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Characterization of the Celiac and Cranial Mesenteric Arteries In A Dog: Case Report of Anatomical Variation

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ABSTRACT

This paper reports a case of the origin of the celiac and cranial mesenteric arteries via a single trunk (celiac-mesenteric trunk) in a medium sized mixed breed female dog. The case was seen during routine dissections performed at the Laboratory of Animal Anatomy at the Center for Agricultural Sciences at the Federal University of Paraíba (CCA-UFPB). In this case, it was observed that the cranial mesenteric and celiac arteries originated from the abdominal aorta through a single trunk, the celiac-mesenteric trunk. Furthermore, it was noted that after its origin, the trunk did not divide into celiac and cranial mesenteric arteries and subsequently originated the branches emitted by them. The hepatic artery, two left gastric arteries (one larger and one smaller), the splenic artery, the ileocolic artery, the caudal pancreaticoduodenal artery, twenty jejunal arteries, and the ileal artery originated from the celiac-mesenteric trunk. We concluded that the celiac and cranial mesenteric arteries in the animal under study showed different morphology from what has been described in literature, establishing a case of anatomical variation. The knowledge and morphological characterization of the anatomical variations that may occur in the abdominal arterial vasculature of the species are of paramount importance, providing subsidies for clinical, surgical and diagnostic-imaging practices in the region.

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INTRODUCTION

The celiac and cranial mesenteric arteries, both of which are single, emerge from the ventral aspect of the abdominal aorta; the celiac artery is at the level of the aortic hiatus in the diaphragm,and the cranial mesenteric artery is very close to it, caudally (Getty, 2008). The celiac and cranial mesenteric arteries are blood vessels of great medical relevance, because through their branches they irrigate important viscera, such as the liver, stomach and intestines, spleen and pancreas (Nayar *et al*., 1983; Getty, 2008; Dyce *et al*., 2010).

The occurrence of the celiac-mesenteric trunk has been reported in small ruminants (Perreira *et al*., 1978; Nayar, 1983; Ferreira *et al*., 2001), non-human primates (Borelli *et al*., 1971), rodents (Queiroz *et al*., 2011), buffaloes (Machado *et al*., 2000), felines (Roza *et al*., 2009) and humans (Manyama *et al*., 2013). It is known that in dogs, the occurrence of celiac-mesenteric trunk is not a common anatomic variation; however, it has been reported by Schmidt and Schoenau (2007).

This study aimed to describe the occurrence of a celiac-mesenteric trunk in a canine. In this research, the observed celiac-mesenteric trunk did not bifurcate into celiac and cranial mesenteric arteries after its emergence, and the branches commonly emitted by these two arteries subsequently emerged from this single trunk. Despite the morphological variation, the irrigation area of the arteries was maintained. The characterization of anatomical variations in the abdominal vasculature provides subsidies for practices related to diagnostic imaging and to clinical and surgical procedures related to the abdominal region.

MATERIAL AND METHODS

During routine dissections performed at the Laboratory of Animal Anatomy at the Center for Agricultural Sciences at the Federal University of Paraíba(UFPB), it was observed that a medium-sized mixed breed female dog had a single trunk of origin of the celiac and cranial mesenteric arteries (called the celiac-mesenteric trunk). In order to describe the morphology of the vessel, the measurement of the distances between the aortic hiatus

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and the celiac-mesenteric trunk, and between the celiac-mesenteric trunk and the right and left renal arteries, as well as their thicknesses, was carried out with the aid of a caliper. The measuring of the length of this trunk was performed by taking into consideration the point of its emergence in the abdominal aorta until the emergence of the first branch emitted by it, as well as the thickness of each of the branches emitted. The length of the animal from the atlanto-occipital joint to the sacrococcygeal joint was measured with the aid of ameasuring tape.

The nomenclature used is based on the International Committee on Veterinary Gross Anatomical Nomenclature (2012).

Result:

The animal under studywas 55 cm long. The celiac-mesenteric trunk arose directly from the abdominal aorta at the level of the first lumbar vertebra (L1) near the aortic hiatus of the diaphragm. The mesenteric celiac trunk observed in the animal in this study did not divide into celiac and cranial mesenteric arteries after its emergence, and the branches emitted by these two arteries were sequentially emerging from this single trunk (Fig. 1).

In the animal being studied, the celiac-mesenteric trunk was 10 mm thick, and 9 mm in length until the emergence of its first branch. The trunk originated at 37 mm from the aortic hiatus, 34 mm from the left renal artery, and 17 mm from the right renal artery.

Table1: Thickness of the branches emitted by the celiac-mesenteric trunk in the Mixed-Breed female dog.

Branches	Thickness
Hepatic Artery	3.0 mm
Left Gastric Artery 1	1.0 mm
Left Gastric Artery 2	2.0 mm
Splenic Artery	3.0 mm
Ileocolic Artery	2.0 mm
Caudal PancreaticoduodenalArtery	1.50 mm
Jejunal Arteries	1.33 mm*
IlealArtery	1.20 mm

* Average thickness of jejunal arteries

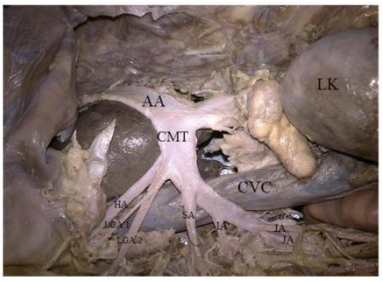

Fig. 1: Side view of the abdominal region of the dog, at the height of the first lumbar vertebra (L1), where the emergence of the celiac and cranial mesenteric arteries via a single trunk (celiac mesenteric trunk) is observed. Note that after its origin, the trunk does not bifurcate into celiac and mesenteric arteries and the branches emitted by these arteries are sequentially emerging from the trunk. AA – Abdominal Aorta; CMT – Celiac Mesenteric Trunk; HA – Hepatic Artery; LGA 1 – Left Gastric Artery 1; LGA 2 – Left Gastric Artery 2; SA – Splenic Artery; IA – Ileocolic Artery; JA – Jejunal Arteries; CVC – Caudal Vena Cava; LK – Left Kidney.

The branches originating from the celiac-mesenteric trunk were, in sequence: hepatic artery, two left gastric arteries (one larger and one of smaller caliber), splenic artery, ileocolic artery, caudal pancreaticoduodenal artery, twenty jejunal arteries, and the ileal artery.

Table 1 demonstratesthe thickness of each of the branches emitted by the celiac-mesenteric trunk in the animal under study. The thickness of the jejunal arteries ranged from 0.5 mm to 2.5 mm, with an average of 1.33 ± 0.45 mm.

Discussion:

The celiac and cranial mesenteric arteries emerge separately from the ventral surface of the abdominal aorta;the cranial mesenteric artery is near and caudal to the celiac artery (Getty, 2008; Dyce *et al*., 2010; König and Liebich, 2011). Nayar (1983) also describes the independent emergence of these two arteries in pigs, rabbits and dogs. The origin of these arteries from a common trunk, as observed in the animal in this study was reported in other animals such as cats (ROZA *et al*., 2009), capuchin monkeys (Borelli *et al*., 1971), guinea pigs (Queiroz *et al*., 2011), goats (Ferreira *et al*., 2001), sheep (Perreira *et al*., 1978; Nayar, 1983), buffaloes (Machado *et al*., 2000), dogs (Schmidt and Schoenau, 2007) and humans (Manyama *et al*., 2013). Still according to these authors, shortly after the emergence of the celiac-mesenteric trunk, it bifurcates into celiac and cranial

mesenteric arteries, which send their branches to the organs of the digestive system (Borelli *et al*., 1971; Perreira *et al*., 1978; Nayar, 1983; Machado *et al*., 2000; Ferreira *et al*., 2001; Schmidt and Schoenau, 2007; Roza *et al*., 2009; Queiroz *et al*., 2011; Manyama *et al*., 2013). Unlike other reports in literature, we observed that in this animal under study the trunk did not bifurcate, and the branches emitted by the arteries originated from the trunk.

In the animal studied, the celiac-mesenteric trunk was 10 mm thick and 9 mm in length until the emergence of its first branch, the hepatic artery. These data are similar to the trunk measurements described in dogs (10 mm thick and 12 mm in length) by Schmidt and Schoenau(2007). In cats, the celiac-mesenteric trunk is thinner, from 4 mm to 5 mm (Roza *et al*., 2009). Moreover, both in cats and capuchin monkeys, the celiac mesenteric trunk is shorter, with lengths of 3 mm to 4 mm in the cat (Roza *et al*., 2009),and of 5 mm in thecapuchin monkey (Borrelli *et al*., 1971).

According toManyama *et al*. (2013), in humans the celiac-mesenteric trunk emerges at 20 mm from the aortic hiatus. In cats this distance is of22 mm (Roza *et al*., 2009). In the dog under study, this distance was greater, and the trunk originated at 37 mm from the aortic hiatus. Regarding the left renal artery, Roza *et al*. (2009) cite a distance of 24 mm in cats, and Schmidt and Schoenau (2007) confirm a distance of 26 mmin dogs. This distance was also greater in the animal under study, since the celiac-mesenteric trunk was 34 mm from the left renal artery. Regarding the right renal artery, it was observed that the distance was 17 mm, however, no reports have been found in literature for comparison.

The celiac artery emits the left gastric, the hepatic, and the splenic arteries (Getty, 2008; Dyce *et al*., 2010). The caudal mesenteric artery emits the caudal pancreaticoduodenal, ileocolic, jejunal and ileal arteries (Getty, 2008). In dogs of the American Pit Bull Terrier breed, it was noted that the cranial mesenteric artery emitted the caudal pancreaticoduodenal, the right and middle colic, the ileocolic, cecum, ileocecal, ileal, and jejunal arteries (Lima *et al*., 2012). In the dog in our study, the branches emitted by the celiac mesenteric trunk were, in sequence, the hepatic artery, two left gastric arteries (one larger and one smaller in diameter), the splenic artery, the ileocolic artery, the caudal pancreaticoduodenal artery, twenty jejunal arteries, and the ileal artery. The number of jejunal arteries observed in the animal under study was higher than that observed by Lima *et al*. (2012) who cited that while investigating the cranial mesenteric artery in dogs, describe that this artery emits 11 jejunal arteriesin 6.67% of the animals, 12 arteriesin 6.67%, 13 arteries in 13.33%, 14 arteries in 13.33%, 15 arteries in 30%, 16 arteries in 20% and 17 arteries in 10% of the animals.

In the animal understudy, we observed the presence of two left gastric arteries emerging from the celiac mesenteric trunk, which differs from that described in literature, since the reports in the field describe the presence of only one left gastric artery originating from the celiac artery (Borelli *et al*., 1971; Perreira *et al*., 1978; Nayar, 1983; Machado *et al*., 2000; Ferreira *et al*., 2001; Schmidt and Schoenau, 2007; Getty, 2008; Ferrer *et al*. 2008; Roza *et al*., 2009; Dyce *et al*., 2010; König and Liebich, 2011; Queiroz *et al*., 2011; Manyama *et al*., 2013).

Schmidt and Schoenau (2007) describe the thickness of the branches originating from the celiac artery in dogs. According to these authors, the left gastric artery is 2mm thick, the hepatic artery is 4mm thick, and the splenic artery is 5 mm thick. In the animal we studied, the thickness of the hepatic and splenic arteries was less than that described by those authors, and was 3 mm for both arteries. Data associated to the thickness of the branches originating from the cranial mesenteric artery in dogs were not found in literature.

Despite the difference observed in the origin of the celiac and the cranial mesenteric arteries, as well as the distribution of their branches, it was observed that the irrigation area of these arteries was not altered. As described in literature (Getty, 2008; Dyce *et al*, 2010), in the female dog studied the vessels were responsible for blood supply to the stomach, liver, spleen, pancreas, small intestine and part of the large intestine.

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