Proceeding of the NAVC
North American Veterinary Conference
Jan. 8-12, 2005, Orlando, Florida

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EXTRACTION TECHNIQUES AND MANAGEMENT OF COMPLICATIONS

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Dental problems occur frequently in dogs and cats. Based on the type and severity of the lesion, extraction of the diseased tooth may be indicated. Utilization of proper perioperative pain management, state-of-the-art dental equipment, and appropriate extraction techniques can provide a better approach to dental extractions in the dog and cat.

PERIOPERATIVE PAIN MANAGEMENT

Perioperative pain management is an extremely important part in the management of patients requiring dental extractions. Proper perioperative pain management permits the patient to eat soft food even after multiple extractions with minimal discomfort. Perioperative pain management includes the administration of appropriate preoperative analgesics, including various narcotics, meditomidine, butorphanol and nonsteroidal antiinflammatory drugs providing preemptive analgesia. Regional nerve blocks can also provide preemptive analgesia. Local blocks prior to extractions also provide preemptive analgesia. Postoperative analgesics include various narcotics, butorphanol, and nonsteroidal antiinflammatory drugs.

STATE-OF-THE-ART VETERINARY DENTAL EQUIPMENT

Dental extractions are most efficiently performed using state-of-the-art dental equipment. This includes dental radiographic equipment, a high-speed fiberoptic handpiece, magnification devices, and appropriately sized sharp hand instruments including dental elevators, luxators, periosteal elevators, curettes, root tip picks and extraction forceps.

SIMPLE EXTRACTION

A simple extraction refers to the extraction of small single-rooted teeth, such as incisors. An appropriate-sized dental elevator is placed in the gingival sulcus to sever the attachments of the gingiva around the tooth. The elevator should be advanced apically between the alveolar bone and the root. The periodontal ligament can be torn by rotating and holding the elevator 90 degrees for 15 second intervals. A dental extraction forceps can then be placed on the crown to rotate the tooth on its long axis and remove it from the alveolus.

MULTI-ROOTED EXTRACTION

Multi-rooted teeth include the premolars and molars which may be difficult to extract when only one root is diseased and the other roots remain firmly attached to the alveolar bone. Most roots are embedded in the alveolar bone at divergent angles which further anchors the tooth into the surrounding bone. Sectioning of a multirooted tooth into two or three segments converts the procedure into multiple simple extractions. A tapered fissure bur on a high-speed handpiece is an efficient technique for sectioning teeth. The furcation is located prior to sectioning the tooth. This can be done by elevating the gingiva with a periosteal elevator. The bur is placed at the furcation and directed through the crown. The segments of the tooth are then independently extracted as previously described for simple extractions.

COMPLICATED OR SURGICAL EXTRACTION

A complicated or surgical extraction technique is generally reserved for teeth that are difficult to extract because of their large root structure including the canine teeth, mandibular 1st molars and the maxillary 4th premolars. A surgical extraction may also be performed when teeth are ankylosed or when attempting to retrieve a broken root tip.

Numerous steps are involved in the performance of a surgical extraction. The initial step is creation of a mucoperiosteal flap. Careful and adequate elevation of the mucoperiosteal flap is important for gaining access to the underlying buccal alveolar bone so that during the procedure the gingiva is not perforated. The next step involves location of the furcation and sectioning of a multi-rooted tooth. The buccal alveolar bone is then removed as needed to provide an efficient controlled technique for delivering large rooted teeth. Excessive removal of buccal bone should be avoided particularly when extracting mandibular teeth because this causes unnecessary weakening of the mandible. Elevation and extraction of each segment is accomplished by gently placing the dental elevator into the periodontal space, advancing the elevator apically and gently rotating and holding the elevator for 10-15 seconds around the entire gingival sulcus until the segment can be easily extracted with an extraction forceps. An alveoloplasty is performed prior to closure to gain access to the extraction site. A smooth bony contour decreasing postoperative pain that may be associated with sharp edges of bone beneath the mucoperiosteal flap.

A small dental curette is placed in the alveolus to remove any necrotic debris, calculus or bone fragments and the alveolus and flap are flushed prior to closure. The mucoperiosteal flap is repositioned and sutured in place. If there is tension on the mucoperiosteal flap when attempting to close a surgical extraction site, the tension can be released by incising the innermost layer of the flap, the inelastic periosteum, near the apical portion of the flap. Incision of the periosteum will permit tensionless apposition of the flap and prevent postoperative dehiscence.

When performing a mucoperiosteal flap for the surgical extraction of the maxillary 4th premolar, several structures should be carefully avoided. When making the mesial (rostral) portion of the incision, the infraorbital artery, vein and nerve should be avoided as they exit the infraorbital canal immediately rostral to the periapical bone of the mesiobuccal root of the maxillary 4th premolar. These structures can be avoided by digitally retracting them dorsally and not extending this incision too far apically. When making the distal (caudal) part of the incision the parotid and zygomatic salivary duct papillae must be visualized and avoided.

There are two approaches for the surgical extraction of the mandibular canine teeth including the labial and lingual approach. The labial approach utilizes a mucoperiosteal flap located on the labial aspect of the tooth while a lingual approach utilizes a lingually located flap. Equal amounts of alveolar bone are present buccally and labially so there is no advantage of one technique over the other with regard to bone removal. The mental artery, vein and nerve exit through the mental foramen located near the labial aspect of the apex of this tooth. A lingual approach would avoid potential damage to these structures.
EXTRACTION OF TEETH WITH ODONTOCLASTIC RESORPTIVE LESIONS

A new technique for removal of teeth with advanced feline odontoclastic resorptive lesions has been described. Until recently, whole tooth extraction was generally considered to be the treatment of choice for teeth with advanced feline odontoclastic resorptive lesions. Feline teeth affected with advanced odontoclastic resorptive lesions are often weakened, have a brittle crown and have radicular ankylosis. These factors make extraction of these teeth difficult, time-consuming, and traumatic, and often results in significant postoperative pain. An alternate technique reported by DuPont recommends crown amputation with intentional root retention for advanced feline resorptive lesions. Utilization of this technique requires preoperative dental radiographs to rule out evidence of endodontic pathosis, which would appear as periapical lysis. Teeth with endodontic pathosis or periodontal pocketing must be treated by extraction rather than crown amputation with intentional root retention. Also cats affected with ulceroproliferative disease are not candidates for this technique. These cats require that all root structure and possibly the surrounding alveolar bone be completely removed.

After radiographing feline teeth with advanced odontoclastic resorptive lesions and ruling out the presence of endodontic pathosis and periodontal pocketing, a very small envelope flap is created with a small feline periosteal elevator. Two small interproximal gingival incisions located mesial and distal to the affected tooth are made using a #15 blade. The gingiva is minimally elevated from the tooth and marginal alveolar bone with a small feline periosteal elevator. The gingiva is retracted and protected with the end of a small flat elevator while the crown of the affected tooth is amputated with a small round bur on a high speed water-cooled handpiece at or slightly below the level of the alveolar crest. Sharp bony projections are smoothed with the bur and the gingiva is closed with simple interrupted 4-0 absorbable sutures.

The DuPont technique is superior to conventional extraction techniques in feline teeth with advanced odontoclastic resorptive lesions because these teeth often lack a distinct periodontal ligament space, have ankylosis of the roots to the surrounding bone and have severe resorption of the root itself making extraction of the entire root difficult for the clinician, often extremely painful for the patient and almost impossible because of the lack of anatomic division between the root and alveolar bone. Immediately following the performance of the DuPont technique cats are less painful and if the technique is performed properly on appropriately screened teeth the cats remain asymptomatic.

MANAGEMENT OF EXTRACTION COMPLICATIONS

There are several complications that may be associated with dental extractions including: (1) hemorrhage, (2) broken root tips, (3) damage to permanent teeth, (4) misplacement of a tooth or root tip into the nasal cavity or sinus, (5) difficulty completing an extraction, (6) oronasal fistulas, (7) iatrogenic fractures, (8) bone sequestra and osteomyelitis, and (9) ophthalmic complications.

Hemorrhage can occur as a complication to extraction when a vessel in the region of the extraction site is inadvertently traumatized or when the tissues surrounding the extraction site are severely inflamed. Hemorrhage can usually be controlled by direct pressure with a gauze sponge, placement of a clotting agent such as gelfoam into the alveolus, electrocautery, ligation of vessels located in soft tissue, and most commonly by closing the gingiva over the alveolus to permit clot formation. In cases in which hemorrhage is excessive for the procedure being performed a clotting profile is recommended to rule out an underlying coagulopathy.

Broken root tips can be a common complication of dental extractions if inappropriate dental extraction techniques are utilized. Additionally, various types of dental pathology may predispose to this problem. These conditions include: abnormal radicular anatomy, radicular ankylosis, odontoclastic resorptive lesions in cats, dental caries, and previously undetected traumatic root fractures. Proper assessment of teeth, grossly and radiographically, prior to extractions can help anticipate and minimize this problem. Failure to remove diseased broken root tips can result in a persistent nidus of infection which clinically may be manifested as a chronic draining tract, persistent oral pain, facial swelling, or osteomyelitis.

Damage to permanent teeth can occur during the extraction of deciduous teeth. The bud of a permanent tooth is located near the apex of the deciduous tooth, predisposing the permanent tooth bud to iatrogenic trauma during extraction particularly in animals less than 10 weeks old. Traumatic injuries of the permanent tooth bud can result in developmental abnormalities including failure of the permanent tooth to erupt, malformation of the permanent tooth, formation of a dentigerous cyst, enamel hypoplasia, and enamel hypocalcification. These problems can be minimized by utilizing careful extraction techniques.

Misplacement of a tooth into the nasal cavity, maxillary sinus, or mandibular canal is an infrequent complication associated with dental extractions. The maxillary canine and the cheek teeth are separated from the nasal cavity by a thin bony plate. The mandibular first molar is separated from the mandibular canal by a thin layer of bone. Advanced periodontal disease or periapical lysis in combination with aggressive extraction techniques can force a tooth or root tip into the nasal cavity, or mandibular canal. It can be very difficult to retrieve root tips forced into the nasal cavity or mandibular canal.

Occasionally difficulty may be encountered completing an extraction. The tooth may be sectioned but difficulty may be encountered while attempting to extract the segments. When this occurs, utilization of the surgical extraction technique is recommended. It is also important to locate the periodontal ligament space while elevating because failure to locate this space often results in inappropriate placement of the dental elevator either on the alveolar bone or tooth. Elevation on the alveolar bone or tooth is ineffective and until the dental elevator is directed into the periodontal ligament space the extraction will not proceed efficiently. The periodontal ligament space can be located by placing the dental elevator in between the cusp segments and rotating and holding the elevator. The periodontal ligament space will fill with a small amount of blood and can be observed as a thin line of blood located between the alveolar bone and the root. The dental elevator should be directed into this space to permit more effective elevation and efficient extraction of the tooth.

Oronasal fistulas are one of the most common complications associated with dental extractions. These fistulas are frequently present prior to extraction and are caused by advanced periodontal disease. Signs associated
with oronasal fistulas include sneezing and mucopurulent or hemorrhagic nasal discharge. The most common location of oronasal fistulas in the dog is the palatal aspect of the maxillary canine tooth. Any maxillary tooth may cause an oronasal fistula. Teeth affected with end-stage periodontal disease should be removed and any associated oronasal fistulas should be repaired with a mucoperiosteal flap.

Iatrogenic fractures are a serious complication that may be associated with extraction of teeth affected with advanced periodontal disease. The alveolar bone surrounding the mandibular canine teeth and mandibular first molars are particularly susceptible to iatrogenic fractures because of minimal bony support around large roots. Careful elevation of the tooth, digital support of the mandible during extraction, and a gentle rotational motion with the dental extractor can help prevent pathologic fractures. These fractures should be managed conservatively with tape muzzles, intraoral acrylic splints, or a soft gruel diet or a partial mandibulectomy with a cheiloplasty.

Osteomyelitis and bony sequestra are serious complications that can occur following extraction of teeth. The etiology of osteomyelitis in these cases include retained tooth roots and exposed alveolar bone and osseous necrosis. A bone sequestra may develop when a piece of alveolar bone is fractured off during a dental extraction and left in the extraction site. Retained tooth roots and bony sequestra should be removed and necrotic bone curettaged to the level of healthy, bleeding bone.

Ophthalmic complications of dental extractions include corneal ulceration, pericocular bruising, and inadvertent perforation of the retrobulbar space, globe, lens or cornea. Utilization of gentle extraction techniques, maintaining a short finger stop near the tip of the dental elevator, adequate ocular lubrication, and careful placement of counter-pressure on the head during extraction procedures will help minimize these serious postoperative complications.

REFERENCES