Surgical management of dental problems in senior dogs

Daniel Koch, Dr. med. vet., Diplomate ECVS, CH-8253 Diessenhofen

1 Surgical management of periodontal disease

1.1 Extractions

If professional cleaning of the dentition, including the important home care and antibiotics or disinfectants do not lead to success, tooth extractions may be an option in periodontal treatment. In my experience, senior dogs, which come more than three times a year for tartar removal and treatment of periodontitis, are likely candidates for this intervention. These are mostly toy breed dogs. The home care is difficult to perform as the dogs only often eat canned food. They sometimes have malocclusions, which can be a predisposition for gingivitis and periodontitis.

Extractions of teeth, which surroundings are deeply affected by an infection, are not difficult to perform. Even three-rooted teeth may be extracted with a clamp and only two or three movements. A multiple rooted teeth must be separated into their roots with a bur or a saw. Then, the single roots are extracted.

The extraction of non affected teeth is rather a process of patience than of force. The epithelial attachment is cut first. With an extraction lever, the periodontal ligament is stretched on different locations until the tooth is loose. Adjacent teeth may be carefully used as an anchor. The resulting bleeding and edema helps and pushes the tooth out of its alveole. Only at the last moment, the clamp is used. Cautious turnings complete the extraction process. Any left root fragments are removed and bony projections are smoothed off to facilitate gingival healing (Fig. 1). It is important to control, that all roots are completely extracted by taking a radiograph.

Figure 1: Extraction technique. A. use of a lever, b. stretching of the periodontal ligament, c. extraction with an extractor

Some teeth, especially canine teeth, must be extracted by an open technique. The gingiva is incised along the root and the alveolar bone is removed with a rongeur or a bur. Then the tooth is elevated with a lever and luxated laterally.
1.2 Gingivoplasty

The goal of a gingivoplasty is the preservation of the periodontium by facilitating plaque removal. Therefore, it is only indicated, when the owner is willing to perform a perfect and regular home care. Overlapping gingival tissue may be a trap for plaque and tartar formation. It can be resected with electrocoagulation. In a similar way, the sulcus gingivalis is cut away as a prevention for gingivitis or periodontitis. In my experience, it is seldom necessary to use these techniques, because home care and correct feeding is a far better approach to periodontal health than surgery.

1.3 Buccal flap technique

Buccal flap techniques are indicated with acquired or traumatic palatal defects, severe periodontitis which led to oronasal fistulation or loss of palatal tissue after difficult resection surgery. The existing passage between oral and nasal cavity leads to nasal discharge and chronic rhinitis. Acute fistula should be treated as soon as possible (eg after caninus extraction with opening of the nasal cavity; simple caninus extraction does not require a flap). In chronic fistula, the edges are resected and a flap from the buccal mucosa is drawn over the defect (Fig. 2). In larger defects, a double advancement flap technique (buccal flap and palatal flap) is advisable. Tissue enhancement is obtained by interposing a layer of small intestinal submucosa (Vet BioSIS®).

Figure 2: Buccal flap technique for closure of chronic oronasal fistula

1.4 Oral neoplasia

The majority of growths in the oral cavity are benign and reactive. From these, epulis are common affections, mainly in Boxer dogs. In most cases, they are the fibrotic reactions to a chronic periodontal problem. Some epulis develop neoplastic activity. Therefore, the epulis should be resected and sent in for histopathological analysis.
Tumors of the oral cavity count for 5-7% of all canine tumors. A thorough work up includes biopsies, lymph node assessments and search for metastasis (TNM). Odontogenic tumors are very rare. Ameloblastomas and odontoma can be seen. The tendency for metastasis is small.

Important malignant tumors are the malignant melanoma (30-40% of all cases, highly metastatic), the squamous cell carcinoma (20-30%, from the gingiva, late metastatic), the fibrosarcoma (invasion of bone, mostly on the palate, Fig. 3) and the osteosarcoma. Most of them show rapid growth and a high tendency for metastasis. Vast surgical resection and chemotherapy or radiation is mandatory. On the palate, defects after resection are closed with buccal flaps. Mandibular tumors often lead to shortening of the jaw, because a mandibulectomy is performed.

Figure 3: Fibrosarcoma in a 10 year old mongrel requiring partial maxillectomy.
2 Dental emergencies

2.1 Tooth fracture

2.1.1 General assessment

In contrast to fractures in a young dog, a tooth fracture in a senior dog seldom is an emergency. Nevertheless, a correct assessment and a good therapeutical plan is advisable for a success. A general algorithm for dental fractures and its endodontic treatment is listed below:
The assessment of a fracture is divided into three steps. The first step is the fracture height (Fig. 4). Crown fractures mostly have a good prognosis, whereas neck fractures and root fractures rarely lead to success. Some apical root fracture may be treated conservatively by splinting, although it is difficult to recognize them.

The next question is the pulp involvement. An enamel or dentin fracture is called uncomplicated and is treated by simple restoration. Pulp exposure by definition leads to pulp contamination. These fractures are called complicated. Every attempt has to be made to reduce the risk of a pulp infection. An endodontic treatment is mandatory.

The last question is the age of the dog. In young dogs with a wide pulp, the risk for a severe pulpitis is high. However, as the dogs get older, the root canal becomes narrow, because the odontoblasts along the inner side produce dentin, which is laid down in the root canal. An old dog may have a very thin pulp and a nearly closed apex. Therefore, the risk of an ascending infection into the alveolar bone is less than in young dogs. An endodontic treatment is made as soon as possible, but at least after 2 weeks.

It is obvious, that every tooth may be extracted rather than preserved. For functional reasons, the canine teeth should be treated. All other teeth are not absolutely necessary in our domestic dogs.

Fistulation, after pulpitis break through and alveolar bone affection, rarely ends up with a satisfying result. Canine teeth may be the only one to treat by partial resection of the apex through a lateral approach, endodontic treatment and antibiotics. The abcessation of the upper first molar or fourth premolar (after fracture or severe periodontal disease) often leads of accumulation and extrusion of pus under the eye. Radiographs reveal the lytic process. The tooth sometimes must be extracted or is treated with apexectomy.
2.1.2 Root canal treatment of a canine tooth

In most cases of tooth fractures in senior dogs, fractures of the canine tooth are presented for a treatment. In the case of a pulp involvement, I prefer the extirpation of the pulp. In very chronic cases, the pulp is grey and smells heavily. The emptied canal is then irrigated and dried. The root canal is filled with Calcium-hydroxide and Guttapercha sticks (Fig. 5). A radiograph is made to assess the filling of the root canal and the closure of the apex. At the same time, a possible alveolar bone lysis is detected and can be treated with antibiotics. Only in very fresh cases, a vital amputation (pulpectomy), which is normally reserved for young dogs, can be attempted.

2.1.3 Capping

The missing crown is restored only in small amounts. After etching the enamel and preparation with several adhesives and bondings, an artificial crown is formed onto the stump (Fig. 6). The smaller the crown, the longer its lifetime. Most restoratives are hardened with blue light cure.

In rare cases, the stomp can be covered with white zirconium oxid or a metal prosthesis (Fig. 7). However, prints must be taken from the dentition and the prepared tooth, and the individual prosthesis must be fixed with special cementum.

2.1.4 Fractures of other teeth

Fractures of molar or premolar teeth are mostly in the sagittal plane. They have a bad prognosis. In most cases, extraction is the best treatment. Incisor teeth fractures are treated as those of the canine teeth or they are extracted.
2.2 Abrasion - attrition

Abrasion is the result of wearing teeth against each other or from inappropriate chewing. When the process of wear is slow enough, the odontoblasts have the chance to produce tertiary dentin, which can be identified as brown or dark yellow spots on the surface (Fig. 8). Probing with a sharp explorer will reveal, that the pulp is not exposed. In the case of aggressive abrasion, the pulp may get exposed and endodontic treatment is necessary. The discoloration is caused by extrinsic factors. The weaker the central part of the dentine, the darker the brown or black colour.

2.3 Tooth luxation

Avulsion of a tooth must be treated in correct manners from the beginning. The tooth should be placed back within 30 minutes. If the owner is not able to do this, the tooth is stored in physiologic saline solution or milk to prevent drying. Any contact with the root is avoided. “Do not clean”, is to tell to the owner. With the veterinarian, the tooth is carefully irrigated and put back. It is fixed with a cerclage wire to other teeth, enhanced by restoratives. The prognosis is guarded.

2.4 Caries

Caries is a rare affection in dogs. Caries is a passive demineralisation of the dental hard tissues by cariogenic bacteria capable of fermenting carbohydrates. Normally, caries starts at the tooth surfaces away from the gingival attachment in molar teeth. Caries lesions are brown to black. They may reach the pulp (Fig. 9). Early recognition may allow endodontic treatment and restoration. Massive destruction leads to extraction.
3 Jaw fractures

Canine mandibular fractures are relatively uncommon, accounting for approximately 3% of all fractures in the dog. Most fractures are traumatic in origin, however, a significant number (11%) may occur during routine dental extraction. Fixation of mandibular fractures varies depending on the expertise of the surgeon, location of the fracture and financial capability of the pet owner. Symphyseal separations can be easily treated with wire fixation (Fig. 11). External coaptation muzzles can be used for treatment of midbody unilateral fractures that are relatively stable. Other methods of fixation include intraoral splints, interdental wires, intercaninus occlusion with composite, intrafragmentary wires (Fig. 12), intramedullary pins, external fixators, or screws and plates. Surgical fixation of mandibular fractures involves a ventral approach to the mandible. The implants are best applied on the tension side of the mandible (oral side) in order to minimize collapse of the construction (Fig. 10).

![Figure 10: Tension and compression side at the canine mandible](image1)

![Figure 11: Symphyseal separation stabilized by a cerclage wire loop](image2)

![Figure 12: Treatment of simple mandible fractures with cerclage wire](image3)

Maxillary fractures may present special problems. Concurrent trauma to the brain, the eyes, the teeth, the oral mucosa, the tongue or the nasal passages may make early repositioning and fixation of bone fragments an essential part of the initial emergency treatment. In cases of severely comminuted fractures, dental occlusion must be used to assess accuracy of surgical reduction; therefore a tracheotomy or pharyngotomy must be used for endotracheal intubation. Several methods have been described for maxillary fractures (intraoral splints, external skeletal fixators, plate fixation, orthopedic wire alone or in combination with K-wires, Steinmann pins). Maximum tensile stress exists at the oral surface and maximum compressive stress at the aboral surface. Therefore, the fixation should be placed as near at the oral surface as
possible, respecting the biomechanical principle of tension band fixation (Fig. 13). Intraosseous wiring techniques are most successful, when all bone fragments can be anatomically repositioned. In cases of severely comminuted fractures with bone loss, buttress devices as miniplate fixation are the methods of choice.

Figure 13: Tension band wiring of longitudinal palatinal fracture.