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CASE REPORT

Presence of a supernumerary root of the right mandibular second molar in a Staffordshire terrier: a case report

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Abstract

The presence of a supernumerary root is an uncommon dental condition in canine patients, referring to an extra root that forms in a tooth beyond the standard number of roots that are typically expected for that specific tooth. It is a developmental anomaly most commonly observed in large-breed dogs, often as an incidental finding. These supernumerary roots may result from a disruption of the Hertwig's epithelial root sheath, which is responsible for root formation. A 3-year-old Staffordshire terrier presented for a complete oral examination under general anesthesia. The initial intraoral radiographic examination revealed a suspected crown-root fracture of the right mandibular second molar tooth (410). A radiographic examination using the parallel technique, a supernumerary root was identified ruling out the suspected crown-root fracture of 410. The supernumerary root did not require treatment as it was not associated with any pathology or clinical signs. This case report highlights the importance of full-mouth intraoral radiography in the diagnosis of unusual dental conditions, such as supernumerary roots, whose presence may become clinically relevant especially if treatment of a particular tooth becomes necessary. Radiographic technique, positioning and interpretation are essential to avoid misdiagnosis and potential negative consequences for the patient as well as guiding the clinician in making appropriate treatment choices. To the best of the authors' knowledge, the presence of a supernumerary root in a mandibular second molar in a dog has not been previously reported in the veterinary dental literature.

Introduction

Developmental tooth disorders can be caused by abnormalities in the differentiation of the tooth lamina and tooth buds (Stephens et al. 1992; Verstraete et al. 1998; Goldschmidt and Hoyer 2022). They could also be caused by abnormalities in the formation of dental hard tissue, or by traumatic, chemical and microbial insults, resulting in abnormalities in the number, size, shape or anatomical structure of the teeth (Wiggs and Lobprise 1997; Pavlica et al. 2001). These developmental abnormalities are well established clinical conditions in veterinary dental pathology, particularly in dogs, where deviations from the normal number or location of teeth are the most common dental abnormalities (Evans 1993; Loic and Reiter 2018). Supernumerary teeth (additional teeth that develop beyond the normal set) are most likely to result from continued proliferation of the primary or permanent tooth lamina, forming a third tooth germ, or from disorders during tooth development (Dole and Spurgeon 1998). Supernumerary roots are may also be observed in dogs, most commonly in the maxillary second and third premolar teeth (Regezi and Sciubba 1989; Pavlica et al. 2001). Furthermore, hyponumerary roots may be seen in mandibular second premolar and molar teeth, as well as in the maxillary second, third and fourth premolar teeth (Wiggs and Lobprise 1997).

Some dental diseases may not be clinically apparent but can be detected with the aid of intraoral radiography. (Verstraete et al. 1998). Although the regular use of full-mouth intraoral radiography is well established in human dentistry (Johnson et al. 1984), it has not been regularly used in veterinary medicine until relatively recently. With advances in veterinary dentistry and the wider availability of appropriate dental radiography equipment, consideration is being given

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to whether the existing standard of care should be extended to include a full- mouth radiographic series at the initial dental evaluation (Stephens et al. 1992; Verstraete et al. 1998).

Radiographic findings without evidence of disease include developmental conditions such as supernumerary roots and root dilacerations. Other conditions such as periapical lesions (without clinical evidence of endodontic disease) and root resorption can also be seen. (Stephens et al. 1992; Verstraete et al. 1998). The diagnostic value of full-mouth radiographs in canine patients referred for dental treatment is high, and the regular use of such radiographs is justified, allowing incidental or clinically important findings to be made while complementing the clinical oral examination (Verstraete et al. 1998).

The aim of this case report is to introduce a new case to the literature of a supernumerary root of a mandibular second molar tooth in a canine patient. Furthermore, the clinical significance of different developmental disorders of the teeth, will be discussed. To the best of the authors' knowledge, the presence of a supernumerary root in a mandibular second molar in a dog has not been previously reported in veterinary dental literature.

Case presentation

A 3-year-old, 16-kg (35.2-lb), castrated male Staffordshire Terrier dog, was referred for a complete oral examination due to acute halitosis. Signs of recent hyporexia and mild lethargy were described by the owners. No other previous significant medical history was reported. General physical examination revealed a grade 3 out of 5 cardiac murmur. Echocardiography showed mild hypoplasia of the aortic annulus with a slight increase in aortic velocity, but without hemodynamic consequences, and no pharmacological treatment was required. A preanesthetic complete blood count and serum biochemical profile analysis were within their respective reference ranges.

No signs of systemic diseases were detected, and no abnormalities were noted during the conscious physical and extraorofacial examinations. On the initial conscious oral examination mild semi-localized abrasion (defined as tooth wear caused by contact of a tooth with a non-dental object), mild generalized periodontal disease, and localized severe periodontal disease including mesioversion of the right and left mandibular first incisor teeth was detected. The patient was anesthetized, and full-mouth intraoral radiographs were obtained, including two views of the right caudal mandible using the parallel technique (the film positioned parallel to the long axis of the tooth, and the x-ray beam is oriented perpendicular to both the tooth and the film), and a complete oral examination with periodontal probing and charting was also performed. The complete oral examination confirmed the initial conscious oral examination findings, and a larger crown surface area on the lingual aspect of the right mandibular second molar tooth was also noticed (Fig. 1). Tooth fractures were not detected.

During the complete oral examination, a larger crown surface area between the paraconid and talonid, including a round metaconid on the lingual aspect of the right mandibular second molar tooth was noticed (Fig. 1). An initial intraoral radiograph of the caudal aspect of the right mandible was obtained using the parallel technique, which revealed potential evidence of a crown-root fracture involving the mesial root of the second molar tooth (Fig. 2A).

In this first intraoral radiographic view, the parallel technique was applied in a slight rostrocaudal direction, resulting in crown superposition of the talonid of the first molar tooth over the paraconid of the second molar tooth, and the crown superposition of the talonid of the second molar tooth over the crown of the third molar tooth (Fig. 2A). To obtain a definitive diagnosis, a second intraoral radiograph of the caudal aspect of the right mandible was obtained in a straight parallel technique (Fig. 2B). Radiographic signs of the presence of a supernumerary root of the right mandibular second molar tooth was confirmed, and the possibility of a crown-root fracture involving the mesial root of the second molar tooth was discarded. A wider periodontal ligament space and less than 25% of horizontal alveolar bone loss (periodontal disease stage 2) mainly affecting the distal root of the second molar tooth and the third molar tooth were also detected.

Under the same general anesthetic episode, periodontal treatment including ultrasonic scaling, polishing and closed root planning was performed. Left and right inferior alveolar regional nerve blocks with mepivacaine HCl 3% (2 mg/kg [0.9 mg/lb]) and simple extraction of the left and right mandibular first incisor teeth (closed with 5−0 poliglecaprone 25 absorbable monofilament suture in a simple interrupted pattern) was performed. Due to the diagnosis of a supernumerary root of the right mandibular second molar tooth and the absence of dental pathology, no treatment was indicated.

A perioperative injection of meloxicam (0.2 mg/kg [0.09 mg/lb], SC) was administered perioperatively and the patient was recovered uneventfully from general anesthesia. Supportive treatment with meloxicam (0.1 mg/kg [0.045 mg/lb], PO, q 24 h, for 5 days) and tramadol hydrochloride (2 mg/kg [0.91 mg/lb], PO, q 12 h, for 1 day) was given to manage postoperative discomfort and a soft diet was prescribed. An alert medical progress examination was performed 14 days after surgery and the owner reported a normal appetite and no halitosis. There was no evidence

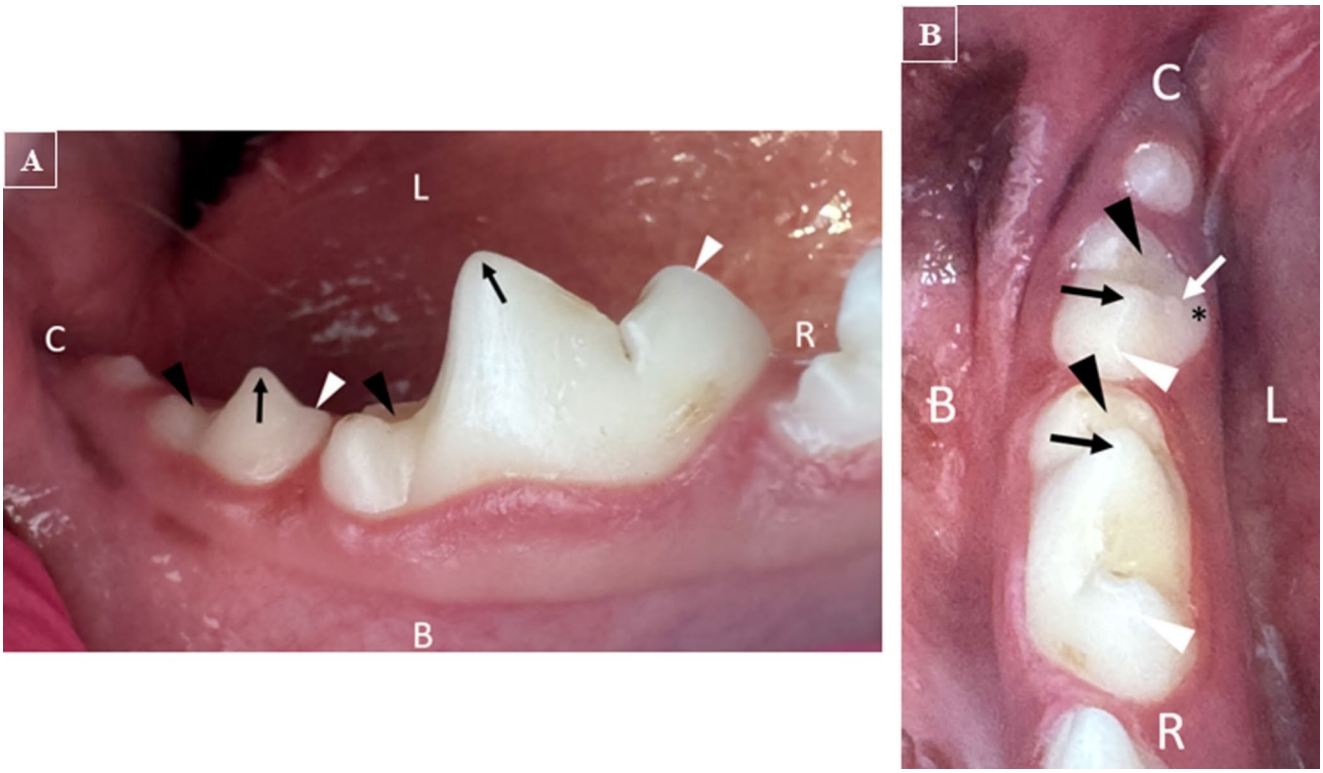

Fig. 1 Photographs of buccal (**A**) and rostro-occlusal (**B**) views of the right mandibular first, second and third molar teeth of a 3-year-old 16-kg (35.2-lb) Staffordshire Terrier dog. The photographs show the paraconid (white arrowheads) and the talonid (black arrowheads) of the first molar tooth and second molar tooth. The protoconid (black arrow) of the first molar tooth and second molar tooth is also annotated. A wider crown surface area (black asterisk) between the paraconid and talonid on the lingual aspect of the right mandibular second molar tooth was noticed; note the presence of a round metaconid in that area (white arrow). R=rostral, C=caudal, B=buccal, L=lingual

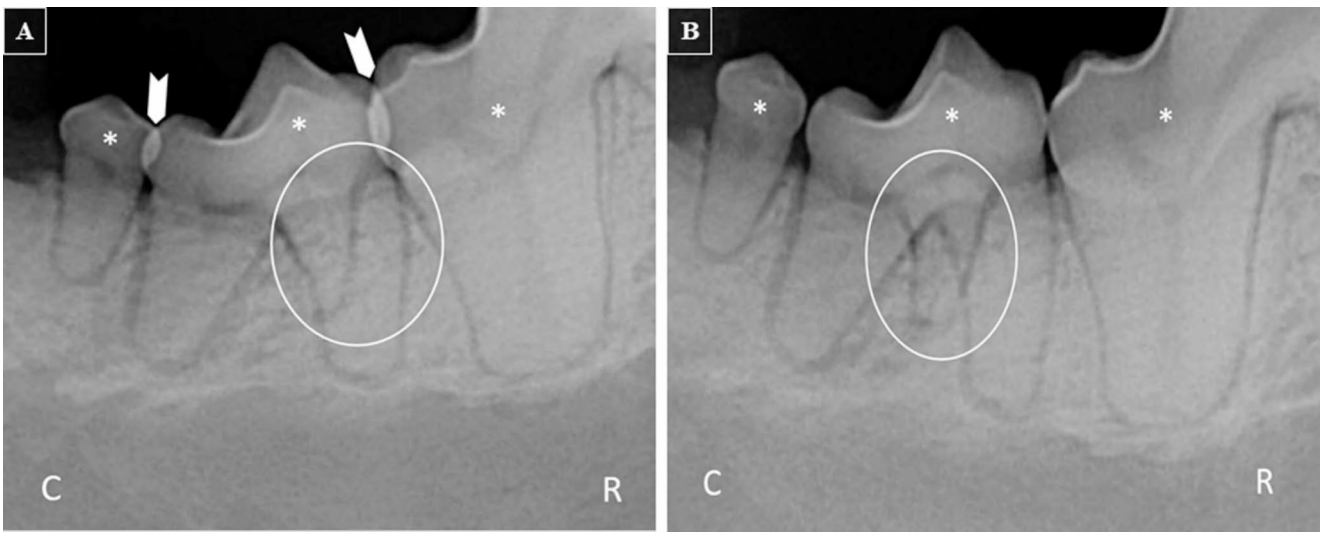

Fig. 2 Intraoral radiographic views (**A** and **B**) of the caudal aspect of the right mandible including the distal part of the first molar tooth, second molar tooth and third molar tooth of the same dog as in Fig. 1. The images were obtained with a parallel technique. The distal part of the first molar tooth, second molar tooth and third molar tooth are indicated (white asterisks). The first radiographic view (**A**) was obtained with a parallel technique in a slight rostrocaudal direction; note the crown superposition of the talonid of the first molar tooth over the paraconid of the second molar tooth, and the crown superposition of the talonid of the second molar tooth over the crown of the third molar tooth (white forked thick arrows). Radiographic signs compatible with a crown-root fracture involving the mesial root of the second molar tooth (white circled line) were initially suspected but was later ruled out by obtaining an accessory radiographic view with a straight parallel technique (**B**); radiographic signs of a supernumerary root of the right mandibular second molar tooth (white circled line) was confirmed. R = rostral, C = caudal

of pain or discomfort, and the surgical site was completely healed.

Discussion

The present case report describes the value of diagnostic imaging in cases where clinically abnormal dental anatomy is noticed. This report highlights that appropriate radiographic positioning and technique as well as taking any necessary accessory radiographs can play an important role in the diagnosis of this uncommon canine dental phenomenon, guiding the clinician to appropriate treatment options when indicated.

Full-mouth intraoral radiography is essential in evaluating unusual dental structures (Bannon 2013). One study showed that radiographic imaging of teeth in areas without clinically evident dental disease revealed incidental findings in 41.7% of dogs, and clinically important lesions in 27.8% (Verstraete et al. 1998). Another study reported that abnormal radiographic findings were noticed in 29.6% of the teeth evaluated (Kim et al. 2013). These findings which are not noticed on clinical oral examination but detected radiographically, are not just frequent in older dogs (Bannon 2013; Kim et al. 2013), but also in younger dogs as evidenced in the case of the dog in this report. Therefore, a radiographic evaluation should be performed to obtain important information for making an accurate diagnosis (Verstraete et al. 1998; Bannon 2013; Kim et al. 2013). Furthermore, correct intraoral dental radiography positioning techniques in different regions of the oral cavity to obtain adequate diagnostic views should be performed.

A supernumerary root refers to the presence of an extra root. This developmental condition occurs due to alterations of Hertwig's epithelial root sheath which has been shown to be present in humans and veterinary patients alike (Kannan et al. 2002; Taneja and Jain 2020).

To the best of the authors' knowledge, there is no article that clarifies the prevalence of the number of supernumerary roots present in the different teeth of various dog breeds. While there are other studies that mention the incidental detection of a supernumerary root through radiographic imaging, these findings are not extensively discussed (Pavlica et al. 2001; Verstraete et al. 1998). There is only one study that described an incidence of 11.1%, highlighting that this condition is more prevalent in large breed dogs (21.9%), followed by medium (6.0%) and small (2.5%) breed dogs (Verstraete et al. 1998). This condition can be detected on any multirooted tooth as in this case, but most commonly affects the permanent maxillary third premolar tooth followed by the mandibular fourth premolar tooth in dogs (Regezi and Sciubba 1989; Verstraete et al. 1998; DuPont and DeBowes 2009; Loic and Reiter 2018; Goldschmidt and Hoyer 2022). One study reported this finding in 18 teeth of the 627 dogs evaluated; the supernumerary roots were mainly found on the mandibular and maxillary third premolar teeth and although there were no significant differences, supernumerary roots were found mainly in large mesaticephalic breeds, followed by large brachycephalic breeds and small mesaticephalic breeds (Pavlica et al. 2001). There are no articles showing a correlation between abnormal crown shape and the presence of supernumerary roots, which further emphasizes the diagnostic value of dental radiography in these cases. The presence of a supernumerary root in a canine second molar has not been previously reported in the veterinary dental literature. However, it has been documented in the human dental literature (Alghali et al. 2024; Aydin et al. 2001). Additionally, some studies in humans have demonstrated an association between crown morphology and the presence of a supernumerary root. In people the occurrence of a supernumerary root was found to be linked to a wider mesiodistal dimension and an increase in the buccolingual diameter of the crown (Alghali et al. 2024).

Supernumerary roots generally do not cause a problem on their own and are usually an incidental finding. However, they should be taken into consideration when exodontic or endodontic therapy is indicated in an affected tooth (Loic and Reiter 2018). Therefore, it is imperative to obtain dental radiographs prior to any dental or oral surgical procedure (Loic and Reiter 2018).

The main differential diagnoses in the present case included crown-root fracture, root fracture, odontodysplasia, presence of radicular groves, presence of persistent deciduous teeth and ectopic supernumerary teeth. When necessary, dental radiographs taken in various projections and orientations as discussed should be obtained to determinate the correct diagnosis.

In conclusion, the case described in the present report involved the presence of a supernumerary root of the mandibular second molar tooth of a dog. This is an atypical presentation of this developmental condition and highlights the importance of dental radiography to make a definitive diagnosis. Further studies evaluating root abnormalities identified through dental radiographs are crucial in veterinary dentistry.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Animal ethics The owner has provided consent for the necessary surgical intervention at the Veterinary Hospital Veterios and for the publication of his pet's data. No approval of research ethics committees was required.

Consent to participate A written inform consent was signed by the owners of the patients.

Consent to publish Not applicable.

Competing interests The authors declare no competing interests.

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