SUCCESSFUL CLOSURE OF ACQUIRED ORONASAL FISTULAE
Gary C. Lantz, DVM, Diplomate ACVS, Diplomate AVDC
Professor of Surgery and Dentistry
Purdue University, West Lafayette, Indiana

Surgical Anatomy of the Palate
The major palatine foramen in the dog is located halfway between the palate midline and dental arcade at the level of the distal root of the maxillary fourth premolar. This foramen in the cat is located halfway between the palate midline and dental arcade at the level of the palatal root of the maxillary fourth premolar. The major palatine artery, vein and nerve exit this foramen, course along the length of the palate in the palatine sulcus. The palatine sulcus is located halfway between the midline and dental arch making it relatively easy to find and ligate the major palatine vessels. The artery enters the nasal cavity through the palatine fissure as the rostral septal branch of the nasal septum. At the level of the palatine fissure an arterial branch originates from the major palatine artery and courses on the palate through the interdental space between the canine and third incisor teeth to terminate on the lateral aspect of the incisive bone.

Instrumentation and Suture Materials
Incisions are made with a 15 or 15C blade. Palatal mucoperiosteum is gently “subperiosteally” elevated using an appropriately sized periosteal elevator. Every effort is made to leave a portion of periosteum covering the bone. The tissue being elevated is “sandwiched” between the elevator and the operator’s fingertip. Force is transferred to the finger and minimizes the risk of tearing tissue during elevation. However, mucoperiosteal elevation is easily accomplished in the young patient as the periosteum is loosely attached to the bone. Because of this loose attachment, it is difficult to leave a tissue covering on the bony donor site. The epithelialized margin of mucoperiosteum at the rim of a palatal defect is removed using a 15C or 12B blade. The 12B blade is also good for making releasing incisions for soft palate closure. The blade has two cutting surfaces and can be used in a push or pull mode. Sharp Iris or Goldman-Fox scissors are used to custom trim flap margins. Minimally traumatic thumb forceps (Ewald or Bishop-Harman) are used to handle the flap. Any “crushed” areas along the flap margin are removed with scissors as these areas will impair healing. Flaps can be manipulated with temporary stay sutures instead of thumb forceps so as not to injure areas of the flap margin. Absorbable suture materials such as polydioxanone, poliglecaprone, and polylactin 910 are used. Polylactin 910 has considerable tissue drag, even when moistened, and may damage fragile thin flaps. The P3 cutting needle is good for all oral surgery. The RB-1 taper needle is acceptable. For a one-layer closure, polydioxanone in a simple interrupted pattern with knots in the oral cavity is recommended. For a two-layer closure, the deep (nasal mucosal) layer is apposed using polydioxanone in a simple interrupted pattern with knots placed in the nasal cavity. The oral suture layer is made using poliglecaprone in a continuous pattern. This reduces the number of knots in the oral cavity and may increase patient postoperative comfort.

Surgical Principles for Oral Surgery
Oral soft tissues are well vascularized, however, the oral cavity is a hostile environment for wound healing. The normal resident bacteria, movement of the tongue and forces from mastication, drinking and swallowing can place stress on intraoral surgical repairs. Optimal tissue healing is promoted by observing the following surgical principles:
• Preserve local blood supply
• Atraumatic surgical technique
• Suture lines supported by bone when possible
• Double layer closure if possible
• Avoid suture line tension
• Make the mucosal flaps larger (2-4 mm) than the defect
• Do not oppose intact epithelium, remove marginal epithelium
• Protect oral suture lines. Consider gastrostomy or esophagostomy in young patients with thin, friable oral tissues

**Perioperative and Surgical Considerations for Palatal Surgery**

Clinical signs include nasal discharge. Definitive diagnosis is made on physical and oral examination. Thoracic radiographs are made to evaluate for aspiration pneumonia. If aspiration pneumonia is present, orogastric tube feeding is continued or, in larger animals, a gastrostomy or esophagostomy tube may be placed and all nutritional and hydration requirements and antibiotics are administered through the tube. On average, the pneumonia is resolved in approximately two weeks. Once the pneumonia is resolved, general anesthesia may be induced and the palatal defect closed.

Anesthesia concerns for pediatric patients included hypoglycemia and hypothermia and are addressed. Endotracheal intubation may limit access for closure of secondary palate defects. Therefore, in certain patients, access to the caudal aspect of the secondary palate is facilitated by intubation through a temporary tracheostomy.

In smaller, younger patients the palatal mucoperiosteum is thin and friable with poor suture retention strength. Suture lines stress can occur with tongue movement, eating and drinking and chewing on foreign objects. In these patients, it may be prudent to place a gastrostomy or esophagostomy tube immediately before starting the palatal surgery. Tube placement at this time will avoid iatrogenic damage to the palate repair and will minimize suture line stress during recovery. All food and water is administered via the tube for 3-4 postoperative weeks.

Surgical repair of the defect is preoperatively planned. The client must be told that more than one surgery may be needed, especially with larger defects as dehiscence may occur. Before the incision is made, the nasal cavity is irrigated with sterile saline to remove foreign bodies (food, hair, grass etc.). Closure technique depends on the size of the defect and surgeon preference. Specific flap techniques include unilateral or bilateral sliding bipedicle flaps and overlapping (hinge) flaps. Extremely large defects may require alveolar mucosal flaps combined with tooth extraction to mobilize these flaps to the palate defect area. Releasing incisions are made and flaps elevated. Flaps are made larger than needed to avoid suture line tension. Flap margins are de-epithelialized where appropriate and a tension-free closure is performed using two suture layers (nasal and oral) if possible.

Soft palate closure is ideally accomplished in three layers (nasal and oral mucosa and palatal muscle) if possible. Unilateral or bilateral partial thickness releasing incisions may be needed to accomplish tension-free apposition. Generally, the caudal extent of soft palate closure is to the level of the caudal aspect of the tonsils.

Warn the owner that more than one surgery may be needed.
Acquired Oronasal Fistulae (ONF)
Injury from trauma (gunshot, vehicular, falling, bites), electrical shock, periodontal disease and dental extraction can result in oronasal fistulae. The fistula may also be a complication of previous surgery such as a partial maxillectomy. Clinical signs include serous to mucopurulent unilateral or bilateral chronic nasal discharge and possible sneezing. Differentials include nasal foreign body or fungal disease, dental disease or invasive neoplastic disease. The diagnosis is based or oral examination including periodontal probing, imaging (radiographs or CT) and possible preoperative histopathology is neoplasia is suspected.

As with repair of congenital cleft palate, concerns include patient condition, quality of the tissue at the fistula site, time since trauma, protection of the surgical repair and postoperative nutrition. With recent gunshot or electrical shock injuries, the full extent of the injury may not be evident at the initial evaluation. A gastrostomy or esophagostomy tube is installed and the ONF serially evaluated over a period of several days. It is best to wait before definitive surgery is performed so that the full extent of the injury is present, otherwise, continued tissue necrosis may result in repair failure. The progression of tissue damage is usually completed by approximately 7-10 days. Skull radiographs or CT scans are made of trauma patients to identify fracture areas. CT scans have been shown to be more accurate in detection of all fractures. Careful planning of the surgical closure is required. During surgery, small bone fragments and devitalized soft tissues are removed. Epithelium is removed from ONF soft tissue margins. The debrided ONF area is usually larger than the original defect. Defect size and location will determine the type of flap(s) needed for closure. Broad-based flaps are essential to provide adequate blood supply to the entire length of the flap. Soft palate advancement flaps, palatal artery based axial pattern flaps (unilateral or bilateral) or island flaps, and alveolar buccal mucosal flaps can be used for caudal and mid hard palate defects. Mid and rostral hard palate defects may be closed with palatal artery rotational flaps, bipedicle mucoperiosteal flaps, double-layered flaps using palatal mucoperiosteum and labial/alveolar mucosa or using only single layer labial/alveolar mucosal flaps. Tension-free apposition is essential. Direct closure of even a small fistula may result in failure because of tension. Fistula located in the palate central area may need extraction of local teeth to allow creation and mobilization of alveolar mucosal flaps. An ONF associated with periodontal disease is usually diagnosed using a periodontal probe. Although this condition may be associated with any maxillary tooth or several teeth, the palatal aspect of the maxillary canine teeth is often involved. The main clinical sign is often chronic unilateral or bilateral nasal discharge (serous, serosanguineous, mucoid, purulent). Periodontal probing is performed around the entire circumference of each maxillary tooth. Full maxillary intraoral radiographs are made. Radiographic signs that may be seen with an ONF include periodontal bone loss, periapical lysis, and tooth root resorption. Radiographs may also be normal. CT scans can also be used to help locate oronasal fistulae. Oronasal fistulae may also develop at extraction sites where teeth have been extracted due to periodontal disease that eroded the palatal aspect of the alveolus and exposed the nasal cavity. Closure of the extraction site failed resulting in a fistula. Several steps are needed for successful closure of the fistula. The soft tissue epithelialized margin of the fistula is removed. Surrounding soft tissues are subperiosteally elevated and all abnormal appearing bone is excised until normal appearing bleeding bone is visible. Often, the debrided fistula area is larger than the original fistula. A large labial/alveolar mucosal flap or double flap (palate mucoperiosteal flap followed by a labial/alveolar mucosa flap is used to close the defect. Often an initial tension free closure is not possible if gingival recession has occurred as part of the periodontal disease.
process. Methods to achieve tension free closure include: 1) periosteal release along the base of the labial/alveolar mucosal flap, 2) extension of the flap incisions combined with supraperiosteal dissection in dorsal/rostral/caudal directions and 3) reduction of the palatal alveolar bone margin height. Often only a periosteal release is needed. If this does not allow a tension-free closure then one or two of the other methods may be used.

Oronasal fisulæ may recur if surgical principles are not followed. Tension, poor flap blood supply due to incorrect flap harvesting, inadequate debridement of the original fistula site and traumatic surgery may all contribute to failure of healing and dehiscence. Infection and local recurrence of a previously excised tumor may cause dehiscence. In addition, failure of healing may also be promoted by not protecting the surgery site from patient activity.

**Postoperative Care and Complications**

Soft food is fed for 3 weeks. A therapeutic course of broad spectrum antibiotics is administered. Chewing on foreign objects and chew toys is eliminated. If a feeding tube was installed, all food, water and medications are given via the tube. In these patients, a basket muzzle will eliminate the possibility of chewing on foreign objects. Nasal discharge is expected until the chronic rhinitis is resolved.

Dehiscence can occur as discussed above. (Note – the owner must be warned about this before surgery.) In general, additional surgery is performed about 3 weeks after the dehiscence occurred to allow for local tissue blood supply recovery and for reduction in inflammation. If tumor recurrence is suspected, a biopsy is obtained before closure. Surgical repair is delayed (1-2 months) for small areas of dehiscence that contribute to minimal (or no) clinical signs. Often these smaller areas will contract to a small linear, ovoid or round defect and there are minimal to no clinical signs.

Rhinitis may be a life time complication for patients that have had chronic oronasal fistulae. This must also be communicated to the owner before surgery.

**Selected References**