

SURGICAL MANAGEMENT OF DENTAL DISORDERS IN LLAMAS AND ALPACAS

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Key Points:

- Dental Disorders are common in llamas and alpacas
- Good Physical examination and radiographic imaging is usually sufficient to make a diagnosis
- Surgical therapy can be associated with good success

Anatomy:

Camelids have dentition designed for grinding of forages similar to other herbivores. They have incomplete rostral arcades with three lower incisors but only one upper incisor per side. The premolars and molars are referred to as the cheek teeth and are well established.

The rostral and caudal roots of the cheek teeth do not communicate in llamas and alpacas. Disease can be confined to the pulp cavity of one root and not involve the adjacent pulp cavity of the other root. The surgeon also has the freedom to split the tooth in the case of focal disease and remove 1 root (and associated pulp cavity) without disruption of the other.

The mandibular and maxillary cheek teeth do not oppose each other completely. The maxillary teeth are in a labial position to the mandibular teeth which lie more lingual. Wear is uneven creating enamel points on the labial side of the maxillary arcade and the lingual side of the mandibular arcade. These usually are not problematic and floating of the teeth to a more level confirmation is not recommended as a routine procedure as in horses.

Radiographic Imaging:

Radiographic imaging is necessary to definitely diagnose and to localize much of the dental disease in llamas and alpacas. Proper radiographic technique and patient positioning can increase the diagnostic power of radiographs. Computed tomography (CT) is a very sensitive imaging modality which can be useful in picking up subtle dental lesions.

Under sedation, a minimum of 4 radiographic projections are made: lateral, dorsoventral (DV), 45-degree right oblique, and a 45-degree left oblique projections. All projections with the exception of the DV should be made with a radiolucent mouth gag to separate the maxillary from the mandibular arcades and prevent overlap of the opposite arcade. The oblique projections are the most valuable to localize disease to specific teeth since they highlight specific arcades without summation of the opposite hemi-mandibular arcade. Each oblique view highlights one mandibular arcade and the opposite maxillary arcade. Properly marking the radiographs is of utmost importance, and this is best achieved by placing BOTH right and left markers on the plate to indicate which hemi-mandible and maxilla are being highlighted.

As with any radiographic study, familiarity with the normal radiographic anatomy is important to being able to diagnose pathology. The roots of the teeth should have a thin, well margined, radiolucent periodontal ligament that surrounds each tooth root. The alveolar bone adjacent to that area should appear smooth and uniform. The most common radiographic abnormalities include abscessation around the tooth roots, osteomyelitis affecting the alveolar bone, and sequestra.

Infectious Dental Disease:

Tooth root abscesses are the most common dental condition afflicting llamas and alpacas. Every tooth is a candidate for developing a tooth abscess but mandibular teeth (n=216) are 15 times more likely than maxillary teeth (n=14) to be affected and cheek teeth (n=211) are 14 times more likely to be affected than incisors or canines (n=19).¹ Abscesses are seen in camelids of all ages but most present around 5 years of age.^{1,2}

The etiology or predisposing factors for animals developing tooth abscesses has not been established. The most widely advocated predisposing factor is ingestion of rough forages which cause abrasions within the oral mucosa and allow ascension of commensal organisms. Another theory is that premature breakage of the deciduous cap when the permanent teeth are erupting is another theory.¹ Other proposed causes of abscesses include fractured teeth, trimming of fighting teeth exposing the pulp cavity or decay of the infundibulum. Hematogenous spread is also thought to be a possibility. A fracture of the mandible or maxilla may also provide a route of ascending infection. Genetic predisposition to development of bony infections is also possible. The cause of tooth abscesses are likely a combination of these as well as husbandry practices that may predispose to development of tooth infections.

Animals with tooth abscesses usually present to the clinic with a hard, bony swelling over the affected tooth. The hard swelling is due to reactive bone and osteomyelitis resulting from the infection. The degree of swelling is generally indicative of the chronicity of the disease. A draining tract may also be present in late stages of disease. Most animals eat normally and are not painful when masticating although pain on mastication and subsequent anorexia and weight loss are possible clinical signs.

Primary osteomyelitis (lumpy jaw) is often difficult to distinguish from tooth root abscesses. Clinically, these cases present similar to tooth root abscesses with a hard, bony swelling over the area of pathology. Pain can usually be elicited by external palpation of the swelling but pain on mastication and subsequent anorexia is usually not a reported clinical sign, although these signs may be present in very late stages of disease. Bony sequestra are commonly found within the mandible. These are also surrounded by an area of osteomyelitis and have a similar clinical appearance to tooth root abscesses.

Surgical Treatment:

Although some cases of acute infection respond to medical therapy, it is the author's impression that most tooth roots abscesses in chronic states of disease do not and thus require surgery to remove the nidus for infection (tooth, tooth root, or sequestrum).

Extraction of the affected tooth is the mainstay of surgical therapy, and different techniques have been described for camelid tooth extraction. The author prefers a ventrolateral approach to the mandible centered over the affected tooth. The skin, subcutaneous tissues, and periosteum are incised. The periosteum is reflected dorsally exposing the mandibular bone. A pneumatic burr is used to remove the lateral alveolar plate of the mandible. The tooth is subsequently removed by freeing the periodontal ligament with an elevator or an equine wolf tooth extractor. The tooth can then be pried from its alveolar socket. Care needs to be taken to remove as much lateral bone as necessary and free as much ligament as possible to avoid excess force needed to pry the tooth from its socket which could lead to mandibular fracture in the diseased bone. The alveolus is debrided and thoroughly flushed with a dilute antiseptic solution. If a large defect is created, it can be packed to prevent feed material from becoming impacted. Ideally the defect is kept open to facilitate drainage and allow for lavage of the surgical site.

Following surgery the site should be packed with absorbable packing to control hemorrhage. The author will routinely leave packing in over the next few days to control loss of feed material and saliva. At minimum the packing should be changed on a daily basis. When the packing is changed, the surgical site is lavaged with dilute antiseptic solution. The presence of packing within the defect prevents the defect from closing prematurely and preventing adequate drainage. Maxillary tooth extraction can be accomplished in a similar manner to mandibular tooth extraction. Closure of the skin incision is permitted because ventral drainage is now accomplished into the oral cavity. Tooth repulsion as in horses is another possible approach, but should be used with caution because camelid bone is thinner than equine and is more susceptible to fracture.

A buccal approach is an alternative approach to access the teeth. This approach involves making a full thickness incision through the lateral cheek directly into the mouth. The approach should be centered over M1 and is ideal for removal of the rostral cheek teeth. Placement of the incision too far caudally can result in interference with the parotid salivary duct. It is not recommended to extract M3 from this approach because of the more caudal placement of the incision and the difficult nature of extracting M3 due to its extensive root structure. After gaining access to the mouth, the gingiva is elevated from the affected tooth and a dental elevator is used to dissect along the periodontal ligament freeing the tooth. Debridement of the surrounding alveolar socket can be accomplished in a similar fashion with curettage and lavage.

Post-op Care:

Following extraction of the diseased tooth, the patient should be treated medically. *Trueperella* (formerly *Arcanobacter*) *pyogenes* is the most likely organism to be cultured from camelid tooth root abscesses. Penicillin, Ceftiofur and florfenicol are appropriate drugs based on culture and sensitivity data.¹ Non-steroidal anti-inflammatory drugs are also appropriate to decrease inflammation and pain associated with the osteomyelitis and tooth extraction. Isoniazid is an antimicrobial agent that has good penetration into walled off types of environments and has been used in cattle to treat lumpy jaw, a disease that has a lot of commonality with tooth abscesses and osteomyelitis in camelids. The author has found it to be useful in the treatment of camelid tooth abscesses and uses it on many severe or refractory cases.

Outcome:

The prognosis for successful outcome following tooth extraction is good. The outcome does not seem to be affected by the location of the abscess or the number of teeth affected. The condition of the animal when treatment is started does affect the prognosis with a higher mortality rate associated with animals presented in thin or emaciated conditions.¹

Postoperative complications occurred in 42 of 84 (50%) animals treated for tooth abscesses in one study.¹ The most common complications observed following treatment of tooth root abscesses included reinfection (15/84), chronic draining tract (14/84), and osteomyelitis (14/84). Most complications were minor and resolved with continued treatment or a second surgical procedure.

Anesthesia for Mandibular Surgery:

General anesthesia is ideal to provide restraint and analgesia to remove most teeth. In very chronic disease states, the tooth may be extracted orally with minimal force, in all other cases the tooth is tightly adhered to the alveolus and tooth extraction is an invasive procedure. Post-operative anti-inflammatories and pain medication is also recommended.

An alveolar (mandibular) nerve block is a useful technique to supplement general anesthesia on cases of mandibular surgery. We have begun performing alveolar blocks frequently on cases of mandibular tooth extraction.

Alveolar blocks are can be performed with injection of local anesthetic at the mandibular foramen located on the medial aspect of the ramus of the mandible. This can be located by palpation of the most prominent portion of the most caudoventral aspect of the mandible immediately rostral to the ventral curve of the ramus. Full insertion of an 18 gauge 1.5 inch needle towards the zygomatic arch works well to approximate the level of the foramen. Alternatively injection into the mental foramen will allow backflow of local anesthetic and anesthetize the alveolar nerve. The mental foramen is often palpable 2-3 cm caudal to the incisors. Insertion of the needle into the foramen is possible and injection while placing a finger over the foramen to create a seal is ideal.

1. Niehaus AJ, Anderson DE: Tooth root abscesses in llamas and alpacas: 123 cases (1994-2005). J Am Vet Med Assoc 231:284-289, 2007.
2. Cebra ML, Cebra CK, Garry FB: Tooth root abscesses in New World camelids: 23 cases (1972-1994). J Am Vet Med Assoc 209:819-822, 1996.