

DOI 10.2478/pjvs-2013-0056

Short communication

Prosthetic reconstruction of broken canine teeth in dogs with use of cast metal posts

M. Bładowski^{1,2}, A. Kotowicz-Gears², D. Choszcz³, M. Pawelec⁴, J. Wojtkiewicz¹

¹ Department of Human Physiology, Faculty of Medical Sciences, University of Warmia and Mazury, Warszawska 30, 10-082 Olsztyn, Poland

² Dental Research Center, Szarych Szeregów 5, 10-072 Olsztyn, Poland

³ Department of Technical Sciences, Faculty of Machines and Research Methodology, University of Warmia and Mazury, Oczapowskiego 11, 10-719 Olsztyn, Poland

⁴ Private Veterinary Practice, Bałtycka 138a, 11-041 Olsztyn, Poland

Abstract

Prosthetic treatment, especially restorations of fractured teeth in small animals, has been the subject of many veterinary dental analyses in relation to techniques of endodontic treatment, preparation and cementation, as well as the general principles of prosthetic treatment. The purpose of this paper is to present a previously undescribed method of all-in-one crown and root prosthetic restoration of fractured teeth in large dogs, together with a thorough analysis of the drawbacks, which may help veterinary dentists to use an evidence-based approach when deciding on the type of treatment for their patients with tooth fractures.

Key words: canine tooth fracture, endodontic treatment, prosthetic treatment, cast metal post

Introduction

The dogs' canines are the strongest teeth which are most exposed to mechanical trauma. The most common cause of a canine fracture is a traumatic event or injury. A tooth may be broken, e.g. by chewing on a hard object, a blunt force trauma to the dog's face, fights or a minor car collision. Tooth fractures refer to injuries involving both crown and root. Vertical or subgingival root fractures are indications for extraction, whilst horizontal supragingival fractures, are indications for root canal treatment (RCT) and restoration. In young dogs, a thin layer of dentin together with broad dentinal tubules provide an insuffi-

ciently tight barrier to protect the pulp from infection, and even when primarily there is no pulp exposure, the pulp often becomes infected with consequent inflammation and necrosis (Bellows 2004). In dogs, the restoration of lost canines is usually achieved with the use of metal crowns. These provide restoration of lost shape and function, whilst being more resistant than composite materials, protecting the tooth from future breakage (van Foreest and Roeters 1998, Brine and Maretta 1999). A further aspect of a prosthetic crown is to achieve the highest possible tightness (Coffman and Visser 2007) which is necessary for the success of the RCT and prevents the development of periapical pathology (Niemiec 2000).

Materials and Methods

Eight large dogs of different breeds, aged between one to three years, weighing 30-40kg, with severely fractured teeth, three lower and five upper canines, were admitted to a veterinary clinic, examined and due

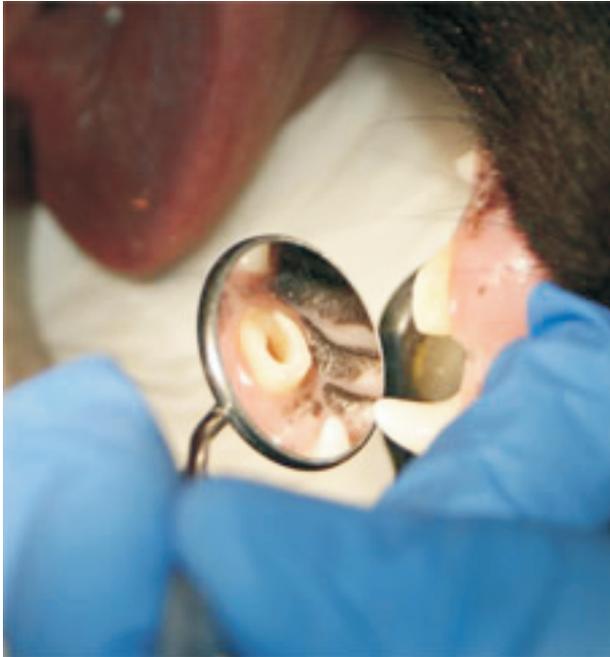


Fig. 1. Fractured right upper canine (during preparation for restoration).



Fig. 2. X-ray image of the tooth root before RCT.

to pulp exposures qualified for standard RCT and subsequent prosthetic restorations. As the crowns were severely damaged (Fig. 1) and the roots intact with completed apexification (Fig. 2), it was decided that a root post with a prosthetic crown would be necessary. For the root canal filling (Fig. 3) The Obtura System-injection of heated gutta-percha technique was used (Lipski et al. 2011). The canals were then prepared for the prosthetic procedures, silicone impressions were taken and referred to the laboratory (Coffman et al. 2007). The restorations were fitted (Fig. 4) and then cemented during a second anesthesia session, using Ketac Cem (3M ESPE)



Fig. 3. X-ray after RCT before further preparation.



Fig. 4. Fitting of post.

glass-ionomer luting cement. The owners were asked to bring the dogs to the first clinical check-ups after four to six weeks (Fig. 5).



Fig. 5. Post in place – five weeks later.

Results and Discussion

To avoid putting the animals through multiple general anesthesia sessions it was decided that, for the RCT procedure, a standard mechanical and chemical preparation with the canal obturation by a heated gutta-percha technique would be used. If the canals were filled using a single cone or cold gutta-percha techniques, the canal preparation would have to be performed in another general anesthesia session, which would be a severe disadvantage for the animal (Bladowski et al. 2011). It was decided to use cast metal posts of a special construction which would make up the crowns of the teeth, as in large dogs due to powerful biting forces, crown-failures are relatively common. Such failures are due to: flawed impression or laboratory errors, mistakes in the cementation or cement material failure, a restoration area insufficient for long-term retention, and animal chewing on hard objects (Bellows 2004). The post lengths were $\frac{2}{3}$ of the lengths of the canals and their diameters were $\frac{1}{3}$ of the diameter of the roots – as is applied in human dentistry. The metal was an alloy used for human dentistry. The restorations were slightly shorter and with a more rounded tip than the original teeth which helps better maintenance (van Foreest and Roeters 1998). Also, an important factor is the fact that further reduction in the number of sessions of general anesthesia could be

achieved; one for root preparation and impression taking and one for cementation were necessary, as no separate crown session (Coffman et al. 2007) was used, which is a significant advantage of this technique.

Conclusions

Despite great care taken to provide the best results, all the restored teeth were lost. The dog owners reported all restorations to be failures after a period of three weeks to six months. All roots suffered vertical fractures (Fig. 6), which classified them for extraction. The damage was due to application of forces much greater than biting whilst feeding (defence training, blunt force trauma, aggression). The authors therefore conclude that if the initial tooth fracture leads to a complete crown loss, it is not advisable to restore the crown. The root should be treated endodontically and protected by the use of a glass ionomer cement (GIC), to assure the tightness for the root filler in order to prevent periapical pathology and further deterioration of the tooth, as caries and gingival inflammation have never, or only seldom, been observed in association with GIC fillings (Forsten 1998). In this way the pathological migration of the neighbouring teeth and the atrophy of the alveolar process, can be prevented; this should ensure no further occlusion problems, and help to avoid further complications such as mandible fractures caused by weakened bone. The authors are also considering further research into reconstructing canines with the use of a post with a crown part which will cover up the top of the root to ensure the ferrule effect and possibly prevent root breakage.



Fig. 6. Vertical root fracture (post missing).

References

- Bellows J (2004) Small animal dental equipment, materials and techniques. A primer, 1st ed., Blackwell Publishing, Oxford.
- Bladowski M, Kotowicz-Gears A, Wojtkiewicz J (2011) Restoration of fractured canines in ferrets after one-step root canal treatment. *Pol J Vet Sci* 14: 137-139.
- Brine EJ, Marretta ASM (1999) Endodontic treatment and metal crown restoration of a fractured maxillary right fourth premolar tooth: a case report. *J Vet Dent* 16: 159-163.
- Coffman CR, Visser L (2007) Crown restoration of the endodontically treated tooth: literature review. *J Vet Dent* 24: 9-12.
- Coffman CR, Visser L, Visser CJ (2007) Tooth preparation and impression for full metal crown restoration. *J Vet Dent* 24: 59-65.
- van Foreest A, Roeters J (1998) Evaluation of the clinical performance and effectiveness of adhesively-bonded metal crowns on damaged canine teeth of working dogs over a two- to 52-month period. *J Vet Dent* 15: 13-20.
- Forsten L (1998) Fluoride release and uptake by glass-ionomers and related materials and its clinical effect. *Biomater* 19: 503-508.
- Lipski M, Woźniak K, Lichota D, Nowicka A (2011) Root surface temperature rise of mandibular first molar during root canal filling with high-temperature thermoplasticized Gutta-Percha in the dog. *Pol J Vet Sci* 14: 591-595.
- Niemiec BA (2000) Management of a complicated fourth maxillary premolar crown-root fracture in a dog. *J Vet Dent* 17: 128-133.