Cervical teratoma in a dog

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ABSTRACT

A young adult boxer dog was examined for a painless swelling in the left cranial cervical area that was refractory to antibiotic therapy. Ultrasound examination revealed a hypoechoic mass abutting the rostrolateral aspect of the left mandibular salivary gland. The cystic mass was excised and was found to extend through the capsule of the salivary gland and appeared to be confluent with the glandular tissue at this point. Histopathological examination of the excised tissue demonstrated tissue from all 3 germinal layers. There was no indication of malignancy and the mass was diagnosed as a benign cervical teratoma. Hypotheses regarding the origin of teratomas in general are discussed and the origin of the teratoma in this case is suggested.

Key words: benign, cervical, dog, extragonadal, mandibular salivary gland, teratoma.

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INTRODUCTION

Teratomas are defined as neoplasms that originate from pluri- or totipotent cells, and comprise a mixture of tissues derived from all 3 embryonic germ layers (endoderm, mesoderm and ectoderm), some of which are foreign to the organ or anatomical site at which they arise[8,10]. Some of these tissues also have the capacity to organise into structures resembling organs or their parts[8]. The tumours may either be solid or cystic and may contain skin, hair, teeth, respiratory and gastrointestinal epithelium, nervous tissue, skeletal muscle, bone, cartilage, and/or other tissue[10]. The organisation into recognisable tissues provides a link to the developmental process (teratology). In addition, they have the capacity for unrestrained growth, indicating a neoplastic process[8], and may therefore be benign or malignant.

Teratomas in dogs, although infrequently described, are reported to occur most frequently in the ovaries[7,9,15,24]. There is a paucity of reports of teratomas occurring at extra-gonadal sites in dogs, and they are therefore presumed to be very rare.

In this case report, the clinical and histopathological findings of a cervical teratoma in the vicinity of the mandibular salivary gland in a young adult dog are described.

CASE HISTORY

A 19-month-old, neutered male boxer dog was referred to the Onderstepoort Veterinary Academic Hospital for evaluation of a swelling in the left cranial cervical region of 6 weeks' duration. The animal had been treated with oral clindamycin (Antirobe, Upjohn, South Africa) for 5 days but the swelling had progressively enlarged.

On clinical examination, a firm, non-painful mass, approximately 3.0 × 4.0 cm, was visualised and palpated in the region of the left mandibular salivary gland to which it felt partially adhered. All other clinical (including an oral examination), haematological and clinicopathological parameters evaluated were normal. Thyroid function tests were not performed. There was no apparent involvement of the local lymph nodes as determined by palpation.

Ultrasound examination of the left cranial cervical area revealed a hypoechoic mass, abutting and partially indenting the rostrolateral aspect of the mandibular salivary gland, which appeared normal. The mass and salivary gland appeared confluent at this point. Multiple echogenic specks were visualised within the mass. A fine-needle aspirate yielded 10 mℓ of brown, floccular, mucinous fluid. A smear of the fluid, stained with a rapid Romanowski stain (CAM's Quick Stain, C A Milsch), revealed moderate numbers of neutrophils, and a few single large cells of epithelial or glandular origin suspended in a necrotic matrix. No microorganisms or neoplastic cells were evident. An aseptically-gathered fluid sample from the mass was submitted for aerobic and anaerobic bacterial culture, but there was no growth. Survey radiographs were not made. The mass was provisionally diagnosed as an aseptic abscess or cyst of the mandibular salivary gland.

The mass was surgically explored after standard aseptic preparation. An off-white, firm, well-circumscribed, spherical, 2.0 × 3.0 cm tissue mass was excised from its connection to the mandibular gland. The gland appeared normal but the capsule was incomplete at this point and the mass appeared to originate from within the gland.

A drained cystic cavity was revealed on incising the mass. A tuft of pale hair and a 10 × 4 mm fragment of mineralised tissue were noted, respectively protruding from or lying within the lining of the cyst. Samples submitted for bacterial culture again proved negative. The excised mass was fixed in 10 % buffered formalin for histopathological examination. Tissue blocks were cut from 3 different parts of the submitted sample. After routine processing and wax embedding, 4 sections were cut from each block, and stained with HE stain. Examination of the sections (Fig. 1) revealed that the bulk of the mass consisted of dense connective tissue containing a number of stratified squamous epithelium-lined tracts resembling large ducts, which opened into the central cystic cavity. The connective tissue also contained multiple dilated sebaceous glands opening onto the epithelial surface. Small foci of well-differentiated neural tissue (Fig. 2) and focal infiltrations of lymphocytes and plasma cells, frequently associated with medium-sized vessels, were also observed, as were scattered haemorrhages. Areas of well-differentiated hyaline cartilage were conspicuous, with one such area abruptly transforming into mature bone with Haversian canals and marrow spaces. In some parts of this bone there was a transition from elongated precursor cells into cartilage, and finally into bone. Normal

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salivary tissue was seen abutting the above-mentioned tissue (Fig. 3). The cystic cavity was lined by squamous epithelium, which was predominantly stratified. Subepithelial tissues were oedematous and infiltrated by a moderate number of neutrophils with scattered plasma cells. There were no indications of malignancy. As a result of these findings, a diagnosis of benign teratoma, possibly originating in the mandibular salivary gland, was made.

Telephonic enquiry regarding the dog's progress 7 months later revealed that the animal was clinically normal and that no visible mass had recurred at the surgical site.

DISCUSSION

In humans and animals, teratomas occur most frequently in the gonads and less commonly in the mediastinum, retroperitoneal space and posterior/dorsal abdominal wall[11,17]. The origin of teratomas at these sites (gonadal and extragonadal) can be explained by primordial germ cells (germ cell theory) which, during embryogenesis, migrate from the yolk sac to their final destination, the paired germinal ridges[3,14]. If these cells fail to reach the germinal ridges, they can continue to develop at any site along this migration route[3,5,14]. The presence of teratomas distant from this migration route is more difficult to explain. There is evidence suggesting that extragonadal teratomas occurring at these distant sites may occur through one or more different pathways[19]. The embryonal cell theory postulates that pluripontential blastomeres, segregated from the primitive streak during early embryonic development, escape the influence of the primary organiser[1,22]. During the development of the head, tail, and lateral body folds, these cells are carried to the midline where they develop into teratomas[1]. Alternatively, the extraembryonal cell theory[21] suggests that the cells forming the teratoma may originate from displaced yolk sac remnants. Most recently, Wagner *et al.*[23] have suggested that extragonadal teratomas could originate from pluripotent germ cells that have not yet undergone the first meiotic division, or from pluripotent ectopic embryonal or extraembryonal cells.

In humans, cervical tumours are relatively rare; most occur in neonates and are considered benign. Teratomas in this area are rare in adults but are usually highly malignant[12]. Most of the tumours in this area arise from close to the midline and extend to the lateral aspect(s) of the neck[2,13,18]. This observation supports the embryonal cell theory of histogenesis

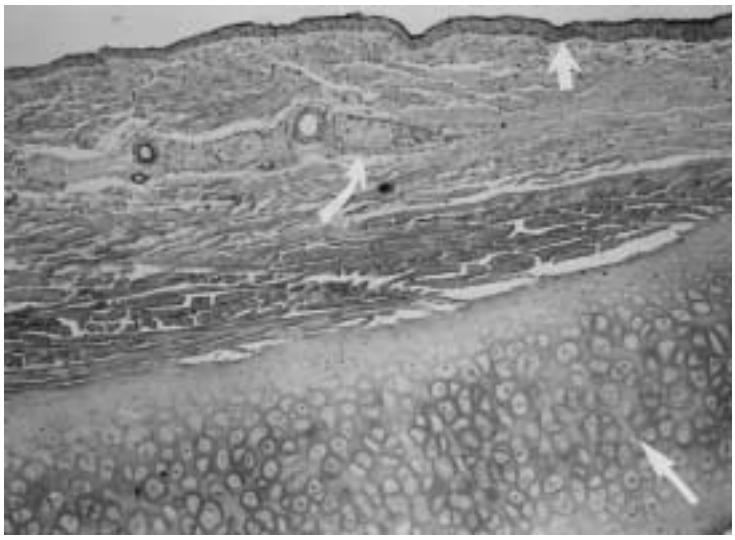

Fig. 1: **Histopathological section of the teratoma. Tissues depicted in this section include stratified squamous epithelium** (short arrow)**, sebaceous glands** (curved arrow) **and well-differentiated, mature cartilage** (thin arrow). ×40.

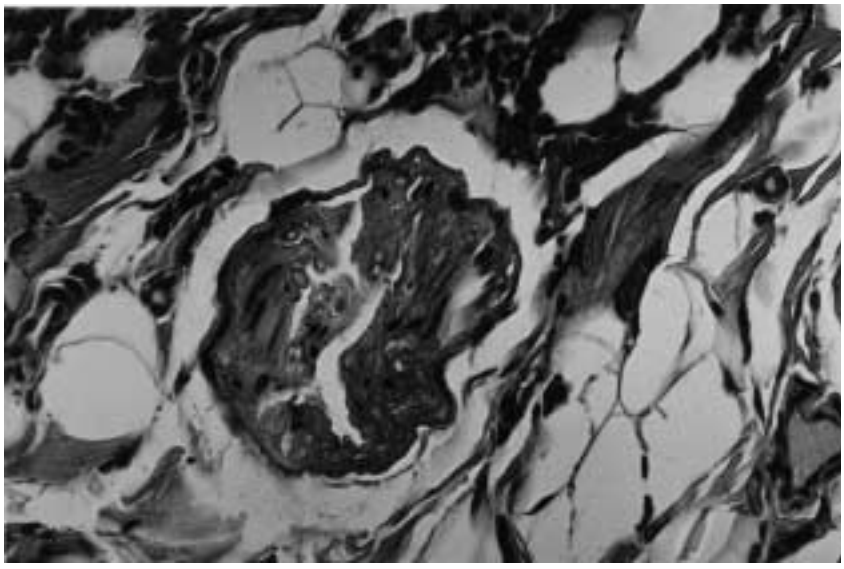

Fig. 2: **Histopathological section of the teratoma demonstrating a focus of well-differentiated neural tissue, located centrally in the photograph.** ×200.

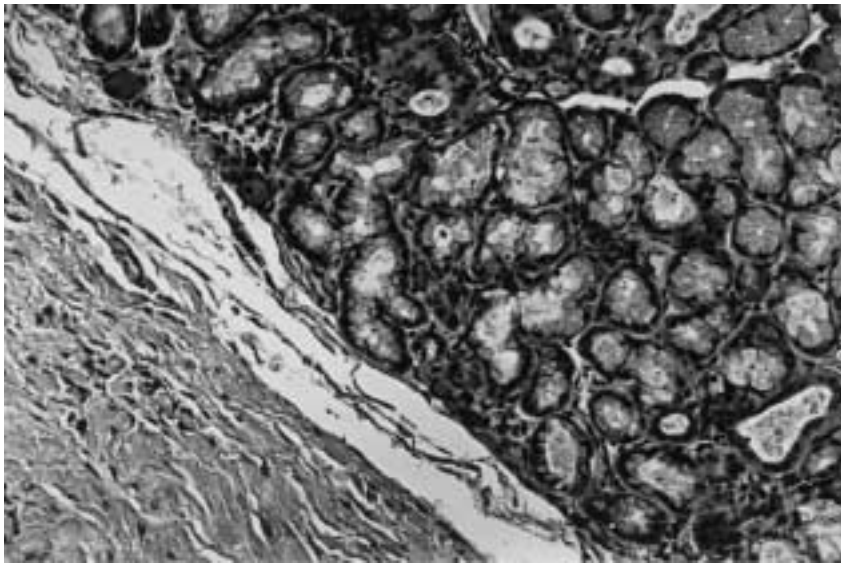

Fig. 3: **Histopathological section showing the relationship between the teratoma and the salivary gland. The teratoma is situated in the bottom left corner of the photograph.** ×100.

where the pluripotent cells are carried to the midline in the developing body folds. They frequently lie within the thyroid gland or, more commonly, in close approximation to it[2,6,12,13,18]. This close and consistent relationship with the thyroid gland has led some researchers to argue that teratomas in this area originate from embryonic cells in the primitive *Anlage* of the gland itself[16]. It is further argued that, in those cases where the teratoma lies adjacent to the thyroid gland, this relationship occurs through dislocation of normal thyroidal tissue[2]. Other researchers, however, believe that the relationship to the thyroid is fortuitous[4]. Teratomas in this region can assume large proportions, making the site of origin difficult to identify, although many appear to arise paramedially[18]. Those that originated within the thyroid gland share the gland's vascular supply[2]. Cervical teratomas of lateral structures are extremely rare in humans[18]. A review of the literature revealed only 2 cases[18,20], in which teratomas involving the left submandibular salivary gland in an infant and the right parotid salivary gland in an adult female were described. Complete surgical resection in most cases of benign cervical teratoma results in permanent resolution of the condition[2,13,18].

In the literature relating to humans[6], teratomas are characterised by the degree of differentiation of tissue. Teratomas are classified as either mature or immature. The former are benign, whereas the latter have a greater potential for malignancy. Mature teratomas are subdivided into those in which all tissue components are well-differentiated (Grade 0) and those in which a small amount of incompletely differentiated tissues occurs (Grade 1). The latter should not exceed 10 % of the sample. Immature teratomas are subdivided according to the amount of undifferentiated tissue. Grades 2 and 3 indicating the presence of 10–50 % and greater than 50 % undifferentiated tissue, respectively. The presence of germ cells or a non-germinal, malignant cell pattern are indications of malignancy. According to these criteria, the teratoma described in this report is classified as mature, Grade 0.

To our knowledge, cervical teratomas have not yet been described in dogs. The case reported here meets the criteria for a teratoma in displaying features representing all 3 germ layers and having tissue (hair, bone and cartilage) in a site where these tissues normally do not occur. Although the traditional requirement is that all 3 germ layers be present, authorities have differed on this exacting requirement[13]. One feature that appears consistent in human cases of cervical teratoma, is the presence of neural tissue[2,12,13,18]. In the case described here, small foci of neural tissue were also seen.

The origin of the teratoma described here is unclear. No attempt was made to establish an anatomical relationship with the thyroid gland. The fact that it extended through the capsule and appeared confluent with normal-appearing mandibular glandular tissue at a single site, suggests that it may have originated from the same embryonal cells that formed the mandibular salivary gland. The condition also differed from most teratomas described in humans at this site in that it was benign despite the animal being adult, and that it occurred away from the midline.

Differential diagnoses for a tumour in this area include cervical and retropharyngeal mucocoele, retropharyngeal abscess, haematoma, seroma, and neoplasia of the regional lymph nodes. Cervical teratomas should also be differentiated from dermoid sinuses (cysts).

The latter are characterised histopathologically by a central sinus pore with a complex basal wall containing mature or primitive hair follicles and sebaceous glands. No bone or cartilage is present. In humans, dermoid cysts have been described from the face, oral cavity, mandible and maxilla[17]. In dogs, dermoid sinuses (cysts) have only been described from the dorsal midline in the cervical, thoracic and/or sacrococcygeal regions[25].

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