Paraganglioma of a presumed celiac ganglion in a dog

Paraganglioma van het ganglion celiacum bij een hond

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ABSTRACT

A 10-year-old French Bulldog was presented for acute vomiting. Ultrasonography and computed tomography of the abdomen revealed a well-delineated mass encircling the celiac artery, close to its emergence from the aorta. Surgery permitted complete excision of the mass. Histopathology combined with immunohistochemistry yielded the diagnosis of paraganglioma.

SAMENVATTING

Een tienjarige Franse buldog werd aangeboden voor acuut braken. Echografisch en computertomografisch onderzoek van de buik gaf een duidelijk beeld van een duidelijk afgelijnde massa rond de arteria coeliaca, dicht bij de plaats waar zij uit de aorta ontspringt. Via chirurgie kon de massa volledig weggenomen worden. Histopathologisch onderzoek in combinatie met immunohistochemisch onderzoek resulteerde in de diagnose van paraganglioma.

INTRODUCTION

Pheochromocytomas and paragangliomas are neuroendocrine tumors that develop in the adrenal medulla and in the extra-adrenal, thoraco-abdominal sympathetic and parasympathetic paraganglia, respectively (Cascón et al., 2013). Paragangliomas are rare neoplasms arising from paraganglia or chromaffin bodies within the sympathetic trunk ganglia and ganglia of the celiac, renal, suprarenal, aortic and hypogastric plexuses (He et al., 2011). Paragangliomas are rarely reported tumors in dogs (Duconseille and Louvet, 2013; Ilha and Styer, 2013; Wey and Moore, 2012; Rizzo et al., 2008; Matsuda et al., 2003; Buchanan et al., 1998; Platt et al, 1998; Mascort and Pumarola, 1995; Dean and Strafuss, 1975).

This paper illustrates an uncommon location of an extra-adrenal paraganglioma in a dog, and describes the ultrasonographic and computed tomography (CT) findings of a presumed celiac paraganglioma.

CASE REPORT

A 10-year-old French Bulldog was presented for acute-onset vomiting of a three-days duration. The vomiting occurred approximately eight hours after feeding. The dog was in a good body condition and no other clinical signs were noted. No abnormalities were found on serum biochemistry. Ultrasonography of the abdomen was performed using a 4.2-10.2MHz broadband microconvex array transducer (Aplio400, Toshiba, Tochigi, Japan) in dorsal recumbency. This revealed moderate gastric fluid distention despite fasting for twelve hours, with a diffuse increase in gastric wall thickness (5 - 7 mm). The wall had a normal, layered structure. A well-delineated, multilobulated, hypoechogenic mass was noted dorsal to the portal vein, caudodorsal to the body of the pancreas, partially encircling the celiac artery. No obvious large contact was noted between the mass and the aorta. The mass was separated from the right adrenal gland. The dorsoventral and craniocaudal dimensions of the mass were 13 mm and 23 mm respectively (Figure 1A). Color Doppler examination did not reveal any signs of vascular invasion into the caudal vena cava, aorta, celiac or cranial mesenteric arteries (Figure 1B). The presumptive diagnosis was gastritis, with the mass being presumably an incidental finding. Considering the anatomical location adjacent to the celiac artery, it was expected to arise from a prevertebral ganglion, most likely the celiac ganglion.

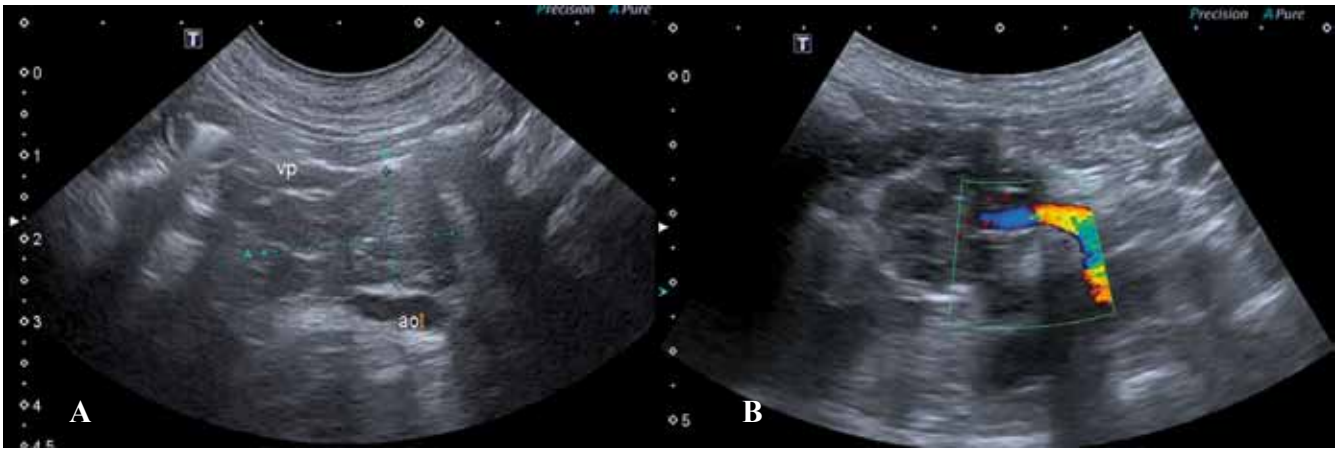

Figure 1A. Oblique ultrasound section of the mass (delineated between cursors), with oblique section of the aorta (located dorsally) and portal vein (located ventrally). 1B. Oblique section of the hypoechoic mass and celiac artery showing the relationship of the mass around the artery but without obvious arterial invasion. ao: aorta, vp: portal vein.

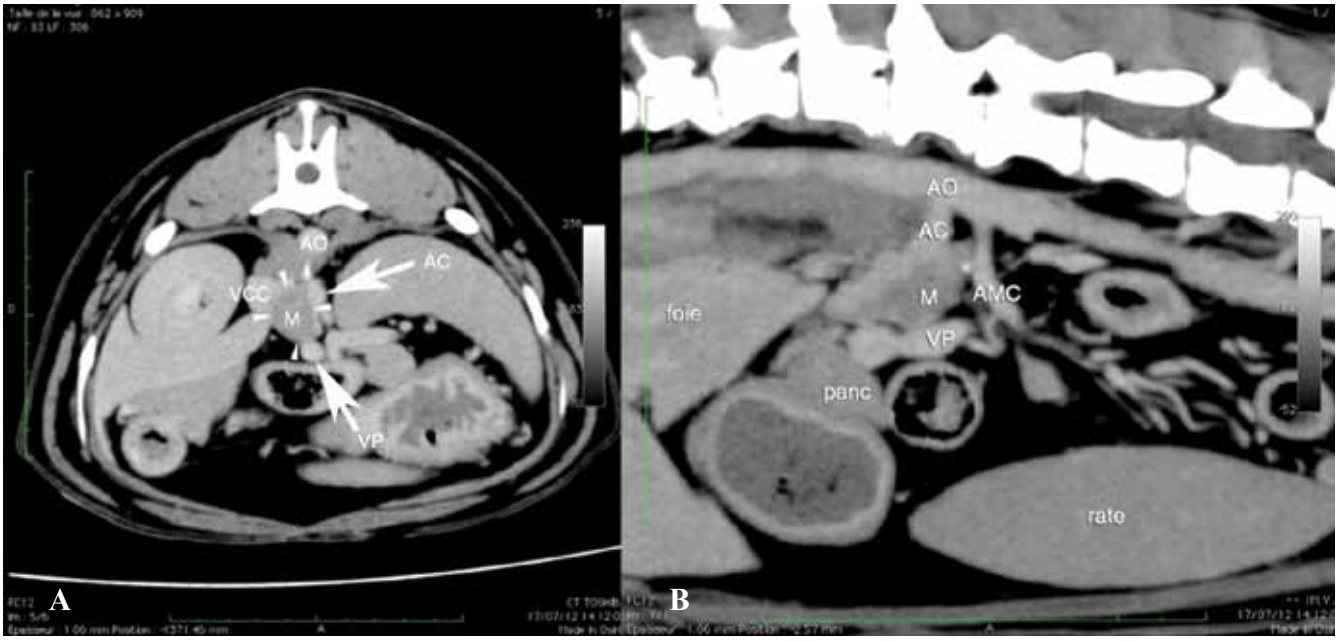

Figure 2A. Transverse postcontrast CT image (WL: 83 – WW: 306). 2B. MPR sagittal oblique reconstruction. The mass (delineated by arrowheads on the left side) lies dorsal to the portal vein, ventral to the aorta, medial to the caudal vena cava (compressing it but with no intraluminal invasion), caudomedial to the celiac artery and ventral to the right crus of the diaphragm and aorta. VP: portal vein, M: mass, panc: pancreas, AMC: cranial mesenteric artery, AC: celiac artery, rate: spleen, foie: liver, AO: aorta.

The dog was given oral omeprazole (Mopral 1mg/kg tid, AstraZeneca laboratory, Rueil-Malmaison, France) for two weeks and the clinical signs resolved.

However, CT examination of the abdomen was recommended to better characterize the mass and was performed a few days later. Helical CT examination of the cranial abdomen was performed with the dog in ventral recumbency (Aquilion 4, Toshiba, Tochigi, Japan) using 1mm slice thickness images and a collimator pitch of 0.75. The lungs were kept inflated during the acquisitions to reduce motion artifacts. A post-contrast acquisition was performed five minutes after intravenous contrast agent administration (Telebrix35, 350mg iodine/ml, 700 mg/kg bodyweight, Guerbet laboratory, Villepinte, France). On pre-contrast images, a well-delineated, multilobulated soft tissue mass was noted dorsal to the portal vein, medial to the celiac artery, partially encircling the latter, ventral to the aorta with mild contact cranial to it. The dorsoventral and craniocaudal dimensions of the mass were 23 mm and 33 mm, respectively. The mass was isoattenuating to the caudal vena cava. On post-contrast series, the mass was poorly enhanced at the periphery (Figure 2). No obvious vascular invasion was noted in the celiac artery and surrounding vessels. It exerted a slight mass effect with compression on the medial aspect of the caudal vena cava but did not appear to invade the wall or lumen. The other abdominal organs had a normal appearance. Because of the close proximity of the

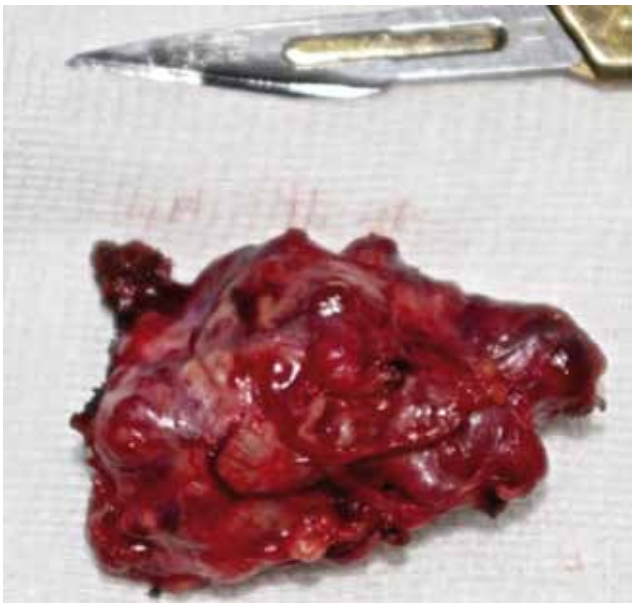

Figure 3. Neoplastic mass after its removal, showing its multilobulated shape and dense vascularization.

mass to the portal vein and several major arteries, no satisfactory, safe window could be identified for fine needle aspiration. CT examination of the thorax was unremarkable.

Despite being initially reluctant to undertake surgery, after the initial ultrasonographic and CT examinations, the owner eventually decided to attempt surgical treatment. Repeat ultrasonographic examination was therefore carried out 1.5 months later, before exploratory coeliotomy was performed. The stomach wall had the same appearance as previously, despite the clinical resolution of vomiting. The mass had slightly increased in size as compared with the initial examination. The dorsoventral and craniocaudal dimensions of the mass were 23 mm and 39 mm respectively. No invasion of the celiac artery wall or lumen was noted.

Immediately prior to surgery, gastroduodenoscopy was performed and ten biopsy samples were obtained with endoscopic forceps for histopathologic evaluation (five from the gastric wall, five from the duodenal wall). The abdominal mass was approached through a cranial median coeliotomy incision (Figure 3). A densely vascularized, multilobulated and heterogeneous mass was found to encircle the celiac artery, ventral to the aorta. Its caudal aspect was adjacent to the cranial mesenteric artery. Its location was consistent with that of the celiac autonomic ganglion. Fine dissection with Metzenbaum scissors permitted to create a cleavage plane between the mass and the celiac artery, and the former could be safely separated from surrounding vascular structures and be excised. No perioperative anesthetic or surgical complications were encountered. Blood pressure measurements during surgery were within normal limits. Histologic examination of the gastric and duodenal biopsy samples yielded a diagnosis of non-specific, moderate chronic gastritis according to the World Small Animal Veterinary Association Gastrointestinal Standardization Group consensus (Day et al., 2008). Tissues from the surgically excised mass were fixed in 10% neutral buffered formalin, embedded in paraffin and processed routinely. Morphologic features were evaluated on 3µm hematoxylin and eosin stained paraffin sections. There was a partially encapsulated, multilobulated mass made up of round to polygonal cells. These were arranged in trabeculae and packets, delineated by fine fibrovascular tissue. The neoplastic cells had abundant, fine granular eosinophilic cytoplasm and eccentrically located, round nuclei with finely stippled chromatin. There was moderate anisocytosis, moderate to marked anisokaryosis and 1-2 mitotic figures per high power field. Three-µm-paraffin sections were placed on positively charged slides and processed for immunohistochemistry staining for S100 and chromogranin. The neoplastic cells revealed moderate to strong cytoplasmic expression for S100 and strong cytoplasmic expression for chromogranin (Figure 4).

Two follow-up ultrasonographic examinations were performed three and six months after surgery and no abnormalities were detected (Figure 5).

DISCUSSION

Paragangliomas are chromaffin cell tumors arising from ganglia; when arising in the adrenal gland, they are called pheochromocytomas. In humans, paragangliomas are usually classified into four

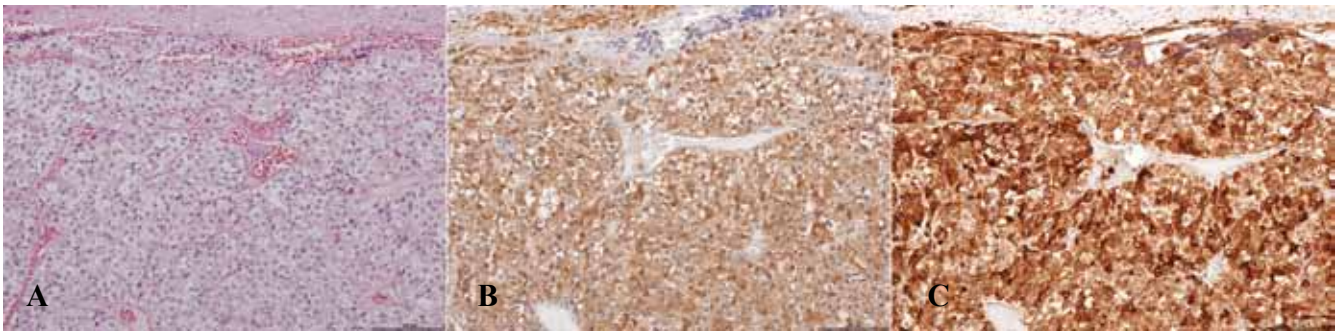

Figure 4A. Lobulated tumor with trabecular distribution compatible with a neuroendocrine tumor, especially a paraganglioma given the anatomic location. 4B. Immunohistochemistry positive for chromogranin. 4C. Immunohistochemistry positive for protein S100.

categories. Branchiomeric paraganglima include aortic and carotid bodies origin. Intravagal paraganglioma refers to masses located along the vagus nerve. Aortico-sympathetic paraganglioma are located in the retroperitoneal space, as in the present case. Finally, visceral-autonomic forms are of various origin, such as thyroid, middle ear, digestive tract, pancreas, prostate, larynx, gallbladder, thorax and peripheral blood vessels (Kim et al., 1994). The most common locations of paraganglioma are in the head and neck at the level of the carotid body, followed by the jugular bulb and vagus nerve (Moyer and Bradford, 2001).

In the veterinary literature, only case reports or small series have been described and because it is such a rare tumor, a genetic predisposition has not been further studied, although predisposition in brachycephalic breeds has been proposed (Dean and Strafuss, 1975). Most cases have addressed adrenal pheochromocytomas (Maher and McNiel, 2001; Schultz et al., 2009; Rosenstein, 2000; Barthez et al., 1997). Paraganglioma of the equine orbit (Miesner et al., 2009), of the canine mediastinum and heart (Wey and Moore, 2012; Rizzo et al., 2008; Buchanan et al., 1998; Mascort and Pumarola, 1995), of the bovine, canine and equine retroperitoneum (Matsuda et al., 2003; Ilha and Styer, 2013 ; Herbach et al., 2010, Kim et al., 1994), and of the canine, feline and equine spine (Duconseille and Louvet, 2013; Kim et al. 1994; Davis et al., 1997 ; Platt et al., 1998) have been reported. In addition, paraganglioma can be associated with multiple endocrine neoplasia (MEN type 1 and 2) as described in several case reports (Kiuper et al., 2000; Walker et al., 2000). In the present case, imaging findings were not specific but permitted an accurate anatomic localization, thus facilitating the surgical approach. The location of the mass ventral to the aorta and surrounding the celiac artery, with no involvement of the adrenal glands, suggested lesion of an autonomic prevertebral ganglion, most likely a celiac ganglion, given the anatomic location. Nevertheless, differential diagnosis included mass arising from a vessel wall. Contact between the mass and the caudal vena cava and to a lesser extent with the aorta (only noticed on CT images), without luminal invasion, was a CT finding not confirmed at surgery. The animal was placed in ventral recumbency during CT examination, which could have led to pressure from the mass against the surrounding vessels, especially the caudal vena cava. CT sensitivity and specificity for detecting vascular invasion by adrenal masses in dogs, when compared to surgery or necropsy, are 92 and 100% respectively, which is greater than for ultrasonography (Schultz et al., 2009; Kyles et al., 2003). In a study by Schultz et al. (2009), vascular invasion of adrenal masses occurred into the lumen of the phrenicoabdominal vein, with secondary invasion of other veins. Direct erosion through vessel walls was not the cause of intraluminal invasion in that study, so contact between the lesion and a vessel – as seen in this case – does not necessarily imply vascular invasion (Schultz et al., 2009). The neoplastic mass

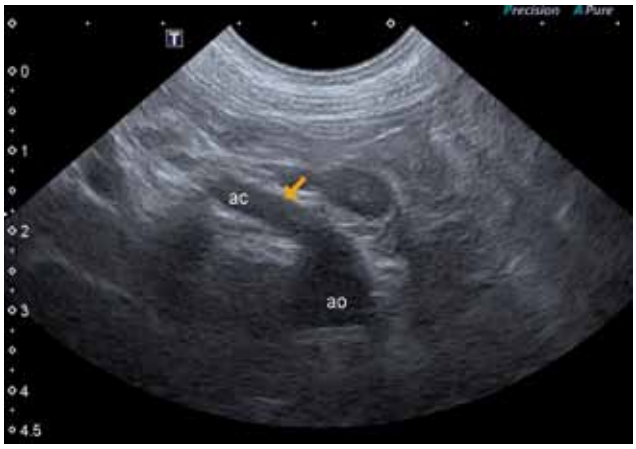

Figure 5. Post surgical ultrasonographic transverse section of the aorta showing the origin of the celiac artery (arrow). The mass has been completely resected.

completely encircled the celiac artery in this case, which caused a surgical challenge. The first goal of the surgical exploration was to obtain a biopsy sample of the lesion for histopathologic examination. Surgical ablation was to be performed if deemed sufficiently safe. Surgical hazards, particularly the risks of perioperative vascular injury, had been thoroughly discussed preoperatively with the owner, considering the subtlety of the clinical presentation. The decision to carry out surgical exploration was made because it was feared that the mass might grow larger, making it difficult to resect it at a later stage. The tumor could be completely removed without complication. Nevertheless, its role in the clinical presentation remains unclear and speculative at best. While adrenal pheochromocytomas generally secrete significant amounts of catecholamines, with resulting systemic signs, such as hypertension, arrhythmias, neurologic and gastrointestinal disorders, extra-adrenal paragangliomas may not behave in the same way and may lose their secretory properties. In human patients, only 25% of mesenteric paraganglioma are functional tumors (Chetrit et al., 2012). In the current case, there was no specific pre- or perioperative sign that could be related to catecholamine release by the tumor. This point should however be taken into consideration when contemplating surgical resection of a presumptive paraganglioma.

This case report shows an unusual location of paraganglioma in a dog and describes its imaging characteristics. When suspected, positive immuno-histochemistry staining for S100 and chromogranin is the method of choice to confirm a paraganglioma.

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