

COMPLICATIONS

Tooth Extraction

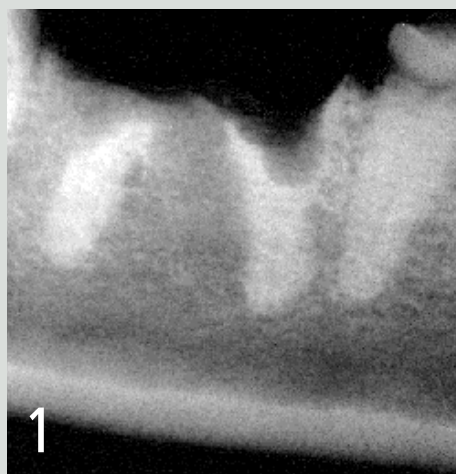
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Indications for extraction include crown fracture, severe periodontal disease, root pathology, nonvital teeth, retained primary teeth, and abnormally positioned teeth affecting jaw development and/or occlusion. Tooth extraction is a routine and commonly performed procedure in small animal practice when the owner desires less expensive or more definitive treatment. However, complications may occur and include fragmented roots, iatrogenic mandibular fracture, ocular trauma, and infection.

Fragmented Roots

Diagnosis

Root fragmentation may occur secondary to crown or maxillofacial trauma, in which case the diagnosis is made after evaluation of skull or dental radiographs. However, the disorder most commonly results from iatrogenic causes during tooth extraction. Radiographs may also aid diagnosis of root fragmentation during tooth extraction (Figure 1), but other indicators are obvious during the procedure. The clinician often hears an audible crack. Inspection of the extracted tooth reveals an apical root defect and the remaining root has a jagged edge; the root apex normally has a rounded appearance. If one uses suction or a cotton applicator to visualize the fragmented root within the alveolus, the remaining root fragment appears tan in color and has a centrally located root canal. Alveoli without root fragments well up with blood, similar to ink wells; alveoli with root fragments tend to have less blood because of the presence of the root.



Radiograph showing retained root fragments

Prevention

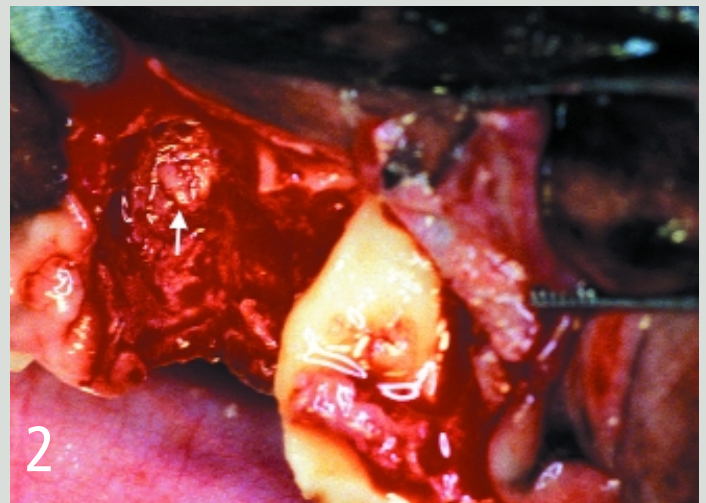
Take preoperative radiographs to be informed of any problems that could increase the potential for complications. The best way to prevent fragmented roots is to use controlled elevation force for 10 seconds at a time to sever the periodontal ligament gradually and methodically. Extraction forceps

should not be used until the tooth is so mobile that it could be removed using finger pressure. Excessive force with the periodontal elevator or premature use of the extraction forceps causes root fragmentation.

Treatment

If the root fragment cannot be adequately visualized, take a radiograph. Removal of fragmented roots requires continuation of extraction techniques to remove the root fragment. Periodontal elevators with a narrow working blade surface or special root fragment elevators may be used to facilitate the process. If a high-speed handpiece is available, further alveolar bone may be removed with a round or pear-shaped bur to outline the root fragment, making elevation easier (Figure 2). Although not recommended, another treatment option includes using the same high-speed handpiece to obliterate the root fragment. The root fragment is harder than the surrounding alveolar

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Surgical exposure of a retained root fragment (arrow)

bone; therefore a change in resistance to the drilling process indicates that the root fragment has been obliterated. Complications associated with this technique include incomplete removal of the root fragment, relocation of the fragment into the mandibular canal or nasal cavity, and hemorrhage from trauma to the infraorbital or mandibular alveolar arteries. A radiograph should be taken of the extraction site to confirm removal of all fragments.

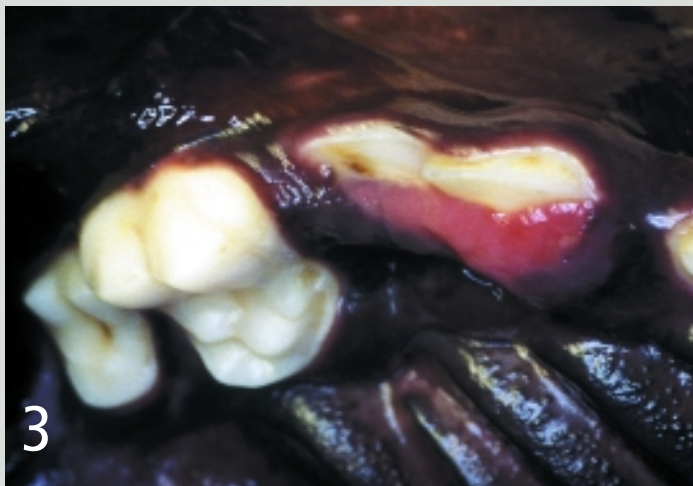
Nontreatment

The only situation in which root fragments should not be removed is if harm may be inflicted on the patient by the procedure. Remaining root fragments are less likely to be associated with chronic infection if the blood supply from the apex is intact and the root fragment is not affected by disease. If a root fragment is not removed, the owner should be informed that the extraction was complicated, necessitating root fragment retention, and that diligent monitoring for clinical signs associated with infection is required.

Clinical Signs

A draining tract and swelling secondary to an abscess are likely clinical signs related to retained root fragments. Whether secondary to crown or maxillofacial trauma (Figure 3) or complications of tooth extraction, such root fragments should be removed if possible using the techniques described earlier. However, a specific surgical procedure—similar to surgical procedures for tooth extraction—may be required to access the root fragment. All too often, “wait and watch” is presented to the owner as the most viable treatment of retained roots with crown fracture following trauma. Early treatment is advised, however, since the exposed root pulp would be expected to be quite painful. Pulpitis is an inevitable consequence of pulp contamination by oral bacterial flora, and periapical abscess is a possible sequela.

If the patient requires general anesthesia for oral fracture or soft tissue repair, retained roots should be removed during the same anesthetic episode. The procedure may also be scheduled as a component of a

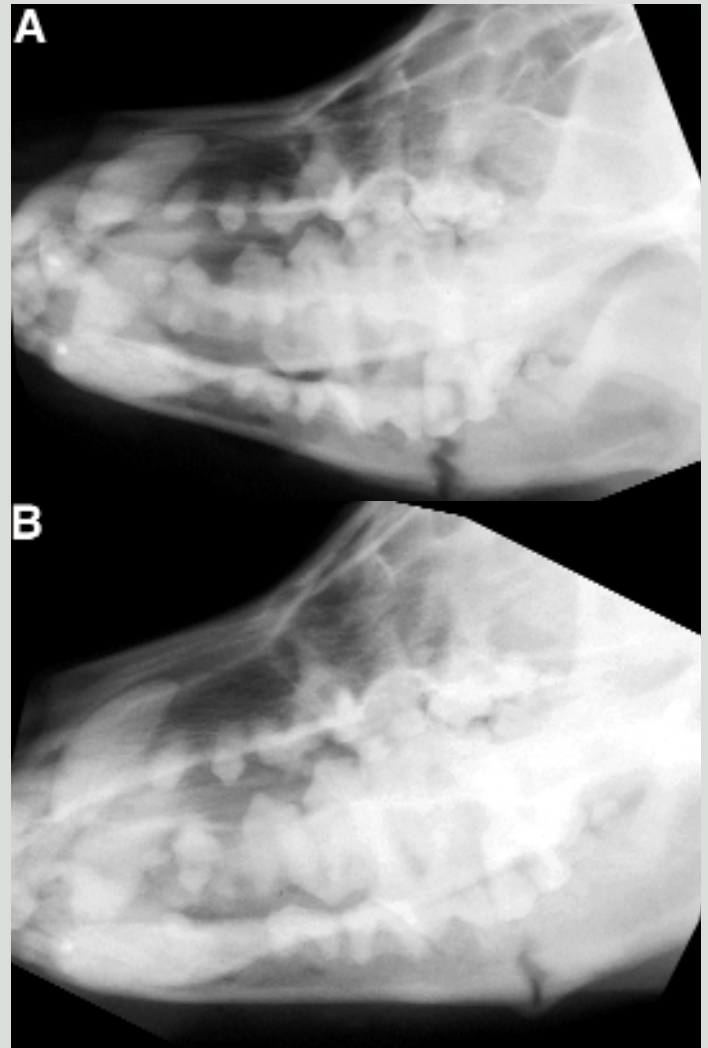


3 Retained root fragments following crown fracture secondary to vehicular trauma

professional teeth cleaning procedure at an appropriate time following patient stabilization. In summary, a “wait-and-watch” treatment plan should only be implemented at the request of the owner and not recommended by the veterinarian.

Iatrogenic Mandibular Fracture Diagnosis

Iatrogenic mandibular fracture may occur when exodontics are being performed on any tooth of the mandibular dental arcade; however, it is most commonly associated with the mandibular first molar or the mandibular canine (Figure 4). Fracture associated with extraction of the mandibular first molar usually occurs during simple exodontic techniques in the presence of apparent severe periodontal disease with deep periodontal pockets. The clinical signs of periodontal disease may mislead the clinician into believing the tooth is mobile and easy to extract. Even with severe destructive periodontitis, the tooth is usually



4 Mandibular radiographs showing iatrogenic mandibular fracture (A) and early bony callus formation (B) during conservative management of the fracture

not mobile because of the large surface area of the root that may continue to have substantial periodontal attachment. Destructive periodontitis may also cause such severe periodontal bone lysis that the ventral mandible has become thin and is prone to spontaneous fracture or fracture during relatively routine exodontic maneuvers. Finally, older patients requiring extraction of the mandibular first molar may have age-related osteopenia that may also contribute to the incidence of fracture. Similar underlying periodontal or age-related changes contribute to iatrogenic fracture of the rostral mandible during mandibular canine extraction.

Prevention

Preprocedure intraoral or standard radiographs will show bone lysis secondary to periodontal disease (Figure 5). Information gained from radiographic assessment of teeth to be extracted aids the clinician in warning the owner about potential complications during tooth extraction. Controlled force and an emphasis on buccal or lingual luxation of tooth roots are recommended to prevent iatrogenic fracture. If the clinician is concerned about fracture during normal alimentation following extraction, materials that stimulate bone formation such as synthetic hydroxyapatite or bioactive glass coated with hydroxylcarbonate apatite (Consil—Neutramax Labs, Baltimore, MD) may be placed in the alveoli before wound closure.

Treatment

Preprocedure radiographs and owner consultation about the potential problems allow easier explanation of the complication of iatrogenic

mandibular fracture should it occur. Owner compliance and permission for treatment of the fractured mandible is enhanced when it is perceived as a complication and not a “mistake.” As with other fractures, treatment options for iatrogenic mandibular fracture are limited to repair or salvage techniques. Repair techniques may be associated with delayed or nonunion based on advanced age of the patient, osteopenic bone, and destructive periodontitis. Fibrous union is a relatively common outcome; therefore, the clinician must weigh the likelihood of a positive clinical outcome from successful repair as a result of bony union with that from a salvage, resective procedure. It has been documented that canine patients receiving rostral mandibulectomy or rostral hemimandibulectomy for treatment of neoplasia have a good clinical outcome with respect to prehension and mastication of food. These resective surgical procedures may be appropriate for treatment of iatrogenic mandibular fracture based on expectation of a positive outcome, inexpensive cost, low complication rate, and the provision of immediate, definitive therapy for the complication. Alternatively, intraoral splints may be applied to the edentulous mandible to provide stability and eventual bony union (Figure 6).

Ocular Trauma Diagnosis

Iatrogenic trauma to ocular structures may occur during extraction of the maxillary fourth premolar, first molar, or second molar. The cause of such trauma is related to the thin alveolar bone and proximity of the

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5 Intraoral dental radiograph showing bone loss secondary to periodontal disease



6 Edentulous area (A) with iatrogenic mandibular fracture and the application of an intraoral splint (B) for fracture management in a dog. (From Legendre L. Intraoral acrylic splints for maxillofacial fracture repair. *J Vet Dent* 20:70-78, 2003. With permission.)



7 Caudal aspect of the canine skull showing the location of the caudal maxillary teeth in relation to the orbit

ventral floor of the orbit (Figure 7). These structures are adjacent to the caudal maxillary teeth and may be perforated by a pointed instrument, such as a periodontal elevator, especially in patients with destructive periodontal disease.

Prevention

Ocular trauma can be prevented by using controlled force and by gripping the periodontal elevator with the palm, with fingers placed near the working end or tip of the instrument. This grip limits accidental penetration of the instrument to the distance between fingers and the tip of the instrument (Figure 8).

Treatment

Panophthalmitis may result from perforation of the globe by the periodontal elevator (Figure 9). If antimicrobial and antiinflammatory treatment fails, enucleation is an unfortunate result.

Infection

Diagnosis

Infection of the extraction site after tooth extraction is an unusual complication. The localized osteitis is related to the trauma of the extraction, disruption of blood supply, and bacterial contamination of exposed bone.

Prevention

Lavage of the extraction site with 0.12% chlorhexidine followed by primary wound closure minimizes the incidence of infection. An extraction site that seems to be nonhealing 7 days or more after surgery is abnormal and not necessarily related to infection. Infected sites may seem unusually inflamed with a serous or mucoid discharge. At 7 days, it is possible for some extraction sites to still be granulating and not to be completely epithelialized. If the clinician has any doubt about the status of the extraction site, the nonhealing area should be considered for biopsy to rule out neoplasia, such as squamous cell carcinoma.

Treatment

Localized osteomyelitis may be secondary to severe periodontitis (Figure 10). The affected tooth and periodontium are the focus of the infection with the maxilla or mandible showing clinical signs of osteomyelitis. Extraction of the tooth alone is not sufficient to treat this



8 Skull specimen showing proper technique for handling a periodontal elevator with the index finger positioned as a "stop" to prevent orbital penetration

problem. Additional procedures that are required include elevation of a periodontal flap and removal of necrotic bone with bone rongeurs or a round bur on a high-speed handpiece. The bone may be submitted for bacterial culture; however, the result will be polymicrobial and difficult to interpret. Thorough debridement of necrotic bone followed by administration of a broad-spectrum antimicrobial is usually sufficient treatment. ■



9 Gross signs of panophthalmitis following iatrogenic ocular trauma with a periodontal elevator in a dog

PHOTO CREDIT

Figures 7, 8 & 9. From Smith MM, Smith EM, La Croix N, et al. Orbital penetration associated with tooth extraction. *J Vet Dent* 20:8-17, 2003. With permission.



10 Devitalized bone (arrow) indicative of osteomyelitis associated with severe periodontal disease in a dog

See Aids & Resources, back page, for references, contacts, and appendices.