LUNG LOBECTOMY WITH THORACOSCOPY
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Key Points
- Thoracoscopy can be used to perform lung lobectomy in dogs
- Small masses away from the hilus are amendable to removal with thoracoscopy
- One lung ventilation is very helpful for the exposure of the hilus of the lung lobe

Thoracoscopy is a minimally invasive operative procedure for the examination of the pleural cavity and its organs. With the development of high-resolution micro-cameras, video optics, and fiberoptic light delivery systems, clear magnified images of the surgical field can be transferred to a video screen. The ability to perform diagnostic and advanced therapeutic procedures is possible with minimally invasive video-assisted endoscopy in combination with minimally invasive surgical instruments.

Instrumentation
To perform a lung lobectomy, stapling equipment is required. An EndoGIA is used for the procedure, and it comes in three different lengths for the cartridges: 30, 45, and 60 mm. Staples are 2.0, 2.5, 3.5 or 4.8 mm long before closure. The EndoGIA places 6 rows of staples and cuts in between the staple lines.

Thoracoscopy technique:
Anesthesia
One-lung ventilation technique with selective intubation of either the left or the right lungs will allow a better exposure of the hilus of the lungs. It will facilitate placement of the stapling equipment. One entire lung is going to be excluded during the procedure. A bronchial blocker can be used instead of selective intubation to achieve one-lung ventilation. The blocker will be placed in the lung lobe that needs to stay deflated. When one-lung ventilation is used, the non-ventilated lung is going to collapse. The non-ventilated lung is then creating a shunt, which results in severe hypoxemia. Arterial blood gases are needed to monitor oxygenation of the patient. Positive end expiratory pressure can be applied to improve oxygen saturation during one lung ventilation. Positive end expiratory pressure does not affect cardiac output or oxygen delivery during one lung ventilation and thoracoscopy.
One lung ventilation should be induced after the patient is positioned in the operating room to avoid dislodgment of the blocker during manipulation of the patient. A bronchoscope is required to visualize placement of the blocker. It is more difficult to block the entire right side because of the cranial location of the bronchia of the right cranial lung lobe. The balloon at the end of the blocker should be inflated under visualization with the bronchoscope to make sure it is not obstructing the contralateral side. Enough pressure should be placed in the balloon to avoid the creation of a one-way valve and overinflation of the lungs. A capnograph is required to monitor ETCO2. If the balloon gets dislodged during the procedure and occlude the distal trachea ETCO2 will drop to 0 immediately. Then the balloon has to be deflated.

**Surgical technique**

Lung lobes with small masses and away from the hilus of the lung can be removed with minimally invasive surgery. Large masses impair visualization of the hilus of the lung and make manipulation of the lung difficult. Also a large mass will require a large intercostal thoracotomy with retraction of the intercostal space for its retrieval which will then defeat the purpose of the thoracoscopy. Any lung lobe can be removed with thoracoscopy.

Lateral recumbency with intercostal portal placement is the preferred technique for complete lung lobectomy. For a caudal lung lobectomy ports are placed in the 4th intercostal space, while they are placed in the 9th intercostal space for a cranial lung lobectomy. For caudal lung lobes the pulmonary ligament is divided first to free the lung lobe for manipulation into position for placement of the endoscopic stapling device.

Individual structures of the hilus are not isolated for minimally invasive lung lobectomy and are separated from surrounding structures only enough to place the stapling device. A 45 mm to 60 mm long stapling cartridge with 3.5mm staples is placed across the hilus of the lobe to be removed through its own additional portal that is placed ventrally and caudally at a location to allow the stapler to be placed perpendicular to the bronchus and blood vessels. The stapling cartridge must be long enough to include the entire hilus to be stapled.

The resected lung lobe placed in a pouch is removed from the chest through a small intercostal thoracotomy. An endoscopic tissue retrieval pouch facilitates removal of the lung lobe and decreases the potential of seeding neoplastic cells or infection to the chest wall. Enlarged hilar lymph nodes can be biopsied or removed with minimally invasive technique. If a lymph node is to be dissected and removed for biopsy, both sharp and blunt dissection are used for lymph node removal with electrosurgical assistance and clip application for hemostasis. Prior to removal of the telescope, the hilus is observed for air leakage or bleeding. A chest drain is placed at a site away from all portals, the operative and telescope cannulas are removed, and the portals are closed routinely.