CASE REPORT

Novel thoracoscopic approach to difficult posterior mediastinal tumors

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Abstract
Thoracoscopic resection is the preferred treatment of posterior mediastinal tumors. However, thoracotomy may be necessary if the tumors are large or adherent; if they are demonstrate invasion or intraspinal growth; or if they are located in the superoposterior mediastinum or posterior costodiaphragmatic angle. We describe a case of a large, adherent posterior costodiaphragmatic mediastinal mass that would have been otherwise difficult to resect thoracoscopically if it were not for the three-dimensional visualization, greater dexterity, and accurate dissection offered by the Da Vinci robot.

Key words
Posterior mediastinum · Robot · Thoracoscopy

Introduction
The mediastinum is traditionally divided into three compartments: anterior, middle, and posterior. Mediastinal tumors are comprised of various benign and malignant neoplasms. The commonest posterior mediastinal tumors requiring surgical resection are neurogenic tumors (posterior mediastinal neurogenic tumors, or PMNTs). The thoracoscopic experience in the posterior mediastinum as described in the literature is mainly derived from experience with neurogenic tumor resections. PMNTs and other posterior mediastinal tumors can be resected by video-assisted thoracoscopic surgery (VATS). However, if the tumor is large (>5 cm), if it is adherent or demonstrates invasion or intraspinal growth, or if it is located in the superior mediastinum or at the posterior costodiaphragmatic angle, thoracotomy is usually necessary to resect the tumor safely. By virtue of three-dimensional visualization, greater dexterity, and more accurate dissection, the Da Vinci robot broadens our minimally invasive capabilities in the posterior mediastinum, allowing thoracoscopic resection of posterior mediastinal tumors that would have otherwise required open resection.

Case report
A 44-year-old overweight, but otherwise healthy, woman was found to have a $7.5 \times 3.5 \times 3.0$ cm mass, suspected to be a PMNT, in the right posterior costodiaphragmatic angle on computed axial tomography (CT) of the chest that was done for complaints of chest pain (Fig. 1). The patient was advised to undergo right thoracoscopic resection with likely robot assistance. Written informed consent was obtained preoperatively.

Following general anesthesia and successful double-lumen endotracheal intubation, the patient was positioned in a left lateral position with her right side up. Three 2-cm incisions were made in a “lazy V” type configuration. Dissection was carried into the right pleural space. The right lung was deflated, and the patient was maintained on one-lung ventilation. Obviating the need
for more than one rigid retractor that can hinder the robot’s movements, the dome of the diaphragm was retracted inferiorly using a “retraction suture” during the initial VATS setup prior to positioning the robot. A 0 Ethibond suture was placed on the dome of the diaphragm, brought out through the camera port, and fixed to the drapes inferiorly. The camera was introduced into the pleural cavity through the mid-axillary incision (eighth intercostal space, three-fifths the distance between the tip of the scapula and the costal margin). The mass was noted to be adherent anteriorly to adjacent lung tissue and posteriorly to the vertebra. It was clearly not amenable to conventional VATS resection in our hands given its size, location, and adherence to posterior tissues (spine and chest wall).

The robot was then positioned perpendicular to the long axis of the patient’s torso (Fig. 2). The robot’s left and right arms were positioned into the cephalad (third intercostal space) and caudad (sixth intercostal space) anterior axillary incisions. The lung was retracted, opening the subcarinal space; and exposure was maintained with an endoscopic self-retaining retractor placed through a fourth small mid-axillary incision in the seventh intercostal space (4 cm medial to the camera port) (Fig. 3). The mediastinal pleura was then incised and reflected off the subcarinal nodes. Care was taken to avoid vital structures including the esophagus, vagus nerve, and phrenic nerve. With the aid of the Da Vinci robot, the mediastinal mass was carefully dissected from surrounding tissues. After completing the posteromedial dissection and mobilizing the mass off the vertebra, the mass and the adjacent lung tissue were stapled off with an endoscopic gastrointestinal anastomosis (endo-GIA) stapler, completely freeing up the mass. The mass was then delivered in an endo-pouch via the anterior incision (Fig. 4). After ensuring hemostasis, a posterior chest tube was left in place, and the incisions were closed. The surgery lasted 2 h 4 min with <75 ml of blood loss.

Pathology assessment confirmed retromediastinal fibrosis with pulmonary entrapment. The postoperative course was complicated with reintubation required for due to tracheolaryngeal edema. The edema was likely due to the patient’s difficult intubation and exacerbated by her body habitus. She was eventually discharged on postoperative day 9 with no problems during follow-up.