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## SMALL ANIMAL EDITION

# DIAGNOSIS AND TREATMENT OF DENTAL DISEASE IN PET RODENTS

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## TAXONOMY AND DENTAL ANATOMY

Rodents belong to the Order *Rodentia*, the largest mammalian order. They are grouped into three suborders based on anatomical and functional differences of their jaw muscles, namely the Miomorph (Myomorpha, “rat-like” or “mouse-like”), the Sciuromorph (*Sciuromorpha*, “squirrel-like”), and the Hystrychomorph (*Histrichomorpha*, or *Caviomorpha*, “porcupine-like” or “guinea pig-like”) rodents.

Rodents have well-developed incisor teeth. Rodents are monophyodont, with one single set of teeth (no deciduous set), and a single pair of maxillary incisor teeth. Premolar and molar teeth have no anatomical or physiological differences, and are therefore simply called “cheek teeth.” Rodents lack canine teeth, and have incisor and cheek teeth separated by a wide edentulous gap called the “diastema”.

Porcupine-like rodents (the most common kept as pets are the Guinea Pig, the Chinchilla and the Degu) are true herbivores, with complete elodont (open rooted, growing throughout life) dentition.

Rat-like rodents (the most common kept as pets are the Rat, the Mouse, the Gerbil, the Duprasi and the Hamster, including the Golden or Syrian Hamster and the Russian hamsters) are omnivorous, and have elodont incisor teeth and anelodont (teeth with a limited period of growth) cheek teeth.

A few squirrel-like rodents may be encountered as pets, and include the Prairie Dog, the Chipmunk and the European Citellus, also named “dwarf” prairie dog. Like Miomorphs, Sciuromorphs have elodont incisor teeth, and anelodont cheek teeth.

The dental formula of rodents is presented in Table 1.

The cheek teeth of herbivorous species are flat but not smooth, with crests of enamel and grooves in dentine for a proper crushing of food. The anatomy of the cheek teeth of rabbits and porcupine-like rodents is very similar, but guinea pigs show an important structural peculiarity. The mandibular teeth are curved with a pronounced buccal convexity, and the maxillary teeth with a prominent palatal convexity. This results in a 30 degree oblique occlusal plane that slopes from buccal to lingual (lateral to medial) dorsal to ventral (Figure 1).

**Figure 1.**

Despite being herbivorous, prairie dogs have brachyodont (short crowned) and anelodont cheek teeth, which are not open rooted and continually growing as is sometimes reported in literature.

The temporomandibular joint and and masticatory muscles of rodent species allow marked rostrocaudal movement, much greater than in lagomorphs. They are able to rostrally subluxate the mandible during gnawing. Unlike lagomorphs, the cheek teeth are in occlusion when the jaw is at rest. This gives the appearance of brachygnathism, as the mandibular diastema is is shorter than the maxillary diastema.

**Table 1. Dental Formula of Rodents**

| | Cheek Teeth | | | |
|---|---|---|---|---|
| **INCISORS** | **PREMOLARS** | **MOLARS** | **Number of Cheek Teeth** | **Total Number** |
| Maxillary/Mandibular | Maxillary/Mandibular | Maxillary/Mandibular | Maxillary/Mandibular | |
| | | | | |
| 1/1 | 1/1 | 3/3 | 4/4 = 16 | 20 |
| Elodont/Hypsodont | Elodont/Hypsodont | Elodont/Hypsodont | Elodont/Hypsodont | |
| | | | | |
| 1/1 | 0/0 | 3/3 | 3/3 | 16 |
| Elodont/Hypsodont | | Anelodont/Brachyodont | Anelodont/Brachyodont | |
| | | | | |
| 1/1 | 1-2/1 | 3/3 | 4-5/4 =16-18 | 20-22 |
| 1/1 | 2/1 | 3/3 | 5/4 = 18 | 22 |
| Elodont/Hypsodont | Anelodont/Brachyodont | Anelodont/Brachyodont | Anelodont/Brachyodont | |

**DIAGNOSTICS**

The most common clinical signs and symptoms of dental disease in guinea pigs are reduced food intake, anorexia, digestive disturbances and weight loss. Many owners report only chewing difficulties. When compared to rabbits, however, presenting signs and symptoms are usually more severe. Guinea pigs are usually presented for reduced food intake or complete anorexia, which is sometimes reported by owners as sudden onset.

The small size makes safe, effective restraint and oral examination even more difficult in non-anesthetized rodent species than in rabbits. The well-developed buccal skin folds of guinea pigs also complicates introduction of an otoscope cone. Therefore, in most cases, oral examination must be conducted under general anesthesia. Unless the guinea pig is anorexic, the oral cavity normally contains food debris that may impede evaluation of the teeth and soft tissues.

In chinchillas, dental disease often presents as ptyalism and pawing of the mouth. Other common symptoms include chewing and licking of the paws, with resulting dermatitis and other cutaneous lesions. Epiphora and blepharospasm can be symptoms of elongation of the roots of cheek teeth. Dacriocystitis secondary to dental disease can present as nasal discharge and wet fur around the nostrils. The mandibular and maxillary surface should be accurately evaluated. Root elongation may cause cortical bone deformities easily palpable as asymptomatic or painful hard swellings.

Golden hamsters are frequently presented for malocclusion of incisor teeth and for facial swellings, sometimes affecting ocular and periocular structures. Oral inspection of golden hamsters is possible only in calm, properly restrained individuals. Gentle expression of the cheek pouches will help removed stored food that can hinder examination. Inspection of the cheek pouches is an important part of examination of the oral cavity. It can be performed using an otoscope.

Dental fractures of incisor teeth are particularly common in prairie dogs housed indoors. Common causes include falls and chewing on cage bars, especially when cage size is too small. Maxillary teeth are most frequently affected.

Dyspnea, sometimes associated with sneezing or so called “reverse sneezing,” can be due to dystrophic change and root deformation of the maxillary incisor teeth (also referred to as pseudo-odontomas) which lead to reduced nasal air passage. Complete intraoral inspection of the conscious prairie dog is not feasible, and should always be performed under general anesthesia. Conscious examination is usually limited to inspection of incisor teeth.

Radiographic examination of the skull and teeth is an essential diagnostic tool in case of suspected dental disease. Due to the tiny size of these species, good to excellent quality skull radiographs are mandatory. They can be obtained with the use of standard radiographic equipment, and screen films. High-resolution mammography x-ray films are particularly advantageous.

Multiple views are necessary for a full evaluation and diagnosis should never be based on any single radiographic image. The five standard radiographic projections are the lateral, the right and left oblique, the ventrodorsal or dorsoventral and the rostrocaudal (“skyline”). Deep sedation or general anesthesia is usually necessary for perfect positioning.

Due to the occlusal angulation of the cheek teeth of the guinea pig, the rosto-caudal and not the lateral projection is the only one that is helpful in viewing the occlusal plane in this species.

Optimal visualization of the oral cavity of rodents is greatly facilitated by endoscopy, especially in smaller patients. The 2.7 mm rigid endoscope and accessories, are ideal for this purpose. Endoscopy becomes even more critical for detection of lesions in rat-like or other small rodents.

The use of computed tomography has been described in the chinchilla. While currently not practical, CT represents a viable future diagnostic option.

Culture and sensitivity tests are important in cases of dental disease-related infection and abscessation. Guinea pigs have long been used as laboratory models for human gingivitis and periodontal disease, and studies indicate anaerobic bacteria play a large role in infections and abscesses. Therefore requests for culture should specify screening for both aerobic and anaerobic organisms. Purulent material from the core of an abscess is usually sterile, which necessitates collection of samples from the abscess capsule wall.

Histopathology can also be useful in selected cases, particularly when bone neoplasia or dental dysplasia are suspected.

**DENTAL DISEASES**

Malocclusion of incisor teeth is less frequent in guinea pigs and chinchillas than in rabbits. Guinea pigs are less prone to fractures, as they seldom climb or jump, have a quiet behavior and are less prone to chew the bars of their enclosures.

Primary prognathism of the mandible and/or brachygnathism of the maxilla have not been documented in guinea pigs and chinchillas as in rabbits. A mild defect of this nature would likely be counteracted by the significant rostrocaudal movements of the mandible, which is physiologically normal for rodents.

Metabolic bone disease has not been reported in these species.

Malocclusion of the incisor teeth in guinea pigs and chinchillas is almost always secondary to dental disease of cheek teeth.

The typical patterns of malocclusion are different than in rabbits. Maloccluded maxillary incisor teeth usually do not curved as like in rabbits, and rarely cause trauma to the lips or other soft tissues.

Excessive crown elongation and malocclusion of cheek teeth is common in guinea pigs

The underlying cause is related to improper wear of elodont cheek teeth. Unlike in rabbits, metabolic bone disease has not been investigated and reported in

guinea pigs, and is therefore not considered a predisposing factor for dental disease in this species.

Due to the angulation of the cheek teeth occlusal plane, guinea pigs are prone to develop overgrown of cheek teeth (in particular the lower premolars) in a “bridge-like” pattern. The labial portion of the tongue is entrapped under the bridge, severely impairing both chewing and swallowing.

Crown elongation and malocclusion of mandibular cheek teeth also cause elongation of the apexes and deformity of the ventral cortical bone of the mandible, similar to the disease process in rabbits. Deformities of this type are often more subtle in guinea pigs, and often more difficult to diagnose. These lesions appear to produce more pain and disability in guinea pigs than in rabbits, due to pressure on the infra-alveolar nerves.

Severe malocclusion in chinchillas frequently leads to apical deformities of the cheek teeth, resulting in maxillary and mandibular cortical bone deformities that develop in a more lateral position than in rabbits. Apical deformities can result in perforation of the mandibular cortical bone, with resulting exposure of the apexes. Despite this feature, chinchillas appear much less prone to development of periapical abscesses, soft tissue involvement and osteomyelitis than do rabbits.

Dental disease of incisor teeth of hamsters is frequent, and most commonly occurs secondary to fractures, and pulp or periapical infections. Various patterns of maxillary incisor malocclusion may occur. The most common presentation is curved elongation of the incisor teeth, often with secondary lesions of the lips, tongue and hard palate. Incisor teeth are not readily visible to owners, and clinical signs are often mild. Therefore diagnosis is often delayed until the onset of severe secondary complications.

Pseudo-odontoma is a dysplastic disease affecting the roots of incisor teeth, particularly the maxillary incisors of the squirrel-like rodents. This is a common disease in captive prairie dogs. Malocclusion may follow repeated trauma, fractures or improper trimming of the incisor teeth and ultimately interfere with the eruption of the teeth. Apical growth continues, causing deformation of the germinal tissue and surrounding structures such as the incisive bone. The result is severe root deformation, which acts as a space-occupying mass and leads to progressive nasal obstruction (Figure 2).This is not a true neoplastic disease. Therefore the former definition “odontoma” is incorrect.

Prairie dogs are also prone to cavities and excessive wear of the cheek teeth. Malocclusion of premolar and molar teeth is not as much of a concern in this species as it is in porcupine-like rodents, as their cheek teeth do not continue to grow throughout life

**DISEASES SECONDARY TO DENTAL ABNORMALITIES**

Gastrointestinal disorders are a common sequela to acquired dental disease in guinea pigs and chinchillas. Reduced food intake and lack of fiber slows peristalsis and can rapidly lead to gastric bloat.

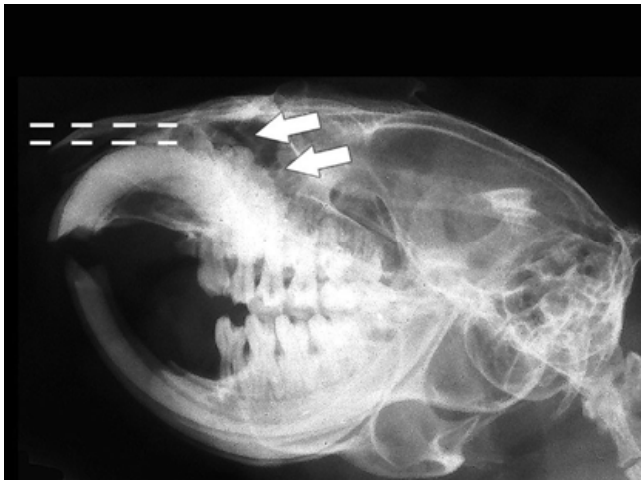

**Figure 2.**

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Abscesses secondary to acquired dental disease occur also in porcupine-like rodents, but with less frequency than in rabbits. Due to the structure and position of the masticatory muscles of the guinea pig, abscesses usually develop under the masseter muscle, and are located more caudal than most mandibular abscesses of rabbits. Deviation of the masticatory muscles causes subluxation of the mandible, with subsequent malocclusion of incisor teeth and disruption of the normal cheek teeth occlusal plane.

**INSTRUMENTS FOR DIAGNOSIS AND TREATMENT**

Specialized instruments have been designed to facilitate small exotic mammal dentistry. Several companies manufacture rabbit and rodent mouth gags, cheek dilator, rasps and even table top mouth gags which optimize the operator’s view and reduces the need for assistants (Figure 3). Special dental handpieces for dental units and burs are also available. Alternatively, many authors use rotating hobby tools for this purpose, which are cheaper and often effective.

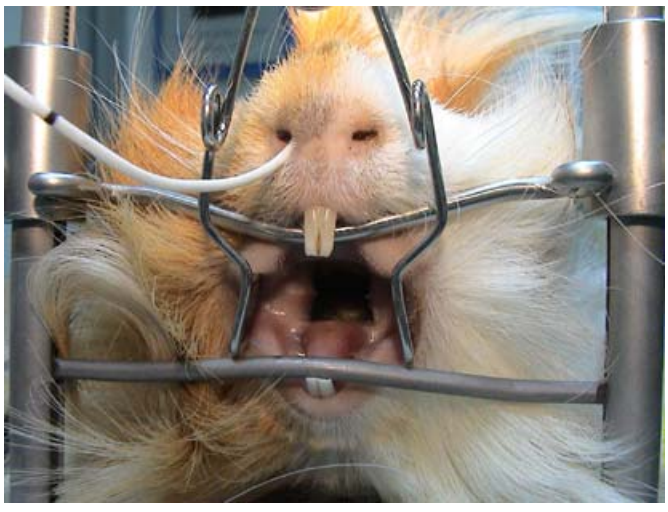

**Figure 3.**

**TREATMENT**

Treatment of dental disease of incisors include coronal reduction, and extraction. The first option is possible when the malocclusion is not severe, has been detected early, and proper restoration of occlusion of incisors and cheek teeth is possible.

Trimmers, clippers and rasps must not be used to reduce the length of elongated incisors, especially when repeated treatment is necessary. Repeated use can result in tooth fracture, exposure of pulp and eventual infection. Moreover, this rough technique is painful when performed without anesthesia.

Extraction of incisors of prairie dogs affected by pseudo-odontoma is very challenging. Severe deformation, adhesions and ankylosis within the alveolar bone increase the difficulty of this procedure. Some authors have reported use of techniques such as rhinostomy and access to teeth via the hard palate, again illustrating the difficulty of extraction in these cases, and overall poor prognosis.

Different options for treatment of dental disease of cheek teeth have been described, depending on the severity of pathologic changes and the anatomical type of the affected teeth. The most common indication for herbivorous rodent species is occlusal adjustment, accomplished through coronal reduction. In some cases extraction can also become necessary, but is much more difficult than in rabbits. The goal of coronal reduction is the restore of the proper occlusal plane. Special attention must be paid in guinea pigs, due to the peculiar sloped occlusal plane.

Simple coronal reduction may correct crown elongation, but may not relieve associated discomfort, once apex elongation and bone deformity has been established. This factor must be considered when offering a prognosis.

Treatment of periapical abscessations of rodent species follows same guidelines recommended for rabbits. Highest rate of treatment success is associated with surgical intervention, and aggressive debridement.

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