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Therapeutic and diagnostic approach to craniofacial osteoma in a dog: A case report

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ABSTRACT

Osteoma is a bone neoplasm that can affect dogs of any age, often underdiagnosed due to its low incidence and slow growth. The aim of this study was to discuss a case of craniofacial osteoma in a Shih-Tzu bitch, highlighting the importance of proper diagnosis and treatment of this condition. In this case, the patient presented with a rigid mass near the left eye, which was evaluated radiographically and diagnosed histopathologically after complete excision of the tumor. No signs of recurrence were observed during follow-up, demonstrating the effectiveness of the surgical treatment. The main findings of the case include an osteoproliferative reaction observed in the radiograph and well-differentiated fibrogranulomatous and osseous proliferation observed in the histopathology. The treatment consisted of complete surgical resection, and no postoperative complications were observed. The patient showed rapid recovery and absence of postoperative pain. It is concluded that osteoma is a benign neoplasm treatable with complete surgical resection, without the need for adjuvant chemotherapy. The study emphasizes the importance of considering osteoma as a differential diagnosis among bone neoplasms in dogs.

Keywords: Bone neoplasm; histopathology; immunohistochemistry; tumor excision; surgery

INTRODUCTION

Osteoma is a benign bone neoplasm frequently found in the head region, which does not invade or destroy adjacent bones (Weisbrode, 1998). It is a well-differentiated tumor composed of mature bone tissue with a predominance of lamellar structures, exhibiting slow growth and restricted to the skull and mandible (Misdorp; Van Der Heul, 1976). Primary neoplasms of cranial bones are rare, with osteosarcoma being the most common, followed by fibrosarcoma, chondrosarcoma, and lastly, osteoma (Canola, Medeiros, Canola, 2016).

The etiology of osteoma is not well understood (Santos et al., 2012), but in humans, it may be associated with infections, trauma, hormonal influences, or genetic factors (Rebouças et al., 2014). In humans, osteoid osteoma is the third most common benign bone tumor (Goksel et al., 2019). Cases of cutaneous osteoma, although rare in dogs and humans, are classified as heterotopic ossification of the skin, defined as a benign cutaneous bone neoplasm (Woo et al., 2019).

Radiography is a valuable tool for assessing the aggressiveness and location of cranial bone neoplasms. Although it does not precisely determine tumor extent, it is widely used in veterinary medicine in the absence of computed tomography (Pavelski; Silva; Froes, 2016). Radiographically, osteoma appears as a dense, circumscribed mass (Canola; Medeiros; Canola, 2016). Radiographic differential diagnoses include chondroma, odontoma, condensing osteitis, osteosclerosis, peripheral odontogenic

fibroma, osteochondroma, mandibular exostosis, and fracture callus, among others (Volker; Luskin, 2014).

Histopathologically, osteoma is composed of mature and well-differentiated bone (Soltero-Rivera et al., 2015), presenting as a multilobulated lesion composed of dense, coalescent trabeculae of well-differentiated bone covered by osteogenic cells (Galiazzo et al., 2017). These lesions are covered by a thin layer of bone and composed of spongy bone with trabeculae lined by well-differentiated osteoblasts, along with delicate fibrous tissue, adipocytes, and hematopoietic tissue interspersed in the intertrabecular spaces (Weisbrode, 1998).

This study aims to report a case of craniofacial osteoma in a dog, detailing the clinical, radiographic, and histopathological findings, as well as the therapeutic approach used.

CASE REPORT

A four-year-old brown Shih-Tzu bitch was presented at the Pulo do Gato Veterinary Clinic in Uberaba, MG. The patient had a rigid, non-mobile mass (20 x 21 x 23 mm) located approximately one centimeter caudal to the left eye and adjacent to the zygomatic bone (Figure 1A). The owner reported that the mass had grown slowly over a year, with accelerated growth in the two months prior to the consultation.

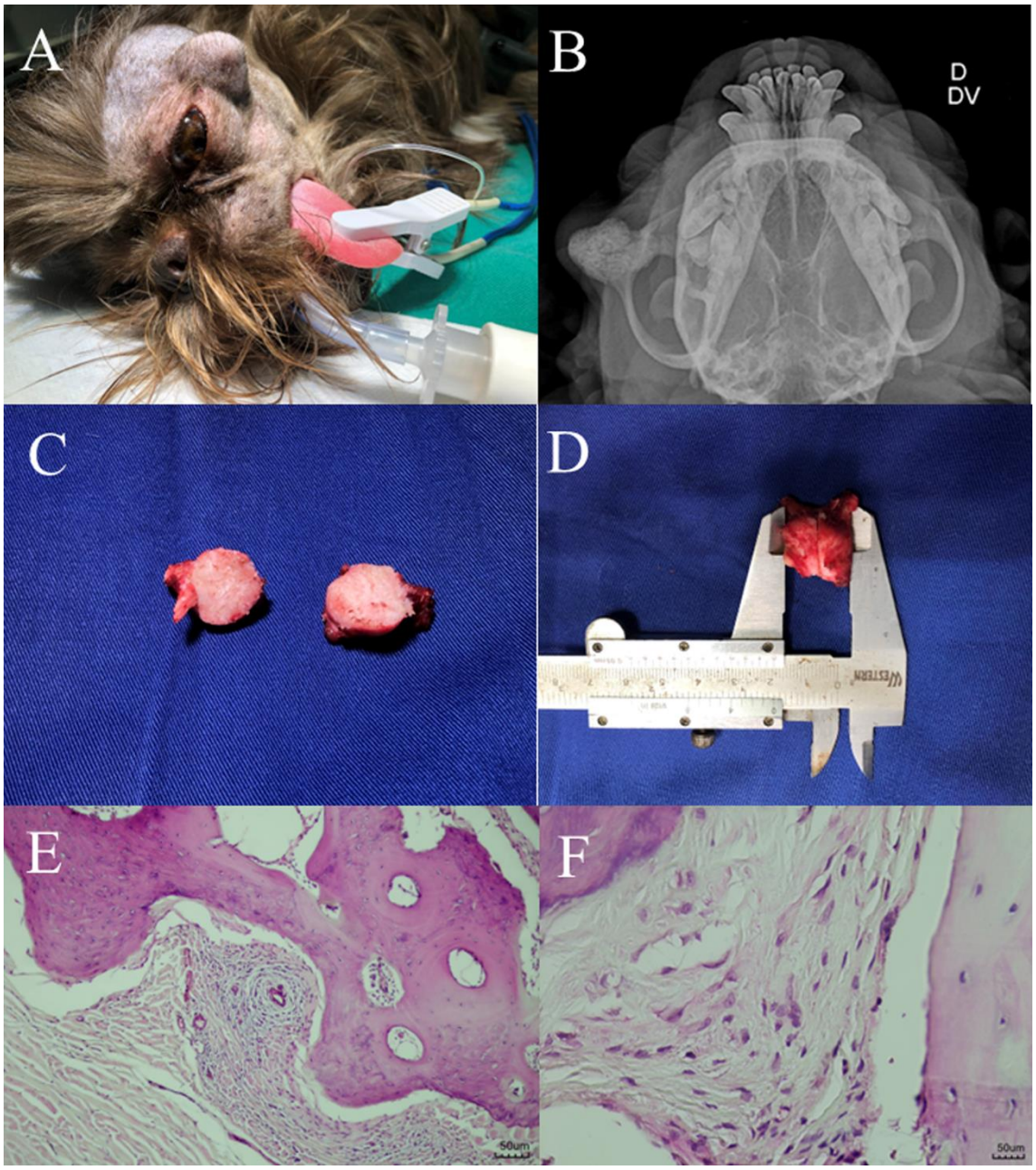
After the clinical evaluation, a radiograph of the left frontolateral region of the skull was requested. The clinical suspicion included osteochondromatosis, exostosis, osteomyelitis, and neoplasia. The radiographic examination revealed an osteoproliferative reaction in the temporal process of the left zygomatic bone, compatible with the clinical suspicions (Figure 1B).

Tumor excision followed by histopathological examination for definitive diagnosis was recommended. Pre-surgical tests included a complete blood count, leukogram, urea, creatinine, alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyltransferase (GGT), alkaline phosphatase (ALP), glucose, lipid profile, triglycerides, and total proteins and fractions. No significant alterations were observed in any of the pre-surgical tests. The animal was fasted for food and water for eight hours before anesthesia. The anesthetic technique used was balanced general anesthesia, partially intravenous. Pre-anesthetic medication included dexmedetomidine (Dexdomitor, Zoetis, Brazil) (3 mcg/kg), morphine (Morphine sulfate, Hipolabor generics, Brazil) (0.2 mg/kg), ketamine (Cetamin, Syntec, Brazil) (4 mg/kg), and midazolam (Dormire, Cristália, Brazil) (0.5 mg/kg). Anesthetic induction was performed with propofol (Propovan, Cristália, Brazil) (2 mg/kg/min). After endotracheal intubation with a size four tube, maintenance was done with isoflurane (Isoforine, Cristália, Brazil) at an effective dose.

The animal was also maintained with fentanyl infusion (Unifental, União Química, Brazil) at 0.2 µg/kg/min.

The patient was positioned in right lateral recumbency, and the surgical field was prepared aseptically using 2% chlorhexidine scrub (Riohex 2%, Rioquímica, Brazil) followed by 0.5% alcoholic chlorhexidine (Riohex 0.5%, Rioquímica, Brazil). Sterile drapes were positioned to delimit the surgical area. An incision was made in the skin over the mass. The mass was dissected with the aid of Metzenbaum scissors and an electrosurgical knife and subsequently resected. This procedure required osteotomy of the zygomatic arch, near the temporal corner of the left eye and approximately 1 cm caudal to the mass. Closure of the dead space and subcutaneous tissue was performed using a continuous simple suture with 2-0 poliglecaprone 25 surgical thread (Caprofyl, Ethicon, Brazil). The skin was sutured with 2-0 polyamide thread (Mononylon, Ethicon, Brazil) in a simple interrupted pattern.

Figure 1. Clinical presentation of the osteoma located caudal to the right eye and adjacent to the zygomatic bone, pre-surgical image (A). Osteoproliferative reaction in the region of the left zygomatic arch seen in the dorsoventral radiograph (B). Macroscopic presentation of the surgical specimen in cross-section (C) and macroscopic presentation of the entire surgical specimen with measurement using calipers (D). Histopathological section stained with HE revealing the arrangement of the osteoma with well-differentiated bone trabeculae, osteoblasts, and osteoclasts at 10x magnification (E). Histopathological section stained with HE showing fibrogranulomatous reaction with tissue collagenization and lymphoplasmacytic areas at 100x magnification (F).



After surgery and anesthetic recovery, the animal was discharged with a prescription of enrofloxacin (Baytril, Elanco, South Korea) (5 mg/kg, SID for seven days), meloxicam (Meloxican, Agener, Brazil) (0.2 mg/kg, SID for five days), and dipyrone (Dipyrone, Ibasa, Brazil) (25 mg/kg, TID for three days). Additionally, a thin layer of Keravit® ointment was recommended to be applied to the sutures three times a day until their removal in ten days. A post-surgical radiographic examination was requested to evaluate the remaining bone. The mass was sectioned longitudinally with the aid of a saw, and material from the center of the mass was collected and sent for bacterial and fungal culture, as well as antimicrobial sensitivity testing. The surgical specimen was then fixed in 10% formalin solution for subsequent histopathological examination.

Macroscopically, the mass was found to be a bone fragment measuring 2.7 x 1.7 x 1.0 cm, with a whitish, calcified, and irregular internal surface (Figure 1 C and D). After histological processing and Hematoxylin-Eosin (HE) staining, the tissue sections revealed intense fibrogranulomatous proliferation, with numerous bundles of reactive fibroblasts, tissue collagenization, newly formed vessels, and lymphoplasmacytic aggregates. In the center of the sample, there were multifocal areas of mature bone differentiation, with dense peripheral fibrosis, necro-hemorrhagic foci, and occasional interstitial lymphoplasmacytic areas involving discrete aggregates of bone tissue (Figure 1 E, F).

No microorganisms were isolated in the fungal and bacterial cultures performed from the lesion samples.

The patient exhibited rapid anesthetic and surgical recovery, without pain or discomfort in the following days. A radiographic examination performed 120 days after the surgical procedure showed no signs of osteoma recurrence. Clinical follow-up continued for an additional 580 days, with no changes suggesting recurrence. Thus, the patient was medically discharged.

DISCUSSION

This report describes a case of osteoma in a young patient, differing from most cases reported in the literature. In a review of medical records of six osteoma cases over five years, the average age of the patients was 10.5 years (Volker and Luskin, 2014). In another similar study conducted by the University of Pennsylvania School of Veterinary Medicine, a review of medical records of five dogs with osteoma showed an age range between 1 and 11 years, with an average of 6.4 years (Soltero-Rivera et al., 2015). Additionally, Johnson, Cooley, and Darien (1996) reported a case of a one-year-old Rhodesian Ridgeback presenting an eight-centimeter swelling on the left side of the

zygomatic arch, diagnosed as osteoma. These data suggest that osteoma does not have a specific age predisposition and can affect dogs of any age.

In humans, osteoma is more common in adolescents and young adults, frequently located in the maxillofacial skeleton, although it can occur in any region of the body and at any age (Goksel et al., 2019; Mendonça et al., 2009). In dogs, as observed by Santos et al. (2012), the most common location for osteoma is the craniofacial bones, which is consistent with the present case.

In this reported case, the patient did not exhibit clinical signs of pain or discomfort. However, the tumor location can influence the manifestation of pain. For instance, in a case of appendicular osteoma, the patient presented with intense pain upon palpation and lameness, symptoms resembling osteosarcoma, which led to the decision to amputate (Santos et al., 2012). In another study involving seven felines diagnosed with osteoma in the maxillary region, only one had difficulty eating, possibly due to pain (Fianni et al., 2011).

The radiographic examination of the patient in the present report revealed an osteoproliferative reaction, which is consistent with other reports of osteoma in the zygomatic arch, described as a homogeneous radiodensity (Leonardi et al., 2014). Studies of oral osteoma describe this lesion as proliferative masses of bone density (Volker and Luskin, 2014). However, in cases of appendicular osteoma, the radiographic presentation can vary. For example, in the case reported by Santos et al. (2012), the radiograph of a dog showed a mixed lytic and proliferative pattern, suggesting the diagnosis of osteosarcoma, a much more aggressive neoplasm requiring a completely different treatment.

In the present case, the treatment was effective, possibly due to the complete removal of the lesion rather than a prior partial sampling for diagnosis. This highlights the importance of performing a biopsy with total excision of the mass whenever possible. There are reports, such as that by Johnson, Cooley, and Darien (1996), where a small sample biopsy in a dog with an osteoma in the zygomatic arch initially resulted in a diagnosis of osteosarcoma. After the complete removal of the lesion, the correct diagnosis of osteoma was established, likely due to the small size of the initial sample or the initial presentation of the lesion. Therefore, total lesion excision should be prioritized whenever feasible.

The histopathological report of the present case revealed multifocal areas with mature bone differentiation and bone trabeculae containing well-differentiated bone cells,

in addition to peripheral fibrosis, reactive fibroblasts, and lymphoplasmacytic aggregates. In a review of 15 cases of benign bone-proliferative lesions in the oral cavity of dogs, five were diagnosed with osteoma, all presenting histological characteristics of expansive mineralization and well-circumscribed margins (Soltero-Rivera et al., 2015). In a report of intraoral osteoid osteoma, histopathological findings included mature trabecular and cortical bone, without cellular infiltration (Volker and Luskin, 2013). Another study with six cases of oral osteoma in dogs identified findings ranging from well-differentiated and proliferative mineralized bone, proliferation of trabecular and/or compact and mature bone, to new ossification of trabecular and mature bone. In all cases, there was no cellular atypia or mitotic figures, and the trabecular bone was mature (Volker and Luskin, 2014). Therefore, there is a variation in the description of osteoma findings, but there is a similarity in the presence of areas of mature bone proliferation, with or without cellular infiltration, as well as trabecular bone.

Four months after the surgical procedure, a radiographic examination showed no bone changes in the operated region, indicating the absence of local recurrence. Clinical follow-up and radiographic examination are recommended for monitoring recurrence and evaluating tumor extent when higher resolution imaging is not available (Volker and Luskin, 2014).

CONCLUSION

It is concluded that osteoma is a benign neoplasm that can affect young dogs, that surgical treatment with complete mass resection is effective without the need for adjuvant chemotherapy, and that histopathological examination is necessary and sufficient for an accurate diagnosis.

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