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Complete resection of left paratracheal nodes for stage IIIA disease can be achieved with robotics during left upper lobectomy after induction therapy

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DISCLOSURES

Dr. Moonsamy has no disclosures to report.

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KEYWORDS

Robotics, locally-advanced disease, neoadjuvant therapy, N2 disease

CENTRAL MESSAGE (187/200 characters)

Robotic technology including magnified visualization and small wristed instruments can be advantageous to perform a complete lymphadenectomy and achieve an R0 resection in stage IIIA disease after induction therapy.
GLOSSARY OF ABBREVIATIONS

SCC - squamous cell carcinoma
LUL - left upper lobe
COPD – chronic obstructive pulmonary disease
VATS – video-assisted thoracic surgery
RLN – recurrent laryngeal nerve
CT – computed tomography
PET – positron emission tomography
FDG – F-fluorodeoxyglucose
INTRODUCTION

There is growing evidence to support the feasibility of robotic lung resection after induction therapy\textsuperscript{1,2}. We present a case where robotic technology was advantageous in performing a complete left paratracheal lymph node dissection and highlight techniques that can be employed to improve the safety and efficacy of robotic-assisted lung resection after induction therapy.

CASE

The patient is a 63-year-old male 40 pack-year smoker with COPD and diabetes who was found to have a 1.4cm left upper lobe (LUL) nodule on screening CT scan with associated left paratracheal lymphadenopathy. Both the nodule and left paratracheal nodes were FDG-avid on PET scan (Figure 1). PET/CT and brain MRI revealed no distant metastases and an endobronchial ultrasound (EBUS) biopsy of the level 4L lymph node was consisted with squamous cell carcinoma (stage IIIA, pT1bN2M0). Per institution guidelines, IRB approval and written informed consent was not required for publication.

The patient underwent neoadjuvant chemotherapy ( carboplatin/taxol) and mediastinal radiation (50 Gray) rather than immunotherapy given his negative PDL1 status and restaging PET/CT showed a treatment response. He then underwent robotic left upper lobectomy.
TECHNIQUE

A completely portal approach was used with 4 ports across the 8th intercostal space, two of which were 12mm stapler ports to facilitate stapling from both anterior and posterior aspects. An assistant port was placed in the 10th intercostal space (Supplemental Figure 1).

The inferior pulmonary ligament was resected and level 8 and 9 nodes were removed. The lung was retracted anteriorly, and the level 7 lymph station was harvested (Video 1). The level 11 node on the pulmonary artery (PA) was removed and the plane between the PA and the aorta was developed. The PA was exposed in the fissure and the posterior major fissure was completed. (Video 2). After removal of the interlobar node at the junction of the upper and lobe bronchus, the lingular PA and the parenchyma of the anterior major fissure were transected. All structures were divided with the robotic SureForm™ stapler. The posterior ascending PA branch was then ligated (Video 3).

Significant post-treatment fibrosis was encountered with attempted dissection of the truncus PA branch. Further dissection in this area was deferred until better exposure and total vascular control was obtained. The left main PA was exposed after complete resection of the level 5 and 4L nodes and great care was taken to preserve the recurrent laryngeal nerve in this area (Figure 2, Video 4).
Total vascular control of the left main PA and left inferior pulmonary vein was obtained with vessel loops. The superior pulmonary vein and left upper lobe bronchus were divided before the truncus PA branch to increase exposure. The bedside assistant applied traction to the vessel loops while the truncus PA branch was ligated (Video 5).

An intercostal muscle flap was harvested and buttressed to the bronchial stump to prevent bronchopleural fistula. (Video 6). The patient tolerated the procedure well and was free of vocal cord dysfunction. Final pathology showed 0% residual tumor with 7 lymph node stations examined and one 0.1mm focus of SCC found in the resected 4L lymph node (ypT0pN2a1M0).

COMMENT
This case highlights robotic techniques that can facilitate safe resection of stage IIIA disease after induction therapy. Magnified robotic visualization and small wristed instruments facilitate dissection in tight spaces with difficult access. This technology was advantageous to achieve an R0 resection with complete removal of the left paratracheal nodes. Additionally, total vascular control can be obtained before division of friable pulmonary arterial branches and an intercostal muscle flap can be harvested without the need for thoracotomy. Conversion to thoracotomy for patient safety should not be considered an adverse event. However, avoiding detrimental effects of increased pain...
and changes in chest wall compliance on respiratory mechanics has been shown to improve outcomes\textsuperscript{3}.

There are no randomized controlled trials comparing minimally invasive surgical (MIS) approaches with thoracotomy after induction therapy. One retrospective study of 428 patients who underwent lobectomy after induction therapy (397 thoracotomy, 14 VATS and 17 robotic) showed that outcomes were similar between MIS and thoracotomy groups respectively; including R0 resection rate (97\% vs. 94\%; p=0.99), postoperative morbidity (32\% vs. 33\%; p=0.99) and 3-year disease free survival (49.0\% vs. 42.1\%; p=0.19)\textsuperscript{1}. In the CheckMate 816 trial, 30\% of patients in the neoadjuvant nivolumab + chemotherapy group underwent MIS with favorable surgical outcomes including shorter duration of surgery and less need for pneumonectomy without increase in postoperative complications\textsuperscript{4}.

Patients with locally advanced disease were excluded in the initial published experience of robotics. However, lymph node upstaging and number of harvested lymph nodes with robotics is similar to open and superior to VATS\textsuperscript{5,6}. The advantages of robotics that facilitate a more complete lymphadenectomy must be harnessed to improve oncologic outcomes in this patient population, as long as safety is ensured.
Legends

Figure 1: A) CT chest with left upper lobe nodule (red arrow); B) PET-CT with FDG-avid left paratracheal nodes

Figure 2: Complete resection of level 5 and 4L nodal stations

Video 1: Level 7 lymph node dissection

Video 2: Posterior hilar dissection and dissection on the pulmonary artery in the major fissure

Video 3: Division of the pulmonary artery branches to the left upper lobe

Video 4: Dissection and removal of level 5 and 4L nodes

Video 5: Obtaining total vascular control of the left main pulmonary artery and left inferior pulmonary vein

Video 6: Intercostal muscle flap harvest and buttress to the bronchial stump

Supplemental Figure 1: da Vinci Xi robotic port placement
References


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