Original article

Celiac artery with a pulmonary branch in dog: a rare variation

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Abstract

Hepatic, lienal and left gastric arteries are the "classical branches" of the celiac artery in dogs. This report describes a rare case in which the celiac artery emitted a branch to the caudal lobe of the right lung in an adult male mongred dog. The celiac artery and its proximal branches were dissected in situ, and measured with a digital pachymeter.This vascular variation was not previously known in the canine species. The knowledge about the presence of the celiac artery variations in dogs will contribute to a better understanding of the anatomical alterations that can occur in the vascularization of the abdominal region in dogs. The report is also important for angiographic, surgical and clinical procedures that involve this region.

Keywords: variation, celiac artery, dog.

1 Introduction

Several authors (KENNEDY and SMITH, 1930; SLEIGHT and THOMFORD, 1970; ENGE and FLATMARK, 1972; BORELLI and BOCCALLETTI, 1974; SCHMIDT, LOHSE and SUTER, 1980; BEDNAROVA and MALINOVSKY, 1984; NIZA, VILELA, FERREIRA et al., 2003; ABIDU-FIGUEIREDO, DIAS, CERUTTI et al., 2005; ABIDU-FIGUEIREDO, XAVIER-SILVA, CARDINOT et al., 2008) have studied the ramification of the celiac artery in vertebrates. They showed that the organization of the celiac artery and its branches present several variations, and the study of this variability is of practical, as well as theoretical significance in both, experimental and domestic animals (BEDNAROVA and MALINOVSKY, 1984).

The celiac artery emerges from the abdominal aorta ventral surface as its first visceral branch. It is approximately 4 mm in diameter and 2 cm long. The celiac artery anatomical relations are on the left with the stomach, on the right with the liver and the adrenal gland, and caudally with the left lobe of the pancreas. The celiac artery is divided in three branches: hepatic, lienal and the left gastric arteries. The celiac artery usually trifurcates, although in some specimens the left gastric and lienal arteries emerge of a short common trunk (NICKEL, SCHUMMER and SEIFERLE, 1979; EVANS and LAHUNTA, 1993; ABIDU-FIGUEIREDO, DIAS, CERUTTI et al., 2005). Kennedy and Smith (1930) reported a case in which the lienal artery emerged from the cranial mesenteric artery. Small and inconstant pancreatic and phrenic branches may emerge from the celiac artery.

Recent advances and refinements in radiological procedures as well as in experimental model for vascular surgery have revived interest in vascular anatomy, since a specific knowledge of such anatomy is mandatory to perform such procedures safely and efficiently.

Nowadays, an opportune and objective source, incorporating up-to-date practical application concerning celiac artery anatomy is important for interventional radiologists and veterinary surgeons, as well as to the experimental models for vascular surgery (FARINON, LAMPUGNANI, ZANNONI et al., 1984) in dogs.

This paper reports a case in which the celiac artery emitted a branch to the caudal lobe of the right lung, emphasizing the importance of the knowledge about the occurrence of anatomical variations in clinical and surgical practice.

2 Case description

A mongred male dog with approximately 5 years old which was part of the collection from the animal anatomy department and was destined to the animal anatomy classes. He was positioned in right lateral recumbency and by a thoracic incision, his 6th and 7th ribs were removed. His thoracic aorta was dissected, cannulated to wash the vascular systems with saline solution and fixed by a 10% formaldehyde solution. Then, the vascular system was filled with red stained Petrolatex S-65 and put in a 10% formaldehyde solution for approximately 7 days. After that period, a midline abdominal incision was made to dissect the abdominal aorta immediately below the diaphragm until the emission of the renal arteries. The celiac artery and its proximal branches were dissected and measured. The veterinary anatomic nomenclature (SCHALLER, 1999) and guide to the dissection of the dog (EVANS and LAHUNTA, 1993) were used.

In this case, the celiac artery emerged in a unique way at the level of the first lumbar vertebra measuring 1.3 cm. We noticed the presence of a gastro-lienal trunk (0.4 cm), formed by bifurcation of the left gastric (2.0 cm) and the lienal artery (2.1 cm). The hepatic artery (2.7 cm) was originated from the celiac artery. Before the gastro-lienal trunk a branch perforating the diaphragm muscle ventrally to aortic hiatus ending directly in the caudal lobe of right lung measuring 4.8 cm was observed (Figure 1).

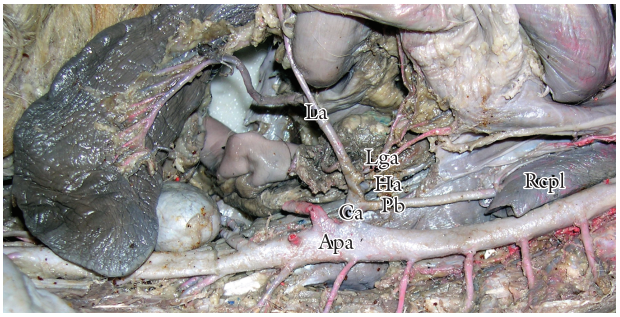

Figure 1. Photomacrography of the abdominal region showing the celiac artery and main branches. Apa: abdominal portion of aorta; Ca: celiac artery; Pb: pulmonary branch; Rcpl: right caudal pulmonary lobe; Ha: hepatic artery; Lga: left gastric artery; La: lienal artery.

3 Discussion and conclusions

Anatomical variation is defined as a normal flexibility in the topography and morphology of body structures (SYKES, 1963). This must be differentiated from anomalies, abnormalities and malformations commonly presented in the literature. Although the exact distinction has not yet been made between these terms, the latter ones should be applied when the structural changes exert negative influences on body functions (SANUDO, VAZQUEZ and PUERTA, 2003). Variations generally have no effect on body functions, although they may have significant influences on predisposition to an illness, the course of a disease, the findings of clinical examinations or patient management (WILLAN and HUMPHERSON, 1999).

The origin variations and arteries courses of different organs are not only of anatomical and embryological interest, but also of practical clinical importance. For example, when these variations are possibly the agents of pathological conditions, during surgery, and when knowledge of them can result in more accurate treatment (NOTKOVICH, 1956). Although several authors have consistently described the celiac artery and its branches, these blood vessels presents several variations which may occur in different levels (NIZA, VILELA, FERREIRA et al., 2003).

In humans, the celiac trunk emerges ahead of the 12th thoracic vertebra and may be shorter or longer than usual (BERGMAN, THOMPSON, AFIFI et al., 1988). In carnivorous animals is usually originated at the level of the first lumbar vertebra (SCHWARZE, 1970; NICKEL, SCHUMMER and SEIFERLE, 1979; ABIDU-FIGUEIREDO, DIAS, CERUTTI et al., 2005), but it may also be originated between the 13th thoracic vertebra and the 1st lumbar vertebra (NIZA, VILELA, FERREIRA et al., 2003). In our dissected dog, the celiac artery origin occurred in the first lumbar vertebra and its length (1.3 cm) was similar to the man's (0.8 to 1.5 cm) (BERGMAN, THOMPSON, AFIFI et al., 1988).

In this report, the celiac artery emerged as a single blood vessel. This result has been consistent with the ones that were obtained by Pott (1949), Borelli and Boccalletti (1974), and Bednarova and Malinovsky (1984), who performed dissections in cats. However, Berg (1961) dissected 100 cats and found variations in two cats. In the first one, the celiac artery emerged together with the mesenteric cranial artery and in the other one, he noticed the presence of a celiacmesenteric trunk, as well as observed by Roza, Pestana, Silva (2009). Schmidt and Schoenau (2007) described a single origin of the celiac and cranial mesenteric arteries through a common trunk (celiacmesenteric) in an adult mongred male dog. In sheep, the presence of a celiacmesenteric trunk, formed by the celiac and cranial mesenteric arteries, was reported (LANGENFELD and PASTEA, 1977). In humans, there is also the presence of a celiacmesenteric trunk formed by celiac and the superior mesenteric arteries (CIÇEKCIBAŞI, UYSAL, SEKER et al., 2005). Nonent, Larroche, Forlodou et al. (2001) observed a rare variation, a structure formed by the celiac, superior mesenteric and inferior mesenteric arteries, called celiac-bimesenteric trunk.

The hepatic, lienal and left gastric arteries are the "classical branches" of celiac trunk in humans. However, Sridhar Varma, Pamidi, Vollala et al. (2010) reported a rare variation, a hepato-spleno-mesenteric trunk with two classical branches of celiac trunk and superior mesenteric artery having common origin from the abdominal aorta. The third classical branch of the celiac trunk (left gastric artery) was arising directly from the abdominal aorta.

Through the selective angiography, Enge and Flatmark (1972) confirmed the classical arrangement, noticing that in most of the examined canidae, the celiac artery was divided in three branches: the hepatic, lienal and left gastric arteries, corroborating the results obtained by Sleight and Thomford (1970) in the dissection of dogs, and Bednarova and Malinovsky (1984) in cats. However, Schmidt, Lohse and Suter (1980) and Niza, Vilela, Ferreira et al. (2003) noticed in their studies, that most of the celiac arteries of dogs ended in two branches: hepatic artery and gastrolienal trunk. The predominance of this arrangement was also seen by Berg (1961) and Borelli and Boccalletti (1974) in cats. In our study, the celiac artery also presented two branches. A less frequent variation in which the lienal artery originated in the cranial mesenteric artery instead of in the celiac artery, as it usually happens, was observed by Schmidt, Lohse and Suter (1980).

Our result showed a rare variation in the celiac artery, giving a unique branch directly to the caudal lobe of right lung emphasizing the importance of knowledge about the occurrence of anatomical variations in clinical and surgical practice.

In addition, the present data should provide important information for devising experiments and interpreting results when mongred dogs are used as a experimental model for surgical and radiological practice of the celiac artery, especially when making comparisons to human anatomy.

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