

The Diagnosis and Surgical Removal of a Dentigerous Cyst Associated with an Unerupted Mandibular Left First Premolar in a Shih Tzu

Brett Beckman, DVM, FAVD, DAVDC, DAAPM
Affiliated Veterinary Specialists, Orlando, Florida
Florida Veterinary Dentistry and Oral Surgery, Punta Gorda, Florida
Animal Emergency Center of Sandy Springs, Atlanta, GA
www.veterinarydentistry.net
veterinarydentistry@gmail.com

Introduction

Dentigerous cysts arise from odontogenic epithelium associated with an unerupted adult tooth. (1,2,3,4,5,6,7,8) Gingival changes associated with these cysts can be minimal to non-existent. Without adequate assessment of edentulous areas conditions that result in patient discomfort and tissue destruction may go undetected. This case report describes the diagnosis and surgical treatment of a dentigerous cyst associated with a seemingly missing mandibular left first premolar (305) with minimal visible gross gingival pathology.

History:

A three year old, male neutered, Shih Tzu weighing 8 kg presented for an annual examination in March 2002. No prior oral care had been provided by the owner. Dental cleaning had never been performed.

Diagnostics:

Physical examination of the patient was within normal limits. Oral examination revealed a gingivitis index of II, a calculus index of II, and a plaque index of II.(9) There was a marked distolingual rotation of the maxillary right (106) and left (206) second premolar teeth and the maxillary right (107) and left (207) third premolar teeth. Lingual displacement of the mandibular left (302) and right (402) second incisor teeth was noted. The patient was missing the mandibular left first (305) and second (306) premolar teeth and the mandibular right second premolar tooth (406). Close inspection revealed a firm one millimeter nodule present dorsally in amelanotic gingiva six millimeters distal to the left mandibular labial frenulum (Figure 1). No additional abnormalities were present. The patient was kept for complete dental radiographs and dental cleaning pending an appropriate pre-anesthetic evaluation.

The differential diagnosis for the nodule in amelanotic gingiva associated with the missing tooth included gingival overgrowth obscuring a retained root fragment from previous tooth fracture, abscess(2,5), neoplasia,(2,4,5,7,8,10) fibrous lesion of the mandible (2) and cyst.(1,2,3,4,5,6,7,8,11)



Figure 1

A small amelanotic region is present just distal to the frenulum.
A small nodule can be seen in the gingiva.

Pre-anesthetic blood testing included a complete blood count, ALT, BUN and glucose which were all within normal limits. Pre-anesthetic ECG^a analysis showed a normal sinus rhythm, normal complexes and a heart rate of 106. Mucous membrane color, capillary refill time, pulse character and chest auscultation were all within normal limits.

Butorphanol^b (3.2 mg IM) was given 30 minutes preoperatively and a 20 gauge intravenous catheter^c placed in the right cephalic vein. General anesthesia was induced with ketamine^d (40 mg IV) and valium^e (2 mg IV). The patient was intubated with a 5.5 mm cuffed endotracheal tube^f and the cuff was gently inflated. The animal was maintained with isoflurane^g (2.0-2.5%) and oxygen (1.0 L/min)(12) using a semi-closed anesthetic delivery system^h, placed on a water circulated heating padⁱ and leads for the ECG monitor^b positioned. A balanced electrolyte solution^j was administered at 10ml/kg/hr.(12) Temperature, respiration, pulse and capillary refill time were regularly recorded by a technician.

A complete oral examination was performed and abnormalities noted on the dental chart. In addition to the changes discovered during the initial oral examination slight bleeding was present upon probing the buccal aspect of teeth 206 and 207 at the furcation. All pocket depths were within normal limits. The oral cavity was thoroughly rinsed with 0.12 % chlorhexidine^k solution. Complete supragingival and subgingival scaling^l was performed. The teeth were polished using a disposable prophylaxis angle^m on a slow speed handpieceⁿ and polishing paste^o. The oral cavity was rinsed thoroughly with saline followed again by 0.12 % chlorhexidine^k solution.

Dental radiographs^p were taken of all teeth. Radiographic findings included a rounded, one centimeter diameter lucency in the left mandible. It extended from the mesial aspect of the mandibular left third premolar tooth (307) to the central aspect of the root of the mandibular left canine tooth (304). (Figure 2) The apex of the mandibular left first premolar tooth (305) was displaced in a coronal and distal direction and the root was tipped distally. The distal cusp of tooth 305 rested just above the level of the alveolar crest and bone was absent at this interface.



Figure 2

The cyst has displaced the unerupted premolar and can be seen surrounding a portion of the mandibular left canine tooth (304).

Diagnosis:

Based on the radiographic appearance of this lucency and its association with unerrupted tooth 305 a tentative diagnosis of a dentigerous cyst was made¹. The tentative diagnosis was relayed to the owner.

Treatment Plan:

The treatment plan included pre-operative and post-operative pain management, aspiration of the cyst for cytologic evaluation, and complete removal of the lining to prevent recurrence. Placement of a synthetic bone implant⁴ prior to closure in order to fill the defect and maintain the alveolar ridge was also planned.

Treatment:

The patient was placed in right lateral recumbency. A mental nerve block was performed by injecting bupivacaine^f (1.5 mg), using a tuberculin syringe and a 25 gauge 1 inch needle^s, at the entrance to the left middle mental foramen and holding digital pressure over the foramen for sixty seconds. The surgical site was thoroughly lavaged with 0.12 % chlorhexidine^h solution.

A #15 Bard Parker blade^t mounted on a No. 7 scalpel handle^u was used to make two divergent vertical releasing incisions starting in the gingiva at the lingual aspect of the mandible and extending six millimeters beyond the mucogingival line. One incision was made at the mesial angle of tooth 307 and the other three millimeters distal to tooth 304. The incisions were connected by incising the gingiva on the mandibular crest. A No. 2 Molt periosteal elevator^v was used to elevate the flap apically to expose the area. The distal portion of the crown of tooth 305 could be visualized with a portion of the cyst lining adhered to the neck of the tooth.(Figure 3) The cyst opening could be seen as a lytic area in the bone mesial and buccal to tooth 304. Tooth 305 was easily extracted with a dental luxator^w using minimal effort. The fluid in the cyst was clear and was aspirated into a 3 cc syringe with a 22 gauge needle^x and kept for cytology. A No. 4 round bur^y in a high speed delivery systemⁿ was used to remove a small portion of alveolar bone to aid in cyst visualization and curettage. The cyst lining could be visualized adhered to the exposed bone and a portion of the root of tooth 304 and extended around the root, lingually and

bucally. (Figure 4) The cyst lining was grasped with an ophthalmic thumb forcep^z and (a portion) was peeled from the bone. Remnants of the lining were gently scraped from the walls using a No. 2 Molt periosteal elevator^v being careful not to damage the exposed root of tooth 304. (Figure 5) Following removal of the cyst lining the defect was thoroughly lavaged with saline^{aa}, 24% EDTA^{bb} was applied to the exposed cementum for two minutes and rinsed from the site with saline^{aa}. A synthetic bone implant^q was placed in the defect to the level of alveolar crestal bone. (Figure 6) The gingiva was sutured in a simple interrupted pattern using Mayo Hagar needle holders^{cc} and 4-0 monocryl with a 3/8" NFS-2 cutting needle^{dd}. (Figure 7) A post-op radiograph showed complete fill of the cystic site with bioglass^q. (Figure 8) Ketoprofen^{ee} (16 mg IM) was administered for pain control. The cyst lining was sent for histopathology. Cytology of the contents of the cyst was unremarkable, containing only occasional red blood cells.



Figure 3

A portion of the crown of the mandibular left first premolar (305) could be visualized with a portion of the cyst lining adhered to the neck of the tooth.



Figure 4

The cyst lining could be visualized adhered to the exposed bone and a portion of the root of 304



Figure 5

The cyst lining was carefully scraped from the walls using a No.2 Molt periosteal elevator.



Figure 6

A synthetic bone material was placed to fill the defect and help maintain the alveolar ridge.



Figure 7

The mucoperiosteal flap was sutured with 4-0 monocryl in a simple interrupted pattern



Figure 8
Complete fill of the cyst site with synthetic
bone material immediately post-op.

Post-op Care

The patient was placed on a blanket in recovery and carefully monitored. At the first sign of swallowing the endotracheal tube^g was deflated and removed. The patient was monitored until sternal recumbency was achieved. Head bobbing was encountered and the patient was held by a technician until able to stand without danger of self-trauma. Prior to discharge the IV catheter^d was removed and a light pressure bandage placed over the catheter site to aid in hemostasis.

A recheck was scheduled for two weeks post-op to monitor healing of the surgical site. Instructions were to feed soft food only for a period of two weeks eliminating access to anything in the environment that was hard that could be chewed. Ketoprofen^{ec} was dispensed in a flavored oral suspension (10mg/ml) with instructions to give 8 mg every twenty four hours for three days starting twenty four hours post-op. Two days following discharge the owner was contacted by phone. The patient showed no adverse effects from the procedure.

A diagnosis of odontogenic cyst was confirmed by histopathology three days later. The results were relayed to the owner by phone.

Follow-up/Results

A recheck examination two weeks post-op showed complete healing of the surgical site. The sutures were intact. The owner was instructed to resume feeding the regular kibble diet and to start brushing the teeth daily paying particular attention to buccal aspect of teeth 206 and 207 at the furcation. CET toothpaste^{ff} was dispensed. An appointment for dental cleaning and radiography of the surgical site was made for October to evaluate for possible return of the cyst due to inadequate removal of the lining and to evaluate tooth 304 for external resorption or endodontic complications.

The patient presented for possible foreign body ingestion in June. During sedation for survey abdominal radiography, a dental radiograph^q was taken of the surgical site. Radiography revealed an increase in bone density in the area of the former cyst. (Figure 9) The periodontal ligament space on the distal aspect of tooth 304 was present although widened slightly in the coronal one-third.

The patient returned for oral examination, radiography, and cleaning in December. Radiography revealed normal bone and periodontal ligament space surrounding tooth 304. (Figures 10 and 11) The gross appearance was normal. (Figure 12)



Figure 9

Radiography revealed an increase in bone density in the area of the former cyst at seven months post-op.



Figure 10

Radographic appearance at 12 months post-op. Healing is complete with no indication of damage to the canine tooth.



Figure 11

An alternate view at 12 months shows no indication of damage to tooth (304)



Figure 12
Gross appearance at 12 months post-op

Discussion

This case demonstrates the importance of radiographic evaluation of even minor gingival lesions associated with edentulous areas in the oral cavity. Several conditions can be considered in the initial differential list for minor gingival lesions as the one described in this case in association with a missing secondary tooth. A fractured tooth with gingival overgrowth obscuring root fragment(s) should be considered. Teeth may be ankylosed or impacted both preventing eruption but unassociated with cyst formation (13). Other possibilities include abscesses (2,5) and fibrous lesions of the mandible(2). A simple cyst may exist without association with an impacted tooth.(5,11) Finally, dentigerous cysts are odontogenic cysts associated with a unerupted tooth and can present as described in this case.(1,2,3,4,5,6,7,8) Dentigerous cysts are generally benign however the veterinary literature describes cases in which they have given rise to odontomas(9), ameloblastomas (7), carcinomas (8), and ameloblastic fibro-odontomas (4).

Cysts of odontogenic origin arise from cells of the developing tooth. Further classification is based upon histopathology and at times radiographic appearance. A dentigerous cyst is a type of odontogenic cyst that arises from the epithelial components of the developing tooth follicle or its

remnants and occurs infrequently. (1,2,3,4,5,6,7,8) Two types of dentigerous cysts have been described in the veterinary literature.(1) An eruption cyst results from the expanding follicular space around the crown of a tooth as it erupts and generally requires no treatment. A follicular cyst arises from the developing tooth follicle surrounding the neck of the tooth. The radiolucency surrounding the crown of the unerupted tooth in this case is typical of a follicular cyst. Based upon histopathology and radiographic appearance this cyst could be classified accordingly. Follicular cysts are locally aggressive lesions that should be approached early in their course to attempt to remove the cyst lining in its entirety eliminating further destruction of tissue. (3,5)

In this case the adjacent canine tooth was partially surrounded by the cyst. Although no visible signs of damage were present grossly or radiographically initially or on follow-up, this tooth should be monitored for signs of root resorption, ankylosis and endodontic disease.

Conclusion

Missing teeth with or without gingival lesions can be associated with a variety of benign and potentially pathologic conditions. Detection of pathology can be gained with the help of radiography. Therapeutic decisions should be made based upon radiographic findings. Early surgical intervention is important in preventing tissue destruction where cysts are present in conjunction with unerupted teeth. Radiographic follow-up is important in assessing the success of cyst removal and for continued monitoring of adjacent teeth for after-effects of cyst impingement.

Products

- a) EKG analyzer, Vetronics, Lafayette, IN
- b) Torbugesic, Fort Dodge Animal Health, Fort Dodge, IA
- c) Surflo intravenous catheter, Terumo Medical Corp, Elkton, MD
- d) Ketaset, Fort Dodge Animal Health, Fort Dodge, IA
- e) Valium, Abbott Laboratories, N Chicago, IL
- f) 5-0 Endotracheal Tube, Rusch, Deluth, GA
- g) IsoFlo, Abbott Laboratories, N Chicago, IL
- h) VMS Anesthesia Machine, Matrix Medical, Inc., Orchard Park, NY
- i) T Pump, Gaymar Industries, Orchard Park, NY
- j) Lactated Ringer's solution, Abbott Labs, N Chicago, IL
- k) Chlorhexidine, First Priority, Elgin, IL
- l) Neosonic, Amdent, Cherry Hill, NJ
- m) Disposable prophylaxis angle, Carlisle Labs, Rockwell Centre, NY
- n) High Speed Delivery System, Beaverstate Dental, Tualatin, OR
- o) Prophyl 1 Paste, Carlisle Labs, Rockville Centre, NY
- p) DentX Image Vet X70, AFP Imaging, Elmsford, NY
- q) Consil, Nutramax Laboratories, Baltimore, MD
- r) Bupivacaine, Abbott Laboratories, N Chicago, IL
- s) Tuberculin syringe and needle, Nipro Medical Corp, Miami, FL
- t) No. 15 surgical blade, Carlisle Labs, Rockville Centre, NY
- u) Scalpel handle, Spectrum, Stow, OH
- v) No. 2 Molt periosteal elevator, Hu-Friedy Co, Chicago, IL
- w) L-5S Luxator, Cislak Manufacturing Inc., Glenview, IL
- x) 3 cc syringe and 22 gauge needle, Nipro Medical Corp, Miami, FL
- y) No. 4 round bur, Carlisle Labs, Rockville Centre, NY
- z) Ophthalmic Thumb forceps, Spectrum, Stow, OH
- aa) 0.9% saline solution, Abbott Labs, N Chicago, IL
- bb) Prefgel, Biora, Inc., Chicago, IL
- cc) Mayo-Hagar needle holders, Spectrum, Stow, OH

- dd) 4-0 Monocryl, Ethicon, Inc. Somerville, NJ
- ee) Ketofen, Fort Dodge Animal Health, Fort Dodge, IA
- ff) CET Toothpaste, Virbac, Ft. Worth, TX

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