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CASE REPORT

Companion or pet animals

Curative-intent minimal ostectomy for canine oral osteoma

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Abstract

Two dogs were referred for the investigation and treatment of incidentally identified oral osteomas. Recurrence following incomplete excision of osteoma is likely, and traditionally, the recommended treatment is surgical excision with 2 cm margins. Both dogs underwent surgical excision with a minimum 1 mm margin using a high-speed bur. This novel surgical approach allowed complete excision while preserving functionality and normal appearance in both dogs. No complications were reported, and no recurrence was observed in the subsequent 24 months. Marginal ostectomy should be considered as a surgical option for benign osteoma of the mandible and maxilla with the possibility of curative-intent resection, minimising morbidity, simplifying surgery and preserving cosmesis.

BACKGROUND

Osteomas are benign expansile bone tumours rarely reported in dogs that are thought to have low metastatic potential.¹ They are slow-growing, firm masses generally affecting the skull and possibly arising through intramembranous ossification.² Osteomas in people are subclassified on the basis of location and tissue origin, but this categorisation is not established in dogs.³ Clinical signs are infrequently seen but correlate with the size and location of the osteoma. Typically, inflammation of the mass causes discomfort. It is suggested that local recurrence following incomplete excision is likely, and the reported gold standard treatment is removal with up to 2 cm margins.^{4,5} Here, the authors describe the clinical presentation, diagnosis and histopathology of a mandibular and a maxillary osteoma treated with minimal ostectomy in two dogs using a high-speed burr and curettage, with no associated complications and no recurrence to date.

CASE PRESENTATION

Case 1

A 15-month-old, neutered, male Rottweiler had a 1.2 cm discrete firm mass, incidentally identified on the buccal aspect of the mandible at the level of the right mandibular third premolar tooth. The patient was uncomfortable on direct palpation of the mass, but otherwise normal on examination. There was no evidence of periodontal disease. Dental radiographs were performed by the referring veterinarian, which showed

no periapical bone lysis or tooth root disruption. Complete biochemical and haematological analyses were unremarkable. The dog was referred for further investigation and treatment.

Case 2

An 18-month-old, neutered, female old English sheepdog had two maxillary masses incidentally identified: a 2.4 cm mass located on the buccal aspect of the right maxillary canine tooth and a 1.2 cm mass located buccally between the right maxillary third incisor and the canine tooth. The larger mass was excised at the level of the gingiva by the referring veterinarian and diagnosed as osteoma on histopathology. It recurred within 4 weeks.

INVESTIGATIONS

Case 1

Clinical examination confirmed the features of the mandibular mass, but was otherwise unremarkable. Computed tomography (CT) images of the head were attained under sedation using a 64-row multidetector CT scanner (Somatom Definition AS Siemens, Erlangen, Germany). Images were obtained before and after administration of iodinated non-ionic contrast medium (Iopamidol-Niopam 350, Bracco UK, High Wycombe, UK) injected intravenously at a dose of 2 ml/kg. The injection of contrast medium was followed by the injection of 10 ml saline solution. CT images showed a solid,

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well-circumscribed, mineral-dense mass (mean 1046 HU), measuring approximately 1 × 0.6 cm arising from the middle mental foramen of the mandible, on the distal aspect of the right mandibular third premolar tooth and on the mesial aspect of the right mandibular fourth premolar tooth, invading the mandibular canal. There was an associated mild increase in mandibular canal attenuation, but no soft tissue swelling and no contrast enhancement of the tissues surrounding the lesion (Figure 1). Jamshidi needle bone biopsies were taken, and osteoma was not fully conclusive. Treatment options included monitoring for progression, palliative treatment with non-steroidal anti-inflammatories (NSAIDs) on the basis of a single case report that showed complete resolution with NSAIDs only, or proceeding with surgical excision (including minimal ostectomy or wider margins).⁶ The dog's owners elected for minimal ostectomy to minimise morbidity and reach a definitive diagnosis.

Case 2

Clinical examination confirmed the features of the maxillary masses, but was otherwise unremarkable. Complete biochemical and haematological analyses were also unremarkable. A CT scan was performed, as per Case 1, which revealed a solid, well-circumscribed, round mineral-dense maxillary mass lesion (mean 1346 HU) on the buccal aspect between the right maxillary third incisor tooth and the right maxillary canine tooth, invading the infraorbital canal (Figure 2). A second irregular, mineral-dense mass (mean 1228 HU) was visible extending along the distal aspect of the right maxillary canine tooth. The lesions were proliferative with no destructive component. There was no soft tissue swelling and no evidence of contrast enhancement. Mild retropharyngeal and submandibular lymphadenopathy consistent with the young age of the patient was present. Treatment options were given as in Case 1, and the owners again consented to surgery with a preference for minimal ostectomy.

TREATMENT

Case 1

The dog was premedicated with methadone (0.2 mg/kg; Comfortan, Dechra) and dexmedetomidine (5 µg/kg; Dexdomitor, Zoetis) intravenously and then induced with propofol (PropoFlo, Abbot). The dog was intubated, and anaesthesia was maintained with isoflurane and oxygen. The patient was surgically prepared and positioned in left lateral recumbency. The oral mucosa was incised immediately over the mass, and a Freer periosteal elevator was used to separate the gingiva from the underlying mandible circumferentially around the mass. A high-speed air-powered burr was used to remove a 1 mm margin of bone on the mandibular body, circumferentially around the mass (Figure 3). A Volkmann spoon was used to lift the mass from the mandibular canal. The mandibular artery was ligated and transected, and the mandibular nerve was sharply transected following perineural injection of bupivacaine (Marcaine 0.5%; Pfizer). The remainder of the mandibular body and the lingual mandibular body

LEARNING POINTS/TAKE-HOME MESSAGES

- Firm, bony lesions on the mandible or maxilla in dogs may be benign osteomas.
- Minimal ostectomy may be a curative treatment for benign bone lesions/tumours.
- Minimal ostectomy has lower morbidity than maxillectomy/mandibulectomy.

were preserved. The roots of the right mandibular third premolar tooth and the right mandibular fourth premolar tooth were preserved. The gingiva was closed in two layers: a simple continuous mucoperiosteal layer using 3-0 poliglecaprone 25 (Monocryl; Ethicon) and a continuous gingival layer using 3-0 coated polyglactin 910 (Vicryl; Ethicon). Excised tissue was submitted for histopathology. The dog received methadone (0.2 mg/kg) intravenously every 4 hours for three doses, meloxicam (0.2 mg/kg; Metacam, Bayer) intravenously as a single dose and then 0.1 mg/kg orally (per os [PO]) once daily for 5 days postoperatively and paracetamol (400 mg) and Codeine (9 mg; Pardale V; Dechra) PO every 8 hours for 5 days postoperatively.

Histopathological analysis revealed an exophytic neoplasm extending from the mandibular bone. It was primarily composed of lamellar bone, with intertrabecular spaces lined by a layer of osteoblasts containing loose connective tissue. The periphery was dominated by spindle cells interpreted as a reactive process in the surrounding soft tissues. A final diagnosis of a completely excised osteoma was made (Figure 4).

Case 2

The dog was premedicated with methadone (0.2 mg/kg; Comfortan, Dechra) and acepromazine (0.03 mg/kg; ACP injection, Novartis) intravenously and then induced with propofol (PropoFlo, Abbot). The dog was intubated, and anaesthesia maintained with isoflurane and oxygen. The patient was surgically prepared and positioned in left lateral recumbency. The oral mucosa was incised over the masses collectively, and the gingiva was elevated, as in Case 1. An air-powered burr was used to create a maxillary bone osteotomy, approximately 1 mm surrounding the mass and right maxillary canine tooth, on the dorsal aspect and the ventral aspect of the mass. A sagittal saw (DrillSaw mini 300TM, Arthrex) was then used to complete the ostectomy of the maxillary bone in a rostro-caudal fashion. The section of bone containing the mass and right maxillary canine tooth was lifted away. The distal tip of the right maxillary canine tooth was transected during the ostectomy and then removed with a dental elevator. A rasp was used to smooth the sharp bone edges. The oral mucosa was closed into two layers: a simple continuous mucoperiosteal layer using 3-0 poliglecaprone 25 (Monocryl; Ethicon) and a gingival layer of cruciate sutures using 3-0 coated polyglactin 910 (Vicryl; Ethicon). Excised tissue was submitted for histopathology. Postoperative analgesia was provided as in Case 1.

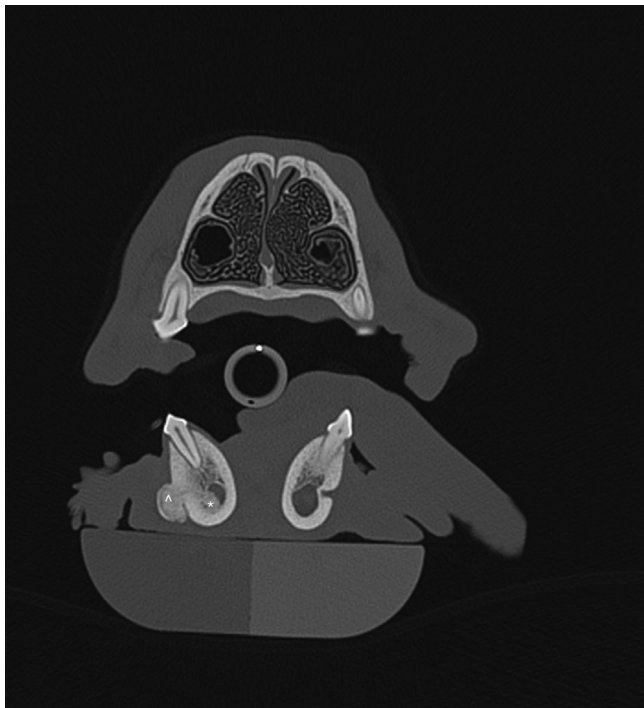


FIGURE 1 Transverse three-dimensional computed tomography image reconstruction of the muzzle at the level of the bony lesion (^) showing mandibular canal invasion (*)

Histopathology confirmed a completely excised osteoma. The mass was lined superficially by osteoblasts with a thin rim of spindloid cells. It consisted predominantly of trabeculae of woven and lamellar bone, which merged with the pre-existing bone at the caudal, and narrowest, margin of 1 mm. The spindle cells did not exhibit criteria of malignancy (Figure 5).

OUTCOME AND FOLLOW-UP

Both dogs ate soft food in the evening following surgery. No wound dehiscence or short-term complications were recorded in either case at the 10–14-day veterinarian follow-up.

In both cases, the referring veterinarian and owner follow-up confirmed no gross recurrence or complications within 24 months postoperatively. Although offered, repeat CT imaging was declined in both cases, as there were no abnormal clinical findings that would support the use of sedation or general anaesthesia.

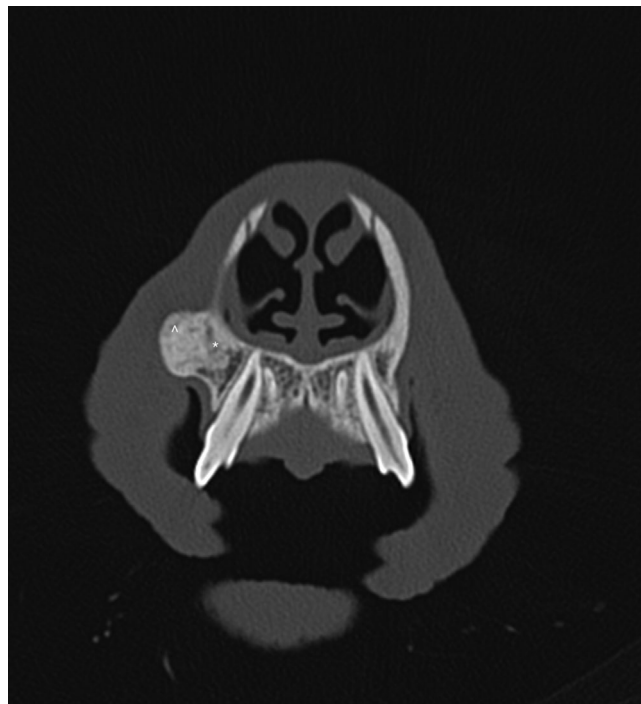


FIGURE 2 Transverse three-dimensional computed tomography image reconstruction of the muzzle at the level of the bony lesion (^) showing maxillary invasion (*)

DISCUSSION

To the authors' knowledge, this is the first report describing the treatment of osteoma using marginal ostectomy in small animals. No complications were reported, and no evidence of recurrence was noted in the medium- to long-term (24 months) using a lower morbidity surgery than segmental or complete mandibulectomy/maxillectomy, with excellent cosmetic and functional outcomes.

Osteomas are the most commonly diagnosed primary bone tumour in humans, but are rarely reported in domestic animals. Osteoma has only been reported in the skull in dogs, but rare cases affecting the clavicle and patella have been reported in humans.^{7,8} Distinguishing between benign and malignant lesions or exostoses and osteomas on radiography is often not possible.⁹ CT of skull masses in our cases defined the precise anatomical location and extent of the masses and facilitated surgical planning.¹⁰ The findings of highly circumscribed, mineral-opaque proliferative bony masses on CT were highly suggestive of benign osteoma, but biopsies were

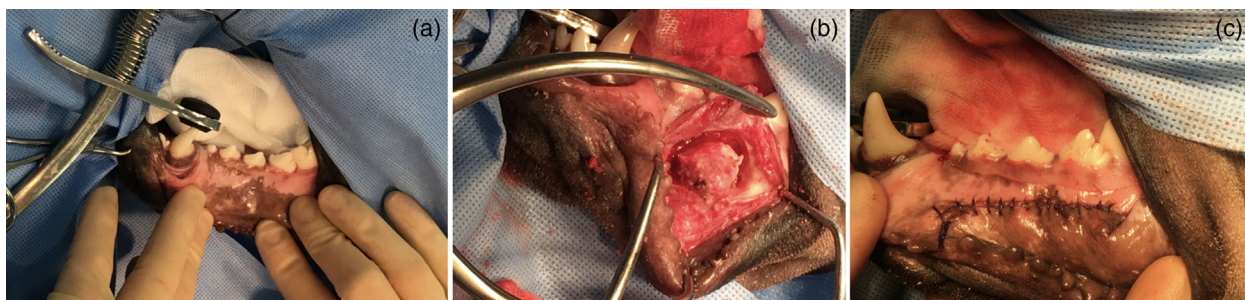


FIGURE 3 Intraoperative images showing (a) osteoma in situ before surgical resection; (b) osteoma in situ (^) with gingiva elevated and circumferential ostectomy; and (c) immediate postoperative appearance

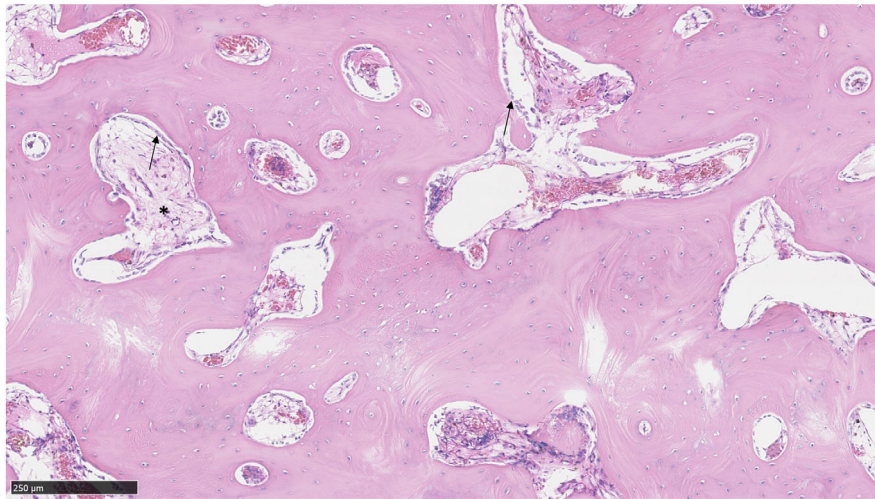


FIGURE 4 Centre of the mass. Trabeculae of lamellar bone lined by osteoblasts (arrows), intertrabecular spaces filled with loose connective tissue (*) (haematoxylin and eosin stain, $\times 100$)

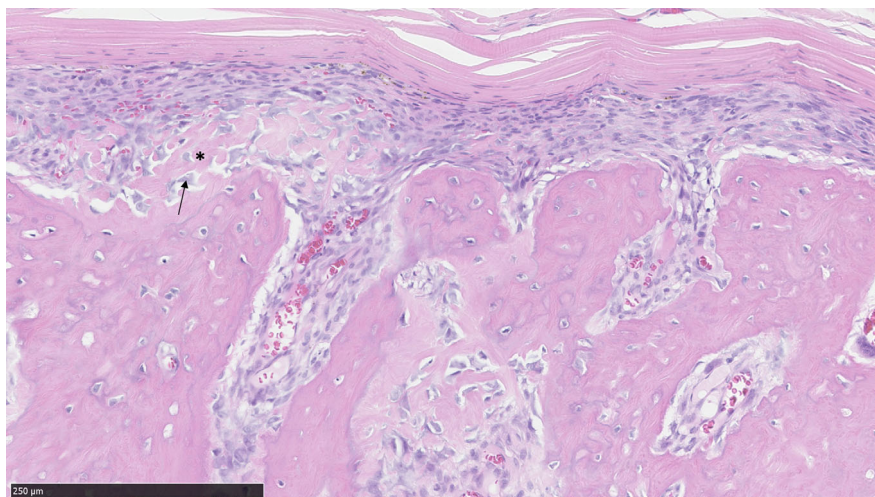


FIGURE 5 Periphery of the neoplasm. Trabeculae of woven bone, well demarcated by a rim of spindle cells. Osteoblasts (arrow) are producing osteoid (*) at the advancing margin (haematoxylin and eosin stain, $\times 200$)

also performed, with the aim of concluding the diagnosis preoperatively, avoiding inadvertent incomplete or narrow excision of a malignant mass.¹¹ Despite the biopsy in Case 1 not being definitive, the owner elected for a minimal osteotomy, knowing the risks of incorrect diagnosis.

Eight dogs have been described in clinical reports of osteoma. Collectively, the reports describe older dogs (median age 6 years; range 3–13 years) of medium–large breeds (median weight 34 kg; range 10–41 kg). Two cases were treated with maxillectomy, two were marginally excised, two were debulked and two (orbital and nasal) were treated with non-steroidal anti-inflammatories.^{5,6,12} A histological review describing the features of bone lesions has also been published. This paper reports additional five cases of canine osteoma. They confirmed that two cases were treated palliatively, and three cases had a partial maxillectomy or zygomectomy (wide excision), with the surgical cases showing a response to treatment at the 18-month follow-up.¹³ These authors suggested that the gold standard treatment is excision with 2 cm clear margins, often necessitating mandibulectomy or maxillectomy.

A recent, large retrospective review of curative-intent surgery for oral tumours in 234 dogs found an overall complication rate of 16%, with dehiscence being the most common problem.¹⁴ Specific complications of maxillectomy include dehiscence seen in 11%–33% of cases, oronasal fistula, severe intraoperative haemorrhage (53%), requiring transfusion in 42% of dogs, postoperative haemorrhage, infections and subcutaneous emphysema.^{15–17} Complications of mandibulectomy can occur in approximately 20% of dogs and include haemorrhage, prehension dysfunction, ranula, medial drift, tongue lag, excessive drooling and dehiscence.¹⁸ Most dogs experience varying degrees of instability and malocclusion.¹⁹ Pet owners may be reluctant to pursue mandibulectomy/maxillectomy due to concerns regarding the cosmesis and functionality, although 117 owners rated the outcome as good to excellent in 87% of cases.^{14,20} In the dogs we report, a marginal excision option was an attractive alternative to wide resection while providing an equivalent long-term prognosis and maintaining functionality and appearance. It must be noted that the use of air-insufflation surgical devices (i.e., high-speed burs) is controversial, although still

commonly used, in oral and maxillofacial surgery due to the potential for marginal osteonecrosis and possible hindrance of regeneration and healing.²¹ An alternative can be to use a selective and more precise tool (e.g., a piezoelectric burr) to perform a possibly cleaner ostectomy in future cases.²²

A single case report describes the successful treatment of a palpable orbital osteoma using Carprofen (2.2 mg/kg, PO) four times daily for 4 weeks, reduced to twice daily for an additional 15 months. Sixteen months later, there was complete resolution of the palpable mass, but imaging was not repeated at this stage. Based on this single dog, the use of NSAIDs as a treatment in non-surgical cases should be considered, but it may be unsuccessful. Palliative treatment using NSAIDs has been described in another dog, but long-term treatment has not been described.⁶ It is also worth noting that a retrospective report describes seven cats with oral and maxillofacial osteoma. In this report, four cats were treated with wide excision, and two of these cats were euthanased due to an unacceptable quality of life following surgery. This leads to the question of whether marginal excision may be utilised in cats with this presentation with an improved quality of life due to improved functionality.²³

Our case report describes a successful minimal surgical approach for cases of benign mandibular and maxillary osteomas with narrow marginal excision and good medium- to long-term outcomes. An air-powered burr facilitated the minimal ostectomy while preserving normal appearance, minimising haemorrhage and having no effect on maxillary/mandibular integrity and stability. Minimal ostectomy should be considered for excision of mandibular and maxillary osteomas as an alternative to wide excision by maxillectomy or mandibulectomy.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

ETHICS STATEMENT

The authors declare that the patients involved in the case report had been treated according to the authors' best clinical judgement and knowledge.

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AUTHOR CONTRIBUTIONS

All authors contributed equally to this case report. JH and JLT conceived and performed the treatment, and AM provided histopathological input and images. JLT constructed, edited and formatted the manuscript. JH participated in the critical review of the manuscript.

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