SHORT COMMUNICATION **(Open Access)**

# Bilateral complicated crown fractures of the maxillary fourth premolars with pulp exposure and unilateral odontogenic abscess in a geriatric dog: Short communication

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**Abstract**

Complicated crown or crown-root fractures of the canine maxillary fourth premolars are clinically important because direct pulp exposure permits bacterial contamination and may progress to pulp necrosis, periapical infection and odontogenic abscessation. A 12-year-old spayed female Jack Russell Terrier mix named Beba was presented with bilateral maxillary fourth premolar crown fractures with pulp exposure; the right-sided lesion was associated with abscess formation. Clinical oral examination demonstrated substantial loss of dental hard tissue and communication with the pulp cavity. Because of the extent of the fractures and the established right-sided infection, extraction was selected as definitive treatment. The affected multi-rooted teeth were removed, and gross examination of the extracted teeth confirmed extensive crown disruption and visible pulp-cavity openings. Postoperative follow-up at 5, 10, 30 and 90 days was favorable. At 90 days, no recurrence of the previous oral or tooth-related signs was reported. This case illustrates the progression of pulp-exposing carnassial tooth fractures to odontogenic infection and supports timely definitive dental treatment when preservation of the affected tooth is unfavorable.

**Keywords:** canine dentistry; carnassial tooth; crown fracture; odontogenic abscess; pulp exposure; tooth extraction

## 1. Introduction

The maxillary fourth premolar is a large, three-rooted carnassial tooth with an important role in canine mastication. Its position and function expose it to substantial occlusal forces, and fractures of this tooth are commonly encountered in clinical veterinary dentistry. Experimental loading of canine maxillary fourth premolars has reproduced complicated crown and complicated crown-root fracture patterns at forces within the chewing capability of dogs [4]. A complicated crown fracture exposes the dental pulp. Pulp exposure converts a structural fracture into endodontic disease. The exposed pulp is susceptible to oral bacterial contamination, inflammation, necrosis and subsequent periapical infection. Clinical consequences can include pain, bleeding from a freshly exposed pulp, local periodontal inflammation, facial swelling, draining tracts and odontogenic abscessation. Definitive treatment generally requires either endodontic therapy with appropriate restoration or extraction of the affected tooth. Successful preservation of fractured maxillary fourth premolars using combined endodontic, restorative and periodontal procedures has been described [2,3], whereas extraction remains appropriate when the fracture configuration, infection, periodontal condition or patient-related factors make preservation unfavorable.

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The objective of this report is to describe the clinical presentation, extraction and 90-day follow-up of bilateral complicated crown fractures of the maxillary fourth premolars with pulp exposure and right-sided odontogenic abscess formation in a geriatric dog.

## 2. Material and Methods

### Case Description

#### *2.1. Patient and clinical presentation*

Beba was a 12-year-old spayed female Jack Russell Terrier mix presented for evaluation of maxillary carnassial tooth disease (Fig. 1). Oral examination identified fractures affecting both maxillary fourth premolars. The fractures involved loss of crown structure extending toward the root and were associated with direct exposure of the pulp cavity. The right-sided lesion was additionally associated with abscess formation. The findings were consistent with bilateral complicated crown-root fractures, with advanced odontogenic infection on the right side.

#### *2.2. Diagnosis and treatment decision*

The diagnosis was based on the clinical oral findings and gross appearance of the fractured teeth. Because the fractures communicated with the pulp and the right-sided lesion had progressed to abscess formation, definitive treatment was indicated. Extraction was selected rather than endodontic preservation because of the extent of the crown-root disruption, the established infection and the clinical circumstances of this geriatric patient. Intraoral dental radiographs were not available for inclusion in this report; therefore, no radiographic findings are inferred.

#### *2.3. Dental extraction and gross findings*

The affected maxillary fourth premolars were both extracted. Owing to their multi-rooted anatomy and the pre-existing crown disruption, the teeth were carefully removed. After extraction, the recovered tooth material was examined macroscopically. The specimens demonstrated marked disruption of crown and root structures (Figs. 2 and 3). Distinct openings communicating with the pulp cavity were visible on the fractured dental surfaces, confirming pulp exposure (Figs. 2C and 3A-C). The extracted root components also demonstrated the characteristic multi-rooted anatomy of the maxillary fourth premolar.

#### *2.4. Postoperative follow-up*

Beba was clinically reassessed after extraction. At the 5-day follow-up, her general postoperative appearance was documented photographically (Fig. 4). Further assessments at 10, 30 and 90 days showed an uncomplicated clinical course. At each follow-up, she was reported to be doing well, with no recurrence of the previous oral or tooth-related signs. At 90 days after extraction, the owner reported no further dental problems, and Beba's general appearance was documented in Fig. 5. Thus, the favorable clinical outcome was maintained throughout the 90-day observation period.

## 3. Results and Discussion

This case illustrates the clinical progression that may follow complicated crown fracture of the canine maxillary fourth premolar. The maxillary fourth premolar is subjected to substantial masticatory forces. Soltero-Rivera et al. [4] demonstrated experimentally that complicated crown fractures and complicated crown-root fractures are readily produced in this tooth under angled compressive loading. These findings help explain the susceptibility of the carnassial tooth to clinically important fracture when dogs chew hard objects.

Direct pulp exposure is the defining feature that distinguishes a complicated fracture from an uncomplicated fracture and has immediate therapeutic implications. Once the protective enamel and dentin are disrupted and the pulp is exposed, bacterial contamination from the oral cavity can result in pulpitis, pulp necrosis and apical infection. In the present case, the right-sided abscess was clinically consistent with progression of infection beyond the exposed pulp into the surrounding tissues. The gross appearance of the extracted fragments provided direct visual documentation of communication with the pulp cavity.

Preservation of a fractured maxillary fourth premolar can be appropriate when the remaining tooth is structurally and periodontally suitable for restoration. Niemiec [2] reported successful surgical, endodontic and restorative management of a complicated maxillary fourth premolar crown fracture, with a favorable 18-month outcome. Reiter and Lewis [3] likewise described combined endodontic, restorative and periodontal management of a complicated crown-root fracture. Endodontically treated maxillary fourth

premolars remain biomechanically relevant teeth, and alternative approaches to the palatal root have been investigated experimentally [1]. These reports demonstrate that extraction is not the only treatment option.

In Beba, however, bilateral crown disruption with pulp exposure and established right-sided abscessation favored extraction as a definitive treatment. The treatment decision should not be interpreted as indicating that advanced age alone is an indication for extraction. Rather, the choice between endodontic preservation and extraction should consider fracture extent, periodontal support, infection, restorability, availability of dental imaging and endodontic expertise, anesthetic considerations, expected function and owner preferences.

The 90-day follow-up is a strength of this case because it documents a sustained favorable clinical course after definitive treatment. Nevertheless, the report has limitations. Intraoral dental radiographs, detailed periodontal measurements, standardized pain scores and the complete anesthetic and perioperative analgesic record were not available for inclusion. Consequently, the article is deliberately restricted to documented clinical observations, gross post-extraction findings and postoperative follow-up and does not infer unrecorded radiographic or perioperative findings.



**Figure 1**. Beba, a 12-year-old spayed female Jack Russell Terrier mix, the patient described in this report.



**Figure 2.** Gross appearance of extracted maxillary fourth premolar material. (A) Extracted root components demonstrating the multi-rooted anatomy. (B) Extracted fragments showing extensive crown-root disruption. (C) Close-up of a fractured crown fragment showing a distinct opening into the pulp cavity and documenting pulp exposure.



**Figure 3.** Additional gross views of extracted maxillary fourth premolar fragments. (A-C) Different orientations demonstrate irregular fracture surfaces, loss of crown substance, root components and communication with the pulp cavity.



**Figure 4**. Beba at the 5-day postoperative follow-up after extraction of the affected maxillary fourth premolars.



**Figure 5**. Beba at the 90-day follow-up after dental extraction. The clinical course remained favorable, and no recurrence of the previous oral or tooth-related signs was reported during the 90-day follow-up period.

## 4. Conclusions

Bilateral complicated crown fractures of the maxillary fourth premolars resulted in direct pulp exposure in this geriatric dog, with progression to odontogenic abscess formation on the right side. Gross examination of the extracted fragments clearly demonstrated severe crown disruption and communication with the pulp cavity. Extraction provided definitive treatment, and the postoperative course was favorable through 90 days, with no recurrence of the previous oral or tooth-related signs. Pulp-exposing carnassial tooth fractures require timely definitive treatment, with the choice between endodontic preservation and extraction based on the individual tooth, infection status and patient circumstances.

## 5. Acknowledgements

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