A clinical case of feline crown restoration with monolithic zirconia

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ABSTRACT

Direct pulp exposure necessitates immediate extraction or root canal treatment in pets. Monolithic zirconia is used as a crown material in dentistry. In the current study, a 4-year-old female Ankara cat had a monolithic zirconia crown restored following root canal therapy. The tooth underwent root canal therapy, and preparation was done for a fixed monolithic zirconia prosthetic full crown restoration. Monolithic zirconia crowns are new, significant restorative materials that have been used rarely and little studied in veterinary dentistry despite having important material properties. Consequently, this is the first reported case of monolithic zirconia crown restoration from Türkiye, and the use of this material is strongly suggested to clinicians.

Direct pulp exposure from a fractured tooth occurs in 10% of pet animals, and it necessitates immediate extraction or root canal treatment (RCT) (1). Patients who have been exposed to dentine because of trauma from falling, being hit by cars, or fighting should have a radiograph taken to check for signs of infection, inflammation, or loss of tooth vitality (3, 9). Bacterial invasion through the dentinal tubules may result in pulpitis. The only appropriate clinical solution is immediate RCT and restoration in one visit (13). Monoblock yttrium oxide stabilized tetragonal zirconia polycrystals are widely used by clinicians in fixed crown restorations due to their biomechanical advantages, such as high mechanical properties, dimensional and chemical stability, fracture resistance, and non-toxic properties (4,5). Monolithic zirconia (MZ) ceramic is the restoration of only zirconia ceramic in one piece (6). Since it does not contain a superstructure, it has high fracture resistance (8). The aim of this study is to present the endodontic treatment of pulp exposed after trauma in pet animals and its restoration with MZ crowns.

A complicated left maxillary canine tooth fracture due to falling on a 4-year-old female cat was diagnosed. An oral and dental examination confirmed the tooth as suffering from a significant crown fracture with pulp exposure under sedation (Figure 1a). Enamel tissue loss necessitated a full crown restoration and RCT. A standard RCT was performed with complete isolation using a rubber dam under general anesthesia. The tooth was ultrasonically scaled prior to the RCT. Handheld endodontic files and rotary devices were used to clean, disinfect, and shape the root canal before sealing the pulp cavity. Sodium hypochlorite and EDTA solutions were used as lubricants and endodontic irrigants to disinfect the canal. Several files were used to remove the exposed pulp through the coronal fracture site (Figure 1b). Before and immediately after the treatment, digital radiographic images of the affected tooth were taken using the bisecting angle technique in order to determine the working length and check the final obturation (Figure 1c). The root canals were dressed after being dried with paper points. A lentulo

spiral filler was used to introduce endodontic sealer. At the 12,5 mm working length, calibrated gutta-percha points were positioned and compressed vertically without heating the compacting tool. The canal was filled consistently. Self-adhesive resin cement was used to lute the glass fiber post. The core was constructed from composite resin. The tooth was prepared following polymerization (Figure 1d). With the putty wash technique, impressions were made. A three-dimensional computer-aided design technology was used to produce the plaster model. The restoration was made from a MZ semi-sintered ceramic block using computer-aided manufacturing. Examining and making the necessary adjustments to the internal adaptation of the crown on the model, occlusal contacts, marginal fit, harmony of the external contours, and approximate surfaces. Afterwards, external B1 color staining and glaze were done. In the patient's mouth, the restoration was evaluated. The crown was cemented with self-adhesive resin cement. The restoration was exposed to the curing light for 20 seconds. Overflowing cement residues were cleaned immediately (Figure 1e). Approximately one month after the procedure, the patient returned to the referring veterinarian for a postoperative check-up. The gingiva in the area was in good health and showed no signs of inflammation. The MZ crown fit perfectly. The patient had resumed regular chewing patterns and was eating normally. About six months after the initial treatment, the patient went back to the referring vet for a conscious oral examination. The tooth and its surrounding structure healed properly. Palpation revealed no signs of pain, and the tooth remained functional. There was no swelling, movement, or fluctuation during the intraoral inspection. The marginal adaptation of crown restoration was well done. On probing, there were no signs of caries. Moreover, the restoration still has its original hue. No gingival recession occurred. The teeth of the antagonist have no wear (Figure 1f).

Canine teeth commonly encounter dentin and enamel breaking off since they are the longest and most front teeth (10). RCT is frequently used on pets to avoid tooth loss (11, 12). In this case, a complicated crown fracture was determined, and a single-session RCT was applied. Prosthodontic crowns have been recorded in client-owned animals during the past 45 years as a technique to support endodontic therapy, replace missing tooth structure, safeguard the tooth from future harm, and finally restore the patient's normal function (12, 13). Despite the fact that full metal crowns are commonly used in pets, there is limited research in the literature using MZ crowns (9, 14).

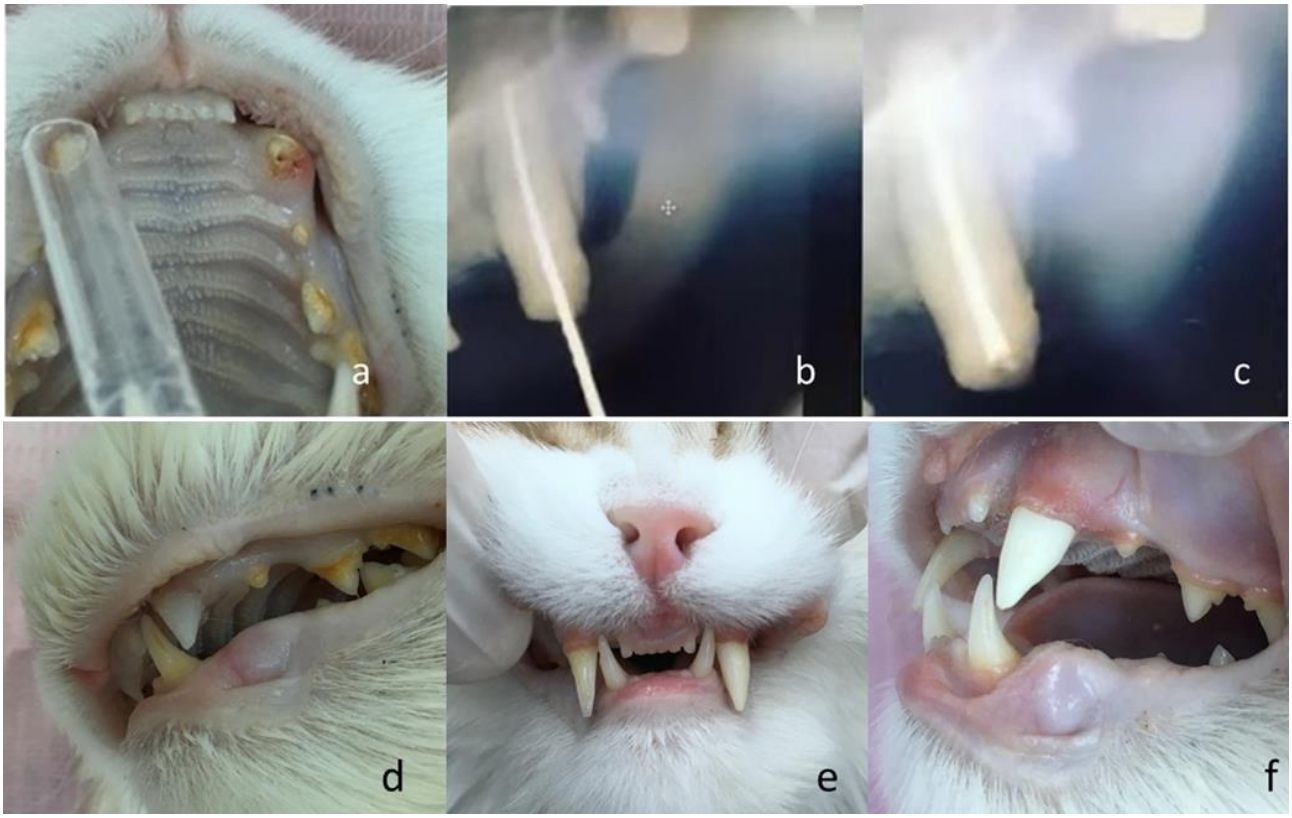

Figure 1. a: Pulp exposure of left maxillary canine tooth b: The initial file for the tooth. c: The final obturation. d: Tooth preparation for monolithic zirconia crown. e: Monolithic zirconia crown. f: Clinical appearance of six months follow-up.

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Coffman et al. (5) mentioned zirconia crowns as an as an alternative to porcelain or ceramic restorations. Ahmed et al. (2) applied two different crowns and found that apoptosis occurred less with zirconia crowns. Similar to this case, Fink et al. (7) reported two cases of tooth fractures restorated with zirconia crowns after RCT to protect teeth from further damage. After being informed of their options for care, the owners chose to proceed with a RCT and subsequent prosthetic repair. The findings of this case study lead us to the conclusion that MZ crown restorations following RCT demonstrated adequate strength and could serve as a replacement for complete metal crown restorations in animal dentistry. Further studies are needed to assess long-term efficacy and treatment success in other animal species.

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Ethical Statement

This clinical case report does not present any ethical concerns.

Conflict of Interest

The authors declared that there is no conflict of interest.

Author Contributions

Both SC and ÇC conceived and planned the study. SC and ÇC did clinical and radiographic examintion, patient's follow-up. All authors contributed to the interpretation of the results. SC took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis and manuscript.

Data Availability Statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Animal Welfare

The authors confirm that they have adhered to ARRIVE Guidelines to protect animals used for scientific purposes.

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