

Single-port robotic right upper lobe lobectomy: A case report



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Right upper lobe lobectomy was performed on the da Vinci SP system.

CENTRAL MESSAGE

We present a technique of single-port robotic lobectomy using the da Vinci SP system (Intuitive Surgical).

▶ Video clip is available online.

Robotic lung resection has become increasingly accepted as a safe and effective alternative to thoracoscopic surgery.¹ The introduction of the da Vinci SP System (Intuitive Surgical) has recently marked a major technical breakthrough.² Here, we describe a patient diagnosed with a right upper lobe adenocarcinoma who underwent a successful robotic lung resection using the da Vinci SP System.

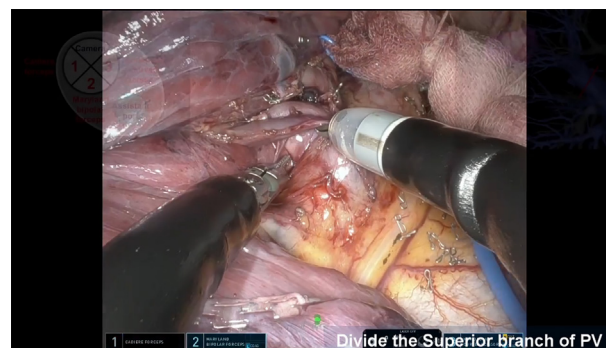
CASE REPORT

A 70-year-old woman was referred to the surgical clinic due to a diagnosis of cT2 N0 M0 adenocarcinoma in the right upper lobe (RUL) (Figure E1). RUL lobectomy was performed on the da Vinci SP System. Informed consent was obtained for publication of the patient's data. The study was approved by the Institutional Review Board of Chang Gung Memorial Hospital, Taiwan (reference: CGMH-IRB

202101423A0; October 12, 2021. This study is registered at www.ClinicalTrials.gov, identifier NCT05535712).

Surgical Technique

The surgical technique is illustrated in Video 1. After intubation with a double-lumen endotracheal tube, the patient was placed in the left lateral decubitus position. A



VIDEO 1. Single-port robotic right upper lobe lobectomy using the da Vinci SP System (Intuitive Surgical). Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00188-8/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00188-8/fulltext).

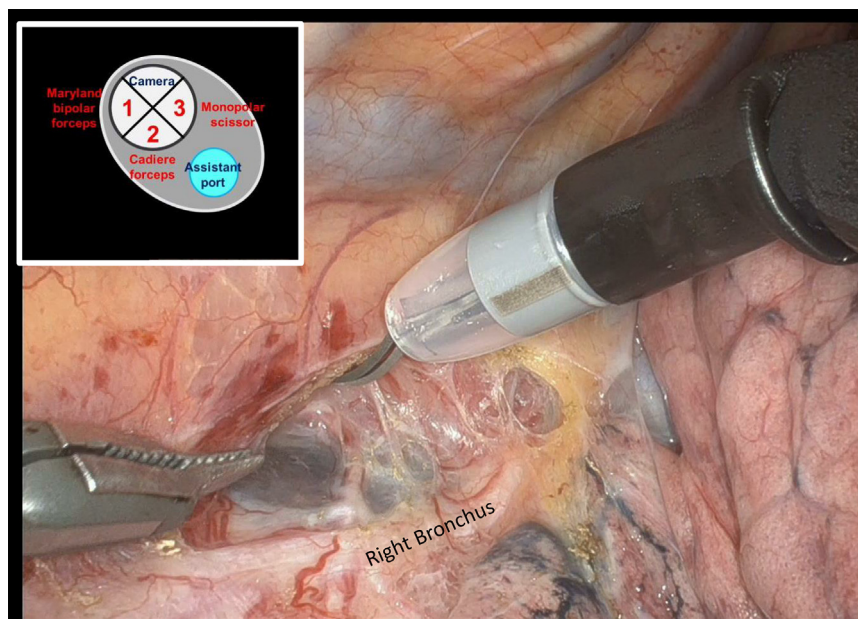


FIGURE 1. In the dissection of subcarinal lymph nodes, a monopolar curved scissors was utilized in the right hand (arm #3), whereas a Maryland bipolar forceps was employed in the left hand (arm #1) as energy devices for dissection. Additionally, a Cadiere forceps or fenestrated bipolar forceps served as the third arm for lung traction (arm #2).

4-cm incision mark was initially positioned at the intersection between the subcostal arch and the midclavicular line (Figure E2, red line). A 5-mm observation port was subsequently created at a distance of 10 to 12 cm, perpendicular to the midpoint of the subcostal incision mark, and connected to a carbon dioxide insufflator

(pressure, 8 mm Hg) (Figure E2, green circle). The subcutaneous tissue and the oblique muscles were incised until the transverse abdominis fascia was visible. By tunneling with finger blunt dissection below the costal cartilages and above the diaphragm, the pleural space was accessed. After insertion of a uniportal access device

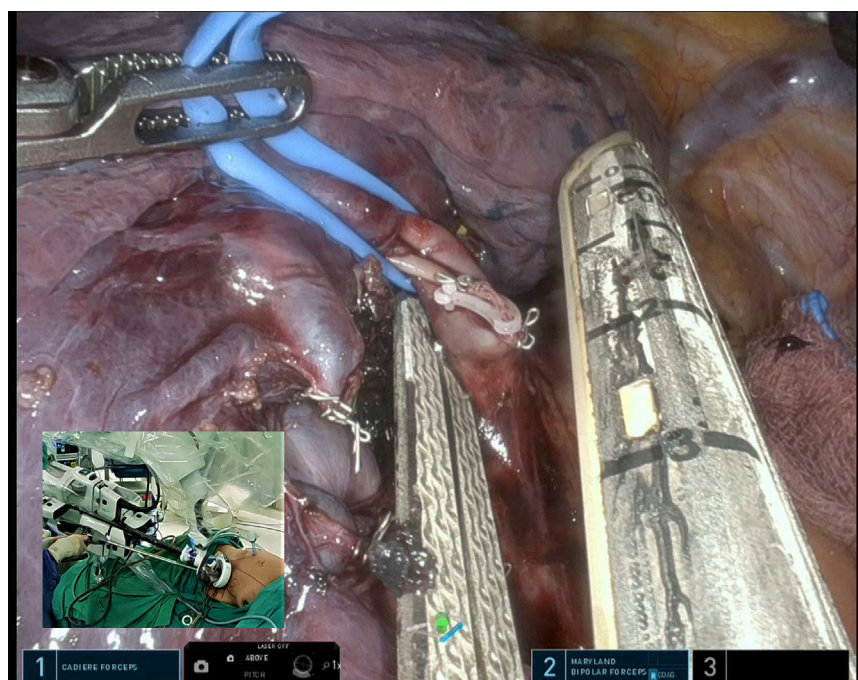


FIGURE 2. The transection of the right upper lobe pulmonary artery was executed using a handheld endovascular stapling instrument, which was inserted through the subcostal incision. Both external and internal views are displayed.

(da Vinci SP Access Port Kit) and connection to an insufflator, the single 2.5-cm trocar was docked to the da Vinci SP Patient-Side Cart Arm. In this procedure, four robotic instruments were employed: a Cadiere forceps, a fenestrated bipolar forceps, a Maryland bipolar forceps, and a monopolar curved scissors. The surgical sequence mirrored that of multiport robotic surgery. Following the completion of mediastinal lymph node dissection (Figure 1), a meticulous dissection was carried out alongside the vessels, creating adequate space for the secure introduction of the stapler. The handheld endovascular stapling instrument was subsequently inserted (Figure 2).

Upon completion of the procedure, the diaphragm and the rest of the wound were closed. The total operating time was 210 minutes, including the creation of subcostal access (14 minutes) and robot docking (4 minutes). No significant intraoperative events were observed. The chest tube was removed on postoperative day 1 and the patient was discharged home on postoperative day 3 without complications. The immediate postoperative pain intensity score was measured at 5 out of 10; however, on the first postoperative day, it decreased to 1 out of 10. Upon conducting a histopathological examination, a lepidic predominant pT1 cN0 (20 examined nodes) adenocarcinoma was identified in the RUL. All tumor resection margins were negative.

DISCUSSION

This is the first account of successfully utilizing this robotic platform for an anatomical lung resection. By incorporating the camera and 3 instruments into a single 25-mm shaft, the system greatly minimizes the risk of collisions. The innovative elbow deployment enables the instruments to deploy in a diamond configuration, allowing the entire operative field to move cohesively as a single unit. Furthermore, a holographic display on the operative panel assists surgeons in tracking the orientation of the instruments internally, relative to themselves,

which helps to reduce conflicts. These features have the potential to facilitate a smooth transition to single-port surgery platforms for surgeons already proficient in multiport robotic surgery. Nevertheless, we encountered a few technical challenges upon implementing this technique. First, the limited width of human intercostal spaces presented a challenge for the insertion of the 2.5-cm cannula, leading us to opt for subcostal access.³ However, the distance between the subcostal arch and the hilum is considerable, causing certain difficulties during the upper mediastinal dissection due to the instrument's inherent length limitations. Consequently, it is essential to further investigate the appropriate range of chest cavity sizes for da Vinci SP System procedures. Another issue is that stapling equipment and advanced energy devices compatible with the da Vinci SP System are currently unavailable. In this scenario, stapling of the bronchus and pulmonary vessels should be performed with a handheld stapler by an experienced bedside assistant. Removal of 1 robotic arm during stapling, the use of staples with an extra-long instrument shaft, and a proper selection of the curve tip design are other useful measures that can ensure a safe, collision-free procedure (Figure 2).

CONCLUSIONS

Our findings substantiate the notion that anatomical lung resections can be executed both effectively and safely using single-port robotic platforms.

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FIGURE E1. Computed tomography imaging findings of the lung tumor.

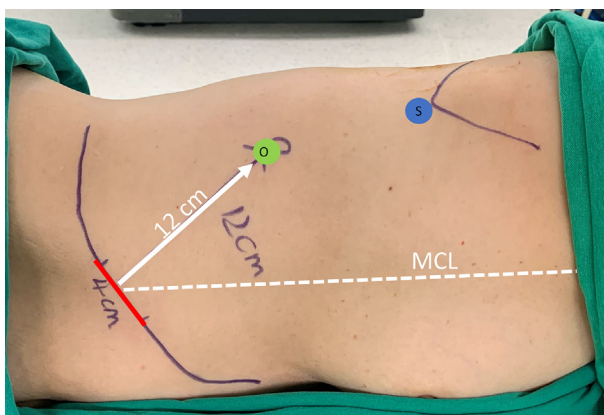


FIGURE E2. Subcostal incision design and observation port (O) placement. *MCL*, Midclavicular line; *S*, scapula tip.