



Supernumerary maxillary fourth premolar teeth in five related Burmese cats

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Abstract

Case series summary This article reports a case series of five Burmese cats with supernumerary teeth. All included cases displayed either unilateral or bilateral supernumerary maxillary fourth premolar teeth. Two cases also displayed supernumerary mandibular fourth premolar teeth, and in one case bilateral supernumerary maxillary third incisor teeth were found. Examination of the pedigrees of the affected cats revealed that all five cats were related with one common ancestor. All patients in this case series were successfully treated.

Relevance and novel information Supernumerary maxillary fourth premolar teeth in cats have not been reported previously in the literature. As all five cats in this case series were shown to be related, supernumerary maxillary fourth premolar teeth may be yet another heritable health condition affecting the Burmese breed. Therefore, Burmese breeders should endeavour to reduce the incidence of supernumerary teeth within the breed by having animals examined by a veterinary dentist prior to breeding, and neutering affected, as well as related, individuals. Burmese cat owners must be made aware of the condition in order to institute early evaluation, diagnosis and treatment.

Keywords: Supernumerary teeth; hyperodontia; Burmese; supernumerary maxillary fourth premolar teeth; supernumerary premolars

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Introduction

In 1930, a walnut-brown female cat, named Wong Mau, was imported from Burma (present day Myanmar) into the USA by Dr Joseph Cheeseman Thompson. Wong Mau was bred to a seal-point Siamese, Tai Mau. This breeding produced two distinct colourations in the kittens; some resembled their seal-point Siamese sire, while others resembled their walnut-brown dam. Through this, Thompson and his associates concluded that Wong Mau was, in fact, a hybrid of the Siamese and the ‘copper cat’ of Burma. When the brown kittens were bred back with Wong Mau or with each other, solid dark-chocolate-brown kittens were produced. These cats were considered the most attractive and formed the foundation of the Burmese breed.¹ This new breed was first registered with The Cat Fanciers’ Association in 1936. In order to increase the Burmese gene pool, Siamese cats were initially included in breeding programmes; however, this resulted in suspension of registration in 1947. Once the practice of outcrossing was eliminated, registrations resumed in 1953.²

The Burmese is now one of the most genetically inbred cat populations worldwide,³ and has been over-represented in a number of conditions, including fronto-nasal dysplasia (Burmese head defect), feline orofacial pain syndrome,⁴ hypokalaemic polymyopathy,⁵ diabetes mellitus,^{6,7} cutaneous asthenia,⁸ endocardial fibroelastosis,⁹ primary glaucoma¹⁰ and GM2 gangliosidosis.¹¹ Genetic tests are available for GM2 gangliosidosis,¹¹ Burmese hypokalaemia⁵ and Burmese head defect.³ These genetic tests allow rapid diagnosis and treatment of affected kittens and the identification of carrier cats, which can then be excluded from the breeding

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population. Successful reduction in the incidence of any hereditary condition depends on the education of breeders and owners.³

This article reports a case series of five related Burmese cats with supernumerary teeth resulting in oral pathology requiring treatment. Supernumerary teeth, or hyperodontia, is a dental anomaly characterised by the presence of an excessive number of teeth in relation to the normal dental formula.¹² The domestic cat (*Felis catus*) normally has a total of 30 teeth with the dental formula:¹³

$$2 \times I \frac{3}{3}, C \frac{1}{1}, PM \frac{3}{2}, M \frac{1}{1} = 30$$

Supernumerary teeth have been documented in domestic and wild felids. These include supernumerary maxillary incisor, second premolar and third premolar teeth, mandibular fourth premolar teeth, as well as conically shaped teeth situated rostral to mandibular third premolar teeth and caudal to mandibular molar teeth.^{13–18} However, no record of feline supernumerary maxillary fourth premolar teeth and no breed-specific predisposition for hyperodontia within domestic cats could be found in an electronic search of the literature.

Case series description

Five client-owned purebred Burmese cats with supernumerary premolar teeth were presented to Cape Animal Dentistry Service (CADS), Cape Town, South Africa, from April 2017 to May 2019. Informed consent was obtained from the pet owners and general anaesthesia was performed using established anaesthetic protocols. Detailed oral and dental examinations were performed using a periodontal probe and explorer, and the findings were recorded on a feline dental chart. Intra-oral radiographs were then acquired and the findings combined with those from the oral examination to formulate a diagnosis. Before any oral surgery was performed, regional nerve blocks (ie, maxillary

and/or inferior alveolar nerve blocks) were performed using lidocaine (Lignocaine injection 2%; Bayer) as per previously described techniques. When closure of the surgical sites was indicated, 5/0 poliglecaprone 25 (Monocryl; Ethicon) suture material with a 16 mm 3/8c Prime reverse cutting needle was used. Appropriate postoperative analgesia was provided for each patient using meloxicam (Petcam; Cipla) and/or buprenorphine (Temgesic; Merck). All owners were instructed to feed a soft diet for the first 7 days postoperatively. The owners were contacted by telephone 1 day after surgery and a follow-up oral examination was performed 1 week after surgery. All patients recovered uneventfully and the presenting clinical signs resolved in each case.

The dental terminology used in this study includes the anatomical descriptive names of teeth, according to the Nomina Anatomica Veterinaria,¹⁹ as well as the modified Triadan system²⁰ (Table 1). Definitions and abbreviations of veterinary dental terms used, according to the American Veterinary Dental College,²¹ are included in Table 2.

Case 1

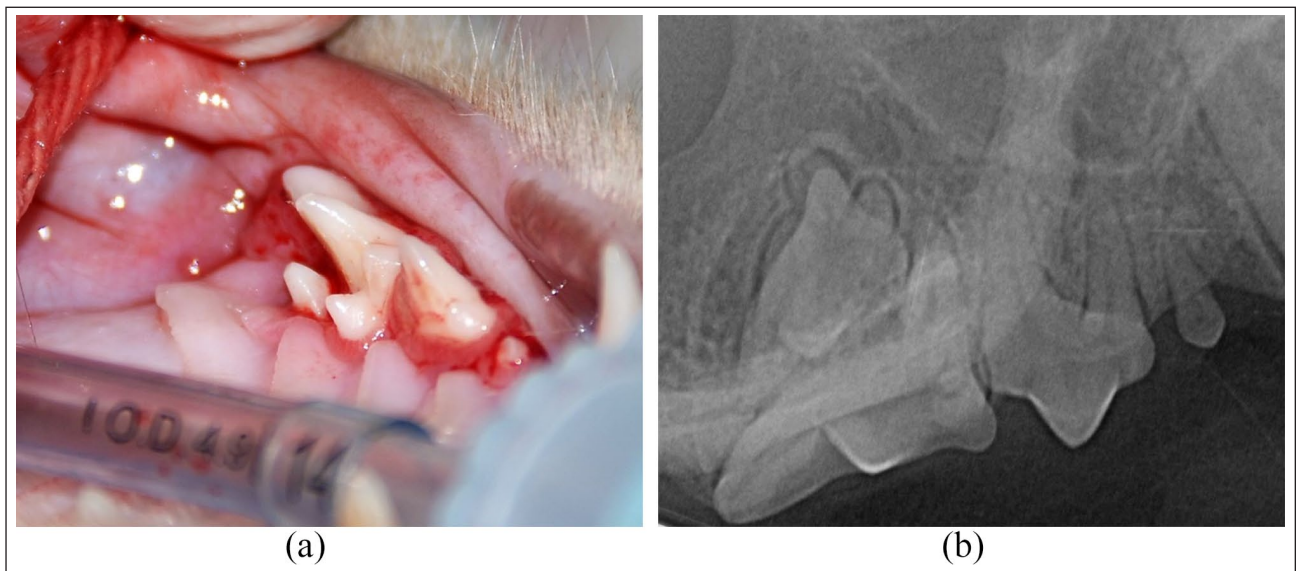
A 19-month-old spayed female Burmese had recently been treated for epiphora. During that clinical examination, the referring veterinarian noticed moderate gingivitis and calculus accumulation. On referral to CADS, bilateral supernumerary (SN) maxillary fourth premolar teeth were diagnosed (Figure 1), with associated stage 3 periodontal disease (PD3). SN 108 and SN 208 were positioned palatal to the normal maxillary fourth premolar teeth. The supernumerary teeth were orientated in the same manner as the normal teeth; that is, the mesiobuccal and distobuccal roots were buccally situated and the mesiopalatal root, palatally situated (Figure 1b). PD3 was also diagnosed at 206, 209, 302, 401 and 402, and tooth resorption (TR) at 309 and 409. Closed extraction of 206, 209, 302, 401 and 402 was performed, without elevating a

Table 1 Dental terminology using the descriptive names of teeth, according to the Nomina Anatomica Veterinaria,¹⁹ as well as the Modified Triadan nomenclature system²⁰

Tooth	Right	Left	Tooth	Left	Right
Maxilla			Mandible		
First incisor tooth (I1)	101	201	First incisor tooth (I1)	301	401
Second incisor tooth (I2)	102	202	Second incisor tooth (I2)	302	402
Third incisor tooth (I3)	103	203	Third incisor tooth (I3)	303	403
Canine tooth (C)	104	204	Canine tooth (C)	304	404
Second premolar tooth (PM2)	106	206			
Third premolar tooth (PM3)	107	207	Third premolar tooth (PM3)	307	407
Fourth premolar tooth (PM4)	108	208	Fourth premolar tooth (PM4)	308	408
Molar tooth (M)	109	209	Molar tooth (M)	309	409

Table 2 American Veterinary Dental College definitions and abbreviations for dental terminology used²¹

Term	Abbreviation	Definition
Supernumerary tooth	SN	Presence of an extra tooth
Periodontal disease stage 0	PD0	Clinically normal
Periodontal disease stage 1	PD1	Gingivitis only (without attachment loss)
Periodontal disease stage 2	PD2	Early periodontitis (<25% attachment loss)
Periodontal disease stage 3	PD3	Moderate periodontitis (25–50% attachment loss)
Periodontal disease stage 4	PD4	Advanced periodontitis (>50% attachment loss)
Tooth resorption	TR	Resorption of dental hard tissue
Class 1 malocclusion Neutroclusion (dental malocclusion)	MAL1	A normal rostrocaudal relationship of the maxillary and mandibular dental arches with malposition of one or more individual teeth

**Figure 1** (a) Oral photograph and (b) intra-oral radiograph of a supernumerary right maxillary fourth premolar tooth in case 1**Figure 2** Extracted bilateral supernumerary maxillary fourth premolar teeth from case 1 (top row) and case 2 (bottom row)

mucogingival flap, while open extractions were performed on SN 108, SN 208, 309 and 409 (Figure 2), by elevating a mucogingival flap. The SN 108 and SN 208 surgical sites were not sutured closed and were allowed to heal by second intention.

Case 2

A 19-month-old spayed female Burmese, a littermate of case 1, was presented with a primary complaint of halitosis. Both cats were fed a raw diet and had not shown any changes in eating behaviour. Oral examination revealed bilateral supernumerary maxillary fourth premolar teeth and a supernumerary left mandibular fourth premolar tooth (SN 108, SN 208, SN 308), with associated PD3 and moderate generalised gingivitis. The supernumerary maxillary fourth premolar teeth were also situated palatal to their normal counterparts (Figure 3), while SN 308 was moderately rotated and situated between 308 and 309 (Figure 4). PD3 was also diagnosed at 209. Tooth 209 was extracted using the closed extraction technique, and SN 108, SN 208 and SN 308 were extracted using the open extraction technique (Figure 5).

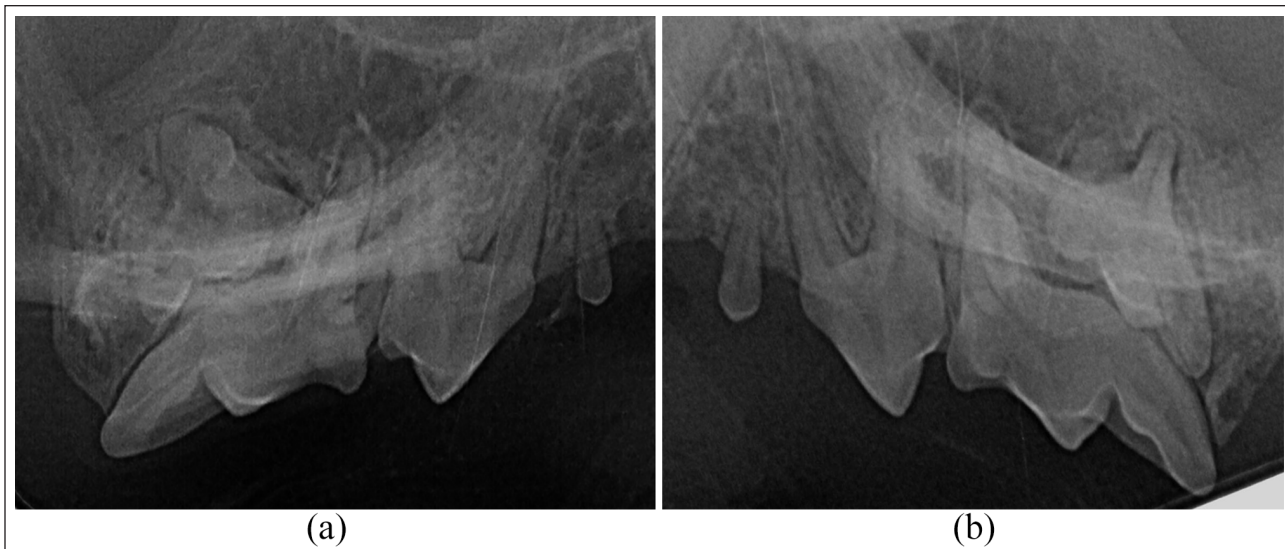


Figure 3 Preoperative intra-oral radiographs of the (a) supernumerary right maxillary fourth premolar tooth and (b) supernumerary left maxillary fourth premolar tooth in case 2

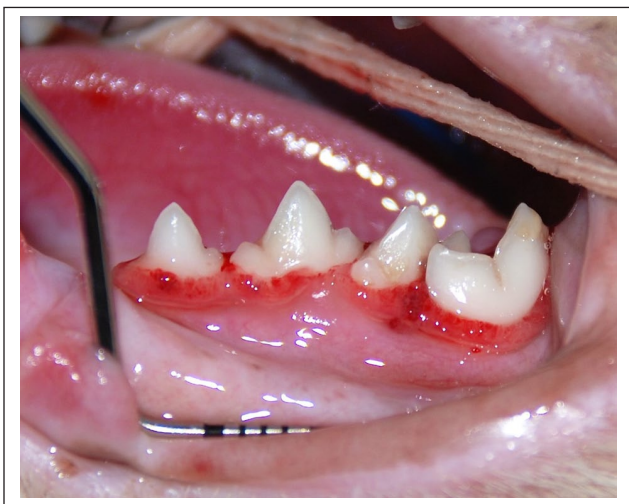


Figure 4 Supernumerary left mandibular fourth premolar tooth situated between 308 and 309 in case 2



Figure 5 Postoperative intra-oral radiograph, following extraction of the supernumerary right maxillary fourth premolar tooth in case 2

The SN 108, SN 208 and 209 extraction sites were allowed to heal by second intention (Figure 6).

Case 3

A 6-year-old castrated male Burmese was presented as the referring veterinarian had noted supernumerary teeth on oral examination. On referral, SN 108, SN 308 and SN 408 were confirmed. The SN 408 was shown to have a supernumerary third root on radiographs. The supernumerary root was slender and situated between the mesial and distal roots (Figure 7). The SN 108 was positioned palatal to the normal 108 (Figure 8) and the SN 308 and SN 408 were positioned lingual to the normal mandibular fourth premolar and molar teeth, causing moderate rotation of the adjacent normal mandibular teeth; 108, 109, SN 108, SN 308 and SN 408 were affected

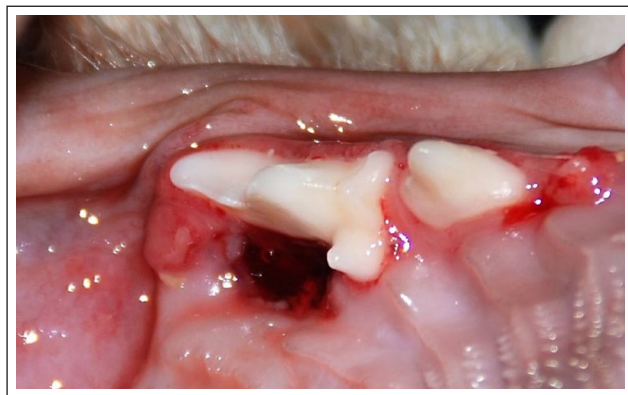


Figure 6 Extraction site of the supernumerary right maxillary fourth premolar tooth in case 2, which was allowed to heal by second intention

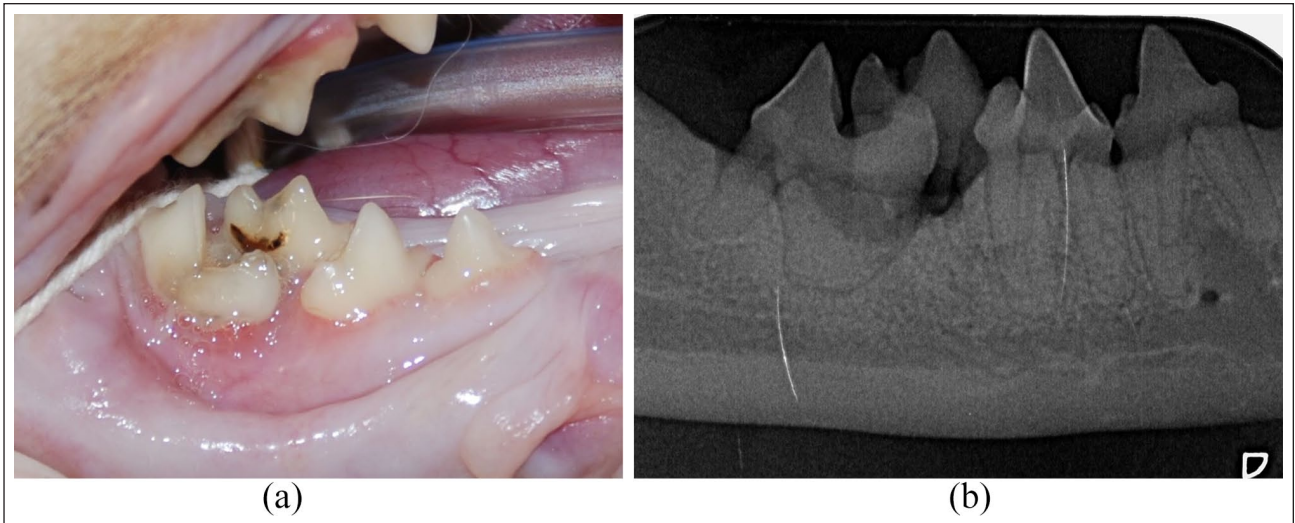


Figure 7 (a) Oral photograph and (b) intra-oral radiograph of a supernumerary right mandibular fourth premolar tooth (SN 408) in case 3. Note the marked horizontal and vertical bone loss at 409 and SN 408, as well as the slender supernumerary root at SN 408

by PD3. Closed extraction was performed at 109. The open extraction technique was used for the extraction of SN 108, SN 308, SN 408 and 108.

Case 4

A 16-month-old spayed female Burmese was referred, because, since it was a kitten, its jaws would frequently lock closed while eating. The cat was fed both dry kibble and canned food. Bilateral supernumerary maxillary fourth premolar teeth, palatal to the normal maxillary fourth premolar teeth (Figure 9), had resulted in a bilateral class one malocclusion. Buccoversion of both mandibular molar teeth had occurred (Figure 10), with these

teeth occluding laterally with the maxillary fourth premolar teeth (Figure 11). Supernumerary maxillary third incisor teeth were also diagnosed (Figure 9). These teeth were not causing crowding and were deemed to be stable; therefore, they were not extracted. In order to relieve the jaw locking, both supernumerary maxillary fourth premolar teeth and both mandibular molar teeth were extracted using the open extraction technique. At the



Figure 8 A supernumerary right maxillary fourth premolar tooth in case 3



Figure 9 Dorsoventral intra-oral radiograph of bilateral supernumerary maxillary fourth premolar and third incisor teeth in case 4, referred for closed jaw locking



Figure 10 Bilateral buccovercion of the mandibular molar teeth in case 4, referred for closed jaw locking



Figure 11 A class one malocclusion in case 4, referred for closed jaw locking. This is also termed a caudal cross-bite

follow-up examination the owner stated that the cat's jaws no longer locked while eating.

Case 5

An 8-year-old spayed female Burmese displayed sudden onset clinical signs of pawing at its face, mildly traumatising its left lip. On oral examination, an SN 208 was found palatal to the normal left maxillary fourth premolar tooth (Figure 12). The supernumerary tooth was situated in a reverse and mirror position to the normal 208, so that the distal root was positioned mesially, the mesio-palatal root positioned palatodistally and the mesio-buccal root positioned adjacent to the normal 208 distal root. PD3 was diagnosed at 108, 109 and 208, and TR of 309. Closed extraction was performed at 109. The SN 208, as

well as 108, 208 and 309, were extracted using the open extraction technique. The SN 208 extraction site was allowed to heal by second intention. The owner stated at the follow-up consultation that the cat did not paw at its face again after the surgery

Discussion

In this case series, supernumerary maxillary fourth premolar teeth, mandibular fourth premolar teeth and maxillary third incisor teeth were diagnosed in pure-bred Burmese cats (Table 3). Of particular interest are the supernumerary maxillary fourth premolar teeth, as these supernumerary teeth have, to our knowledge, not been previously described in cats.

Supernumerary teeth may present with variations in morphology, including fused or partially fused roots, as seen in Figure 2. The aetiology of hyperodontia is not yet fully understood,²² but is most likely multifactorial with an interplay of genetic, developmental and environmental factors.²³ The observed teeth were not as a result of cleavage of a single tooth germ (gemination/twinning), as this would result in an additional tooth that is the mirror image of the original tooth.²⁴ In cases 1–4 of this series, the supernumerary maxillary fourth premolar teeth were positioned palatal to the normal maxillary fourth premolar teeth but in the normal orientation. In case 5, the supernumerary tooth was a mirror image of the normal tooth but in the reverse orientation. Supernumerary teeth may develop from continued proliferation of the dental lamina, resulting in the formation of extra tooth buds.^{22,25} A hereditary influence on the development of supernumerary teeth is suspected in humans as family clustering is often observed,²⁶ and a higher prevalence is seen in patients with some developmental disorders.¹⁶ In some canine breeds (boxers, bulldogs), a predisposition for supernumerary teeth has been reported.²⁷

Examination of the pedigrees of the cats included in this case series revealed that all five cats shared one common ancestor, a Burmese breeding male in Australia, from which several offspring were imported to South Africa. The relationship of the treated cats to the identified ancestor ranged from great-grandsire to great-great-great-grandsire. This suggests the heritability of supernumerary premolar teeth in Burmese cats. Without sufficient genealogical information, it is not possible to determine the precise mechanism of inheritance (dominant vs recessive). However, it is highly probable that the gene or genes involved are autosomal rather than sex-linked, as both male and female cats were affected in this case series.⁷

Supernumerary teeth are clinically significant and warrant early diagnosis, as they may precipitate a number of complications including disturbed eruption or impaction of normal teeth, tooth rotation, overcrowding, malocclusion, cystic lesions and resorption of adjacent teeth.^{23,26,28} A thorough oral examination under general

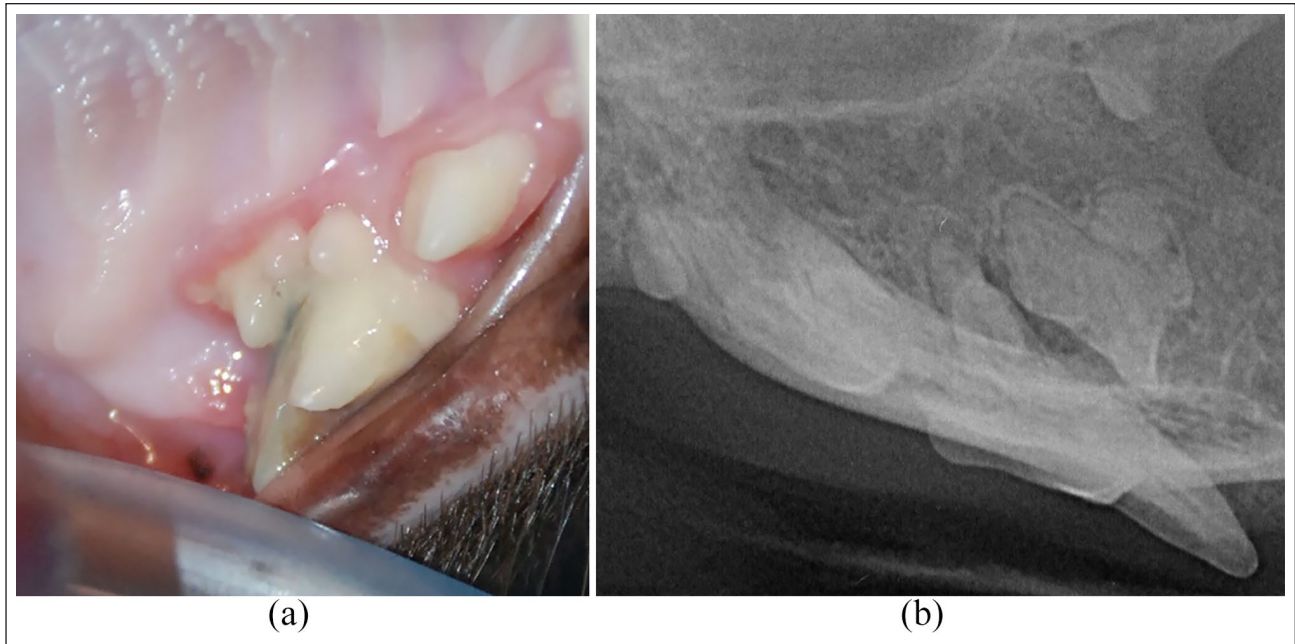


Figure 12 (a) Oral photograph and (b) intra-oral radiograph of a supernumerary left maxillary fourth premolar tooth in case 5. The mesiopalatal root of SN 208 is positioned distopalatal in case 5 compared with mesiopalatal in cases 1–4

Table 3 Summary of supernumerary teeth diagnosed in five related Burmese cats

Case	Supernumerary teeth diagnosed
Case 1	SN 108, SN 208
Case 2	SN 108, SN 208, SN 308
Case 3	SN 108, SN 308, SN 408
Case 4	SN 108, SN 208, SN 103, SN 203
Case 5	SN 208

anaesthesia and full-mouth radiography are invaluable to diagnose supernumerary teeth in feline patients and to determine the appropriate treatment, which depends on the position and possible complications the supernumerary teeth may cause.²² If the hyperodontia is not causing a hinderance to eruption, overcrowding or malocclusion, treatment may not be necessary. However, if the supernumerary teeth have or are likely to cause oral pathology, they should be extracted as soon as possible, taking care not to damage blood vessels, nerves or adjacent tooth roots.²²

Conclusions

South African Burmese breeders should endeavour to reduce the incidence of supernumerary premolar teeth within the breed by having animals examined by a veterinary dentist prior to breeding, and neutering affected,

as well as related, individuals. Owners must also be made aware of the possibility and significance of hyperodontia in order to institute early evaluation, diagnosis and treatment.

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Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval This work involved the use of non-experimental animals only (including owned or unowned animals and data from prospective or retrospective studies). Established internationally recognised high standards ('best practice') of individual veterinary clinical patient care were followed. Ethical approval from a committee was therefore not necessarily required.

Informed consent Informed consent (either verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (either experimental or non-experimental animals) for the procedure(s) undertaken (either prospective or retrospective studies). For any animals or humans individually identifiable within this publication,

informed consent (either verbal or written) for their use in the publication was obtained from the people involved.

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