Lily the Llama's Dental Drama

Tooth Root Abscesses in New-World Camelids

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Introduction

Tooth root abscesses are the most common dental conditions affecting new world camelids, especially llamas and alpacas. South American camelids are much more commonly diagnosed with tooth root abscesses than ruminants[5]. Although every tooth is a candidate for developing a tooth abscess, mandibular teeth are 15 times more likely to be affected than maxillary teeth. Additionally, cheek teeth are 14 times more likely to be affected than incisors or canines[5]. Tooth root abscesses are seen throughout the lifespan of camelids, but typically present around 5 years of age. Neither the predisposing factors nor etiologies of tooth root abscesses have been definitively determined. However, it is speculated that a combination of husbandry practices and a potential genetic may predispose to tooth root abscess development. Clinical presentation of tooth root abscesses typically includes hard, bony swelling over the affected tooth. Other potential clinical signs include difficult mastication, anorexia, and weight loss in progressive cases. Palpation over the area of bony swelling may illicit a painful response. In animals with affected maxillary teeth, subsequent malodorous nasal discharge may also be present if the maxillary sinus is also involved[5]. As patient care standards evolve in veterinary medicine, veterinarians are being asked to perform more surgeries on llamas and alpacas. The most common surgical procedures for llamas and alpacas are castrations, angular limb deformity corrections, gastrointestinal surgical procedures, caesarean sections, and tooth extractions for resolution of tooth root abscesses[1]. Typical treatment of tooth root abscesses includes both medical management with antibiotics for 30 days and surgical extraction of the tooth serving as a nidus for the infection[3].

History and Presentation

Lily is a 9-year-old female llama who presented to the Mississippi State College of Veterinary Medicine (MSU-CVM) Food Animal Services on February 11th, 2021 for “ADR”.

Her owners stated that she has been losing weight over the past 4 months but have not seen her drop any food. Six days prior to presenting, Lily had an episode which her owners described as heat stroke. During this episode, Lily was in sternal recumbency (known as the cush position) and had a rapid breathing rate with expiratory stridor. Additionally, she had an elevated temperature of 104.5°F. Her owners immediately hosed her down with cold water, but when this did not decrease her temperature, her owners administered oral Flunixin meglumine. Lily's temperature responded to this administration, and her breathing rate and effort also returned to normal. Lily had an approximately 1-year history of unilateral discharge from her left nostril, which her primary veterinarian attributed to allergies. Upon presentation to MSU-CVM, Lily was bright, alert, responsive, and well-mannered. She had a respiratory rate of 16 breaths per minute, a pulse of 64 beats per minute, and a temperature of 98.1°F. There was a hard, elevated area of swelling over her right maxilla, and her right eye did not retropulse as easily as the left eye. There was a moderate amount of yellow, viscous, malodorous fluid draining from her left nostril. No crackles, wheezes, rales, or other abnormalities were heard on pulmonary auscultation. No coughing was appreciated. No cardiac abnormalities such as murmurs or arrhythmias were appreciated on auscultation. There were decreased gut sounds (borborygmi) in all 3 stomach compartments (C1-C3). The remainder of Lily's physical exam was within normal limits. At the conclusion of the day, Lily had an episode of increased breathing rate and effort as well as an elevated temperature. Her temperature continued to climb to 105°F despite cooling efforts that included shaving, ice packing, and fans. Flunixin meglumine was administered intravenously and Lily's temperature, breathing rate, and effort returned to normal. A computed tomography (CT) was scheduled for the following day.

Diagnostics

Upon discovery of the hard, prominent swelling on the right maxilla, skull radiographs were performed. Four views are required to complete a full skull study, and these views include lateral, dorsoventral, 45° right oblique, and 45° left oblique views[5]. Findings of the radiographs indicated an absent left maxillary first molar and a soft-tissue opaque structure within the left maxillary sinus. The right maxillary sinus contains a convex deformation of the maxillary bone border. The left maxillary mass was suspected to be due to neoplasia, granuloma due to a foreign body or tooth root abscess, or a hematoma.

During her episode of increased temperature, breathing rate, and effort in the hospital, a venous blood sample was collected and a large animal profile and complete blood count were ran. The results indicated moderately elevated segmented neutrophils, but no other parameters were indicative of pathological changes.

During her episode of increased temperature, breathing rate, and effort in the hospital, an abdominal and pulmonary ultrasound were performed. Mild peritoneal fluid was seen in the abdomen but was deemed insignificant due to amount and location. The lungs appeared normal on ultrasound.

A computed tomography study (CT) was performed the day following her in-hospital episode. The resulting study revealed right maxillary first and second molar tooth abscesses with pulp gas, subsequent marker neuritis of the majority of the right trigeminal nerve, focal meningitis of the adjacent meninges surrounding the right trigeminal nerve, focal osteomyelitis, and rhinitis. Additionally, a left oronasal fistula with impacted feed material and subsequent rhinitis at the location of the absent left maxillary first molar was identified.

Treatment and Management

Depending on the case, treatment of tooth root abscesses can be successfully achieved with medical therapy, surgical therapy, or a combination of both[5]. However, since bony infections are relatively isolated from systemic blood circulation, medical therapy alone most typically will not yield results unless the source of the infection, which is typically the infected tooth root, is surgically removed[5]. Surgical options include affected tooth extraction, tooth splitting, tooth root resection, root canal, and bone debridement[5]. In Lily's case, combination therapy of medical and surgical treatment was elected. Peri-operative Flunixin meglumine and pantoprazole were administered intravenously. Lily underwent a right maxillary sinus flap surgery with right first molar extraction, right nasal drain placement, and left nasal drain placement on February 28th, 2021. Cement packing material was placed in the location of the first right maxillary molar post-extraction. Surgery and recovery were uneventful.

Post-operative medical care included daily nasal flushing, systemic antibiotics, intravenous non-steroidal anti-inflammatories, and intravenous gastroprotectants. Both sinuses were flushed daily with a saline and dilute Gentamicin solution. One liter of the solution was flushed through each nasal drain once a day. The right nasal cavity flushed easily with clear fluid starting from the first day post-operatively. Flushing of the right side was successful over the course of five days, and it was elected to remove this tube five days post-operatively. Although flushing of the left nasal cavity did not produce consistent easy drainage, the administration of Gentamicin directly into the nasal cavity was considered beneficial for an additional two days after pulling the right nasal drain. The left nasal drain was removed seven days post-operatively. A systemic antibiotic was chosen based on necessity for broad-spectrum gram-negative, gram-positive, aerobic and anaerobic coverage. Florfenicol was selected for its broad-spectrum efficacy, as well as its capacity to be used long-term in efforts to penetrate bony tissues,

specifically targeting the affected tooth roots. Florfenicol was administered subcutaneously every three days for the duration of Lily's hospitalization, which was 28 days. Additionally, Lily received three doses of Ponazuril at the beginning of her hospitalization to treat a potential Eimeria macusaniensis infection, which is a highly pathogenic coccidia only seen in camelids.

Pathophysiology

Although the exact etiology for tooth root abscesses is still unknown, it is well accepted that husbandry practices are most likely responsible for their development. Potentially, both genetic predispositions in addition to husbandry practices can result in tooth root abscesses. Ingestion of rough and stemmy forages, leading to abrasions in the oral mucosa and leading to ascension of commensal organisms is the most supported speculated predisposing factor. Another potential predisposing factor is fracturing of the deciduous cap during permanent tooth eruption. Fractured teeth, trimmed fighting teeth, or decay of the infundibulum are other potential predisposing factors. Another predisposing factor could be hematogenous spread from a distant site of infection. An ascending infection due to fracture of the mandible or maxilla could also be a potential cause of tooth root abscess. The hard swelling surrounding the tooth root abscess that is seen on clinical presentation is caused by osteomyelitis and reactive bone at the site of the infection. In late stages of the disease, a draining tract may be apparent upon clinical presentation[5]. Approximately 60% of clinical cases of tooth root abscesses result in compromised periodontal ligaments, which can potentially lead to oronasal fistulas in the case of maxillary tooth root abscesses[2]. In Lily's case, the missing first molar on her left side allowed for an ascension of commensal bacteria into her maxillary sinus via an oronasal fistula. Subsequently, this then presumptively lead to her severe rhinitis.

Conclusion

Lily unfortunately succumbed to another episode of increased temperature, breathing rate, and effort on March 10th, 2021 while in hospital. During this episode, blood was drawn to run a complete blood chemistry and large animal profile. While awaiting bloodwork results, one liter of lactated ringer's solution fluids was administered as a bolus intravenously. The large animal profile indicated severe acute renal tubular acidosis and hypoglycemia, and intravenous isotonic bicarbonate fluids with dextrose were started. Unfortunately, these methods did not improve her condition, and she passed naturally. Necropsy and histopathology indicated acute renal tubular degeneration with proteinaceous and cellular casts and severe pulmonary edema. Additionally, gastric ulceration was found in C3 and was extensive and severe. Maxillary sinusitis with tooth root and infraorbital canal abscessation with an oronasal fistula and mild turbinate atrophy was also found. Although her case was more advanced, the prognosis for treatment of tooth root abscesses is good with surgical management in conjunction with medical management[5]. Overall outcome does not appear to depend upon the location of the abscess or by the number of teeth affected[5]. However, a retrospective study found that camelids with two tooth extractions had significantly more post-operative complications than those that had one tooth extracted[4]. Camelids in poor body conditions were found to be at higher risks for post-operative complications[4]. Routine management, oral exams, and teeth flotation when indicated are preventative measures that can help decrease the incidence of tooth root abscesses. Overall, a good prognosis is dependent upon early detection and intervention[5].

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