



## OUR ONE-YEAR CONSERVATIVE APPROACH TO DENTAL CROWN FRACTURES IN DOGS AND CATS

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### Summary

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Dental crown fractures in small animal pathology are a common morbidity in everyday practice. Cats, usually fracture their canines, due to their exposure in the geometry of the dental arches. Dogs have a higher level of activity and do interact with the environment more than felines, so they have a wider range of teeth' types that are fractured. The conservative approach to dental crown fractures involves endodontic treatment and coronal reconstruction in order to keep the fractured teeth on the dental arch. We wanted to study whether the conservative approach to dental fractures may be a reliable alternative to dental extractions in order to provide best dental medical care for our patients. Only dental crown fractures involving the pulp chamber, leaving the root undamaged were taken into study: 9 cats with 6 upper canines, 3 lower canines: 6 coronal reconstructions with light curing filling materials and 3 prosthodontic crowns: 2 metal alloy crowns and one zirconia; 52 dogs, with 49 single rooted tooth, 16 multirooted teeth, 61 coronal reconstructions with light curing filling materials and 4 prosthodontic crowns: 2 metal alloy and 2 zirconia crowns. The endodontic treatment followed latest endodontic protocols and the root canal fillings were made by cold lateral condensation with mineral trioxide aggregate (MTA) and gutta-percha. Excellent results were confirmed by clinical and radiological findings at one-year follow-up. Only 3 fillings made with light curing materials were missing and no crown loosening was observed. The conservative approach to dental crown fractures in dogs and cats is a reliable alternative to veterinary dental extractions when performed upon correctly selected cases and with adequate operative protocols.

**Key words:** cat, dental crown, dental fractures, dog, endodontic treatment

### INTRODUCTION

Oral pathology in cats and dogs occupies first place in their morbidity, but it is the most underdiagnosed and undertreated veterinary medical issue. As a matter of fact, by the age of 2, 70% of cats will acquire periodontal problems. A higher percent, 80% of the dogs will acquire, by the age of 3, both dental and periodontal

problems. Dental crown fractures occur as a consequence of a mechanical trauma when a determined force is applied on dental structures in a variable angle. Bite force of one individual is a major factor in this complicated equation. Bite force is in a direct relationship with body weight, patient's skull, size and morphology (Kim

*et al.*, 2018) In order to establish which type of teeth are most commonly fractured, we have to corroborate the geometry of the dental arch with the every day activity of our patients. Cats usually fracture their canines, due to their exposure in the dental arch in failed landings after jumping. Dogs, as they are more dynamic and have a greater biting force will present a wider range of teeth' types that are fractured.

According to Reiter & Gracis (2018), the maxillary fourth premolar tooth of a dog, has the highest incidence of fracture compared to any other teeth.

The most wide spread procedure for treating dental fractures is tooth extraction. There are several potential complications during and after surgery than may happen. Even if well performed a lot of inconvenient local consequences can occur: extensive bone loss, adjacent teeth losing their supportive periodontium and bone, acquiring more easily periodontal mobility and periodontal pockets, bending towards the new free-way space, thus resulting in premature, unphysiological contacts between teeth and gingiva. We have to mention the injury produced by the direct impact of food on the remaining gingiva on the edentate space. It is important to understand that every dental unit lost represents a severe functional impairment for the oral cavity, for the dental occlusion' s harmony, for the temporomandibular joint and even more, for the whole process of mastication with a lot of negative consequences on digestion.

The conservative approach to dental crown fractures consists of endodontic treatment and coronal reconstruction in order to keep the fractured teeth on the dental arch avoiding the above-mentioned complications.

## MATERIAL AND METHODS

We took into study only dental fractures that involved the pulp chamber, with no root fractures, treated by over a period of one-year time, from the 1<sup>st</sup> January 2018 to the 31<sup>st</sup> of December 2018, in Romania, Transylvania area. All cats and dogs were in a good health confirmed by biochemical blood tests and a thorough clinical medical examination. Radiographs were taken to ensure lack of periapical processes and to establish working length.

Diagnostic of dental crown fractures was based on inspection, as a fractured tooth has a sharp enamel etches, always in comparison with the symmetric tooth from the other side. When the pulp chamber is affected, one can see a pink-reddish point on the fractured surface, when the fracture is recent, or a dark-black point if the fracture has occurred earlier in time. When exploring with the dental probe the fractured area, the instrument will sink into the pulp chamber through that colored point, mentioned before. (Reiter & Gracis, 2018).

A number of 9 cats: 5 males and 4 females and 52 dogs, 23 bitches and 29 males were selected by the criteria to be included in the study. The age of the subjects varied from 9 months to 10 years in dogs and from 2 years to 7 years in cats. Regarding the fractured teeth's type on the species we had to treat 9 felines with 6 upper canines and 3 lower canines. In the 52 dogs studied there were fractured 7 lower incisors, 9 upper canines, 10 lower canines, 3 upper premolars, 2 lower premolars, 10 upper carnassials, 8 lower carnassials (Fig. 1–5).

All dental procedures were performed under general anesthesia associated with local nerve blocks, according to the clinical situation.



**Fig. 1.** Complicated crown fracture of an upper canine in a cat, personal archive.



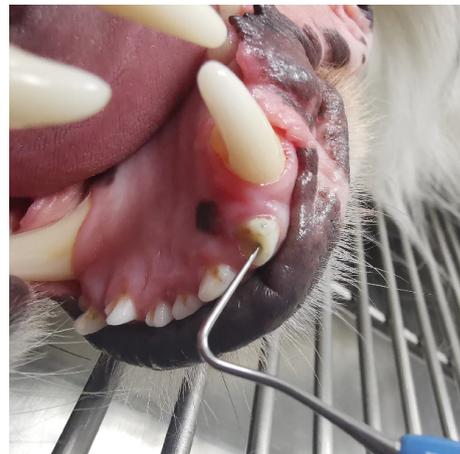
**Fig. 2.** Complicated crown fracture of a lower canine in a dog, personal archive.

Endodontic treatment followed the latest endodontic protocols. Standard root canal therapy was performed aseptically. Working length was established radiologically and electrically. In the selected cases a mechanical and chemical debridement of the root canals was performed with abundant irrigations with hypochlorite 5,25% after each endodontic file and the last irrigation was made with physiological serum. (Moldoveanu, 2018). Root canal filling was made by cold lat-

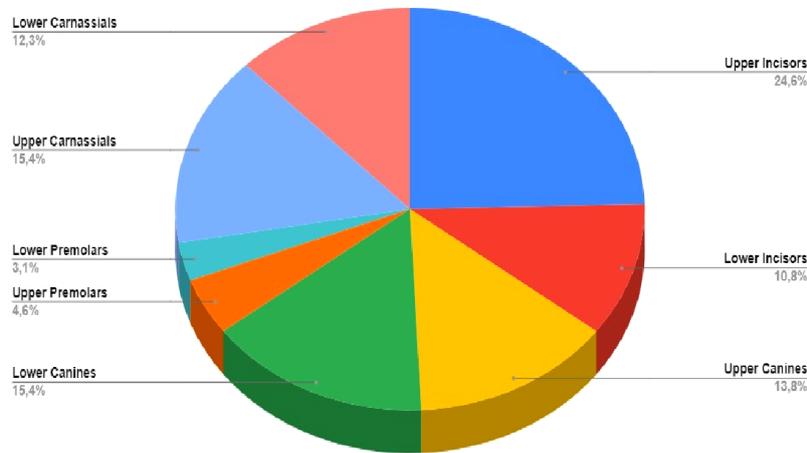
eral condensation technique in order to obtain a complete, dense obturation of the entire root canal. Dental materials used for endodontic sealing were gutta-percha and mineral trioxide aggregate (MTA). MTA is a well-known endodontic material yielding all needed properties for a root canal sealant with a good prognosis. Radiographs were taken to confirm proper root canal obturation.



**Fig. 3.** Complicated crown fracture of a maxillary 4th premolar in a dog, personal archive.



**Fig. 4.** Dental probe inserted in the pulp chamber, personal archive.



**Fig. 5.** Distribution of the fractured teeth in our studied population.

Every endodontic treatment is considered with a good prognosis in time, when coronal restoration manages to seal it, preventing bacterial invasion to the tip of the root and the bone around it. Microleakage is one of the main reasons for endodontic failures. (Hargreaves & Berman, 2016).

When choosing the type of coronal reconstruction, one should consider the amount of lost dental structures. Small amounts of coronal volume may be replaced by coronal fillings made with light curing materials. The indication for prosthetic reconstruction, involving a dental laboratory is imperative when significant part of the coronal volume is lost. (Hargreaves & Berman, 2016).

Coronal fillings' application technique followed producer's indications. First of all, in order to degrease and to remove any residuals a conditioner gel with 37% orthophosphoric acid is applied for 20 seconds. After that, it is flushed out with clear water and the area is dried smoothly with the air syringe for 20 s. The goal is

accomplished when one could clearly see a white snowy, chalky like enamel area, with no glaze around our coronal preparation. A bonding agent is applied and light cured for 20 s. Previous lacking in glaze surfaces will transform themselves in glossy ones (Fig. 6, 7). The composite is



**Fig. 6.** Intraoral image of a coronal reconstruction with light curing materials, for an upper canine, in a cat, personal archive.

applied in sequential layers of 2 mm/20 s. of light curing in order to achieve a good polymerisation and a volume stability in time. (Roman & Pop, 2000).



**Fig. 7.** Intraoral image of a light curing filling made on an upper 4<sup>th</sup> premolar in a dog, personal archive.

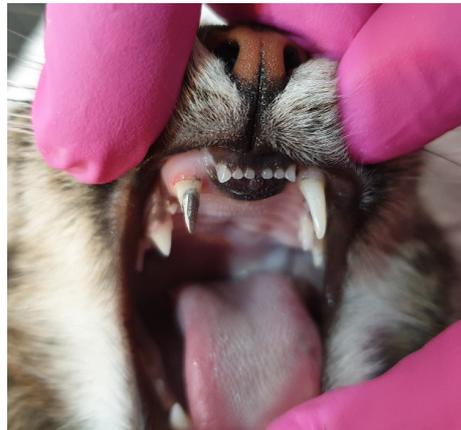
All prosthodontic crowns were realised as Richmond type crowns, to ensure stability in time. Richmond type crown increases the length of the remaining dental crown, managing the arch of rotation under oblique forces. Richmond type crown is indicated in situations when there is an extensive loss of dental structures associated with deep bite with no or less overjet, like all small animals' bites (Mishra *et al.*, 2015). Zirconia stabilized with yttrium is an innovative prosthodontic material, with mechanical properties as stated by the producers, similar to metal alloy, but more aesthetic and more biocompatible than it. The only inconvenient issue with zirconia would be the price, as it has higher costs of production (Fig. 8–12).

Based on the coronal reconstruction, repartition on species, we report in felines: 6 coronal fillings with light curing materials, 3 prosthodontic crowns: 2 made of metal alloy and 1 of zirconia stabilized with yttrium. Dogs received 61 coronal fillings, made with light curing materials,

and 2 metal alloy prosthodontic crowns and 2 made of zirconia stabilized with yttrium.



**Fig. 8.** Prosthodontic piece: a Richmond type crown for an upper canine in a cat, personal archive.



**Fig. 9.** Intraoral image of the metal alloy Richmond type crown cemented on an upper canine in a cat, personal archive.

## RESULTS AND DISCUSSION

Our results revealed that, in the selected population, most fractured teeth in dogs

are incisors, followed by canines and only on the 3<sup>rd</sup> place carnassials (Fig. 5) .



**Fig. 10.** Intraoral image of a metal alloy reconstructed upper 4<sup>th</sup> premolar in a dog, personal archive.



**Fig. 11.** Intraoral image of a zirconia reconstruction for an upper canine in a cat, personal archive.

Clinical and radiological findings at one-year follow-up were no periapical lesions, no crown loosening and only 3 coronal fillings missing in dogs.

Even though we confirm the results of the world-wide-known authors on most fractured teeth in dogs, our study has its limitations, as few people know and are aware of the importance of the dental care in our working area. It is important to

educate owners and medical staff to recognise and to perform clinical check-ups in order to diagnose dental issues in small animals. As human dentistry is acquiring every day new limits, owners are more demanding towards veterinarians. Interdisciplinary teams or specialisation of the veterinarian doctors are the future. Medical market is very dynamic and we have to be up to date in order to offer best dental medical care for our patients.

Dental care for small animals has to become a priority, as oral pathology may lead to complications in vital organs and decreases the quality of life of our patients and of course, of their owners.



**Fig. 12.** Intraoral image of an upper incisor reconstructed with zirconia crown, for a show-dog, personal archive.

Good diagnosis leads to adequate treatment procedures with a good prognosis. Once established that we are dealing with a complicated crown fracture one should perform an aseptically standard root canal therapy throughout the whole working length. Endodontic treatment is a minor surgical procedure with a lot of failure-susceptible stages and one should be up to date with latest endodontic protocols knowing exactly when and where to pay increased attention in order to obtain

repeatable and sustainable results.

Coronal sealing of the endodontic treatment is a major step in order to obtain long term results. Knowing exactly when to perform a prosthodontic coronal reconstruction is also a key to success, but it requires high level abilities from the dental laboratory, as we all know that a veterinary dentistry course for dental technicians does not exist.

Educating owners in posttreatment playing patterns will ensure a higher percent of success. Our 3 cases with missing coronal fillings are based on continuing playing with wooden cracks or ropes and owners not being able or not paying enough time to unlearn the bad habits.

#### CONCLUSIONS

No matter the age, gender or species, when the selected criteria correspond to the indications of the specialized literature, the conservative approach to dental crown fractures in cats and dogs is a reliable alternative to veterinary dental extractions.

An interdisciplinary approach, where the human science meets the veterinary medicine will lead to great accomplishments on both sides.

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