# PROSTHETIC LARYNGOPLASTY INTRA-OPERATIVE PROCEDURE

A videoendoscope can be secured transnasally at this time to allow intraoperative viewing of the larynx by the surgeon. The surgical site is routinely prepared for aseptic surgery and draped, and a 10- to 12-cm (4- to 5-inch) skin incision is made ventral and parallel to the linguofacial vein, extending caudally from a point 4 cm (2 inch) cranial to the ramus of the mandible. Blunt and sharp dissection with Metzenbaum scissors separates the linguofacial vein from the lateral margin of the omohyoideus muscle along the length of the incision. Often it is necessary to ligate and divide a branch of the linguofacial vein that enters the omohyoideus muscle. Elevation of the linguofacial vein with an Allis tissue forceps attached to perivascular tissues at the middle of the incision allows a natural cleavage plane between the sternocephalicus and cricothyroideus muscles to become evident, which can be digitally opened and enlarged. This exposes the lateral and dorsal aspects of the larynx. A 6- to 8-cm wide malleable retractor placed under the linguofacial vein and sternocephalicus muscle is used to expose and maintain access to the larynx. The muscular process of the arytenoid cartilage lies beneath the cranial portion of the cricopharyngeus muscle and can be exposed by sharply separating the cricopharyngeus and thyropharyngeus muscles along the junction of their aponeuroses. Alternatively, a plane of dissection can be created off the back edge of the cricopharyngeus muscle, under the vascular plexus that lies over the CAD muscle. Rostral retraction of the cricopharyngeus muscle often exposes almost the entire CAD muscle and muscular process without interference from the cricopharyngeus muscle. The esophagus, thyroid gland, laryngeal and thyroid vessels, and ventral branch of the first cervical and cranial laryngeal nerves should be avoided during site preparation and suture placement.

The choice of prosthetic suture is often based on surgeon preference. Materials that have been used include braided polyester, with (No. 5 Ticron) or without silicone coating, 6-mm surgical stainless steel wire, braided lycra, and nylon. The prosthetic suture is first placed through the cricoid cartilage. The use of two sutures is common and has been shown in vitro to be mechanically superior to one and also results in a larger cross-sectional area of the rima

glottidis. We prefer the large, swaged-on, reverse-cutting needle on the Ticron, but the suture can be threaded onto a No. 3 Martin uterine reverse-cutting needle and the ends tagged with a small hemostat. (This type of needle is less likely to break off in the laryngeal cartilages than a cutting needle, and it pierces cartilage more easily than a trochar-point needle.) Using the left index finger as a guide, the needle is "walked off" the caudal edge of the cricoid cartilage 2 to 3 mm lateral to the dorsal midline until the point slips under the cartilage. (There is a palpable notch in the cricoid cartilage at this site, but its location can be quite variable.) The needle is advanced in a cranial direction while avoiding penetration into the lumen of the larynx. Then the needle is rotated to penetrate the cricoid cartilage 2 to 3 cm cranial to its caudal border and 1 cm lateral to the dorsal ridge. Before drawing the needle through the cartilage and overlying CAD muscle, inspection of the laryngeal lumen via videoendoscope can ascertain if mucosal penetration has occurred. If the needle has penetrated the larynx, it should be backed out, the incision should be lavaged with saline, and the process should be started again with a new needle. When the needle has been drawn through the cartilage and out of the incision, the needle is cut off and the suture ends are tagged with a small hemostat. The second suture is usually placed 10 mm lateral to the first using the same technique. If the cricopharyngeus muscle has not been retracted forward, a large hemostat is passed under the cranial aspect of the cricopharyngeus muscle to bring both ends of the first and second sutured cranial toward the muscular process of the cricoid cartilage.

Placement of the suture through the muscular process can be achieved by a variety of techniques. Use of heavy needle drivers and a reverse cutting No. 6 Mayo needle or No. 6 Martin uterine needle is common. The use of a 3-mm bone trocar to create a tunnel for the suture has been reported to reduce fissure formation and risk of cartilage failure from suture pullout. A 12- to 16-gauge hypodermic needle can also be used to create the tunnel through the muscular process. The prosthesis can be placed through a loop of No. 1 stainless steel wire that is passed through the tunnel to facilitate prosthesis placement through the muscular process. Before needle placement, some surgeons transect the tendon of insertion of the CAD muscle onto the muscular process and open the cricoarytenoideus articulation. After it is open, the joint

can be curetted to induce fibrosis and ankylosis to try to reduce the loss of abduction frequently observed in the early postoperative period. To enhance this even further, injection of polymethylmethacrylate has been advocated as a better method of joint ankylosis. Removal of the attachment of the cricoarytenoideus muscle also reduces the opportunity for cycling of the prosthesis in horses with grade 3 RLN, which is thought to increase the early postoperative loss of arytenoid abuction. The shape of the muscular process varies among horses, and cutting the tendon of insertion can help identify these variations. To the inexperienced surgeon, this may help, via palpation, avoid placing the suture along a less thanideal pathway through the muscular process. Typically the needle or trocar is passed through the muscular process from the caudomedial aspect of the process toward the craniolateral aspect. The needle can also be placed in a caudal to cranial (sagittal) direction.

After removal of the needle, firm tension is placed on the cranial and caudal ends of the suture to remove any slack, ensuring the prosthesis is tight against the larynx. If a trocar is being used, both sutures can pass through a single tunnel; otherwise, the second suture is placed approximately 5 mm more caudal in the muscular process. Engaging the spine of the muscular process rather than the tip is essential to achieve maximal biomechanical advantage and to avoid early pullthrough of the prosthesis. The trailing ends of the prosthetic sutures can be drawn under the cricopharyngeus muscle if necessary with a hemostat, and the sutures are tied. Care must be taken to ensure that each trailing suture end is matched to its leading end and that both sutures are placed before one is tied (to avoid cutting the tied suture). When tying sutures, direct vision of the larynx via videoendoscopy is advised to avoid excessive or inadequate abduction of the arytenoid cartilage. The degree of abduction observed intraoperatively by videoendoscope sometimes does not match the immediate postoperative view in the standing horse, but surgical experience can reduce postoperative disappointment. After the prosthetic suture or wire is tied or tightened, all retractors should be removed to allow the larynx to assume a normal, nonrotated central position to allow accurate assessment of the degree of abduction. When using suture as the prosthesis, leaving the cutends 1.5 to 2 cm long can allow the knot to be undone and retied if repeat laryngoplasty is performed within the first week of the original

surgery. Maximal abduction, referred to as grade 1,56 is not necessary to achieve success. Abduction to achieve approximately 88% of maximal rima glottidis cross-sectional area (Dixon grade 2) is sufficient to allow adequate airflow. As a general guide, when the curvature of the corniculate cartilage comes in contact with the wall of the pharynx, this is generally the ideal degree of "pull out." When the sutures have been tied, the thyropharyngeus and cricopharyngeus muscles can be reapposed with simple continuous 2-0 absorable suture, if they were separated, followed by apposition of the fascia adjacent to the linguofacial vein to the omohyoideus muscle with simple-interrupted or continuous sutures of 2-0 synthetic absorbable suture material. The skin is closed with staples or 2-0 nonabsorbable monofilament suture material. A stent bandage sutured over the incision can help protect the incision during recovery and minimize swelling postoperatively. At the conclusion of the laryngoplasty surgery, many surgeons routinely place the horse into dorsal recumbency and perform a bilateral ventriculectomy via laryngotomy.

1. **Equine Surgery 4th edition by Auer & Stick**