Masters of Cardiothoracic Surgery

Uniportal hybrid robotic-assisted right upper sleeve lobectomy in an 83-year-old patient with severe pulmonary hypertension

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Submitted Jan 11, 2023. Accepted for publication Feb 06, 2023. Published online Feb 09, 2023.
doi: 10.21037/acs-2023-urats-35
View this article at: https://dx.doi.org/10.21037/acs-2023-urats-35

We present a case of an elderly patient with necrotic lung cancer and severe pulmonary hypertension (PH) [pulmonary artery (PA) 68/24 mmHg, main pulmonary artery (mPA) 38 mmHg measured by right heart catheterization], who underwent a right upper sleeve lobectomy. We used a hybrid technique combining uniportal video-assisted thoracoscopic surgery (UVATS) with uniportal robotic-assisted thoracoscopic surgery (URATS). The postoperative course of the patient was uneventful, being discharged on post-operative day (POD) 7. Pathology showed a squamous cell carcinoma pT3pN1cM0.

Clinical vignette

An 83-year-old patient with permanent atrial fibrillation, and severe PH was admitted to our department. Lung function was limited [forced expiratory volume in one second (FEV1) 1.41; 50%] and the patient had a large squamous cell carcinoma identified in the right upper lobe. Perfusion/ventilation scan showed 4.6%/3.8% in the right upper field. After evaluation by the tumor board, the patient was proposed for surgery. Due to the severe PH (68 mmHg systolic pressure), we performed a hybrid approach (UVATS-URATS) to reduce the surgical time.

Surgical technique

Preparation

The patient was placed in a lateral decubitus position. During the UVATS procedure, the assistant was located on the posterior side of the patient, in front of the main surgeon. During the URATS procedure, the robotic arms came from the posterior side of the patient and the assistant was located on the anterior side.

Exposition

For the lobectomy, an incision in the 5th intercostal space (ICS) was created and the right upper lobe was removed through a UVATS approach. For the anastomosis, the robot was docked from the posterior side of the patient. Robotic arm 1 was cancelled, the camera was on arm 2, the left hand was on arm 3 (bipolar fenestrated) and the right hand was on arm 4 (needle holder).

Operation

The upper lobe was strongly attached to the chest wall and mediastinum but without signs of invasion. After an extrapleural dissection, a right upper lobectomy was performed using thoracoscopic staplers. The intermediate bronchus and right main bronchus were cut with thoracoscopic scissors. The lobe was removed in a protective bag. The robot was docked through the same uniportal incision. A systematic lymph node dissection was performed (paratracheal and subcarinal spaces) with the use of a Maryland dissector and bipolar fenestrated forceps.

In the anastomotic part, the needle holder was in the

right hand (arm 4) and the bipolar fenestrated grasper was in the left hand (arm 3). An end-to-end bronchial anastomosis was accomplished using a 3-0 absorbable barbed running suture (Filbloc, Assut Europe, 30 cm length, 2 needles).

During the URATS procedure, the assistant was standing on the patient's anterior side, helping through the utility incision. The main role of the assistant was to retract the lung for better exposure by using a long-curved suction (Scanlan International, Inc., Saint Paul, Minnesota, USA), removing the lymph nodes with a long node grasping clamp (Scanlan International, Inc.) and adjusting the robotic arms to avoid collision. The surgical time was 2 hours for the UVATS lobectomy and 50 minutes for the robotic procedure (anastomosis: 23 minutes).

Completion

The lung was checked for air leak by inflation. A 24 French chest tube was placed through the anterior axillary line, working port. The wound was closed with an intradermic suture. Bronchoscopy was performed before extubation to remove secretions and ensure there was a good anastomotic caliber with no stenosis. The patient was extubated in the operating room and transferred to the intensive care unit.

Comments

Clinical results

The patient was transferred to the ward after 48 hours. The evolution of the patient was satisfactory, with improvement in cardiopulmonary function and good lung expansion on chest X-ray. The drain tube was removed on the 6th POD and the patient was discharged home on the 7th POD in excellent condition. The final pathology showed a 7-cm large, extensively necrotic, squamous cell carcinoma pT3pN1cM0 with free bronchovascular margins and no pleural invasion.

Advantages

The uniportal approach has proven to show benefits compared to classic open and multiport approaches, especially for fragile and elderly patients. The single incision causes less pain and allows for a faster recovery (1). For centrally located tumors requiring sleeve resections, the surgery can be performed by a uniportal approach, avoiding the risk of a pneumonectomy and the comorbidities related to thoracotomies.

During the last decade, important experience has been gained in sleeve resections performed by UVATS (2). Thanks to this experience, we have implemented the robotic technology to evolve to URATS bronchovascular procedures (3). The use of RATS for sleeve resections has various inherent characteristics, such as three-dimensional vision, seven-degrees of freedom of movement of the instruments, tremor filtering, better exposure, and the facility for tying inside the chest (4). By using the robot, we have seen benefits during the anastomosis such as shortening the surgical time thanks to the use of barbed running sutures. The direct view in parallel with the instruments allows for a very good field for suturing through a single incision approach with no limitations.

Caveats

PH is a condition that entails a high risk for surgery, especially for anatomic lung resections. Patients with PH undergoing thoracic surgery have a higher morbidity and mortality compared with other procedures and should have careful preoperative planning, including perfusion/ventilation scans. Complications could occur, predominantly due to hypoxia and/or hypotension secondary to respiratory failure, congestive heart failure or cardiac dysrhythmia (5). In addition, the thoracoscopic and robotic instrumentation must be used very carefully in these patients, due to the fragility of the pulmonary artery, which in case of bleeding, could end up in a catastrophic event. During the thoracoscopic dissection and the insertion of the robotic instrumentation, there should be perfect coordination with the assistant in order to avoid collision of the arms and/or possible damage to the pulmonary artery. There are few reports in the literature describing minimally invasive surgery in patients with this condition. As far as we know, this is the first report of a sleeve resection performed by minimally invasive surgery in an elderly patient with severe PH.

Acknowledgments

Funding: None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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Cite this article as: Gonzalez-Rivas D, Koziej PH, Sediqi S, Ruprecht B, Jostmeyer H, Valdivia D. Uniportal hybrid robotic-assisted right upper sleeve lobectomy in an 83-year-old patient with severe pulmonary hypertension. Ann Cardiothorac Surg 2023;12(2):136-138. doi: 10.21037/acs-2023-urats-35