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Case Report

Uniportal Thoracoscopic Left Apical Trisegmentectomy (Lingula-Sparing) in an 8-Year Old Child

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Abstract

Minimally-invasive techniques are increasingly used in recent years in the field of thoracic surgery in adults. In children on the other hand, mostly due to limited intrathoracic space, minimally invasive approaches are often only used for minor thoracic procedures such as wedge resections or pleural biopsies. We herein report a case of an 8-year old boy undergoing single-incision thoracoscopic left upper trisegmentectomy for a solitary sarcoma metastasis. The chosen approach not only resulted in minimal access trauma by taking advantage of a uniportal approach, but also a significant amount of lung parenchyma was spared by performing a segmental resection instead of a lobectomy of the left upper lobe.

Keywords: *Video-Assisted Thoracoscopic Surgery (VATS); Single-Incision Thoracoscopic Surgery (SITS); Lobectomy; Segmentectomy*

Introduction

Thanks to many advantages such as less intraoperative bleeding, less pain, less postoperative complications and a shorter hospital stay, minimally invasive approaches are constantly gaining ground in the field of thoracic surgery in adults. In recent years especially the single-incision approach, also called 'uniportal approach' is getting more and more popular thanks to even less complications and better outcomes compared to traditional multiport VATS (video-assisted thoracoscopic surgery) resections [1]. Furthermore this technique seems to even allow a faster recovery of lung function after anatomic lung resections [2].

However, in children these techniques have only been used for minor procedures so far [3-5]. Experience with uniportal VATS for anatomical lung resection is extremely limited in children. So far in the international literature only one case report of a uniportal middle lobectomy for aspergilloma in an 11-year old female and one case of bronchoplastic upper lobe resection in a 10-year old patient is documented [6,7]. No case of uniportal thoracoscopic segmentectomy has been reported to the present day.

Case Presentation

An 8-year-old boy that suffered from a pathological right-sided humeral fracture was diagnosed with localized Ewing's sarcoma of the humerus 3 years ago. After chemotherapy, resection of the tumor and reconstruction of the right humerus with a fibular graft was performed. Two years later positron emission tomography/computed tomography (PET-CT) showed a 3cm tumor mass in the left upper lobe, as well as a suspicious lymph node in the left axilla (Figure 1). CT-guided needle biopsy of the lung mass confirmed the diagnosis of pulmonary metastasis. After another 7 cycles of chemotherapy with slight regression of the lung metastasis, the patient was scheduled for axillary lymph node biopsy and resection of the lung metastasis. Due to the central location of the metastasis in the upper lobe an extra-anatomic resection was not an option, therefore the decision for an anatomical resection of the upper three segments was made in order to preserve as much healthy lung parenchyma as possible. Histopathological examination of the axillary lymph nodes revealed no tumor and only remnants of the previous tumor in the upper lobe after chemotherapy.

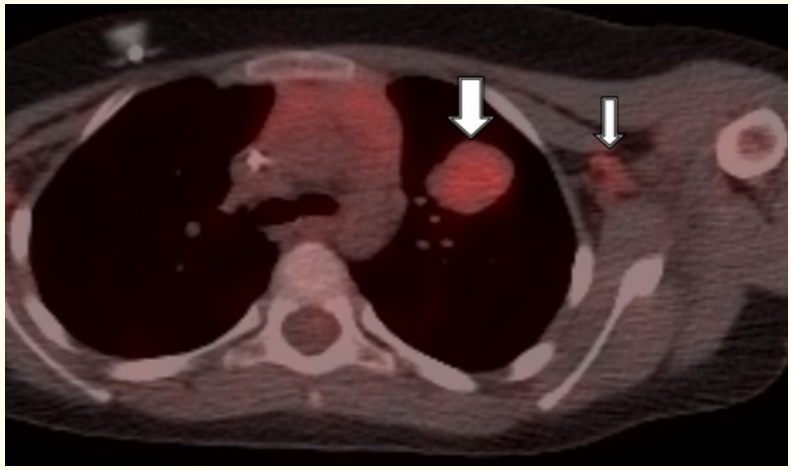

Figure 1: *PET-CT showing tumor mass in the left upper lobe (thick arrow) and a suspicious lymph node in the left axilla (thin arrow).*

Surgical Technique

The patient was put under general anesthesia and a left double lumen endotracheal tube (size 26) was placed for exclusion of the left lung during the procedure. After positioning the patient in a right lateral decubitus position a 2.5 cm incision was made in the anterior axillary line in the 5th intercostal space (Figure 2). The thoracic cavity was then entered with a 5 mm/30° camera. The hilum was approached and the common venous trunk to the upper three lung segments (V1-3) was isolated and divided with a vascular stapling device (Echelon Flex powered vascular stapler - Ethicon) (Figure 3A). Similarly the common arterial trunk A1/A3 and the A2 branch were divided. Then the common bronchus to the upper three segments of the upper lobe was isolated and cut with the same vascular stapling device (Figure 3B). Slight re-ventilation of the left lung allowed clear identification of the intersegmental plane between S1-3 and the lingula, which was then divided by means of a stapling device (Echelon Flex powered Endopath Stapler – Ethicon). After dissection of the lymph nodes in stations 5, 6, 7 and 10, a 20 Fr chest tube was inserted through the incision and the incision was closed.

Figure 2: *Postoperative view of the 2.5cm thoracic incision with indwelling chest tube.*

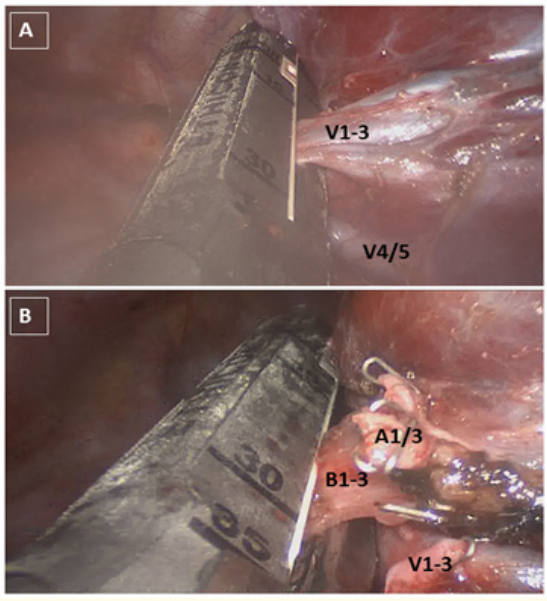

Figure 3: *Intraoperative view showing division of the common venous trunk of the segments 1-3 (V1-3) with a vascular stapling device (A). The venous branches of the lingula are preserved and can be seen in the lower part of the picture (V4/5). B: Division of the common bronchus B1-3 with the vascular stapling device. Also the stump of the divided arterial branches (A1 and 3) as well as the venous stump can be seen (V1-3).*

The chest drain was removed on the 2nd postoperative day with the chest x-ray showing a well expanded left lung after resection (Figure 4) and the patient was discharged on postoperative day 3 without any postoperative complications.

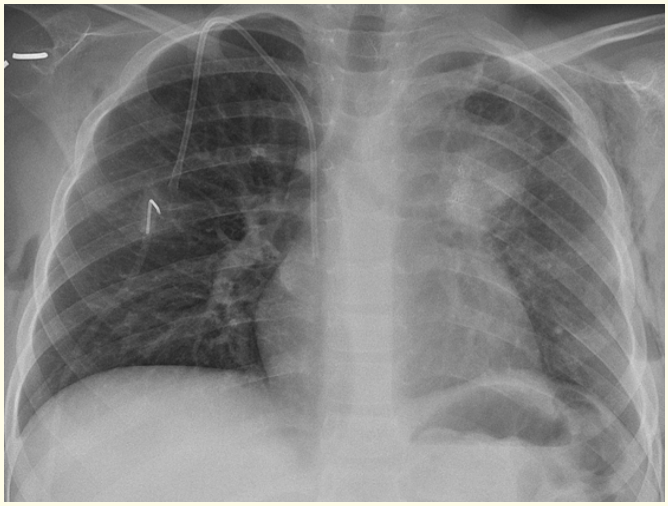

Figure 4: *Chest x-ray after removal of the chest drain on the second postoperative day.*

Discussion

VATS (video-assisted thoracoscopic surgery) approaches have been shown to be safe and effective not only for minor, but also for more complex thoracic surgical procedures in recent years. While allowing the same oncological resection, minimally invasive techniques result in fewer complications, less pain and a shorter hospital stay compared to open surgery [8,9].

Furthermore patients show a faster postoperative recovery, not only concerning lung function recovery, but also overall performance status [2,9,10].

Lung resections in VATS were originally established with multiportal approaches, until several years ago the team of Diego Gonzales-Rivas showed the feasibility of a uniportal VATS or Single incision thoracoscopic surgery (SITS) approach for lobectomy [12]. Due to even less postoperative pain and an accelerated patient recovery, this technique is spreading worldwide and has even been successfully used for minor minimally invasive procedures in children [3,4]. Also one case of single-port thoracoscopic resection of an extralobar sequestration has been described in a child [5].

However, because the intrathoracic space as well as the caliber of the vessels and bronchus is even smaller in children, experience with minimally invasive anatomic lung resection in this population is lacking. In the literature only one report of a 'standard lobectomy' in terms of a uniportal middle lobectomy in an 11-year-old girl with pulmonary aspergilloma has been described [4]. Diego Gonzales-Rivas described another more challenging case of a bronchoplastic right upper lobectomy in a 10-year old patient in 2016 [5]. But so far no reports of anatomical segmental resections in children can be found.

One of the main problems when applying minimally invasive techniques, which were originally developed for adults, in children is the fact that many instruments and especially the available stapling devices are too big in relation to the smaller anatomy of a child. In the presented case we took advantage of a much slender stapling device, which has not only a thinner shaft (9 mm vs. 12 mm) but also a narrower anvil (7 mm vs. 10 mm) than most available stapling devices. Therefore this vascular stapler is much more suitable for the smaller diameter of the vessels of a child. Even the common bronchus to the segments 1-3 could be easily and safely divided with the same stapler.

Conclusion

As illustrated by the presented case, single incision thoracoscopic approaches can also be safely and effectively used by experienced VATS surgeons for anatomic lung resections including segmentectomies in children, allowing these patients to benefit from the same advantages that this technique offers to adults already today.

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