

Cystic compound odontoma in a dog: Diagnosis and management

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Abstract: Tumour of the oral cavity is a rare condition in young animals. The most frequent are odontomas – locally invasive tumours with no metastatic potential. The article describes a case report of 4-month-old male puppy diagnosed with mandibular odontoma with cystic appearance. Authors present clinical features, histopathological examination of odontoma and the surgical management using deep curettage and hydroxyapatite granules deposition. Odontomas can form bone cyst-like structure padded with membrane forming denticles. A deep curettage is acceptable method of treatment but should be supplied with hydroxyapatite deposition if the cyst is present.

Keywords: dental radiography; histopathology; hydroxyapatite; oral tumour; teeth

The most common dental problems in young dogs include retained deciduous teeth, unerupted permanent teeth, dentigerous cyst or malocclusion (Verhaert 2007). Less common in immature animals are tumours of the oral cavity.

In domestic animals odontomas are the most common odontogenic tumours though they are still rarely reported. Horses is the most frequently affected species (Munday et al. 2017) There are few cases of compound odontomas in dogs (Hale and Wilcock 1996; Eickhoff et al. 2002; Felizzola et al. 2003; Papadimitriou et al. 2005; Sowers and Gengler 2005; Klima and Goldstein 2007; Hoyer et al. 2016).

The paper aims at describing a diagnosis and treatment in a case of a 15-week-old dog presenting with cystic compound odontoma.

Case report

A 15-week-old male Schweizer Laufhund was admitted to Veterinary Dentistry and Orthodontics Centre due to swelling of the right mandible. The owners noticed the swelling suddenly few days earlier. The dog showed slightly diminished appetite and pain of affected area during feeding.

During clinical examination a visible swelling of the caudal region of the right mandible was noticed (Figure 1). The bone was covered with mucous membrane. A small ulceration was visible behind 4th primary premolar (808). The 4th premolar tooth (808) was relocated rostrally.

An intra-oral radiography was done in ventro-dorsal and oblique 45-degree projections using iM3 Revolution 4DC device (iM3[®], Vancouver,



Figure 1. Clinical examination of the dog
A visible deformation of the caudal aspect of right mandible (arrows) with small ulceration of mucous membrane (*) caudally to premolar deciduous teeth. The 4th premolar deciduous tooth (808) is dislocated rostrally

WA, USA) and CR 7 Vet Image Plate X-ray scanner (iM3[®], Vancouver, WA, USA). Due to changes in mandibular structure, it was difficult to take proper X-ray images showing the whole bone. A radiolucent cyst spanning from mandibular angle to rostro-ventral portion of mandible with germ of 409 tooth and a shadowing spiky mass over the

409 germ were revealed (Figure 2). An initial diagnosis of dentigerous cyst was made.

Due to the young age of the dog and unfinished growth of the maxilla and mandible, an opening and deep curettage of the cyst with the removal of the excessive bone was recommended.

The surgery was done under general anaesthesia. The dog was sedated using medetomidine [0.02 mg/kg intramuscularly (i.m.)] and butorphanol (0.1 mg/kg i.m.). Induction was performed using diazepam [0.15 mg/kg intravenously (i.v.)] and ketamine (3 mg/kg i.v.) with propofol [1 mg/kg i.v. bolus followed by 0.5 mg/kg/h constant rate infusion (CRI)] used in conduction. Analgetic therapy included preemptive administration of meloxicam [0.2 mg/kg subcutaneously (s.c.)] and maropitant (1 mg/kg i.v.) and local administration of lignocaine (0.3 ml of 1% solution) in the proximity of the mandibular nerve.

After the detachment of mucous membrane, the bone was incised. A cyst filled with amorphous soft tissues and serosanguineous fluid was revealed (Figure 3). All soft tissues and fluid were evacuated. The 409 tooth germ was extracted (Figure 4). The deep curettage exposed that the cyst was padded with membrane containing multiple small hard whitish spikes. An accurate curettage was difficult due to the extent of the cyst. The excessive bone was removed, the bone cyst was filled with HA Biocer granules (Chema-Elektromet, Rzeszów, Poland) and mucous membrane was sutured using resorbable 4-0 suture (Safil Braun, Melsungen, Germany).

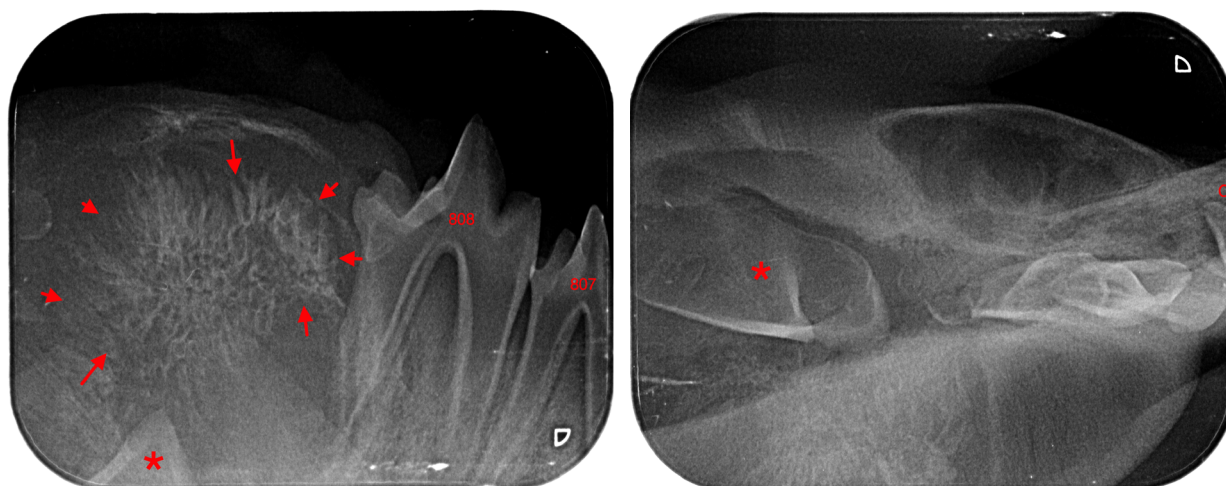


Figure 2. Radiography of the affected bone

The mass presents as a bone cyst filled with radiolucent substance and small spiky-shaped structures (arrows). The germ of 409 tooth is visible deeply in the bone (*). The cyst ranges from mandible angle rostrally to canine tooth (C). 807, 808 – deciduous premolar teeth

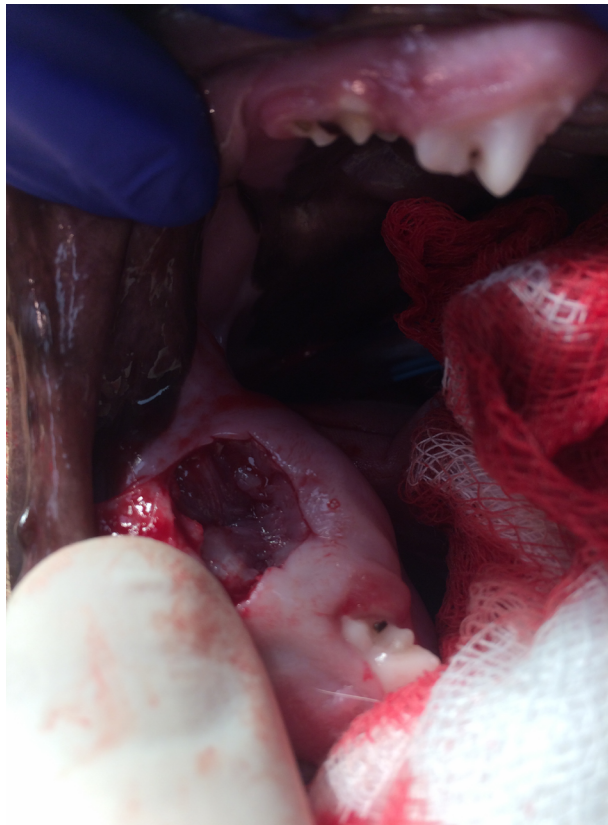


Figure 3. Surgical management of the cyst. Mucous membrane and bone detachment showed a cyst filled with amorphous soft tissues and serosanguineous fluid

The owners were recommended to administer meloxicam (0.1 mg/kg s.i.d. orally for 7 days), clindamycin (11 mg/kg s.i.d. orally for 10 days) and feed the dog with soft food for two weeks.

The tissue collected during the surgery was fixed in 7% buffered formalin solution for 24 h, decalcified with MoL-DECALCIFIER (Milestone, USA), embedded in paraffin blocks and cut at 6 µm sections. The histopathological examination of the spiky membrane was done using standard haematoxylin-eosin stain and Masson-Goldner stain. The examination showed multiple small well-formed tooth-like structures and denticles. They were scattered within the matrix formed by connective tissue with cords of odontogenic epithelium. The histopathological examination was followed by immunohistochemistry using monoclonal mouse anti-vimentin clone Vim 3B4 [dilution $\times 100$ (Dako; Denmark)] and monoclonal mouse anti-human cytokeratin clone MNF 116 [dilution $\times 75$; (Dako; Denmark)] antibodies. Bond enzyme pre-treatment kit (Leica Biosystems, Germany), was used for enzymatic digestion on formalin-fixed, paraffin-embedded tissue



Figure 4. The extracted well-formed 409 tooth germ

sections. Primary antibody binding to tissue sections was visualized using Bond Polymer Refine Detection system (Leica Biosystems, Germany). The immunohistochemical examination confirmed chords of epithelium scattered within mesenchymal matrix (Figure 5). A final diagnosis of compound odontoma with cystic appearance was made.

A check-up after one month revealed a recurrence of right mandibular swelling with hyperplasia and ulceration of mucous membrane over the lesion. The resurgery was done under general anaesthesia performed as previously. A serosanguineous fluid was evacuated. A deep curettage was repeated, and the excessive bone was removed. The cyst was filled with HA Biocer granules and Surgispon® collagen sponge. The mucous membrane was sutured using unabsorbable 4-0 suture (Safil Braun, Melsungen, Germany).

A clinical checkup after a week showed good healing of the affected jaw. The dog showed normal appetite and no signs of pain. The same was declared by the owners on the phone checkup after a month.

Unfortunately, the owners decided to sell the dog and no further follow-up was possible.

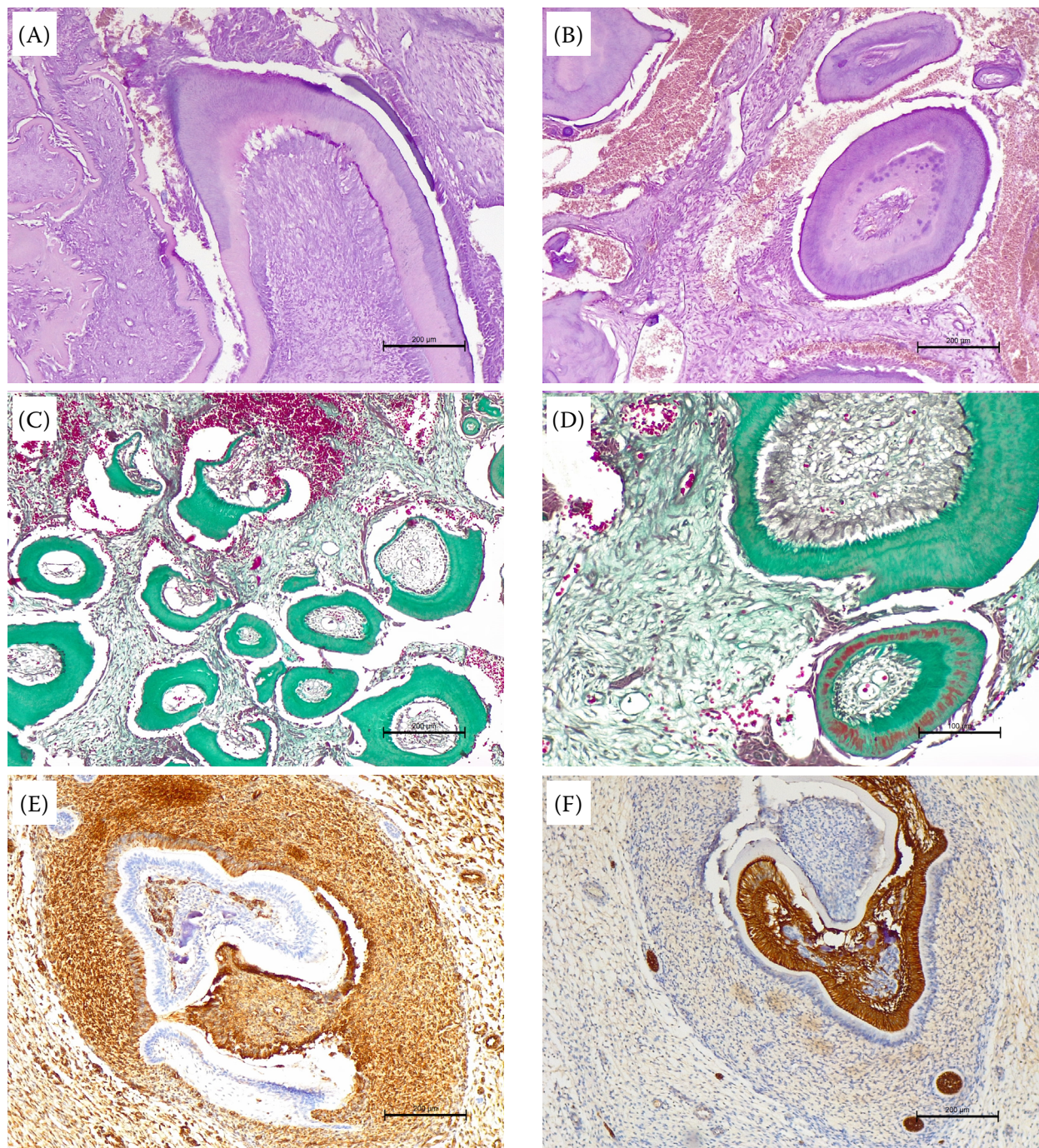


Figure 5. Histopathological examination of the mandibular tumour

(A–D) Well-formed spiky or round denticles scattered within the vascularised cellular fibrous connective tissue matrix. All compounds of growing teeth are visible. (A–B) Haematoxylin-eosin; $\times 100$ magnification (scale bar = 200 μm). (C–D) Masson-Goldner trichrome; (C) $\times 100$ magnification (scale bar = 200 μm); (D) 200 \times magnification (scale bar = 100 μm). (E) Vimentin expression (brown) in the connective tissue matrix surrounding denticles; $\times 100$ magnification (scale bar = 200 μm). (F) Cytokeratin expression in epithelium (brown); $\times 100$ magnification (scale bar = 200 μm)

DISCUSSION

Compound odontoma is defined as a mass lesion of the jaw characterised by the presence of nu-

merous fully differentiated, although abnormally shaped, tooth-like structures (denticles) originating from within the mass. In this type of tumour, the complete odontogenesis occurs within the ma-

trix formed by the dense, collagenous, and vascular connective tissue with cords of odontogenic epithelium (Head et al. 2003; Papadimitriou et al. 2005; Ostermeier 2007; Hoyer et al. 2016; Munday et al. 2017). It should be distinguished from complex odontoma which is a mass lesion with fully differentiated dental components (dentin, enamel matrix and odontogenic epithelium resembling the enamel organ) that does not form tooth-like structures (Head et al. 2003). Some authors suggest both complex and compound odontomas should be classified rather as a hamartomas than as a neoplastic lesions (Head et al. 2003; Ostermeier 2007).

The tumour is recognised in young dogs less than 12 months old in both mandible or maxilla (Eickhoff et al. 2002; Head et al. 2003; Papadimitriou et al. 2005; Sowers and Gengler 2005; Klima and Goldstein 2007; Walker et al. 2009; Hoyer et al. 2016; Munday et al. 2017). The lesion is mostly a single tumour but in exceptional cases more than one tumours can occur in one animal (Eickhoff et al. 2002; Ostermeier 2007). The tumour can be occasionally close to an unerupted tooth (Papadimitriou et al. 2005; Klima and Goldstein 2007; Walker et al. 2009; Munday et al. 2017).

The patient history includes mostly facial swelling. A depressed appetite, signs of pain, sneezing, one-eye epiphora (in case of maxillary tumours) can also be noticed by the owners. Clinical examination shows deformation of the affected bone and in some cases ulceration of mucous membrane (Papadimitriou et al. 2005; Sowers and Gengler 2005; Klima and Goldstein 2007; Ostermeier 2007; Walker et al. 2009; Hoyer et al. 2016). The history and clinical signs of presented case were similar to the ones described in the literature, although the disease developed rapidly.

On radiography odontomas present as radiodense tooth-like structures that may be surrounded by radiolucent zones (Eickhoff et al. 2002; Ostermeier 2007; Walker et al. 2009; Munday et al. 2017). In the presented case the tooth-like structures were visible within a large bone cyst filled with radiolucent fluid accompanied by 409 tooth germ. The presence of bone cyst is not typical for this type of tumour. The unusual appearance of the tumour could be a result of the presence of numerous small denticles surrounding the unerupted 409 tooth, similarly to the evolution of dentigerous cyst. In the latter the presence of fluid is a consequence of retaining of odontogenic epithelium (Head et al. 2003).

The tumour is locally destructive and can cause teeth displacement but has no metastatic potential and should be treated by adequate excision including either a deep curettage, mass removal or maxillectomy/mandibulectomy (Head et al. 2003; Ostermeier 2007; Munday et al. 2017). The treatment method depends on various factors including the age of the animal, the extent of the lesion and the owners' consent. Both extensive curettage and maxillectomy or mandibulectomy result in good healing and prevent recurrence (Hale and Wilcock 1996; Eickhoff et al. 2002; Felizzola et al. 2003; Papadimitriou et al. 2005; Hoyer et al. 2016). In the presented case, due to the young age of the dog, a decision of curettage was made. Due to the extension of bone cyst, the deep curettage was supplemented with deposition of granules of hydroxyapatite and collagen sponge to bring the healing on.

In conclusion, odontomas, although have no metastatic potential, can be a cause of prominent bone deformation and pain. The choice of treatment method depends on various factors including the lesion extent, form and character and the animals' age.

In cases showing a bone cyst additionally to the tumour, a bone-replacement material should be deposited in the bone cyst. In complex cases, the healing can be prolonged and require resurgery.

Conflict of interest

The authors declare no conflict of interest.

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