Robot-assisted segmental resection for intralobar pulmonary sequestration

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ABSTRACT

INTRODUCTION: Pulmonary sequestration is a rare congenital malformation found most frequently as intralobar sequestration in the left lower lobe. Complete surgical resection is considered the treatment of choice.

PRESENTATION: We present the case of a 29-year-old woman with intralobar pulmonary sequestration (ILS) diagnosed on chest CT. The sequestration was located in the left lower basal segments (segments 9 and 10) and was treated successfully by robot-assisted segmental resection without complication.

DISCUSSION: Recently, robot-assisted thoracoscopic lobar resections started to be performed for ILS. The sublobar, segmental resection are reserved mainly for the resection of pulmonary nodules. We report a first case of robot-assisted anatomical segmental resection for ILS.

CONCLUSION: We highlight the role of robotic technology offering three-dimensional view and excellent dexterity enhancing the surgical performance and getting the surgical procedure more precise and safer. This could be useful especially in case of challenging sublobar resections.

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1. Introduction

Pulmonary sequestration is a rare pulmonary anomaly in which a nonfunctional pulmonary tissue separated from normal pulmonary parenchyma is supplied by aberrant vessel(s) arising from the systemic circulation [1]. Complete surgical resection is the treatment of choice for any type of pulmonary sequestration. In the past, thoracotomy was considered as the best surgical approach. Nowadays VATS (video-assisted thoracoscopic surgery) proved its role and is widely accepted as a valid option for experienced surgeons. Recently robot-assisted thoracoscopic resections were successfully performed providing encouraging results in management of various thoracic pathologies.

2. Presentation of case

A 29-year-old female patient was diagnosed with a left lower lobe intralobar sequestration on a chest CT performed because of a unique episode of hemoptysis. Otherwise she was completely asymptomatic and an active smoker with no relevant past medical or surgical history.

The chest CT showed a cystic lesion in the left lower lobe occupying the basal segments with two aberrant vessels arising directly from the descending aorta and measuring 11.1 mm and 6.5 mm in diameter (Fig. 1). Findings matched with Pryce III intralobar sequestration. Further preoperative investigations comprising pulmonary function tests and echocardiography were strictly normal. After discussion with the patient and because of favorable anatomy we opted for a robot-assisted thoracoscopic segmental resection.

The patient was placed in a right lateral decubitus position. A 4 cm incision was made in 5th intercostal space and three additional trocars were placed in a usual robotic layout. The Da Vinci robot located on the backside of patients head was approached and docked. A 30° angled-scope was used and the dissection was performed mainly with anatraumatic grasper and electrocautery hook.

Diffuse pleural adhesions were gently liberated and the pulmonary ligament was divided. The dissection continued cranially in order to identify the two aberrant vessels described by imaging (Video 1). The vessels were carefully liberated and transsected using a stapling device (ENDO-GIA™, Curved Tip Reload, Covidien, Mansfield). After detailed lower lobe inspection, the apical segment was found to be completely normal and a sublobar resection was performed. The division of the left lower pulmonary vein was visualized and the basal lower vein was stapled (Video 2). The border between apical and basal segments was progressively stapled and
3. Discussion

Pulmonary sequestration is a rare entity, encountered sporadically in adult thoracic surgical patients. It was first described in the 19th century by Pryce, establishing the definition later in 1946. It represents about 0.15–6.4% of all congenital lung anomalies and is the second most common lung anomaly detected antenatally [1]. Two types, the extralobar and intralobar sequestrations are distinguished, the latter are more common and make up for 75% of the cases [1]. The symptoms are often non-specific. Hemothysis and recurrent pulmonary infections are the major symptoms present in two-thirds of patients. However, the diagnosis is based on radiological appearance on contrast enhanced chest CT or MRI.

Treatment modalities of ILS include surgical resection, endovascular treatment of the aberrant artery and combined procedures. Complete surgical resection is still accepted as the gold standard treatment. The most challenging step during the surgery is the identification and ligation of the aberrant artery because of inflammatory changes and pulmonary adhesions caused by recurrent infections. Better exposure enabling safer aberrant artery control was the main reason why thoracotomy remained for a long time the principal surgical approach. In 1994 Watine et al. reported for the first time a case of an extralobar pulmonary sequestration treated by VATS [2]. Since then many case reports describing VATS resection of pulmonary sequestration were published. In 2006 Kestenholz et al. suggested in his series that VATS was a safe surgical option [3]. In the same year Tsang et al. published a series of 6 patients showing results similar to conventional thoracotomy [4]. In 2013 Shen et al. reported 25 patients treated by VATS concluding that VATS was associated with shorter operating time, shorter length of hospital stay and no or postoperative complication [5]. Most recently Liu et al. reported retrospective case series including 42 patients comparing VATS resection to thoracotomy. The results of both techniques were comparable with no significant difference [6].

Sublobar resections are feasible particularly in case of limited basal segment location. VATS wedge resection or anatomical segmentectomy represent the main alternatives to standard lobectomy in localized ILS. In 2004 Sakuma et al. published the first case of VATS wedge resection of right basal segment for localized ILS and recommend sublobar VATS resection as an appropriate treatment in this case [7]. The feasibility depends particularly on perioperative findings, sequestrated lung delimitation and surgeon experience. However, larger studies comparing thoracotomy to thoroscopic management and lobar to sublobar resections are lacking.

Recently, robot-assisted thoracoscopic resections started to be performed and a first case of ILS resection was published by Al-Mufarrej in 2009. The patient underwent robot-assisted right lower lobectomy without any complication [8]. In 2011 Melfi et al. reported the first series of 4 patients with ILS treated by robotic pulmonary resection. The type of surgical procedure was not specified, no mortality or perioperative morbidity was described and all patients were discharged from hospital the third postoperative day [9].

For our patient we chose a robot-assisted thoracoscopic segmental resection as an appropriate treatment with a good result. In our experience the robotic technology provides better manageability and an excellent view, which is ideal particularly in

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**Fig. 1.** Coronal contrast chest CT image showing the two aberrant arteries (white arrow) arising directly from the thoracic aorta and the left lower lobe cystic lesion.

**Fig. 2.** Fixed histological section of pulmonary sequestrate measuring 14 × 8.5 × 5 cm.
limited spaces. This could be beneficial in case of difficult dissection and aberrant artery control in ILS resection. The robotic technology enables safe segmental anatomical resection and avoids any traction during aberrant artery dissection reducing so the risk of perioperative vascular injury.

4. Conclusion

Even though there is no study confirming the superiority of VATS in ILS resection, this technique replaced nowadays a traditional thoracotomy approach. We consider that robot-assisted thoracoscopic resection especially for sublobar resection is more precise and safe than conventional VATS reducing the risk of perioperative complications and conversion. It should be particularly useful for challenging cases but further studies should prove its role.

Ethical approval

None needed.

Conflict of interest

The authors declare that there is no conflict of interest.

Methods

The case report is conformity with CARE Guidelines: http://www.care-statement.org [10].

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None.

Authors’ contributions

J. Konecna: writing the manuscript and literature review, W. Karenovics: correction of the manuscript and supervision, G. Veronesi: correction and supervision, F. Triponez: patient contact, correction and supervision.

All authors read and approved the final manuscript.

Consent section

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Guarantor

F. Triponez.

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