Why so Many Options for the Treatment of Dental Abscesses in Rabbits?

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INTRODUCTION

Chronic acquired dental disease and odontogenic abscesses are very common in domestic rabbits (Oryctolagus cuniculus). Although a variety of 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" (not the "root"), while the supragingival portion is the "clinical crown." The rabbit dental formula is 2 (I2/1, C0/0, PM3/2, M3/3) = 28. Rabbits have four maxillary incisors (two larger incisors and two "peg" teeth), which differentiates them from rodents (two maxillary incisors). 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.

ODONTOGENIC ABSCESSES

The pathophysiology of odontogenic abscesses is not completely understood, but is likely associated with the elodont 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 also can result in uneven tooth 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 can split the tooth and result in abscessation. Periapical infections spread to surrounding alveolar bone and soft tissues, resulting in osteomyelitis and soft tissue abscesses. The capsule is often ossified. Abscesses are usually firm and rounded, often 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 pus at the time of presentation. Periapical abscesses of the caudal maxillary cheek teeth can result in retrobulbar abscesses.

Bacterial Flora of Odontogenic Abscesses

In one study, 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. In a separate study, 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. 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. However, in one study, 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.

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 odontogenic abscesses in rabbits with drainage or lavage alone usually fails, in part due to the thick, caseous nature typical of rabbit pus.
Surgical Abscess Debridement

Debridement of odontogenic 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 many authors. This allows debulking of the infection and surgical exposure of underlying alveolar bone and associated tooth material. 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. In these cases, partial excision and curettage are often advocated. Bony abscess capsules and infected bone can be debrided using a burr, drill, curette, or rongeurs. Surgical access for debridement of retrobulbar 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 it can be enucleated, allowing improved surgical access to the retrobulbar area.

Marsupialization

Marsupialization is the process of suturing the remaining abscess capsule wall to skin, allowing delayed closure for repeat flushing and other treatment options. 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. Wounds close through granulation, contraction, and reepithelialization. Reported wound closure times vary in the literature but are often stated as several weeks. 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.

Tooth Extraction

Many authors advocate extraction of teeth associated with odontogenic abscesses in rabbits. 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. 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. 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, 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 abscesses 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 odontogenic abscesses reported in one study, empiric 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 abscesses 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, honey, sugar, antibacterial gauze, and bioactive ceramics, among others. Treatment with calcium hydroxide is not recommended due to the alkaline nature of the compound and reported severe soft tissue, skin, and bone necrosis associated with its use. Proprietary products that reportedly promote healing have also been advocated for topical use in the treatment of odontogenic abscesses in rabbits.

**References**


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