 cm from the tumor, and 13 negative lymph nodes were obtained. The patient was discharged home on postoperative day 1 after chest tube removal with no complications.

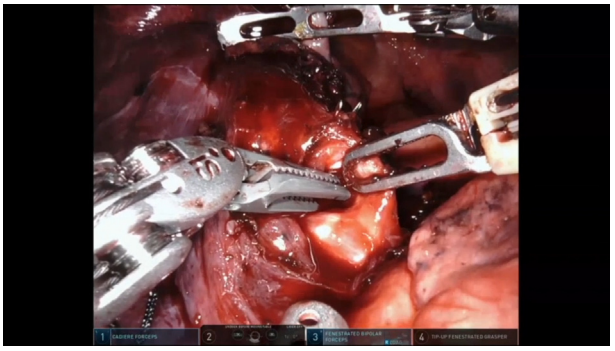
DISCUSSION

Surgical excision remains the key treatment method for patients with early-stage non–small cell lung cancer, and the extent of resection may depend on the patient's clinical condition.[1] Segmentectomy can be considered for tumors <2 cm, as several studies have confirmed similar disease-free survival and local recurrence rates with better functional outcomes compared to lobectomy.[2] In our case, the patient was a relatively young heavy smoker with a prior vulvar malignancy and also a high risk of lung cancer; apicoposterior bisegmentectomy was felt to be appropriate given the small size and depth of the lesion. Wedge resection was considered problematic in terms of achieving an adequate margin in this particular case owing to the depth of the lesion, as well as its disadvantages compared to segmentectomy in terms of hilar nodal dissection and potentially recurrence-free survival.[3] In the present case, trisegmentectomy or lobectomy would have no apparent advantage over apicoposterior bisegmentectomy, given the location and size of the lesion.

Intravenous ICG injection permits identification and demarcation of segments. It is given after arterial and venous ligation of the target segment. Previous studies have demonstrated the safety and utility of ICG use in sublobar resection.[4]

Minimally invasive surgical techniques are being increasingly preferred over thoracotomy. Video-assisted thoracoscopy and robotic segmentectomy are associated with fewer postoperative complications and comparable oncologic efficacy to thoracotomy.[5]

A recent randomized controlled trial of patients with tumors ≤2 cm showed superior overall survival outcomes of segmentectomy versus lobectomy, suggesting that segmentectomy can be strongly considered for these patients.[6]



VIDEO 1. Video of robotic left apicoposterior bisegmentectomy. Video available at: https://www.jtcvs.org/article/S2666-2507(23)00058-5/fulltext.

CONCLUSIONS

Robotic apicoposterior bisegmentectomy is a safe and effective method for removal of pulmonary tumors in the

left upper lobe, allowing postoperative conservation of lung function.

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