INTRALESIONAL INJECTION OF FORMALIN FOR TREATMENT OF PROGRESSIVE ETHMOID HEMATOMA (PEH)

Intralesional formalin can be used to treat a PEH. A practitioner with an endoscope can perform this procedure. Mila International makes an injection apparatus called the “Lance-A-Lot.” It is passed through the biopsy channel of the endoscope and used to inject formalin into the mass. The diameter of the injection tubing is 2.5 mm and will easily pass through the standard biopsy channel which is 2.8 mm in diameter. However, the biopsy channel on some endoscopes is less than 2.5 mm in diameter so it is important to check this prior to placing an order. The length of the injection tubing is 190 cm. The injection needle on the Lance-A-Lot is 17 gauge. There are endoscopic sclerotherapy needles that are available from other companies but the size and length of the injection needle is very small. You can make your own injection apparatus using polyethylene tubing (PE) and a needle. To do this you must sever the hub of the needle off and insert the “lance” into the appropriate sized PE tubing. If you make your own you cannot withdraw the injection apparatus through the biopsy canal - it will get stuck. My advice is to purchase the commercially available product. After you have examined the horse and determined that injection is necessary it is best to sedate the horse for the treatment. Prior to passing the endoscope it is best to have the formalin drawn up in a luer lock syringe. The volume of 10% formalin (4% formaldehyde) that is required will depend on the size of the mass. I will start with 20 cc unless the mass is very small. I also drape a towel over the noseband of the halter so that if the horse snorts during or after the injection then the formalin will not be blown in anyone’s face. Everyone that is helping with the procedure should wear gloves and protective eyewear. Once the horse is properly sedated and restrained pass the endoscope and insert the needle into the mass, attach the syringe and inject the formalin. I will fill the mass until the formalin begins to leak. Once the mass is injected withdraw the needle and endoscope. It is very common for the horse to snort. Often times the mass will bleed post injection but this is self-limiting. Explain to the client that nasal discharge is to be expected as the formalin is causing the tissue to slough. I will repeat the injection in 2-3 weeks. The number of injections required is highly variable. I explain that it will be a series of injections and the number necessary will depend on how the tissue responds. Owner compliance is very important with this technique. There has been a fatal complication reported in one horse with this procedure. The cribriform plate had been damaged by the ethmoid hematoma and formalin reached the frontal lobes of the brain resulting in death. Damage to the cribriform plate was not evident by endoscopic or radiographic evaluation. Cross sectional imaging (CT or MRI) would be required to determine if the progressive ethmoid hematoma has involved the calvarium.

EMERGENCY TRACHEOTOMY

Performing a tracheotomy is most often an emergency procedure to bypass a life threatening obstruction of the upper respiratory tract. Examples of such conditions include but are not limited to bilateral arytenoid chondritis, bilateral laryngeal paralysis, severely enlarged retropharyngeal lymph nodes (strangles), and guttural pouch tympany. The degree of respiratory distress will determine the amount of diagnostic evaluation & preparation that is indicated prior to the procedure. There is no time for clipping, prepping, or the use of local anesthetic in a horse that is cyanotic and near collapse. Often times a horse will become violent when in severe respiratory distress. If this is the case then it is not safe to attempt to perform a tracheotomy until the horse “passes out”. Once this happens a tracheotomy must be performed as fast as possible. Pulmonary edema is likely to develop in a situation such as this. It is best to avoid these situations if at all possible by performing a tracheotomy prior to the horse deteriorating to this level. In other words, if you think the horse needs or will need a tracheotomy proceed with surgery. It will be less stressful to you and the horse if you perform a tracheotomy prior to the horse being in a critical state.
Fortunately the clinician will be able to prepare the surgical site for the procedure in most instances. Sedation should be used with caution. It is easiest to perform the surgery in the standing horse with the head slightly extended. The location for the tracheotomy is at the junction of the proximal and middle thirds of the neck. The trachea is most superficial at this location and easiest to palpate. The hair should be clipped and the skin prepped. Local anesthetic is injected on midline to desensitize the surgical site. Using a head lamp for illumination is very helpful. A scalpel blade is used to make a midline incision approximately 8 cm in length. Sharp dissection is continued on midline to the level of the tracheal rings. Small vessels are often encountered and mosquito forceps can be used to provide hemostasis. Once the incision is at the level of the tracheal rings the tracheotomy is performed by incising through the ligament between tracheal rings to enter the tracheal lumen. The incision between the tracheal rings is continued to the right and left sides for approximately 120 degrees of the ventral tracheal circumference. Care must be taken to avoid incising the tracheal rings. An index finger can be inserted into the tracheal lumen to facilitate placement of a tracheotomy tube. Tracheotomy tubes can range from commercially available J-tubes, self-retaining metal tubes, or silicone tubes to a piece of stomach tube or hose that has been cut off. It is extremely important when placing the tracheotomy tube to make sure that the tube is in the lumen of the trachea and has not been placed subcutaneously. Following placement the tube should be secured to the neck. Some tubes have an inflatable cuff. It is not advisable to inflate cuff due to the potential for tracheal mucosal damage caused by pressure necrosis.

Postoperatively, monitoring of the patency of the tracheotomy tube is very important. The tube can become obstructed with a blood clot or mucus causing dyspnea. The tube should be monitored at least 3–4 times per day and changed/cleaned as needed. The skin surrounding the surgical site should be clean as needed. It is important when monitoring the surgical site to make sure there are no “ventral pockets” where exudate can dissect along tissue planes. The tracheotomy site will heal within 14–21 days following removal of the tracheotomy tube.

**SINOCENTESIS AND SINUS LAVAGE**

Trephination allows limited access to the paranasal sinuses but can be used as a procedure for aspiration and irrigation in the standing, sedated patient. This technique is mainly for diagnostic purposes but does have therapeutic value in the form of sinus lavage. Sinocentesis is indicated in horses that have fluid accumulation in the paranasal sinuses. This will allow the clinician to obtain samples for culture and cytology. Following sample collection lavage of the sinuses can be performed as well.

The paranasal sinuses that can be accessed include the rostral maxillary sinus, caudal maxillary sinus, and the frontal sinus. Upper airway endoscopy and radiographs of the skull will aid in selecting the trephination site. Prior to performing the procedure the clinician must be familiar with the local anatomy and borders of the different paranasal sinuses.

The locations for trephination are as follows:

- **Rostral maxillary sinus**: 50% of the distance from the rostral end of the facial crest to the level of the medial canthus and 1 cm ventral to a line joining the infraorbital foramen and the medial canthus.
- **Caudal maxillary sinus**: 2 cm rostral and 2 cm ventral to the medial canthus.
- **Frontal sinus**: 60% of the distance in a lateral direction from midline to the medial canthus.

The horse should be sedated and the trephination site clip, prepped, and blocked with local anesthetic. A #15 scalpel blade is held between the thumb and forefinger and a stab incision is made through the skin down to the bone. A Steinmann pin held in a Jacob’s chuck is used to drill into the sinus. Approximately 5 mm of the Steinmann pin should be protruding from the Jacob’s chuck so deeper structures will not be injured. The size of the pin will depend on the purpose of the procedure. Once access has been gained to the sinus a catheter can be introduced in order to aspirate a sample for culture and cytology. If the material is extremely thick a 20–30 ml of sterile saline can be infused and a sample obtained. The sinus can be lavaged using sterile saline delivered with a pressure bag. To do this an administration set is attached to a 1 liter fluid bag and the end of the fluid administration set is inserted into the trephination site and the fluid is infused with the aid of a pressure bag. Fluid/mucopurulent
material should drain from the nostril. Following lavage the skin incision can be closed with a staple or a single suture. Another option is to secure an indwelling catheter for future lavage. Postoperatively there is minimal after care. The trephination site should be monitored for the development of cellulitis.