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Masters of Cardiothoracic Surgery

# Uniportal robotic-assisted thoracic surgery anatomic segmentectomies

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## Clinical vignette

A 67-year-old female, smoker 30 pack/year, presented with a right upper lobe nodule discovered on a computed tomography (CT) scan during symptomatic COVID; personal and family history was not relevant. She was proposed for a uniportal robotic S3 (segment 3) right segmentectomy after clinical examination and standard paraclinical investigations. The patient signed the informed consent for the proposed surgery.

## Surgical technique

### Preparation

The patient was placed in left lateral decubitus position and ventilated with a double lumen tube into the left lung. The robot was docked on the patient's back, with active arms No. 2, 3, and 4 (arm No.1 canceled). Video-assisted thoracoscopic surgery (VATS)/thoracotomy instruments were prepared.

### Exposition

The single 4cm incision was performed on the 7$^{th}$ intercostal space, between the anterior and middle axillary lines.

### Operation

After initial intrapleural inspection, the exposure for dissection was obtained with the left-hand robotic instrument and long suction from the assistant. Dissection was initiated at the level of the anterior hilum, reading the venous segmentation. Then the identification of the pulmonary artery truncus intermedius was performed and the minor fissure partially stapled, being completed in a further step. A total of three venous branches, tributaries for S3, were identified and sectioned. The artery for the ventral segment (branching from the truncus superior) was then dissected and sectioned, followed by the bronchus B3 and segmental lymph nodes. The distal stumps were freed of parenchyma in order to correctly apply, proximal to them, the parenchymal staplers. For accurate margins of S3, intravenous indocyanine green (ICG) was injected and the robotic camera was shifted to Firefly mode. Stapling and extracting the disconnected S3 is the final step of the resection. Paratracheal lymph nodes were dissected.

### Completion

Hemostasis was checked and lung parenchyma was inflated. The intrapleural 24 Fr drain was exteriorized at the

surgical wound's posterior angle and attached to water-seal drainage. The patient was extubated in the operating room. The chest drain was removed the next day, and the patient was discharged after another two days, with normal postoperative evolution. Pathology result was granulomatous chronic inflammation presenting necrosis, in the pulmonary lesion and lymph nodes. The patent was referred to the pneumology service.

## Comments

### Clinical results

Follow-up at seven months presented a patient with normal quality of life, following the pneumological recommendations.

### Advantages

Anatomic segmentectomy(-ies), performed for pulmonary lesions ≤2 cm, successfully combine excellent oncological results with lung sparing principles. The oncological benefit arises from the peribronchial lymph node excisions. A segmentectomy is considered "simple" when one single plane is to be divided from the remaining parenchyma, and "complex" when multiple planes must be created for separating the resected segment(-s) (1). There is no standard anatomy of pulmonary segments, only anatomic variations that are more or less frequent (2). With this in consideration, a segmentectomy is technically more difficult compared to a lobectomy. Therefore, preoperative assessment in each case with identification of the arterial, venous and bronchial variations (and, if possible, of the parenchymal margins) is mandatory. Intraoperatively, most of the authors consider segmentectomy a fissure-based technique, performing an extensive dissection of the elements in the fissure for accurate anatomical identification. Other authors successfully practice, when appropriate, fissure-last technique segmentectomies, based on a thorough study of the CT reconstructions. We performed this approach by uniportal robotic-assisted thoracic surgery (U-RATS) for both techniques, depending on the particularities of each case. Segmentectomy was initially practiced for aged/marginally fit patients, as a compromise for lobectomy; now, the segmentectomies are intentionally performed in indicated cases, for oncological and non-oncological pathology (3). The segmentectomy offers simultaneous diagnosis and treatment for undetermined nodules detected on CT scan, for which no further assessment is possible (neither bronchoscopic nor by CT-guided biopsy).

The exact margins of the segment(-s) to be resected are identified preoperatory and intraoperatively. Preoperatory, CT scan reconstructions are studied; 3D imaging models are useful. The bronchoscopist must be trained for surgical requirements. Intraoperatively, different techniques are available, such as inflation, deflation, or intravenous ICG. Correct oncological margins present at least 2cm from the nodule/lesion. Robotic segmentectomies offer a more precise dissection of vessels and bronchi at the segmental level and, maybe most importantly, an extremely accurate segmental lymph node dissection. The robot offers the additional benefit of dexterity, making segmentectomy accessible to more thoracic surgeons, including less experienced ones, increasing the number of complex procedures performed. Earlier detection of lung cancer due to screening programs and the development of systemic personalized therapies may allow for an increasing role of the anatomic segmentectomy in the multimodal, personalized treatment plan for lung cancer patients. One key issue is that, if positive lymph nodes or positive microscopic margins are detected after segmentectomy, the patient can be technically reoperated on for obtaining R0 through completion lobectomy. U-RATS technique uses unique access both as a utility incision and extraction port, as they are defined in the consensus statement published by Cerfolio and collab. in 2017 (4). With U-RATS, using the Da Vinci Xi® system, we had no limitation in performing upper or lower, simple or complex, and single or combined segmentectomies. We performed over 30 U-RATS segmentectomies, and three quarters of them are complex segmentectomies: S1+S2, S2+S6, S7+S10, S8+S9, S6+S10a, S6+S8, S9+S10. With an experience of more than one year in U-RATS now, we anticipate a much more comfortable progression from open or from VATS to robotic surgery using the U-RATS technique. Compared to U-RATS, U-RATS offers much more flexibility, and better access for posterior segmentectomies, due to its deeper 3D view and enhanced maneuverability (5). Regarding mediastinal lymph node dissection performed by U-RATS, we more frequently utilized the vessel-sealer for dissection compared to the Maryland dissector.

### Caveats

The most important principle when preparing an anatomic segmentectomy by uRATS is knowing the case's specific

anatomy. Polymer ligating clips (placed with the 90-degree angulation robotic applicator) and the robotic vessel-sealer are most useful in segmentectomies than in other U-RATS lung resections (5). Experience in uniportal access, both for the operating surgeon and the assistant surgeon is highly recommended for the uniportal RATS segmentectomies.

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## Footnote

*Conflicts of Interest:* The authors declare no conflicts of interest.



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## References

1. Kodia K, Nguyen DM, Villamizar NR. Comprehensive narrative review of segmentectomy for lung cancer. AME Med J 2021;6:19.
2. Nomori H, Okada M. Illustrated Anatomical Segmentectomy for Lung Cancer. Tokyo: Springer Japan, 2012.
3. Yang CFJ, D'Amico T. Segmentectomy and Lesser Pulmonary Resections. In: LoCicero J, Feins RH, Colson YL, et al., editors. Shields' General Thoracic Surgery, 8th edition. Philadelphia: Wolters Kluwer; 2019. p.439-451.
4. Cerfolio R, Louie BE, Farivar AS, et al. Consensus statement on definitions and nomenclature for robotic thoracic surgery. J Thorac Cardiovasc Surg 2017;154:1065-9.
5. Gonzalez-Rivas D, Manolache V, Bosinceanu ML, et al. Uniportal pure robotic-assisted thoracic surgery—technical aspects, tips and tricks. Ann Transl Med 2022. doi: 10.21037/atm-22-1866.



 