Management of Dental Abscesses in Rabbits

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INTRODUCTION

Chronic acquired dental disease and odontogenic abscesses of periapical origin are very common in pet rabbits (*Oryctolagus cuniculus*). Although a variety of medical and surgical treatment options have been described in the peer-reviewed veterinary literature, there is an overall lack of evidence-based data and multi-institutional studies regarding treatment outcomes. This lack of data can easily confound the practitioner when attempting to select the best treatment option for individual rabbits.

RABBIT DENTITION

Lagomorphs including domestic rabbits are true herbivores. All teeth in lagomorphs are elodont (continually growing), aradicular (lacking a true root), and hypsodont (long anatomic crown). The subgingival portion of the crown is the "reserve crown" (technically not the "root"), while the supragingival portion is the "clinical crown."

Rabbits have four maxillary incisors (two larger incisors and two "peg" teeth), which differentiates them from rodents (two maxillary incisors) (Table 1). There are no canine teeth, and the diastema is large in the rabbit. Premolars and molars are anatomically similar and so together are often simply called "cheek teeth." The cheek teeth are encased in alveolar bone. The maxillary cheek teeth are encased in a bony, capsule-like structure termed the "alveolar bulla."

*Table 1. Rabbit dental formula*
<table>
<thead>
<tr>
<th></th>
<th>Maxillary</th>
<th>Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisors</td>
<td>2 (1 major incisor, 1 peg tooth)</td>
<td>1</td>
</tr>
<tr>
<td>Canines</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Premolars</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6 cheek teeth</td>
<td>5 cheek teeth</td>
</tr>
<tr>
<td>Molars</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>8 x 2 = 16</td>
<td>6 x 2 = 12</td>
</tr>
</tbody>
</table>

**PATHOPHYSIOLOGY**

The pathophysiology of periapical odontogenic abscesses is not completely understood, but is likely associated with the elodont (continually growing) nature of rabbit teeth. Diets inadequate in long-stem fiber can result in insufficient and uneven wear to the occlusal surface of the cheek teeth. Congenital malocclusion and other nutritional imbalances also can result in uneven tooth growth and wear. The clinical crown elongates and the reserve crown axis elongates and begins to bend, resulting in or worsening malocclusion of the maxillary and mandibular cheek teeth. The reserve crown further elongates, often resulting in apical deformity, distortion, and perforation of surrounding alveolar bone. Remodeling of the periodontal ligament can result in the formation of periodontal pockets that can trap debris and bacteria and may result in periapical infections. Most odontogenic abscesses in rabbits are believed to be periapical. Abscesses can also result from endodontic infections, penetrating foreign bodies, local tissue injury, and hematogenous spread. Improper incisor trimming (e.g., with nail clippers) can easily split the tooth and result in abscessation. Periapical infections often spread to surrounding alveolar bone and soft tissues, resulting in osteomyelitis and soft tissue abscesses. The abscess capsule is frequently ossified. Abscesses are usually firm and rounded, occasionally with multiple pockets, and extend from the affected tooth or teeth, often along the ventral or lateral mandible or cheek. Often, these abscesses have ruptured and are draining caseous or liquid pus at the time of presentation. Periapical abscesses of the caudal maxillary cheek teeth can result in retrobulbar abscesses.

**CLINICAL PRESENTATION**

Periapical abscesses are generally slowly growing in rabbits, although there are exceptions. They are not usually associated with fever. In some cases, dental abscesses are an incidental finding. Rabbits may show no
outward signs of pain or be quite painful, depending upon the extent of disease. Some rabbits will have difficulty chewing if there is intraoral swelling or other dental pathology. Most rabbits are presented for a visible or palpable swelling along the mandible, cheek, or nasal bridge, or after an abscess ruptures and drains caseous or liquid pus (Table 2).

Table 2. Possible clinical presentations for periapical abscesses, listed by affected teeth

<table>
<thead>
<tr>
<th>Teeth</th>
<th>Presentation</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maxillary</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incisors</td>
<td>Swelling on the nasal planum, purulent nasal discharge, dyspnea, stridor</td>
<td>Extraction of affected incisor straightforward in most cases, but surgical access to abscess may be challenging. Abscesses can extend into nasal cavity and paranasal recesses.</td>
</tr>
<tr>
<td>Rostral cheek teeth (CT1, CT2)</td>
<td>Facial swelling, possibly nasal discharge, nasolacrimal duct obstruction, dacryocystitis</td>
<td>Extraction of affected cheek teeth. Surgical abscess debridement and treatment.</td>
</tr>
<tr>
<td>Caudal cheek teeth (CT4, CT5, CT6)</td>
<td>Retrobulbar or infraorbital abscess - exophthalmos</td>
<td>Extraction challenging. Surgical approach for abscess debridement challenging. Enucleation may be necessary.</td>
</tr>
<tr>
<td><strong>Mandibular</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incisors</td>
<td>Swelling, abscess along ventral, medial, or lateral mandible</td>
<td>Extraction of affected incisor. Abscess debridement and treatment.</td>
</tr>
<tr>
<td>Rostral cheek teeth (CT1, CT2)</td>
<td>Swelling, abscess along ventral, medial, or lateral mandible</td>
<td>Extraction of affected cheek tooth (teeth). Abscess debridement and treatment.</td>
</tr>
<tr>
<td>Caudal cheek teeth (CT4, CT5, CT6)</td>
<td>Swelling along caudal cheek, may extend to medial mandible under chin and may be difficult</td>
<td>Treatment is challenging. Surgical access difficult due to masseter muscle. Caudal cheek</td>
</tr>
</tbody>
</table>

Table 2. Possible clinical presentations for periapical abscesses, listed by affected teeth
**CLINICAL EVALUATION**

Rabbits with confirmed or suspected periapical abscesses should be thoroughly clinically evaluated. A complete oral exam is best done with heavy sedation or general anesthesia. Imaging such as plain radiography and computed tomography (CT) is strongly recommended to assess the dental reserve crowns and skull. Presurgical hematology and biochemistry testing are advised.

**Bacterial Flora of Odontogenic Abscesses**

In one study,\(^5\) the majority of bacterial isolates from 12 rabbits with maxillary or mandibular abscesses were anaerobes, with a mix of anaerobic gram-negative rods such as *Fusobacterium nucleatum*, anaerobic gram-positive non-spore-forming rods such as *Actinomyces* spp., and aerobic gram-positive cocci such as *Streptococcus* spp. The authors stated that these findings were consistent with bacterial flora reported for periodontal infections in humans and other mammals.\(^5\) In a separate study,\(^6\) anaerobes were isolated from 6/14 abscesses, aerobes from 5/14, and no bacteria were cultured from 4 abscesses. Both anaerobic and aerobic cultures should be performed on clinical specimens. Cytology and Gram staining can also be considered.\(^2,6\)

There is mixed opinion regarding the sample source, with many authors suggesting that pus is a poor specimen for culture and that active infection is at the periphery of lesions and therefore the abscess capsule should be the source for microbiologic culture.\(^1,7\) However, in one study,\(^5\) pus yielded a greater variety or quantity of organisms than cultures from the margin in about half of the abscesses sampled. In another study, bacteria were identified by Gram stain from smears of pus in several abscesses that did not grow bacteria in culture.\(^2\)

**SURGICAL ODONTOGENIC ABSCESS TREATMENT OPTIONS**

**Lancing and Drainage**

Abscess lancing and lavage, often with the placement of Penrose drains, is common practice in dogs and cats. However, treatment of abscesses in rabbits with drainage or lavage alone usually fails, in part due to the thick, caseous nature typical of rabbit pus that fails to adequately drain.\(^1,5\)

**Surgical Abscess Debridement**
Debridement of periapical abscesses in rabbits typically involves surgical resection of as much of the abscess and its fibrous or bony capsule as possible and is recommended by most authors.\(^3\)\(^5\)\(^7\) This allows debulking of the infection and surgical exposure of underlying alveolar bone and often the associated tooth. Complete abscess excision is difficult to impossible for odontogenic abscesses given their close association with alveolar bone and close proximity to important soft tissue structures.\(^3\)\(^4\)\(^7\) In these cases, partial excision and curettage are often advocated.\(^3\)\(^4\)\(^7\) Bony abscess capsules and infected bone can be debrided using a burr, drill, curette, or rongeurs.\(^1\) Surgical access for debridement of retrobulbar and infraorbital abscesses is far more challenging than for facial abscesses and often requires meticulous periorbital soft-tissue dissection that avoids the vascular plexus deep to the third eyelid. If the affected eye is blind, enucleation can be considered, which may allow improved surgical access to the retrobulbar and infraorbital areas as well as the dorsal aspect of the alveolar bulla.

**Marsupialization**

Marsupialization is the process of suturing the remaining abscess capsule wall to skin, allowing delayed closure for repeat flushing and other treatment options.\(^3\)\(^4\) Clients are typically advised to perform daily wound care consisting of wound cleansing and lavage and are often advised to then pack the wound with medication. Marsupialization is advocated by many authors.\(^1\)\(^3\)\(^4\) Wounds close through granulation, contraction, and re-epithelialization. Reported wound closure times vary in the literature but are often listed as 2 to 4 weeks.\(^2\) Delayed wound closure may suggest inadequate debridement of necrotic or infected bone or tooth material. Reported limitations of marsupialization include unattractive cosmetic appearance, wound contamination with food and bedding, requirement of daily treatment, and necessity of working near the face, which is often stressful and risks trauma to the rabbit and its handler.\(^2\)

**Tooth Extraction**

Many authors advocate extraction of teeth associated with periapical abscesses in rabbits.\(^1\)\(^2\)\(^7\) Surgical and medical management of a periapical abscess may be ineffective without tooth extraction, particularly in the face of significant osteomyelitis, especially since periodontal pockets may continue to fill with debris and bacteria.\(^7\) Affected teeth can be extracted from an intraoral or extraoral approach. Intraoral extraction is frequently challenging at best since the diseased tooth is often fractured, brittle, or ankylosed to surrounding bone.\(^1\) In many cases, the reserve crown of the affected tooth is visible extending through the alveolar bone at the extraoral surgical site or can be reached through careful bone debridement during surgery. Gingival closure through suturing is possible in many cases but is often challenging to impossible, and so the alveolus may become impacted with food after extraction. In these cases, marsupialization offers the benefit of continued drainage while the gingiva heals through secondary intention and the fistula closes. The empty socket can also be packed with a gelatin sponge. In one report,\(^2\) 13/14 odontogenic abscesses in rabbits reportedly resolved with wound packing without tooth extraction within the study period. Endoscopic-assisted
extraction of a maxillary cheek tooth in a rabbit with a retrobulbar abscess and local flushing with gentamicin and doxycycline were reportedly successful in resolving the abscess in one published case report.

**NON-SURGICAL ODONTOGENIC ABSCESS THERAPIES**

Non-surgical treatment options for odontogenic abscesses include systemic antibiotics and wound packing with antibiotics, antibacterial agents, or products that are touted to promote healing. Medical treatment options alone are widely considered ineffective without surgical intervention.

**Antibiotics**

Antibiotic selection should always be determined based on results from anaerobic and aerobic culture and sensitivity testing whenever possible. Given the preponderance of anaerobic bacterial isolates from jaw abscesses reported in one study, empirical antibiotic selection should include antibiotics with efficacy against anaerobes. In this same study, many isolated anaerobes were sensitive to azithromycin, chloramphenicol, and clindamycin (19/19 isolates); cefazolin, ceftriaxone, and penicillin G (18/19 isolates); and metronidazole and tetracyclines (15/19 isolates). When possible, bactericidal antibiotics with excellent bone penetration should be selected.

**Systemic Antibiotic Administration**

Systemic antibiotic therapy should never be considered effective alone in resolving odontogenic abscesses in rabbits. However, the use of systemic antibiotics, particularly in the immediate postoperative period, is often recommended. In one study evaluating wound-packing techniques, trimethoprim-sulfamethoxazole with metronidazole and azithromycin were given most often for systemic treatment. Certain antibiotics greatly reduce protective populations of normal gastrointestinal bacterial flora when administered orally to rabbits and may result in fatal enteritis and enterotoxemia, including clindamycin, erythromycin, lincomycin, penicillins, amoxicillin-clavulanic acid, and cephalosporins. Oral use of these antibiotics is not advised.

**Local Antibiotic Administration (Wound Packing with Antibiotics)**

Local antibiotic application provides a high concentration of drug to the affected area and minimizes adverse systemic effects. Numerous topical antibiotics have been advocated for local treatment of odontogenic abscesses in rabbits, such as silver sulfadiazine cream, among others. A variety of wound-packing techniques and vehicles for drug delivery have been described. In one study, the abscess cavity was packed with strips of 3- to 5-mm diameter sterile gauze aseptically cut from the folded edge and impregnated with antibiotic after debridement and flushing. The antibiotics most commonly used were ampicillin and clindamycin. The skin
was closed and the procedure repeated periodically under anesthesia. Mean number of packing procedures for complete resolution in 13 abscesses was 4.8 ± 2.2 with a minimum of 1 and a maximum of 9 procedures. One abscess that cultured *Escherichia coli* did not respond to therapy. Other delivery vehicles with reported use in the treatment of odontogenic abscesses in rabbits include slurries of tetracycline, doxycycline hyclate, or minocycline powder; long-acting doxycycline gel; and antibiotic-impregnated polymethylmethacrylate (AIPMMA) beads. AIPMMA beads with reported use in rabbits include amikacin, gentamicin, clindamycin, and neomycin. One to 2 grams of antibiotic powder are added to 40 to 60 grams of PMMA powder. The beads can be difficult and expensive to manufacture, and each bead likely does not elute antibiotics further than a few millimeters, making AIPMMA beads an impractical solution for larger abscesses.

Non-Antibiotic Wound-Packing Materials

Other antibacterial compounds that have been suggested for use in rabbit odontogenic abscesses include calcium hydroxide, Manuka honey, sugar, antibacterial gauze, and bioactive ceramics, among others. Treatment with calcium hydroxide is not recommended due to the highly alkaline nature of the compound and reported severe soft tissue, skin, and bone necrosis associated with its use for this purpose. Proprietary products that reportedly promote healing have also been advocated for topical use in the treatment of odontogenic abscesses in rabbits.

ADDITIONAL READING


References


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