LOBECTOMY AND PNEUMECTOMY: STAPLERS VERSUS CONVENTIONAL SUTURES

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In this manuscript, we shall discuss partial and total lobar resection, and even total pneumectomy depending upon whether the pathologic process remains localized, as with bronchial foreign bodies, whether there is lobar consolidation, etc. Cats may undergo lobar consolidation in many cases of pneumonia as a final stage of the disease.

Lung lobectomy can be a total or partial lobe resection of one or several lung lobes. It is indicated in cases of isolated primary lung neoplasia, lobar pneumonic consolidations, pulmonic abscess, lobe torsion, traumatic tears and lung biopsy. In one case where a dog suffered from a severe left main bronchus collapse, left pneumectomy was performed with a complete recovery and cessation of all coughing episodes.

In cases where recurrent pneumonia is confirmed and a bronchial foreign body is suspected, surgical excision of the affected lobe is performed after a course of antibiotics have reduced radiological and physical signs to a minimum. New radiographs after antibiotic therapy help to localize the foreign body within the lung.

In order to undertake these procedures, it is necessary to be familiar with surgical anatomy and respiratory pathophysiology. The right lung in the dog represents 60% of all respiratory capacity, so complete resection of the right lung would challenge survival ability.

Dog lungs are divided into six lobes. Four lobes are in the right lung: cranial, middle, caudal and accessory. Two in the left: cranial and caudal, with the cranial subdivided into a cranial and caudal portion, through an incomplete fissure.

SURGERY

Thoracotomy, necessary for lobar resection, can be done through the fifth intercostal space, right or left, or through median sternotomy. The first option simplifies access to the pulmonary hilium but it makes it absolutely necessary to know in advance which side of the thorax contains the lobe or lobes to be resected.

Median sternotomy lets the surgeon choose the lobe to be extirpated, be it in the right or in the left, even through this procedure is somehow more arduous, mainly in deep chested dogs, where extra length instruments will be needed.

When performing a lobectomy using the conventional procedure, careful dissection of lobar artery, bronchus and vein is necessary. The dissection should be done with each structure separately and parallelly to avoid tears.

Three ligatures are placed on each blood vessel and transection is done between the second and third suture peripherally. The bronchus is held with a Satinsky forceps. A continuos "U" pattern suture is performed on the bronchus proximal to the forceps and, once the bronchus is transected, the stump is oversewn with 3-0 or 4-0 absorbable or nonabsorbable atraumatic suture. In cases of suspected infection, sutures must not be multifilament because of the possibility of bacterial retention. In very small dogs and cats, in block suture of the lobar hilium is feasible and yields a good outcome.

In comparison with the stapling method, the conventional suturing procedure has the disadvantage of a longer time of execution and the risk of an incomplete seal of the blood vessel or especially of the bronchus and lung parenchyma in partial lobar resection that could leak air into the pleural cavity. Stapling would allow multiple partial lobectomies with little risk of air leak, contrary to the conventional suturing technique, where there is a trend to execute complete lobar resection, thus reducing ventilatory capacity unnecessarily.

Staplers use titanium made staples. There are a few different manufacturers, and some of these manufacturers use color codes to indicate the size of the staple:

- white cartridge: 3 mm staple height
- blue cartridge: 3.5 mm
- green cartridge: 4.8 mm

For total lobectomy at the lobar hilum, 3.5 mm staples are fine. Partial lobectomy requires 4.8 mm staples as the lung parenchyma pressed within the cartridge and the anvil is thicker.

Thoracoabdominal staplers (TA) are presented with cartridge length of 30, 55 and 90 mm. The gastro-intestinal model with anastomosis performance (GIA) is made in 30, 45 and 60 mm cartridges.

The difference when using one or another size of staples is that with TA staplers, the tissue to be cut is engaged between the cartridge and the anvil, the instrument is fired and staples pass through the tissue, and suture them. Then, with the scalpel laying on the distal part of the stapler the tissue is severed.

The GIA model, when used for this purpose, places two or three lines of staples in two different rows and in between the tissue is cut at the same time the staples are being fired. This avoids potential spillage from the infected or tumoral tissue.

At the end of the procedure the surgeon makes sure the lung parenchyma or bronchus is sealed by pouring warm saline into the chest cavity checking that no bubbles arise, and then recovering the saline when done.

Advantages of staplers are 1) shortened operating time, 2) less chance for blood or air leaking from the stumps, 3) the stapling device is easy to use, and 4) the device facilitates the reach to difficult places within the chest cavity.
The only disadvantage could be, for some owners, the cost of staplers and cartridges.

It is important postoperatively to control pain. Thoracotomies are painful and unnecessary pain has to be avoided for humane considerations and because avoiding stress shortens recovery time. Without this intervention, postsurgical pain limits chest wall expansion, leading to insufficient ventilation and the potential for very dangerous respiratory acidosis.

References