Decision making and techniques to simplify dental extractions in cats have been previously described.1–5 Proper perioperative planning and decision making regarding feline extractions can improve surgical outcome.

Preoperative Considerations in the Feline Dental Patient
It is important to properly assess the feline patient prior to the performance of extractions. This includes complete general physical and oral examinations and appropriate preoperative blood work. Once the patient has been properly assessed, it is important to select an appropriate anesthetic protocol that will provide the feline dental patient with adequate perioperative pain management.

Oral Examination in the Awake Feline Patient
It may be difficult to perform a thorough oral examination in the awake feline patient; however, it is important to attempt to assess the oral cavity in the cat as completely as possible to help determine the general oral health of the patient. It must be remembered that all of the oral and dental lesions will not be readily apparent in the awake feline patient, and a thorough oral examination, including dental radiographs under anesthesia, will be necessary to detect the full extent of the dental lesions. An oral exam is initiated by placing both hands gently around the patient’s head and neck and then gently parting the lips with the thumbs to visualize the buccal aspect of the canine teeth and cheek teeth on each side. The incisor and canine teeth may be visualized from the front of the patient using the index fingers and thumbs to retract the lips. The maxilla is then visually assessed for any evidence of asymmetry or swelling. The eyes and nostrils are evaluated for any signs of asymmetry or discharge. The mandibles are then palpated for any evidence of swelling or asymmetry. The mouth is then gently opened by placing the index finger and thumb of the nondominant hand just below the zygomatic arches and tilting the patient’s nose dorsally and then carefully placing the tip of the opposite index finger over the lower incisor teeth and gently pushing ventrally to open the mouth to permit visualization of the tongue, palate, and pharynx. The thumb of the dominant hand is then placed in the intermandibular space with the index finger still on the lower incisors, to displace the tongue dorsally to permit examination of the ventral aspect of the tongue. Abnormalities detected are discussed with the owner, with the stipulation that additional abnormalities may be detected in the anesthetized patient.

Oral Examination in the Anesthetized Feline Patient
Oral examination in the anesthetized feline patient begins with a thorough oral examination, including evaluation for missing or supernumerary teeth, malformed teeth, proper occlusion, periodontal probing, and exploration of the teeth with a dental explorer to detect pulpal exposure and resorptive lesions. Abnormalities are noted on the feline dental chart.

Dental Radiography in the Feline Patient Prior to Extraction
Dental radiography is an important tool in the decision-making process in feline dental patients. Dental radiography can help determine the most appropriate treatment modality in feline teeth affected with periodontal disease, endodontic disease, and feline resorptive lesions.

Radiographic Changes Associated with Feline Periodontal Disease Requiring Extraction
Dental radiographs demonstrating less than 50% of attachment remaining on any mobile tooth indicate that extraction is indicated. In addition, if dental radiographs indicate that there is loss of attachment to the apex of a single-rooted tooth or loss of attachment to the apex of any root of a multi-rooted tooth, then extraction is indicated.

Radiographic Changes Associated with Feline Endodontic Disease Requiring Extraction or Endodontic Treatment
The presence of endodontic disease or disease of the pulp of a feline tooth requires extraction or endodontic therapy. Radiographic changes associated with endodontic disease include loss of tooth structure to the pulp of the tooth, asymmetrical endodontic canals, periapical lysis, or apical lysis.

Radiographic Changes Associated with Feline Odontoclastic Resorptive Lesions Requiring Extraction or Crown Amputation with Intentional Root Retention
Dental radiography is extremely important in the assessment of feline odontoclastic resorptive lesions, since the selection of the appropriate treatment is based on proper evaluation of the dental radiographs. Feline teeth with
advanced root resorption, without periodontal or endodontal lesions, are good candidates for crown amputation with intentional root retention. Conversely, a tooth with a feline odontoclastic resorptive lesion that has a well-defined periodontal ligament space, bone loss due to periodontitis, or a periapical lesion evident on radiographs requires standard extraction techniques with complete removal of the roots. In individual feline teeth in which one root has an advanced root resorptive lesion and another root has a well-defined periodontal ligament space, it is acceptable to perform a crown amputation with intentional root retention on the root that has severe resorption and perform a routine extraction of the root that has a well-defined periodontal ligament space.

Proper Equipment and Instrumentation for Feline Extractions
A high-speed handpiece with fiberoptics is extremely helpful when performing surgical extractions in cats. The fiberoptic handpiece provides a light source directly on the surgical site. Burs utilized frequently include small round burs for the removal of buccal bone and tapered fissure burs for sectioning multi-rooted teeth. Essential hand instrumentation for performing feline extractions have been previously described. Hand instrumentation specifically designed for feline extractions is available through numerous veterinary supply companies. Instruments for feline extractions may be packaged together in a feline extraction pack and steam sterilized prior to each use. Instrumentation in feline extraction packs includes a scalpel handle upon which a number 15 blade can be placed prior to surgery, a small feline periosteal elevator, a soft tissue retractor, a variety of dental elevators and luxators, small extraction forceps, small needle holders, Adson tissue forceps, suture scissors, and iris scissors for cutting soft tissue. A small root forceps is also helpful for reaching down into an alveolus and obtaining a firm grasp on a loose root tip. It is imperative to routinely sharpen dental extraction instruments to ensure optimal functionality.

Anatomical Features of Feline Teeth
The dental formula in the adult cat is: 2 (I 3/3, C1/1, P3/2, M1/1) = 30. The anatomy of the mouth and teeth of the cat has been previously described. Feline teeth are much smaller and narrower than canine teeth. All the incisors and canine teeth have one root. The small maxillary second premolar usually is a small single-rooted tooth, which may have two roots that may be fused together. The maxillary third premolar has 2 roots, with a supernumerary root sometimes present; the maxillary fourth premolar has 3 roots; and the maxillary first molar is very small, with two roots that may be fused. There are 3 mandibular cheek teeth. The third and fourth premolars each have 2 symmetrical roots, and the first molar has 2 asymmetrical roots with a large mesial root and a small distal root.

Techniques for Performing Feline Extractions
There are several different techniques for performing feline extractions. These techniques include a simple extraction, multi-rooted extraction, single-rooted surgical extraction, partial- or full-mouth extractions for the treatment of feline stomatitis, and crown amputation with intentional root retention for the treatment of feline resorptive lesions.

Simple or Closed Extraction
The incisors, the maxillary second premolar, and the maxillary molar teeth are generally small, single-rooted teeth in the cat and can be removed using simple or closed extraction techniques, which have been previously described. The procedure is initiated by cutting the gingival attachment around the whole circumference of the tooth using a number 11 scalpel blade in a handle or a sharp luxator. A luxator that matches the curvature of the tooth is selected and is placed into the gingival sulcus at a slight angle to the tooth, pressed into the periodontal ligament space, and worked around the entire circumference of the tooth using gentle apical pressure. The operator may now elect to continue the extraction using a dental elevator or continue using a luxator. A dental elevator may be used once adequate space has been created for the thicker tipped instrument. An appropriate sized elevator is selected, placed in the periodontal ligament space, and worked around the tooth with a gentle rotational pressure held at each point for 10–15 seconds to help break down the periodontal ligament. Once the tooth becomes loose it can be removed digitally or gently grasped with a small dental extraction forceps placed as far apically on the tooth as possible, and with a gentle rotational movement of the forceps in the long axis of the tooth, the tooth may be gently rotated and removed from the alveolus.

Multi-rooted Extraction
Extraction of multi-rooted teeth in cats requires additional consideration because of the tendency for these roots to fracture during extractions. A modified technique for extracting multi-rooted teeth in the cat has been reported. This technique involves raising both buccal and lingual flaps and removing adequate alveolar bone to expose the furcation. The furcation is then sectioned using a size 2 round bur, making 2 cuts from the furcation at 45°, one
distally and one rostrally, thereby removing a significant portion of the crown and leaving only a small portion of the crown mesially and distally. A size 2 or 4 round bur is then used to remove the interradicular bone between the mesial and distal roots to the apical region of the roots without invading the nasal cavity or mandibular canal. This results in support of the roots by 3 sides. An appropriately sized luxator or elevator can be eased into the interradicular space created by the bur and into the periodontal ligament of the roots to gently remove the roots independently. Additional buccal bone may be removed as necessary. Sharp edges of bone are removed with a small round bur, the surgical site is flushed, and the flap is closed with 4-0 chromic or 4-0/5-0 poliglecaprone on a small reverse cutting needle.

Single-Rooted Surgical Extraction
The canine tooth in cats often requires a surgical extraction. The maxillary canine tooth can be removed through a labial flap with two releasing incisions with a broad base. Minimal bone is removed over the labial aspect of the tooth to permit delivery of the tooth using the luxators and dental elevators as previously described. Extraction of the mandibular canine tooth in the cat can be performed using a labial, lingual, or alveolar marginal approach. The labial approach utilizes a labial flap with labial bone removal, the lingual approach utilizes a lingual approach with lingual bone removal, and the alveolar marginal approach uses a dorsal approach to the canine root through a single incision over the root of the tooth from the distal aspect of the canine tooth distally toward the mesial aspect of the mandibular third premolar. In this approach the bone is removed over the root along the alveolar ridge in the edentulous space between the canine tooth and the third premolar. Care must be taken when elevating this root to direct the elevator along the sides of the root and not straight down the distal aspect of the tooth, since this type of elevation will direct the elevator into the root of the canine tooth instead of into the periodontal ligament space. Care must also be taken when extracting the mandibular canine teeth in cats to not apply excessive rotational forces with the elevator, since this may result in mandibular fractures.

Partial- or Full-Mouth Extractions for the Treatment of Feline Stomatitis
In cases of feline gingivostomatitis in which medical management is unsuccessful, extraction of all premolars and molars or full-mouth extraction is the treatment of choice. This is facilitated by making a full-thickness gingival flap in each quadrant, using a small feline periosteal elevator to elevate the lingual and/or palatal and buccal aspects to provide adequate exposure to the underlying bone. The buccal bone is removed as needed; the teeth are sectioned and removed as previously described. The rough edges of bone are removed with a small round bur, the alveoli are curettaged, the surgical site is flushed, and the surgical site is closed without tension.

Crown Amputation with Intentional Root Retention for Treatment of Feline Resorptive Lesions
Properly screened teeth with feline resorptive lesions can be treated by crown amputation with intentional root retention. Pre-extraction radiographs are imperative in case selection. Teeth with advanced root resorption, without periodontal or endodontal lesions, are good candidates for crown amputation with intentional root retention. Teeth with an intact periodontal ligament and no severe root resorption or teeth with periodontal or endodontal lesions, or cats with stomatitis require routine extractions. The procedure is initiated by making a small mucogingival flap and amputating the crown with a small round diamond burr on a high-speed handpiece. The site is checked with a dental explorer to ensure complete amputation of the entire crown. Any residual crown and irregular alveolar bone is removed with the round burr. The residual pulp in the surgical will bleed on appropriately screened teeth. The site is flushed and closed.

Complications Associated with Extractions
Complications associated with extractions include root fracture, hemorrhage, delayed wound healing and infection, oronasal fistula, ocular injuries, salivary duct injury, misplacement of root fragments into the nasal cavity or into the mandibular canal, damage to adjacent teeth, and mandibular fracture. Careful extraction techniques and appropriate perioperative management can help minimize these complications.

References