Endosurgical treatment of a retrobulbar abscess in a rabbit

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**Case Description**—A 1-year-old sexually intact female Netherland dwarf rabbit was examined because of a 3-week history of signs of lethargy, decreased appetite, left unilateral exophthalmia, a previous draining sinus from a left maxillary facial abscess, and bilateral nasal discharge.

**Clinical Findings**—The rabbit weighed 1.0 kg (2.2 lb) and had a body condition score of 1.5/5. Physical examination revealed generalized muscle atrophy, bilateral mucopurulent nasal discharge, and severe left-sided exophthalmia. Diagnostic investigation revealed anemia, neutrophilia, severe dental disease, a superficial corneal ulcer of the left eye, and a retrobulbar abscess.

**Treatment and Outcome**—Stomatoscopy-aided dental trimming, tooth removal, and abscess debridement were performed. Antimicrobials were flushed into the tooth abscess cavity, and antimicrobial treatment was initiated on the basis of cytologic findings and results of bacterial culture and susceptibility testing. Two months after the initial surgery, minimal exophthalmia was evident and no further physical, radiographic, or ultrasonographic changes were evident.

**Clinical Relevance**—Stomatoscopy is a valuable technique that can facilitate diagnosis, treatment, and serial reevaluation of rabbits with dental disease. (J Am Vet Med Assoc 2007;230:868–872)

A 1-year-old sexually intact female Netherland dwarf rabbit (*Oryctolagus cuniculus*) with a 3-week history of signs of lethargy, decreased appetite, left unilateral exophthalmia, a resolved draining sinus from a left maxillary facial abscess, and bilateral nasal discharge was referred to the Exotic Animal, Wildlife, and Zoological Medicine Service at the University of Georgia Veterinary Teaching Hospital. Prior to referral, the rabbit had undergone surgery for an abscess involving the left maxillary area of the face and had been treated with several antimicrobials, including enrofloxacin, trimethoprim-sulfonamide, and cephalixin (dosages unknown).

At the time of initial examination at the teaching hospital, the rabbit weighed 1.0 kg (2.2 lb) and was in poor body condition (body condition score, 1.5/5). Generalized muscle atrophy and bilateral mucopurulent nasal discharge with severe exophthalmia of the left globe were observed. The frequency of gastrointestinal sounds was abnormally low in all 4 abdominal quadrants, but findings pertinent to the cardiorespiratory system were considered normal.

Initial diagnostic tests included hematologic and plasma biochemical analyses, measurement of the serum Pasteurella multocida antibody titer,cranial and thoracic radiography, ophthalmologic examination, and ultrasonographic examination of the globe and retrobulbar space in both eyes. The rabbit was anesthetized to facilitate radiographic imaging, ophthalmic ultrasonography, and detailed oral cavity examination. Sevoflurane (7%) in oxygen was delivered by means of a face mask in a Norman elbow nonrebreathing system to induce anesthesia, and 2% to 3% isoflurane was administered for anesthetic maintenance. A blood sample (2.5 mL) was collected from the central auricular artery. Hematologic analysis revealed normochromic macrocytic anemia with moderate anisocytosis and severe polychromasia: Hct was 25% (reference range, 30% to 50%), RBC count was $3.33 \times 10^6$ RBCs/µL (reference range, 4.0 to $8.0 \times 10^6$ RBCs/µL), hemoglobin concentration was 8.1 g/dL (reference range, 8.0 to 17.5 g/dL), mean corpuscular volume was 75 fL (reference range, 58.0 to 66.5 fL), and mean corpuscular hemoglobin concentration was 32.4 g/dL (reference range, 29 to 37 g/dL). The WBC count was slightly high at $12.7 \times 10^3$ leukocytes/µL (reference range, 5 to 12 $\times 10^3$ leukocytes/µL), and apart from mild neutrophilia (61%; reference range, 33% to 55%), the leukocyte differential was within reference range. Results of plasma biochemical analyses were within reference ranges, and there was no serum anti- *P multocida* antibody titer.

Radiographs of the cranium (dorsosentral, right and left lateral, and oblique views) were obtained on a mammography cassette and films. Radiography revealed severe malocclusion of the premolars and molars, with multiple elongated roots. The left maxillary second molar appeared to penetrate into the left retro-
bulbar space. These findings were consistent with severe dental disease \(^3\) (Figure 1). Ophthalmic examination confirmed exophthalmia and a dorsally deviated left globe that could not be retropegulated. Intraocular pressure \(^4\) was 14 and 13 mm Hg in the right and left eye, respectively. Fluorescent staining \(^5\) revealed a superficial corneal ulcer in the left eye. Ocular ultrasonography revealed a poorly defined area of hypoechoic, flocculent-appearing material caudomedial to the left globe, most consistent with a retrobulbar abscess (Figure 2).

The rabbit was hospitalized for supportive care overnight and was scheduled for elective surgery for tooth removal and abscess debridement the following day. Fifteen minutes before anesthetic induction via a face mask, the rabbit was premedicated with midazolam (0.5 mg/kg [0.23 mg/lb], IM), hydromorphone (0.1 mg/kg [0.05 mg/lb], IM), and glycopyrrolate (0.01 mg [0.005 mg/lb], IM). After induction, the rabbit was intubated by use of a fiberoptic laryngoscope \(^6\) and a 2-mm uncuffed nasotracheal tube. \(^7\) A 24-gauge IV catheter was placed in the cephalic vein, and 22.2 mL of half-strength lactated Ringer's solution (NaCl concentration, 0.45%) containing 2.5% dextrose was administered at 10 mL/h during the anesthetic period. The rabbit was positioned in sternal recumbency on a table over a warming blanket. \(^1\) The rabbit's head was placed over the dentistry board with the mouth elevated and held open with a dental head support. \(^1\) Anesthesia was monitored with a capnograph \(^8\) and indirect blood pressure determination. \(^1\) The pharynx was packed with moistened gauze.

Endoscopic examination was performed with a 5-mm, 0° otoendoscope and a 2.7-mm, 30° Hopkins telescope attached to a xenon light source via a fiber-optic cable and a camera providing video feed to a monitor. \(^9\) Digital video and still images were captured with a documentation system. Stomatoscopy revealed minor elongation of and a lingual spur associated with the left mandibular fourth premolar, which was reduced by use of a rotary power tool \(^9\) and a dental burr. \(^9\) The left maxillary second molar was found to be loose, and exudate emanated from the gingival margin around it (Figure 3). A small angled elevator was used to break down the soft tissue attachments securing the molar.

Small hemostats were used to grasp the crown and rotate the molar around its longitudinal axis before elevating the tooth, in its entirety, into the oral cavity. A swab was inserted into the socket, and a swab specimen was submitted for aerobic and anaerobic bacterial culture. A second swab was used to obtain smears for Gram staining and cytologic analysis. A mixed population with gram-positive and gram-negative bacilli and many degenerative polymorphonuclear cells was detected, consistent with bacterial infection.

With endoscopic guidance, an angled curette was used to debride and remove inspissated material from the socket in piecemeal fashion (Figure 3). Gentle retropulsion of the left eye was used to aid in removal of inspissated material. An 18-gauge catheter was directed into the cavity, which was copiously flushed with 200 mL of warm sterile saline (0.9% NaCl) solution. Endoscopic examination yielded visual confirmation of a cavity, and maxillary and dental elements were visible through the gingival defect. The cavity was flushed with 3.0 mL of sterile saline solution containing 300 mg of gentamicin and 100 mg of doxycycline. Meloxicam (0.5 mg, SC) was given for postoperative pain control. Anesthesia was discontinued, and the rabbit recovered from anesthesia without complications.

The rabbit was discharged from the hospi-

![Figure 1](image1.png) 
**Figure 1**—Dorsoventral (a) and right dorsal–left ventral oblique (b) radiographic views of the head of a rabbit examined because of unilateral exophthalmia and an history of a draining sinus in the left maxillary area of the face. Notice the soft tissue mass representing the exophthalmic left eye (white arrow) and the abnormally located left maxillary molar (black arrow). L = Left. R = Right.

![Figure 2](image2.png) 
**Figure 2**—Transverse planar ultrasonographic images of the left eye and retrobulbar area in the same rabbit as in Figure 1. a—Image of the left eye and retrobulbar area at the time of initial examination. Medial is on the right side of the image, and lateral is to the left. The abscess capsule is defined by the hyperechoic curvilinear line (arrowheads) caudomedial to the globe (arrow), and the abscess contents are the hypoechoic material ventral to the line. Notice that the material caudomedial to the curvilinear line is less echogenic than the wall and that the structure displaces the globe rostrally. b—Image of the eye and retrobulbar area 4 weeks after surgery. Notice that the previous hyperechoic curvilinear line caudomedial to the globe is absent.
tial with instructions to the owners to administer a triple antimicrobial ophthalmic ointment (containing bacitracin, neomycin, and polymyxin B sulfate) and administered topically, every 8 hours, for 10 days), penicillin G (60,000 U/kg [27,300 U/lb], SC, q 48 h, for 21 days), and meloxicam (0.5 mg/kg, PO, q 12 h, for 10 days). One week after surgery, results of bacterial culture of the abscess fluid revealed light growth of *Pseudomonas aeruginosa* and very light growth of *Enterococcus* spp. No anaerobic organisms were isolated. Results of susceptibility testing revealed that no single antimicrobial was effective against both bacteria. Therefore, ciprofloxacin (10 mg/kg [4.5 mg/lb], PO, q 12 h) was added to the treatment regimen at the time of the first recheck (2 weeks after surgery), and treatment was continued for 21 days.

The rabbit was reevaluated 2, 3, and 4 weeks after surgery. During these examinations, improvements in demeanor and appetite were observed, along with a 14% weight gain to 1.14 kg (2.5 lb) at the time of the first reevaluation. The corneal ulcer and nasal discharge had completely resolved 3 weeks after surgery. There was a gradual decrease in the degree of exophthalmia, and repeat cranial radiographs (16 days after initial radiographs) revealed the absence of the left maxillary second molar and the results of trimming of occlusal surfaces of the remaining molar teeth (Figure 4). Stomatoscopy revealed a caseous plug at the site of left maxillary second molar extraction; the site was debrided with an angled curette. The cavity had decreased in size and was copiously flushed with sterile saline solution and antimicrobials, as described. The course of antimicrobial treatment was consequently extended until complete clinical remission was observed. Ocular ultrasonography performed 4 weeks after the initial surgery revealed no flocculent material or other evidence of an abscess (Figure 2). Given the absence of obvious signs of retrobulbar infection and the tendency for food and debris to accumulate in the cavity, an antimicrobial-impregnated bioactive dental ceramic and infused into the cavity.

Two months after the initial surgery, only minimal exophthalmia was evident and no further physical, radiographic, or ultrasonographic changes were noticed. Stomatoscopy examination revealed no opening or cavity. Results of blood testing were within reference ranges. Administration of ciprofloxacin and penicillin G was discontinued at that time. Physical and ophthalmic examinations 6 months after the surgery yielded no remarkable findings, and the rabbit weighed 1.4 kg (3.1 lb) and had a body condition score of 3/5. Stomatoscopy confirmed overgrowth of the left mandibular second molar; and small spurs affecting the lingual surface of the left maxillary second and third premolars were reduced. The owner was advised to monitor the rabbit’s weight and have dental examinations repeated every 6 months. One year after the initial diagnosis, the rabbit was clinically normal and no further complications were reported.

**Discussion**

Causes of exophthalmia include orbital or retro-orbital abscess, cellulitis, neoplasia, hematoma, orbital cyst (including *Taenia serialis* cyst), retrobulbar fat pro-
lapse, salivary mucocele, myositis, lacrimal gland disease, foreign body, granuloma, and trauma. Exophthalma must be distinguished from buphthalmia secondary to congenital glaucoma or other diseases such as uveitis, trauma, tumors, or *Encephalitozoon cuniculi* infection.11,12 Retrobulbar disease is the most common cause of exophthalmia in rabbits.7,12 Retrobulbar abscesses may be the result of endodontic infection, penetrating foreign bodies, local injury; or spread of infection from the bloodstream.13 Understanding rabbit dental anatomy and physiology is essential to diagnosis, treatment, and prognosis of conditions involving the oral cavity. Continuously growing dentition predisposes rabbits to development and persistence of dental problems.13,15 Dental disease in pet rabbits can be staged.3,16,17 The precise etiology of dental disease in pet rabbits is still unknown and is likely to be multifactorial and include genetic, dietary, metabolic, traumatic, and infectious components.17,18 Dental disease can be caused by primary (inherited) or secondary (acquired) malocclusion. Disease at an early age may also be attributable to genetic maxillary brachygnumia (in dwarf and brachycephalic rabbit breeds).3,17,19 The most likely etiology of secondary malocclusion is a combination of husbandry-related deficiencies. Systemic problems may also affect the metabolically active apical germinal tissue and odontoblasts.13,19-23

Diagnosis and treatment of dental disease are often complicated by a vague clinical history, examination late in the disease process, variable and nonspecific clinical signs, and the difficulty inherent in performing detailed oral cavity examination in conscious rabbits. Clinical signs may include decreased appetite, chewing or swallowing difficulties, ptalysym, palpable facial or mandibular swellings secondary to periapical pathologic changes or soft tissue infection and abscess formation, exophthalmia, ocular or nasal discharge, abnormal rabbit anisognathous occlusion, and unkempt body fur.17 Diagnostic imaging techniques including radiography, computed tomography, and ultrasonography are useful for localizing dental and associated soft tissue lesions before undertaking surgical correction.11,24

Although a cursory examination with an otoscope or illuminated nasal speculum can be conducted in anesthetized rabbits, endoscopic examination is superior for providing a focused light source and magnification.4,20,23 Radiography has limitations in assessment of dental disease;20 however, it is indicated as a primary diagnostic tool.17,20 Although its use has not been well documented in the investigation of dental disease in rabbits, computed tomography may also be useful in selected instances of refractory dental disease.24 Endoscopy has been advocated for evaluation of the oral cavity in lagomorphs and rodents.3,26,27 To the authors’ knowledge, the use of rigid endoscopy in the assessment and treatment of a retrobulbar abscess has only been previously reported in association with an extraoral approach.28

Similar endoscopic techniques performed with an intraoral camera system have been reported in human and equine dentistry.29 In the rabbit of the present report, a 2.7-mm telescope permitted detailed examination and assisted in successful tooth extraction and abscess debridement. Stomatoscopy should be regarded as a valuable technique that facilitates diagnosis, treatment, and serial reevaluation of dental disease.

Treatment options for retrobulbar abscesses are presently limited in pet rabbits, and in 1 review,20 the prognosis was considered to be guarded to grave. In some instances, palliation was achieved with antimicrobial treatment and surgical debridement of the abscess.3,21 However, because rabbits form caseous exudates within thick-walled pyogenic capsules, incomplete excision often leads to recurrence.13,30 The recommended treatment for retrobulbar abscesses includes exenteration of the orbit and enucleation to allow access to and debridement of the retrobulbar space.3 Other described approaches that have been used after dental extraction and aggressive surgical debridement include packing the abscess cavity with antimicrobial suspensions, gentamicin-soaked collagen material, clindamycin powder or perforated capsules, calcium hydroxide, antimicrobial-soaked bone matrix material such as hydroxyapatite, bioactive ceramics, antimicrobial-impregnated poly(methylmethacrylate) beads, or doxycycline-containing polymer gel.9,28,31 There is at least 1 case report18 in which use of an endoscope facilitated surgical debridement of an abscess cavity, but in that instance, the endoscope was used extraorally. Antimicrobial-impregnated beads were not used in the rabbit of this report because of the open tract leading to the oral cavity. The more conservative approach performed in this instance required repeated flushing and debridement, making the use of beads unsuitable.

Although bacterial culture has low sensitivity and specificity because of the polymicrobial nature of endodontic infections and rabbit coprophagia, it is considered important in determining antimicrobial selection.29,34 Biopsy of the abscess wall was not performed because of the inaccessibility of the site with the endoscope introduced orally. The absence of angle in the straight telescope and rabbit oral cavity conformation enabled us to gain access to the bottom of the abscess cavity. Swabs from the abscess were collected instead of a biopsy specimen because swab specimens have also been found to be valuable diagnostically.34 In an earlier study34 of dental abscesses in pet rabbits, the etiologic agents often included a mixture of anaerobic gram-negative rods (especially *Fusobacterium nucleatum*); anaerobic gram-positive, non-spore-forming rods (predominantly *Actinomyces* spp); and aerobic gram-positive cocci (particularly the *Streptococcus milleri* group).34 *Pseudomonas aeruginosa* and *Enterococcus* spp were not isolated from mandibular and maxillary abscesses in that study, but other etiologic agents have been isolated from orbital abscesses in rabbits that were not reported.28 In humans, *P aeruginosa* and *Enterococcus* spp have been implicated in orbital abscesses.35 Given the favorable response to surgical and medical treatment, it was concluded that these organisms were the true etiologic agents and that the approach was successful in obtaining a representative sample. *Pasteurella multocida*, which is believed to be a frequent cause of abscesses in rabbits, was not isolated from the rabbit of this report.9,36

Even with intense medical management and surgical debridement, the prognosis is generally guarded for
rabbits with retrobulbar abscesses because of abscess recurrence secondary to incomplete removal of the abscess wall. In the rabbit of the present report, no signs of retrobulbar disease were detected 1 year after treatment. If clinical resolution is not gained, enucleation may be performed instead. The mild anemia noticed on the first hematologic evaluation in the rabbit of this report may have been caused by systemic inflammation. A reticulocyte index was not performed in conjunction with the initial blood analyses; however, a sign of RBC regeneration (ie, polychromasia) was detected. The anemia was not investigated further, and results of postoperative hematologic testing were within reference range.

The success of this conservative approach to management of a retrobulbar abscess resulted partly from frequent monitoring, serial stomatoscopy, and good client compliance. Radiography of the cranium and ophthalmic ultrasonography helped to assess the extent and progression of the process. Serial stomatoscopy and ultrasonographic evaluation were useful for evaluating the oral and retrobulbar areas, respectively, and are recommended for evaluation of retrobulbar abscesses in rabbits.

References