

L. JAMES

I'm presenting to you today a patient who has a right upper lobe biopsy-proven lung cancer. And we will be resecting this lung cancer, minimally invasive, with robotic assist.

WUDEL JR.:

The patient is positioned on the side in the operating room, and small port sites, approximately eight millimeters, are created to allow for trocars, or tubes, to be inserted inside of the chest. These tubes will facilitate the placement of robotic instruments into the patient's chest to perform the operation. The placement is done bluntly to minimize trauma to the muscle structures, nerves, veins, and arteries. A camera is used to assist in the port placement.

Four ports are typically placed for this operation, three of which are used by the robot. And one port is an accessory port, which is used by my assistant, who stands at the bedside. The robot is then moved into position and docked with the patient, meaning that the robotic arms are locked onto the port sites to ensure that they're stable and that instruments can be inserted in and out of the chest easily. The instruments are then loaded onto the robotic arms, as is the camera, and all of them are advanced inside of the chest.

Typically a scrub nurse and an assistant are at the bedside. I sit in a console approximately 20 feet away from the operative field and control the robot remotely. The instrument arms move 360 degrees inside of the patient, and enabled me to move exactly like I would if I were performing the operation with an open approach.

This operation is started by insicing the inferior pulmonary ligament, which will allow for mobilization of the lung, and also will allow the lung to expand properly and fill the entire chest cavity to compensate for the removed portion of the lung. As the dissection continues, from a posterior approach initially, the major structures are identified, including the bronchus, the veins, and lymph node structures. Lymph nodes are harvested as the dissection proceeds from an inferior to superior direction.

This is resection of a level seven lymph node, which sits beneath the bifurcation of the air tubes. Lymph node staging is critical in the evaluation of a patient with cancer. To stage them properly so adequate treatment can be provided, the lymph nodes are then removed from the chest and sent to the pathology department for analysis.

After the posterior portion of the operation is complete, it is then carried superiorly and anteriorly to expose more lymph nodes-- and, once again, to expose the critical structures of the right upper lobe, including the bronchus, which is the air tube, the vein, which drains blood from the right upper lobe, and the pulmonary arteries, which feed the right upper lobe with their needed blood supply. This is resection of a level four lymph node, which sits on top of the right upper lobe.

This is a picture of the heart, the diaphragm, and the phrenic nerve, which innervates the diaphragm and powers it. There's a thin layer of tissue called the pleura which overlies the major structures that feed the lung. This area is referred to as the hilum of the lung. The structure that's becoming apparent, which is blue, is the superior pulmonary vein, which drains blood from the right upper lobe. It is very carefully dissected and encircled with a silk suture for retraction and traction purposes. It is then elevated, and it is cut with an endoscopic stapling device. The stapling gun will deploy six rows of very small titanium staples. In the middle of the staple gun is a channel for a knife blade. So, as you will see shortly, this device will cut and seal the pulmonary vein at the same time.

After ligation of the pulmonary vein, the artery segments that feed the right upper lobe become apparent and are well seen. This is the trunkus anterior artery, which is the major artery that feeds blood to the right upper lobe. It is, once again, encircled with a silk suture and elevated, and using the endoscopic stapling gun, it is ligated.

There is another small accessory branch, called the posterior ascending artery, that more than 50% of patients have feeding the right upper lobe as well. It is also dissected and, once again, encircled, elevated, and ligated.

There are lymph nodes that surround the major structures in the hilum that are dissected. Attention is then turned toward the bronchus, which is the air tube that ventilates the right upper lobe. It is dissected, encircled with a silk suture, and elevated. And, using an endoscopic stapling device loaded with a heavier staple cartridge, the right upper lobe bronchus is cut and ligated and sealed.

The right upper lobe is then separated from the right middle and the right lower lobes by following the minor fissure, which is a natural division that separates these portions of the lung. The endoscopic stapling device is used to complete that fissure with multiple consecutive applications of the stapling device.

More lymph nodes are harvested from within the hilum to complete the staging evaluation for the patient. Progel surgical sealant is then applied to the staple lines and the dissection in the mediastinum to promote healing and to prevent the development of any leak of air or fluid from the stapled tissue.

The right upper lobe, which has been resected, is now elevated and placed into a 15-millimeter Endo Catch bag to be removed from the chest. The bag is closed to ensure that there is no contact between the lung tissue and the chest wall tissues. A small drain tube is then placed through one of the port sites, which concludes the operation.