Challenges of Exotic Dentistry

Exotic caged pets are seen by many small animal veterinary practices, although in most practices, they are not dealt with as commonly as dogs and cats. Owners may also handle their smaller caged pets infrequently. This leads to two main difficulties when they are presented for dental treatment: that veterinary staff may not be as familiar with their dental diseases and appropriate treatment, anesthesia, and pain management; and that by the time the client notices a problem and the exotic patient is presented, it may be quite debilitated.

Rodent Dentistry

All rodents possess two pairs of continuously growing incisors and no canine teeth. Rodents also lack a set of exfoliating primary teeth, growing only permanent teeth. However, not all rodents are created equal when it comes to the rest of their dentition. Two types of rodents will be discussed within this section: caviomorph rodents and murine rodents.

Caviomorph Rodents (Guinea Pigs, Chinchillas, Degus)

All teeth of caviomorph rodents have open root apices, allowing the teeth to grow continuously, a type of dentition called elodont. These teeth, worn down by a diet of abrasive grasses and vegetation, are constantly replaced by new growth.

Oral Anatomy and Dentition of Caviomorph Rodents

The oral cavity is small and narrow, with a large space, the diastema, separating the incisors from the cheek teeth. The enamel on the incisor teeth is thickest on the facial surface and is a yellow-orange color. This pigmentation is not present in guinea pigs. The cheek teeth have large chewing surfaces, and rather than being set parallel in the mouth, diverge caudally (Figs. 9.1–9.4).

Murine Rodents (Rats, Mice, Hamsters, Gerbils)

Murine rodents possess continuously growing incisors that allow them to nest and to tunnel through hard obstacles to gain access to food, but they do not have continuously growing cheek teeth. Murines consume diets of seeds, roots, and tubers, which are not particularly abrasive. Their molars possess true anatomical roots and short crowns, called brachyodont.
Oral Anatomy and Dentition of Murine Rodents

2\( (I1/1 : C0/0 : P0/0 : M3/3) = 16 \)

Murine rodents possess the same sort of long, narrow oral cavity as caviomorph rodents; however, cheek tissue fills the diastema between the incisors and the molars.\(^6\) Hamsters have large cheek pouches that are used to store and carry food, bedding, and
their young. As with all rodents, murines have two pairs of elodont incisors. The mandibular incisors are normally three times longer than the maxillary incisors. The enamel is thicker on the facial surface of the incisors and is orange in color. There are no canine teeth or premolars. The molars are brachyodont and situated caudally in the mouth (Fig. 9.5, Online Fig. 9.6).
Chapter 9: Dentistry and the Exotic Patient

Oral Examination of Rodents

The face and head should be first assessed for any asymmetry, swellings, ocular or nasal discharge, drooling, saliva staining, inability to close the mouth, obvious incisor overgrowth, and/or abnormal incisor wear pattern. A complete intraoral examination of the awake rodent is difficult. An otoscope can sometimes be used in larger awake rodents to visualize the oral cavity and cheek teeth, but more often, the pet will need to be sedated or anesthetized. Mouth gags, cheek dilators, magnifiers, and dental mirrors can be used in the sedated/anesthetized patient to improve visualization of the caudal oral cavity. Check for an unlevel occlusal plane, sharp points or hooks on the cheek teeth, food impaction between teeth, tongue entrapment, soft tissue lacerations or ulcerations, cheek pouch impaction, stomatitis, or fractured teeth (Online Figs. 9.7–9.9). Skull radiographs should also be obtained as part of the complete oral examination, which allow occlusal evaluation and can reveal tooth root elongation and periapical lucencies.

Anesthesia and Pain Management

Preanesthetic fasting should be limited to 1–2 hours, as these small patients do not vomit and are at risk of developing hypoglycemia. Preanesthetic blood panels should be run on those patients large enough to perform venipuncture. The lateral saphenous or cephalic veins are the most accessible to collect small amounts of blood and for intravenous catheter placement (use 24-gauge or smaller) for emergency access with or without fluid administration.

Some procedures such as oral examinations or incisor trimming can be done using only chemical restraint. Drugs such as ketamine, oxymorphone, butorphanol, midazolam, medetomidine, glycopyrrolate, and atropine are commonly used to provide sedation,
reduce the stress associated with induction, decrease salivary secretions, and provide pain relief. There are many excellent texts and resources that can be consulted with regard to rodent drug protocols and dosages (Table 9.1).

Intubation of very small rodents is generally not an option. Alternately, a kitten-sized anesthetic mask on a nonrebreathing system can be used to induce anesthesia with isoflurane and O\textsubscript{2} administration. Anesthetic maintenance can be accomplished by placing a small anesthetic mask over only the nose, or by using a rubber catheter thin enough to fit into a nostril cut to accept an endotracheal tube adapter and trimmed to extend approximately 1 in. into one of the nostrils while the other nostril is occluded by a finger. For murines, chamber induction can be used. A large anesthetic mask placed over the patient with the mask’s diaphragm pressed firmly against a table can serve as a makeshift induction chamber. For anesthetic maintenance, a rubber dental dam or the palm of an examination glove is stretched over the end of a Bain system anesthetic hose using an elastic band to keep it in place. The patient’s nose is placed through an “X” cut in the rubber, leaving the mouth free. A staff member must hold the nasal tube or mask to keep it in place. This person can also be dedicated to anesthetic monitoring (Online Fig. 9.10). Heart rate can be monitored via pediatric stethoscope, Doppler blood pressure monitor (Doppler crystal can be held or taped directly over the fur of the chest in most patients), or a lingual SpO\textsubscript{2} sensor placed on a foot, ear, or scrotum. Visualization of the mucous membrane color (tongue is especially useful) and the chest movements of respirations is essential. Circulating warm water blankets, microwavable oat bags (Online Fig. 9.11), and exam gloves filled with warm water can all be useful in maintaining body temperature.

Table 9.1 Some common drugs and dosages for premedication of rodents and other small exotic pets

<table>
<thead>
<tr>
<th>Agent</th>
<th>Guinea Pig</th>
<th>Chinchilla</th>
<th>Hamster</th>
<th>Rat/Mouse</th>
<th>Hedgehog</th>
<th>Sugar Glider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>22–44 mg/kg IM</td>
<td>20–40 mg/kg IM</td>
<td>20–40 mg/kg IM</td>
<td>22–44 mg/kg IM</td>
<td>5–20 mg/kg IM</td>
<td>20 mg/kg IM</td>
</tr>
<tr>
<td>Oxymorphone</td>
<td>0.2–0.5 mg/kg SC, IM</td>
<td>–</td>
<td>0.2–0.5 mg/kg SC, IM</td>
<td>0.2–0.5 mg/kg SC, IM</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Butorphanol</td>
<td>0.4–2.0 mg/kg SC</td>
<td>0.2–2.0 mg/kg IM</td>
<td>1–5 mg/kg SC</td>
<td>1–2 mg/kg SC</td>
<td>0.05–0.4 mg/kg SC</td>
<td>0.5 mg/kg IM</td>
</tr>
<tr>
<td>Midazolam</td>
<td>1–2 mg/kg IM</td>
<td>1–2 mg/kg IM</td>
<td>1–2 mg/kg IM</td>
<td>1–2 mg/kg IM</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Medetomidine</td>
<td>0.3 mg/kg SC, IM</td>
<td>–</td>
<td>0.1 mg/kg SC, IM</td>
<td>0.1 mg/kg SC</td>
<td>0.1 mg/kg IM</td>
<td>–</td>
</tr>
<tr>
<td>Glycopyrrolate</td>
<td>0.01–0.02 mg/kg SC</td>
<td>0.01–0.02 mg/kg SC</td>
<td>0.01–0.02 mg/kg SC</td>
<td>0.01–0.02 mg/kg SC</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Atropine</td>
<td>0.1–0.2 mg/kg SC, IM</td>
<td>0.1–0.2 mg/kg SC, IM</td>
<td>0.1–0.4 mg/kg SC, IM</td>
<td>0.1–0.4 mg/kg SC, IM</td>
<td>0.01–0.04 mg/kg SC, IM</td>
<td>0.01–0.02 mg/kg SC, IM</td>
</tr>
</tbody>
</table>

IM, intramuscular; SC, subcutaneous.
Source: Adapted from Morrisey and Carpenter.9
Small mammals do not often show obvious signs of pain, but this does not mean they should be denied pain relief. Pain management can include narcotics used in premedication, injectable analgesics such as buprenorphine, and oral nonsteroidal anti-inflammatory drugs (NSAIDs) such as meloxicam. The placement of dental local blocks in rodents is usually impossible. Some signs that pain relief is not adequate are teeth grinding, hiding, depression, and anorexia. Pain must be recognized and treated quickly as rodents can become debilitated very quickly if not eating.

**Common Dental Problems of Rodents**

**Malocclusion**

The most common dental problem seen in rodents is malocclusion, causing overgrowth of the incisors (with or without cheek teeth in caviomorphs) (Online Fig. 9.12). Secondary tongue entrapment, in which the lower cheek teeth overgrow and due to their angulation arch over the tongue, preventing the animal from prehending food or swallowing; soft tissue lacerations of the tongue and buccal mucosa; tooth root elongation; and excess salivation (“slobbers”) can occur. Malocclusions can result from traumatic injury to a tooth causing a loss of a portion of the crown and subsequently the loss of normal wear on the opposing tooth, or can result from hereditary conditions such as a mandible that is too narrow or too short, nutritional deficiencies such as not consuming enough roughage resulting in insufficient tooth wear, weakness of the jaw muscles, or behavioral problems such as cage chewing (Online Fig. 9.13).

**Treatment**

Traumatic malocclusions are treated by smoothing the edges of the fractured tooth with a bur or file to reduce soft tissue injuries, treating the pulp if exposed by removing any infected tissue and capping it with calcium hydroxide paste topped with a thin layer of glass ionomer, and performing routine odontoplasty (also referred to as crown height reduction or occlusal levelling) on the opposing tooth until the fractured tooth regrows. Atraumatic malocclusions can be treated, although not usually cured, with routine odontoplasty (usually every 6–8 weeks for the remainder of the animal’s life), extraction of the affected teeth, dietary changes, or reducing the animal’s stressors in cases of behavioral problems such as cage chewing or barbering. For details of odontoplasty and extraction, see the “Rabbit Dentistry” section (Online Figs. 9.14 and 9.15).

**Tooth Root Abscess**

This can be secondary to infection due to food or debris impaction between teeth, which spreads periapically, tooth fracture leading to endodontic disease, or plaque-associated periodontal disease. Facial swelling is the most common presentation. Radiographs are necessary to determine not only whether the abscess is from the teeth but if so, from which tooth. The location of facial swelling can be misleading, as the root apex of the incisors can extend to the premolars in caviomorphs and beyond the third molar in murine rodents. Tooth root abscesses of elodont teeth are usually very difficult to resolve, possibly
due to the difficulty of completely removing all abscess material, often requiring multiple procedures for extraction of the affected teeth, surgical debridement of the abscess, long-term antibiotic administration, and possible force-feeding. Abscessed brachydont teeth may be extracted using a small luxator or an 18-gauge needle. Suturing the gingiva closed over the extraction sites is very difficult in these tiny patients, so they are usually left open to heal.

**Scurvy**

Like humans, Guinea pigs cannot synthesize vitamin C from glucose, and so require vitamin C supplementation from their diet. If vitamin C is not provided or ingested, they will develop scurvy. Oral signs of scurvy include gingival bleeding and loose teeth sometimes resulting in malocclusion.

**Cheek Pouch Impaction and Eversion**

The cheek pouches of hamsters can become impacted if sticky, dry, or sharp materials are ingested and the hamster is unable to remove these materials from the pouch. The impacted pouch needs to be emptied and rinsed clean with saline. Long-term impaction can lead to stomatitis, and oral antibiotics may be necessary. Cheek pouches may also become everted, which appears as a pink, moist mass protruding from the mouth. The pouch should be replaced and a suture placed through the cheek to prevent re-eversion (Online Fig. 9.16).

**Caries and Tooth Resorption**

Feeding a diet high in sugars or refined carbohydrates can cause dental caries in rodents. Tooth resorption can also occur, possibly secondary to periodontal inflammation. Extraction is the treatment of choice for brachydont teeth, or for elodont teeth that have extensive damage. If a carious lesion is present on an elodont tooth that otherwise appears healthy and is still erupting, odontoplasty (and pulp capping if necessary) can be attempted.

**Periodontal Disease**

Plaque-induced periodontal disease can affect brachydont teeth, particularly in pet rats. These patients should have dental prophylaxis and extraction of teeth that have advanced attachment loss or infection. Periodontal disease involving elodont teeth is much more likely to be due to impaction of food or debris.

**Dental Instruments**

A complete set of rodent dental instruments comprises a mouth gag and cheek dilators to ensure adequate visualization of the oral cavity, and a rodent tongue depressor to
protect the tongue and soft tissues of the mouth from trauma. High-speed burs (i.e., FG330, FG701) are used for incisor trimming, and low-speed burs (i.e., HP5, HP8, HP558) and/or molar/premolar rasps are used for crown height reduction of overgrown premolars and molars. A pair of rodent molar/premolar cutters can be used if no drill is available. For extraction of elodont teeth, a set of incisor and molar/premolar luxators are required, which are inserted into the periodontal space lateral to the tooth being extracted, then held while applying pressure longitudinally for 20 seconds. This is then done on the mesial aspect of the tooth being extracted, and the process repeated until the periodontal ligament is torn and the tooth is mobile. Extraction forceps are then used to intrude the tooth into the alveolar socket in a rocking motion to tear any remaining periodontal ligament and damage the apical germinal tissue to prevent tooth regrowth. Lastly, the extraction forceps are used to extract the tooth completely. Other useful tools include magnifying loupes, 18G needles to use to luxate very small teeth, a saliva ejector suction tip fitted with a urinary catheter to suction fluid and debris from the mouth, and cotton-tipped applicators to staunch blood flow, absorb fluid, and remove debris from the mouth.

**Husbandry and Home Care**

Debilitated patients or patients who have had oral surgery may need nutritional support. A variety of soft foods can be offered or force-fed, such as Oxbow Critical Care (Oxbow Animal Health, Murdoch, NE; www.oxbowanimalhealth.com), which is a recovery food in powder form that is mixed with water and fed from a syringe; yogurt; or hay, vegetables and water pureed in a blender. Abscess-flushing syringes with the tips trimmed off halfway work to force-feed chinchillas and guinea pigs; and 1- to 3-mL syringes work well for tinier patients [Online Fig. 9.17]. Distasteful medications such as enrofloxacin may be mixed with apple or other juices in the dosing syringe to improve palatability.

To aid in preventing dietary-related malocclusions, owners should feed caviomorph rodents the majority of their diets as roughage, such as timothy hay, fresh greens, and vegetables; and at most, one-third of their diets should consist of commercial pellets. Guinea pigs must also be given vitamin C supplementation to prevent scurvy. Stress can often be reduced by enlarging the animal’s cage, removing or adding companions, or adding stimulation such as toys and mazes. Chew aids, such as wooden blocks, can help wear down rodent incisors.