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Origin and main ramifications of celiac artery in *Cerdocyon thous*

Running head: Celiac artery in crab-eating-fox

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Abstract

Cerdocyon thous is the canid with the greatest geographical coverage in South America. The aim of this study was to describe the origin, skeletopy, length and main branches of the celiac artery in *C. thous*. The dissections were performed on 14 cadavers of adult specimens, six males and eight females, with a rostralsacral length average of 67.00 ± 4.7 and 62.09 ± 5.7 cm respectively. The specimens were collected dead on highways on the banks of the Atlantic Forest (Rio de Janeiro) and the Pampa biome (Rio Grande do Sul) in Brazil. The cadavers were fixed and preserved in a formaldehyde solution until dissection. The celiac artery was dissected, the length was measured “in situ” and its main branches were recorded. The celiac artery emerged as a single artery in all dissected animals. The average length of the celiac artery was 1.43 ± 0.17 cm in males and $1.39 \text{ mm} \pm 0.24$ cm in females, with no significant difference in this measurement between sex. The predominant skeletopy was at the level of the 2nd lumbar vertebra (57.1%), positioned on average 1.43 cm cranially to the cranial mesenteric artery. In most individuals (92.9%), the classic trifurcation was formed: the celiac artery originated the hepatic, left gastric, and lienal arteries. Only one male animal presented a bifurcation formed between the hepatic artery and a gastrolial trunk. These anatomical characteristics are similar to those of other species of the Canidae family, possibly due to their phylogenetic proximity.

Key words: animal anatomy, cardiovascular system, crab-eating-fox, wild
carnivorans

INTRODUCTION

Cerdocyon thous, known as “crab-eating-fox”, is the most widely distributed wild canid on the South American continent, populating Colombia to Uruguay. With great adaptability, it inhabits closed and open vegetation areas [8,9,18,19]. Body mass ranges from 5 to 9 kg and can measure up to 1.2 m from the tip of the snout to the tail [19]. The diet is based on fruits, small vertebrates, eggs, insects, and crustaceans, characterizing an opportunistic omnivorous diet [9,18]. *Cerdocyon thous* is threatened by hunting, hit-and-run, and diseases transmitted by *Canis familiaris*, although its conservation is not a concern [9,18,19].

The high occurrence of free-ranging *C. thous* and its high frequency in zoos and private collections makes it frequently subject to veterinary care [8,32].

The celiac artery is one of the most important arteries in the abdominal part of aorta, it is a short vessel that emerges ventrally from the abdominal aorta, at the level of the aortic hiatus of the diaphragm muscle [20]. Close to its origin, this vessel is surrounded by the celiac plexus and ganglia. On the left, the celiac artery forms a syntopic relationship with the stomach; on the right, with the liver and adrenal gland, and caudally with the left lobe of the pancreas [17,20]. The celiac artery emits the hepatic, left gastric, and lienal arteries [17].

In mixed-breed *C. familiaris*, the celiac artery presents two morphological arrangements distinct from branches: classical trifurcation (formed by the hepatic artery, left gastric, and lienal), and hepatic artery and gastrolieal trunk [1]. Anatomy knowledge and possible variations in branches of the main splanchnic vessels is fundamental for planning surgeries and supports comparative studies on vascular arrangement in different species.

The aim of this article was to describe the origin, skeletopy, and main branches of the celiac artery in *Cerdocyon thous*.

MATERIALS AND METHODS

Adult specimens of *C. thous* were collected dead on highways of the Atlantic Forest biome (State of Rio de Janeiro, Brazil) and in the Pampa biome (Rio Grande do Sul, Brazil) under authorization of the Ethics Committee on Animal Experimentation (protocol 018/2017) and IBAMA / SISBIO (number 33667). Since most of the cadavers

collected on highways had abdominal vessels and viscera ruptured, only specimens in perfect condition were selected for the dissection of the celiac artery and its main branches. Thus, fourteen cadavers (six males and eight females), seven from each biome, were dissected.

Initially, the cadavers were thawed under running water, sexed, and identified by placing a plastic tag attached to the common calcaneal tendon using a string. The rostrum-sacral length of each animal was measured using a precision metal measuring tape. The tip of the snout was used as a reference for the proximal insertion of the tail. The cadavers were placed in right lateral decubitus position to access the thoracic aorta through an incision made between the 6th and 10th left intercostal spaces. The artery was cannulated with a number eight or ten urethral probe, depending on the diameter of the vessel, and was attached with a string to prevent leakage and maintain intravascular pressure. Fixation was performed by injecting a 10% formaldehyde solution through the probe in a caudal direction.

Immediately following the fixation of the cadavers, petrolatex S65 (Petrobrás Duque de Caxias Refinery (REDUC), Duque de Caxias/RJ) solution was injected and stained with Suvinil pigment for repletion of the arterial system. Then, the cadavers were immersed in polyethylene boxes containing 10% formaldehyde solution for to complete the latex fixation and polymerization process.

Seven days after the latex injection, the cadavers were dissected in order to determine the origin, skeletopy, and main branches of the celiac artery. After skin removal, two incisions were made in the abdominal wall: the first in the linea alba, starting from the xiphoid cartilage to the pubic region; the second transversely at the level of the last rib in both antimers, starting from the transverse process of the first lumbar vertebra to the linea alba. The cranial celiac and mesenteric arteries were dissected after locating the abdominal aorta.

A digital caliper (ZAAS Precision, Amatools®) was used to measure the distance between the centers of the origins of the celiac and cranial mesenteric arteries and the celiac artery length until it originated its first branch.

The mean and standard deviation of the animals' rostrorsacral length, celiac artery length, and the distance between celiac artery and cranial mesenteric artery were calculated. These values were compared for both sexes and considered significant when

$p < 0.05$ using the unpaired “t” test. The data were analyzed using the Graphpad Prism 5[®] Software.

RESULTS

The rostromesenteric and celiac artery length mean was higher in males (Table I) while the distance between the celiac and cranial mesenteric arteries was higher in females, although there was no significant difference in any comparison between sexes ($p > 0.05$).

In all dissected specimens, the celiac artery originated ventrally from the abdominal aorta. The predominant skeletopy of the celiac artery in *C. thous* occurred at the level of the second lumbar vertebra (Table II).

Although the celiac artery in *C. thous* presented a variable skeletopy between the individuals, there was no statistical difference between sex ($p = 0.05$).

In 13 specimens, the classic trifurcation was formed: the celiac artery originated the hepatic, left gastric, and lienal arteries (Figure 1). Only one male animal presented a bifurcation formed between the hepatic artery and a gastrolial trunk (Figure 2).

DISCUSSION

Origin

The celiac artery emerged ventrally from the abdominal aorta, close to the aortic hiatus of the diaphragm, similar to what is described in different mammals [1,2,3,10,22,23,27,33]. However, in *Bubalus bubalis* fetuses [24] and in 33% of *Lycalopex gymnocercus* specimens [22], the origin of the celiac artery occurred in the thoracic aorta. Despite phylogenetic proximity to *L. gymnocercus*, no celiac arteries originating in the thoracic aorta were found in the sampling of *C. thous* from the present study.

Some studies have noted variations in the emergence of the celiac artery in some species of mammals and mention the presence of a common trunk formed by the celiac and cranial mesenteric arteries called the celiac-mesenteric trunk. It was reported with *Ovis aries* [21], *B. bubalis* [24], *Capra aegagrus hircus* [13], *Myocastor coypus* [23], *C. familiaris* [30], *Felis catus* [29], *Didelphis albiventris* [11], and humans [15]. In humans, another arrangement has been described: the formation of the celiac-

bimesenteric trunk, formed by the celiac, superior mesenteric, and inferior mesenteric arteries [7,26].

Regarding the incidence in mammals, the celiac-mesenteric trunk was divided into three groups: a group with a regular or preponderant incidence, observed in *Cavia porcellus*; a group with frequent incidence, observed in *O. aries*; and a group with a low or zero incidence observed in *Castor fiber*, *Erinaceus europaeus*, *Mesocricetus auratus*, and *Mus musculus* [31]. In canids, the occurrence of celiac-mesenteric trunk is described only in *C. familiaris* [30], not being found in *L. gymnocercus* [22] or *C. thous*.

Skeletopy

In domestic carnivores, the celiac artery has a predominant origin at the level of the first lumbar vertebra (Table III) [1,29,33], although origin points as cranial as the 13th thoracic vertebra or as caudal as the 2nd lumbar vertebra are often described [1,25,33]. In the wild canid *L. gymnocercus*, the predominant skeletopy of the celiac artery was at the level of the 2nd lumbar vertebra, varying cranially to the 1st lumbar [22], similar to the results obtained in the sampling of *C. thous* in this research. In other carnivores, including *C. familiaris* and *F. catus* as well as wild canids *Vulpes vulpes* and procyonid *Nasua nasua*, the skeletopy was at the level of the first lumbar [1,5,12,33].

Getty [17] reported that the celiac artery appears at the level of the 17th and 18th thoracic vertebra in *Equus ferus caballus*, at the level of the 1st lumbar vertebra in *Bos taurus* and *O. aries*, between the 1st and 2nd lumbar vertebra in goat, and between the last thoracic vertebra and the 1st lumbar vertebra in *Sus domesticus*. In *Oryctolagus cuniculus*, the celiac artery's level predominates between the 13th thoracic vertebra and the 1st lumbar[2], ventrally to the 1st lumbar vertebra in *C. porcellus* [17], and the celiac trunk appears at the level of the 12th thoracic vertebra in humans [26].

Reports of celiac artery length measurements are still scarce. In the *C. familiaris* it measures around 2 cm [14], 1.3 cm in *F. catus* [33], and about 1.4 cm in *C. thous*. Regarding the distance between the origins of the celiac and cranial mesenteric arteries, it was described as 3 mm in *B. bulbalis* fetuses, ranging from 1.8 to 5 mm [24]. In humans, it was 12 mm, ranging from 3 to 23 mm [4]. The mean value found in *L. gymnocercus* was 6.66 mm, had a moderate correlation with the animal's length [22], and was smaller than in the *C. thous* specimens analyzed.

Main branches

The classic trifurcation of the celiac artery into hepatic, left gastric, and lienal arteries was the most prevalent arrangement in *C. thous*, similar to that registered in *C. familiaris*, *O. cuniculus*, *M. coypus*, and *Galea spixii* [1,2,10,27]. The bifurcation in a hepatic artery and gastrolial trunk found in a single specimen of *C. thous* of this sampling was also reported as sporadic in *C. familiaris* [1,14]. However, this bifurcation was found in almost half of *F. catus* [33]. In *O. cuniculus*, unlike in other species, the celiac artery emitted only one arrangement: the lienal artery and then the left gastric artery, which continued to be hepatic [2]. In *Hystrix cristata* and *D. albiventris*, the celiac artery was divided into only two branches: the lienal artery and the hepatic artery in all animals studied [6,11].

CONCLUSIONS

It can be concluded that the celiac artery in *C. thous* originates as a single artery in the ventral face of the abdominal aorta, predominantly at the level of the second lumbar vertebra, about 1.5 cm from the cranial mesenteric artery, cranially. The artery measures about 1.4 cm until the predominant classic trifurcation occurs, although a bifurcation variant can be verified. These anatomical characteristics are similar to those described in other canids, possibly as an expression of the evolutionary proximity of these species.

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REFERENCES

1. Abidu-Figueiredo M, Dias GP, Cerutti S, Carvalhode-Souza B, Maia RS, Babinski MA. Variations of celiac artery in dogs: Anatomic study for experimental, surgical and radiological practice. *International Journal of Morphology*. 2005;23(1):37-42, <http://dx.doi.org/10.4067/S0717-95022005000100007>.
2. Abidu-Figueiredo M, Xavier-Silva B, Cardinot TM, Babinski MA, Chagas MA. Celiac artery in New Zealand rabbit: anatomical study of its origin and arrangement for experimental research and surgical

- practice. Pesquisa Veterinária Brasileira. 2008;28(5):237-240. <https://doi.org/10.1590/S0100-736X2008000500002>
3. Amadori A, Birck AJ, Fidelpho AL, Guimarães GC, Peres JÁ, Souza RAM. Origem e distribuição da artéria celiaca em veado catíngueiro (*Mazama gouazoubira*). Revista Científica Eletrônica Medicina Veterinária [Internet]. 2012 Jul. [cited 2020 Mar 03];10(19). Available from: http://faef.revista.inf.br/imagens_arquivos/arquivos_destaque/NnwiPEIvFhCS7oy_2013-6-24-12-3-16.pdf. Portuguese.
 4. Araújo-Neto S, Franca HA, Mello Jr CF, Silva Neto EJ, Negromonte GR, Duarte CM, et al. Anatomical variations of the celiac trunk and hepatic arterial system: an analysis using multidetector computed tomography angiography. Radiologia Brasileira. 2015;48(6):358-362. <https://doi.org/10.1590/0100-3984.2014.0100>
 5. Assunção MPB, Oliveira TAD, Oliveira TS, Oliveira LP, Silva DCO, Barros RAC, Silva Z. Comparative Anatomy of Abdominal Aorta in Coati (*Nasua nasua*). International Journal of Advanced Engineering Research and Science 2019; 6(2): 259-267.
 6. Atalar O, Yimaz S. The branches of the arteria celiaca in the porcupine (*Hystrix cristata*). Veterinarni Medicina. 2004;49(2):52-56. <https://doi.org/10.17221/5675-VETMED>
 7. Bergman RA, Thompson SA, Afifi AK, Saadeh FA. Compendium of human anatomic variation: Catalog, Atlas and World Literature. Urban & Schwarzenberg, Munich 1988.
 8. Cheida CC, Nakano-Oliveira E, Fusco-Costa R, Rocha-Mendes F, Quadros J, editors. Ordem Carnívora. In: Reis NR, Perachi AL, Pedro WA, Lima IP (eds). Mamíferos do Brasil. Nelio R. dos Reis, Londrina 2006. 231-276.
 9. Courtenay O, Maffei L. Crab-eating fox *Cerdocyon thous* (Linnaeus, 1766). In: Sillero-Zubiri C, Hoffmann M, Macdonald DW, editors. Canids: Foxes, Wolves, Jackals and Dogs. Status Survey and Conservation Action Plan. IUCN/SSC Canid Specialist Group, Cambridge 2004. 32-38.
 10. Culau POV, Azambuja RC, Campos R. Ramos colaterais viscerais da aorta abdominal em *Myocastor coypus* (nutria). Acta Scientiae Veterinariae. 2008;36(3):241-247.
 11. Culau POV, Reckziegel SH, Goltz LV, Araújo CP. A artéria celiaca em *Didelphis albiventris* (gambá). Acta Scientiae Veterinariae. 2010;38(2):121-125. <https://doi.org/10.22456/1679-9216.16589>
 12. Doğan GK, Dalga S, Akbulut Y, Aslan K. Kızıl Tilkiilerde (*Vulpes vulpes*) Arteria Celiaca ve Dalları Üzerinde Bir Çalışma. Harran Üniversitesi Veteriner Fakültesi Dergisi 2019; 8 (2): 168-172.
 13. Evans H, An MQ. Anatomy of the Ferret. In: Fox JG, Marini RP (eds) Biology and Diseases of the Ferret, 3rd ed, John Wiley & Sons: Philadelphia, 2014. 23-67.
 14. Evans HE, Lahunta A. Miller's Anatomy of the Dog. 4th ed. Elsevier Health Sciences, New York 2013.
 15. Fakoya AOJ, Aguinaldo E, Velasco-Nieves NM, Barnes E, Vandever ZT, Morales-Marietti N, Afolabi AG, McCracken T. A Unique Communicating Arterial Branch between the Celiac Trunk and the Superior Mesenteric Artery: A Case Report. OAMJMS. 2019;7(13):2138-2141. <https://doi.org/10.3889/oamjms.2019.562>
 16. Ferreira F.A. Origem das artérias mesentéricas cranial e caudal em fetos de caprinos da raça Saanen (*Capra hircus* Linnaeus, 1758). Brazilian Journal of Veterinary Research and Animal Science. 2001;38:69-73. <https://doi.org/10.1590/S1413-95962001000200005>
 17. Getty R, Sisson S, Grossman JD. Anatomia dos animais domésticos. 5th ed. Vol. 1. Guanabara Koogan, Rio de Janeiro 1986.
 18. Hunter L. Carnivores of the World. Princeton University Press, Princeton 2011.
 19. Kasper CB, Trinca CS, Sanfelice D, Mazim FD, Trigo TC. Os carnívoros. In: Gonçalves GL, Quintela FM, Freitas TRO (eds). Mamíferos do Rio Grande do Sul. Pacartes, Porto Alegre 2014. 161-190.
 20. König HE, Liebich HG. Anatomia dos animais domésticos: texto e atlas colorido. 6th ed. Artmed, Porto Alegre 2016.
 21. Langenfeld M, Pastea E. Anatomical variants of the celiac artery in sheep with special reference to the celiomesenteric arterial trunk. Anatomischer Anzeiger. 1977;142:168-174.
 22. Leão-Neto LFL, Souza EC, Santos EAR, Montana MM, Carvalho AD, Junior PS. Esqueletopia e topografia da artéria celiaca no *Lycalopex gymnocercus* (Fischer, 1814). Revista Acadêmica Ciência Animal. 2019;17:1-7. <http://dx.doi.org/10.7213/1981-4178.2019.17007>.
 23. Machado GV, Souza JR, Gonçalves PR, Parizzi A, Donin DG. A artéria celiaca e seus ramos no rato-do-banhado (*Myocastor coypus* - Rodentia: Mammalia). Biotemas 2002;15(2):44-52. <https://doi.org/10.5007/%25x>

24. Machado MRF, Miglino MA, Cabral VP, Araujo N. Origin of celiac and cranial mesenteric arteries in buffaloes (*Bubalus bubalis* L. 1758). Brazilian Journal of Veterinary Research and Animal Science. 2000;37:99-104. <https://doi.org/10.1590/S1413-95962000000200002>.
25. Niza MMRE, Vilela CL, Ferreira AJA, Gonçalves MS, Pisco JM. Irrigação arterial hepática em canídeo. Revista Portuguesa de Ciências Veterinárias 2003;98(546):69-76.
26. Nonent M, Larroche P, Forlodou P, Senecail B. Coeliac bimesenteric trunk, anatomic and radiologic description: Case report. Radiology. 2001; 220:489-491. <https://doi.org/10.1148/radiology.220.2.r01au34489>
27. Oliveira, GB, Oliveira REM, Bezerra FVF, Câmara FV, Júnior HNA, Oliveira MF. Origem e distribuição da artéria celiaca em preás (*Galea spixii* Wagler, 1831). Ciência Animal Brasileira. 2017;18:e-32918. <https://doi.org/10.1590/1089-6891v18e-32918>
28. Pinheiro LL, Araújo AB, Lima AR, Martins DM, Melul R, Souza ACB, Pereira LC, Branco É. Os ramos colaterais da aorta abdominal em jaguatirica (*Leopardus pardalis*). Pesquisa Veterinária Brasileira 2014; 34(5): 491-495. <https://dx.doi.org/10.1590/S0100-736X2014000500018>
29. Roza MS, Pestana FM, Silva BX, Hernandez JMF, Abidu-Figueiredo M. Tronco Celiaco-Mesentérico em Gato. Revista Portuguesa de Ciências Veterinárias 2009;104(569):83-86.
30. Schmidt DP, Schoenau LSF. Origem das artérias celiaca e mesentérica cranial por tronco comum em cão. Ciencia Rural 2007;37(2):408-411. <https://doi.org/10.1590/S0103-84782007000200017>.
31. Schultz W. Der Magen-Darm-Kanal der Monotremen und Marsupialier. In: Helmeke JG, Starck D, Wermuth H. (eds). Handbuch der Zoologie. Walter de Gruyter, Berlin 1976. 1-117.
32. Silva ASL, Feliciano MAR, Motheo TF, Oliveira JP, Kawanami AE, Werther K, Palha MDC, Vicente WRR. Mode B ultrasonography and abdominal Doppler in crab-eating-foxes (*Cerdocyon thous*). Pesquisa Veterinaria Brasileira 2014;34(1):23-28. <https://doi.org/10.1590/S0100-736X2014001300005>.
33. Xavier-Silva B, Roza MS, Babinski MA, Scherer PO, Palhano HB, Abidu-Figueiredo M. Morfometria, origem e esqueletopia da artéria celiaca no gato doméstico. Revista Brasileira de Medicina Veterinária 2013;35(3):253-259.
34. Yousefi M. Ramification of Celiac artery in the pine marten (*Martes martes*). Iranian Journal of Veterinary Science and Technology 2016; 8(2): 60-65. <https://doi.org/10.22067/veterinary.v8i2.54842>

Table I. Mean and standard deviation (cm) of the rostrum-sacral length, length of the celiac artery and the distance between the celiac and cranial mesenteric arteries in *Cerdocyon thous*. The p value corresponds to that obtained in the t-test of comparison of means between sex.

	<i>Cerdocyon thous</i> (n=14)		
	Males (n=6)	Females (n=8)	p
Rostrum-sacral length	67.0 ± 4.79	62.09 ± 5.78	0.11
Celiac artery length	1.43 ± 0.17	1.39 ± 0.24	0.78
Distance between celiac and cranial mesenteric arteries	1.48 ± 0.20	1.60 ± 0.26	0.36

Table II. Absolute and percentage frequencies of the skeletopy of the celiac artery in *Cerdocyon thous*.

Skeletopy	Males (n=06)	Females (n=08)	Total (n=14)
L1	2 (33.3%)	-	2 (14.3%)
L1-L2	1 (16.7%)	3 (37.5%)	4 (28.6%)
L2	3 (50.0%)	5 (62.5%)	8 (57.1%)

Table III. Summarization of common skeletopy, average length and primary branches of celiac artery in species of the order Carnivora.

Species	Family	n	Common skeletopy	Lenght	Branches
<i>C. thous</i>	Canidae	14	L2	1.41 cm	Hepatic, left gastric & lienal arteries
<i>L. gymnocercus</i> [22]	Canidae	15	L2	-	Hepatic, left gastric & lienal arteries
<i>V. vulpes</i> [12]	Canidae	06	L1	-	Gastrolienal trunk & hepatic artery
<i>C. familiaris</i> [1]	Canidae	30	L1	0.98 cm	Gastrolienal trunk & hepatic artery <i>or</i> hepatic, left gastric & lienal arteries
<i>M. martes</i> [34]	Mustelidae	01	-	-	Gastrolienal trunk & hepatic artery
<i>M. p. furo</i> [13]	Mustelidae	-	-	-	Hepatic, left gastric & lienal arteries
<i>N. nasua</i> [5]	Procyonidae	04	L1	-	Hepatic, left gastric & lienal arteries
<i>F. catus</i> [33]	Felidae	30	L1	1.30 cm	Gastrolienal trunk & hepatic artery <i>or</i> hepatic, left gastric & lienal arteries
<i>L. pardalis</i> [28]	Felidae	02	-	-	Hepatic, left gastric & lienal arteries

Figure 1. Photomacrography of the aorta (**Ao**), cranial mesenteric (**CrM**) artery and celiac artery (**Cel**) and its main branches (classic trifurcation): hepatic (**Hep**), left gastric (**LG**) and lienal (**Lie**) arteries in a female, adult, specimen of *Cerdocyon thous*. Scale bar: 10mm

Figure 2. Photomacrography of the aorta (**Ao**), cranial mesenteric (**CrM**) artery and celiac artery (**Cel**) and its main branches. In this specimen, an adult male *Cerdocyon thous*, celiac artery originated a gastrolienal trunk (**GLTr**) and a hepatic artery (**Hep**); the gastrolienal trunk bifurcated into lienal (**Lie**) and left gastric (**LG**) arteries. Scale bar: 10 mm



