

Multidisciplinary approach to minimally invasive lung segmentectomy

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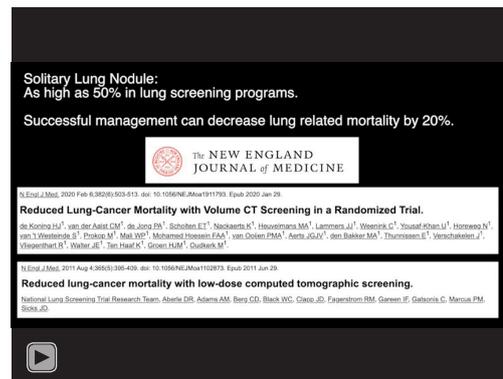
In this narrated video (*Video 1*), we present the role of segmentectomy in the treatment of early stage lung cancer (1-4), lung metastases (5), as well as its diagnostic roles. It shows our multidisciplinary approach in a complete manner in the case of robot-assisted segmentectomy.

We then explore some of the technical challenges related the anatomical variations that we usually encounter, the difficulties in demarcating the intersegmental plane, and how to ensure having sufficient margins around the lesion.

We next underline a shift from open thoracotomy to minimally invasive approaches when it comes to this type of surgery in France. The data of the graph are extracted from Epithor database (6), and it shows the number of segmentectomy, according to the surgical approach from 2009 till June 2019.

The authors think that segmentectomy represent an adapted diagnostic and therapeutic option in the case of solitary lung nodules. Those present as high as 50% of the lesions in lung screening trials, one must emphasize that the successful management of such lesions decrease lung mortality by more than 20% (7,8), and that despite advances in imaging-based percutaneous or endobronchial techniques, getting a precise diagnosis can still be very challenging.

Faced by the aforementioned difficulties we developed a multidisciplinary approach to minimally invasive lung segmentectomy (9,10). We first started by creating 3D reconstructions out of contrast-enhanced CT scans with infra-millimetric slices to study the unique anatomy of the patient, the margins around the lesions, and predict its



Video 1 Multidisciplinary robot-assisted right S2 segmentectomy.

distance from the intersegmental plane.

To ensure enough margins, we started asking our pulmonology team to do endobronchial dye markings, notably when the lesion seems close to the intersegmental plane on the 3D reconstruction model. The procedure is done at the operative theater, under general anesthesia minutes before the surgical procedures, thus avoiding repetitive unnecessary general anesthesia and logistic issues.

The teams' technique and initial experience with endobronchial dye marking using virtual bronchoscopy and rEBUS was published in 2018 (11). In a series of 22 patients (25 nodules in total) who underwent infra-lobar resections (segmentectomy and wedge resections), the procedure added an average of 10 minutes to the surgical resections, histological diagnosis and free margin resection were obtained in all cases. It's worth noting to say that the

same operative precision was considered impossible by the surgeon without dye marking in 21/25 cases.

The video includes a whole team approach (3D reconstructions, Virtual bronchoscopy, rEBUS double dye marking) in the case of right S2 robot-assisted segmentectomy.

As per our robot-assisted approach, we used 4-arm approach with an assistant port. We used indocyanine green (ICG) to identify the intersegmental plane once all target vessels were identified and stapled. The pulmonologist used double dye endobronchial marking in order to help the surgeon visualize the lesion and its distance from resection plane at all times (during normal and infra-red visions).

The case is that of a 70-year old man who was treated of colorectal cancer in 2015. He was in complete remission till 2019 when on a follow-up CT scan we discovered a left lower lobe 2.5 cm, and a 0.9 cm right upper lobe lesions.

The patient was in a good shape, and had normal pulmonary function tests. He first underwent left lower lobectomy, final histological analysis showed 2 adjacent lesions, the first was metastatic of colorectal origin, and the second was a primitive lung cancer.

The multidisciplinary meeting decision was to carry out an a right S2 segmentectomy.

The postoperative course was uneventful, and histological analysis showed a metastatic lesion of colorectal origin.

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Footnote

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