

EQUINE LASER SURGERY

<http://www.acvs.org/AnimalOwners/HealthConditions/LargeAnimalEquineTopics/EquineLaserSurgery/>

The following is an excerpt from the ACVS website, please refer to this site for the complete article and more information about laser surgery.

LASER is the acronym for Light Amplification by Stimulated Emission of Radiation. But what is a laser? A laser is a device that generates an intense beam of light that can cut, seal or vaporize tissue. It is different than the light around us in several ways. The most important is that laser light consists of one wavelength while the light around us is composed of many different wavelengths. The beam of a laser is created by energizing molecules to emit light at a certain wavelength, and the wavelength of the light determines how it will affect tissues. There are many different kinds of lasers, each of which operates at a unique wavelength. Three examples of popular lasers include the carbon dioxide (CO₂), Nd:YAG and Diode.



Figure 1. Endoscopic view inside a horse's throat with the laser fiber extending out from the scope, beginning to cut an epiglottic entrapment.

The Diode (wavelength 810-10,600nm) laser has become increasingly popular in large animal surgery. It has a very similar wavelength to the Nd:YAG and therefore can also be delivered via a small quartz fiber through a videoendoscope. The advantage of a Diode laser over the Nd:YAG laser is that it is small, portable, and more efficient.

Advantages and Disadvantages of Laser Surgery

Advantages:

- " Less Bleeding - The laser seals small blood vessels during surgery.
- " Less Swelling - Less bleeding and no crushing of tissues, which decreases swelling.
- " Less Hospitalization - Many procedures can be done with standing sedation and do not require general anesthesia. This reduces hospitalization time and the risk of complications.
- " Precision - The laser can be controlled precisely to remove thin layers of tissue.
- " Less Pain - The laser seals nerve endings as it cuts.
- " Sterilization - The laser sterilizes the surgical site (kills bacteria) as it cuts
- " Faster Recovery - Less bleeding and swelling will result in faster healing of tissue. This will lead to a faster return to activity and use.

Disadvantages:

- " Requires specialized equipment and training
- " Can result in excessive thermal damage to adjacent or target tissue if not used appropriately. This can cause excessive swelling, prolong healing time, and increase the risk of complications.

Conditions Amenable to Laser Surgery

Laryngeal Hemiplegia (roaring):

Laryngeal hemiplegia is a condition in which the muscles of the throat or voicebox (the larynx) are paralyzed, weakening its ability to open its upper airway fully during

breathing or close it during swallowing or vocalizing. The larynx is usually paralyzed on the left side because of loss of left recurrent laryngeal nerve function. It is a common cause of exercise intolerance and abnormal respiratory noise (roaring) in horses. The most common surgical treatment for the disease is a "prosthetic laryngoplasty" or "tieback" procedure. With this procedure, the cartilages in one side of the airway are permanently tied open on one side of the throat - just like propping open a door- to prevent airway from closing as the animal breathes in. Additionally, the vocal folds ("vocal cords") and the laryngeal sacculles (the lining behind the folds) can be removed (ventriculocordectomy) to decrease the abnormal noise and increase airway diameter, potentially improving performance. Traditionally vocal folds are removed through an incision in the throat region (laryngotomy) under general anesthesia after the "tieback". Instead, the laser can be used to remove this tissue in a standing horse (or under general anesthesia) through the endoscope (Figure 2) so that a surgical incision is unnecessary.

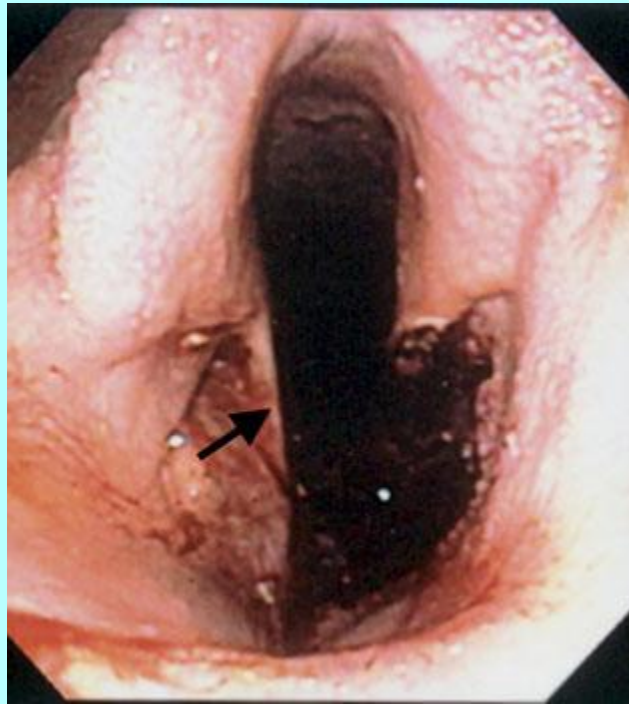


Figure 2. Endoscopic view after the left vocal cord has been resected (removed) employing the laser. Arrow on remaining normal right vocal cord.

Epiglottic Entrapment:

Epiglottic entrapment is a condition in which a loose part of throat lining (called the "aryepiglottic" tissue) abnormally wraps over the epiglottis (a cartilage of the larynx). It

is a common cause of exercise intolerance and abnormal respiratory noise in racehorses and can also occasionally cause coughing and nasal discharge. Epiglottic entrapment can easily be diagnosed with upper airway endoscopy. Traditional surgical correction involved splitting the obstructing tissue down the middle with a curved blade or surgical resection through an incision in the throat region; both techniques are usually performed under general anesthesia. Laser division of the tissue can be performed using either the Nd:YAG or diode laser through the videoendoscope (Movie 1). This technique can be done on an outpatient basis (with the patient under sedation and application of a local anesthetic) and has fewer surgical complications and reduced healing time than invasive techniques. The re-entrapment rate is also slightly lower with the use of a surgical laser versus a traditional surgical approach.



Figure 3. View of epiglottis from horse in figure 1 after epiglottic entrapment has been treated.

Ethmoid Hematoma:

A hematoma is a pocket of blood that collects within tissues, causing a swelling or mass. Ethmoid hematomas arise from the ethmoid turbinates (thin bony structures in the back of the nasal passages) or occasionally from the sinuses. The most common clinical sign of ethmoid hematoma is a mild, intermittent nosebleed from one nostril. If the mass is large, it may cause abnormal respiratory noise and can occasionally cause foul breath. Definitive diagnosis may require a biopsy, although a tentative diagnosis can be made using upper airway endoscopy. Treatment consists of removing the mass and the

tissue of origin (the source of the hematoma). Small masses that arise from the ethmoid region can be injected with formalin under standing sedation. This process may need to be repeated several times. For large masses, removal of the tissue under general anesthesia through a sinus bone flap may be necessary. Laser ablation of the mass, a less invasive technique, can be performed through an endoscope in the standing horse. This procedure can be performed as a first line of treatment or after formalin or sinus flap surgeries if these techniques have failed. The use of the laser decreases bleeding during surgery and the chance of recurrence of the mass.

Guttural Pouch Tympany:

The guttural pouch is unique to horses and is an air filled outpouching of the Eustachian tube. Guttural pouch tympany is a condition in foals where the guttural pouch is overdistended with air and occasionally some fluid. The exact cause of the condition is unknown but most agree that the mucosal (tissue) flap that forms an opening to the pouch acts as a one-way-valve, allowing air in but not out. Foals affected with this condition have a large, non-painful swelling on one or both sides of the throat latch region. Diagnosis is based mostly on clinical signs. Traditional surgical therapy is performed with the foal under general anesthesia; through an incision in the throat latch region, a new opening is created between the two guttural pouches. Alternatively, the surgical laser can be used to create this opening or to create a new opening from the pouch into the pharynx. Either approach can be performed with the foal standing under sedation through the videoendoscope (Figure 3), and most foals can be released from the hospital on the same day.



Figure 4. Fistula created between the two guttural pouches of a foal affected by guttural pouch tympany.

Dorsal Displacement of the Soft Palate:

The soft palate is an extension of tissue that divides the nasal and oral cavities. During swallowing it moves up to cover the back of the nasal passages; during breathing it swings back downward and catches over the tip of the epiglottic cartilage, which holds it in place. Occasionally the soft palate can become displaced over top of the epiglottis during breathing, blocking the airway. This causes exercise intolerance and abnormal respiratory noise in performance horses. Several techniques have been described with varying success for the treatment of dorsal displacement of the soft palate. One therapy in conjunction with traditional surgical techniques is the use of a laser in several small areas along the free edge of the soft palate. This is thought to produce scar tissue and stiffen the edge of the soft palate to prevent further displacement.

Upper Respiratory Tract Cysts and Masses:

Masses within the upper airway (trachea, pharynx, larynx) and cysts in the epiglottis, pharynx, and nasal passages can all be treated with laser surgery. Use of the laser reduces trauma to the surrounding tissue, decreases bleeding, and decreases recurrence compared to traditional surgical approaches (Figure 4a,b).



Figure 5a. Granulation tissue obstructing the view of the normal larynx (voice box).

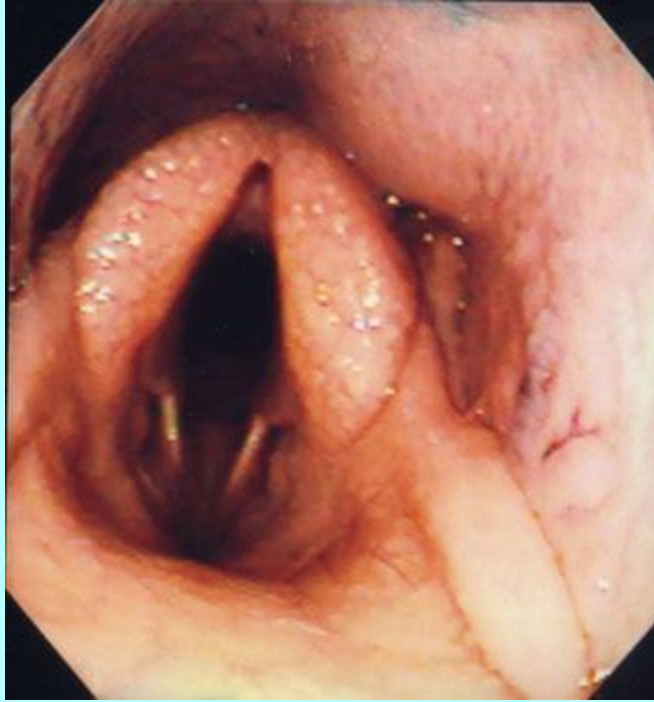


Figure 5b. One month after granulation tissue in the throat was removed with the laser.

Conclusion

Laser surgery is a specialized technique of performing surgery; its great advantage in large animals is being able to reach and perform surgery through a minimally invasive approach without general anesthesia.. If you have any questions about laser surgery you should contact an ACVS Veterinary Surgeon. Find a Surgeon

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