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ORIGIN LEVEL OF THE VENTRAL BRANCHES OF THE ABDOMINAL AORTA IN THE RABBIT AND EUROPEAN HARE

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ABSTRACT

The aim of this research was to describe the level of origin of the branches originating from the ventral surface of the abdominal aorta in the rabbit and hare. The study was carried out on ten adult rabbits and ten adult European hares using the corrosion cast technique. After euthanasia, the vascular network was perfused with saline. Batson's corrosion casting kit No. 17 was used as a casting medium. After polymerization of the medium, the maceration was carried out in a KOH solution. We found variable levels of the origin of the celiac, cranial mesenteric and caudal mesenteric arteries in both species. In the rabbit, the celiac artery originated in the majority of cases at the cranial end of the first lumbar vertebra and in the hare at the middle part of the vertebral body of the same vertebra. The cranial mesenteric artery in the rabbit originated predominantly at the level of the first lumbar vertebra and in the hare at the level of the second lumbar vertebra. In the rabbit, the caudal mesenteric artery originated mainly at the level of the sixth lumbar vertebra and in the hare, at the level of the fifth lumbar vertebra. We concluded that there were higher variabilities of the origins of the ventral branches of the abdominal aorta in domesticated rabbit in comparison with the European hare.

Key words: caudal mesenteric artery; celiac artery; cranial mesenteric artery; European hare; rabbit

INTRODUCTION

The European hare belongs to the most frequently seen wild mammal in the territories of the Slovak Republic and neighbouring countries. Despite this fact, the literature dealing with the anatomy of this species is rather rare, except for some studies dealing with the anatomy of its arterial system [4, 5].

The arterial pattern including the arrangement, origin, course and variations of almost all arteries, have been the objects of different studies. The branches arising from the ventral surface of the abdominal aorta have been studied in such experimental animals as, a dog [1], cat [7], rabbit [2] and guinea pig [10].

The aim of this paper was to compare the variations in the level of origin of the celiac, cranial mesenteric and caudal mesenteric arteries in the domesticated rabbit and European hare.

MATERIALS AND METHODS

This study was carried out on 10 adult European hares (*Lepus Europaeus*, L. 1758, age 140 days) and on 10 adult rabbits (*Oryctolagus cuniculus f. domestic*a, L. 1758, age 140 days). We used hares (obtained from ISFA APRC, Nitra, Slovakia) of both sexes (female n = 5; male n = 5) with a weight range of 2.5—3.2 kg and New Zealand White rabbits (obtained from HYLAPA s. r. o., Prešov, Slovakia) of both sexes (female n = 5; male n = 5) in an accredited experimental laboratory of the University of Veterinary Medicine and Pharmacy in Kosice, Slovakia. The animals were kept in cages under standard conditions (temperature 15—20 °C, relative humidity 45 %, 12-hour light period), and fed with a granular feed mixture (O-10 NORM TYP, Spišské kŕmne zmesi, Spišské Vlachy, Slovakia). The drinking water was available to all animals *ad libitum*. Thirty minutes before the animals were sacrificed by intravenous injection of embutramide (T-61, 0.3 ml.kg^{-1}) the animals were injected intravenously with heparin (50 000 IU.kg^{-1}). Immediately after euthanasia, the vascular network was perfused with a physiological solution. During manual injection through the ascending aorta, the right atrium of the heart was opened with an aim to lower the pressure in the vessels in order to ensure an optimal injection distribution; 50 ml of Batson's corrosion casting kit No. 17 (Dione, České Budějovice, Czechia) was used as the casting medium. The maceration was carried out in a 2—4 % KOH solution for a period of 5 days at 60—70 °C. This study was carried out under the authority decision No. 2647/07-221/5.

RESULTS

The unpaired celiac artery arose from the ventral surface of the abdominal aorta and supplied blood to the stomach, spleen, liver, pancreas and partially to the duodenum. In the rabbit, its origin was located at the level of the cranial end of the twelfth thoracic vertebra in 20 % of the cases; in the middle of the vertebral body of the thirteenth thoracic vertebra in 30 % of the cases (Fig. 1); and at the level of the first lumbar vertebra in 50 % of the cases. When originating at the level of the first lumbar vertebra, it was located at its cranial end in 30 % of the cases; and in the middle part of the vertebral body in 20 % of the cases. In the hare, the celiac artery originated at the level of the first lumbar vertebra in all the cases (Fig. 2); at the cranial end of this vertebra in 10 % of the cases; in the middle part of the vertebral body in 50 % of the cases; and at the caudal end in 40 % of the cases.

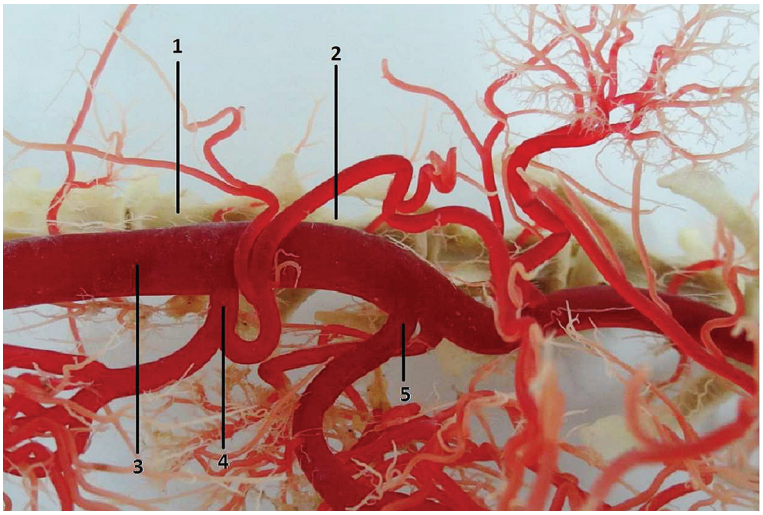

Fig. 1. Origin of the celiac artery at the level of the 13th thoracic vertebra and the origin of the cranial mesenteric artery at the level of the 1st lumbar vertebra in the rabbit
1 — 13th thoracic vertebra, 2 — 1st lumbar vertebra, 3 — abdominal aorta, 4 — celiac artery
5 — cranial mesenteric artery. Macroscopic image, ventrolateral view

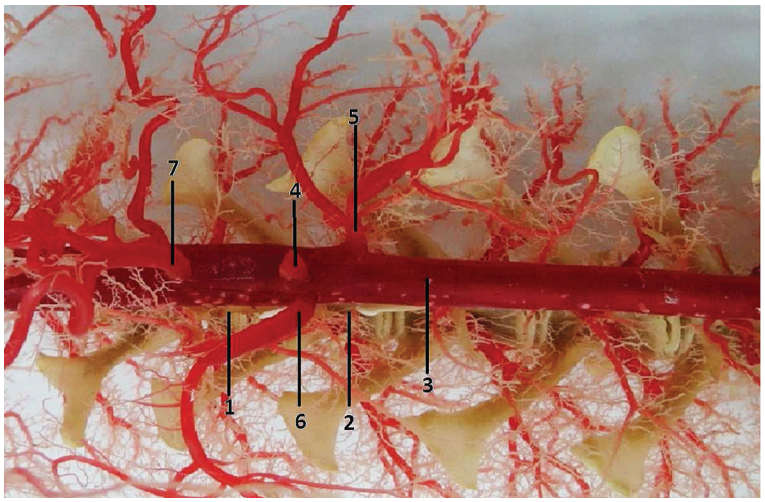

Fig. 2. Origin of the celiac artery at the level of the 13th thoracic vertebra and the origin of the cranial mesenteric artery at the level of the 1st lumbar vertebra in the hare
1 – 1st lumbar vertebra, 2 – 2nd lumbar vertebra, 3 – abdominal aorta, 4 – cranial mesenteric artery, 5 – left renal artery, 6– right renal artery, 7 – celiac artery. Macroscopic image, ventral view

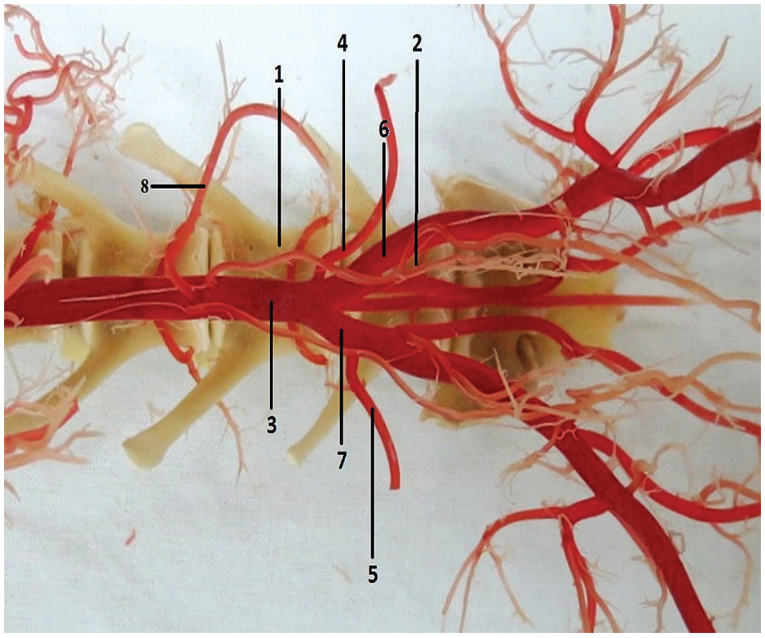

Fig. 3. Origin of the caudal mesenteric artery at the level of the 5th lumbar vertebra in the rabbit
1 – 6th lumbar vertebra, 2 – 7th lumbar vertebra, 3 – abdominal aorta,
4 – left deep circumflex iliac artery, 5 – right deep circumflex iliac artery, 6 – left common iliac artery, 7 – right common iliac artery. Macroscopic image, ventral view

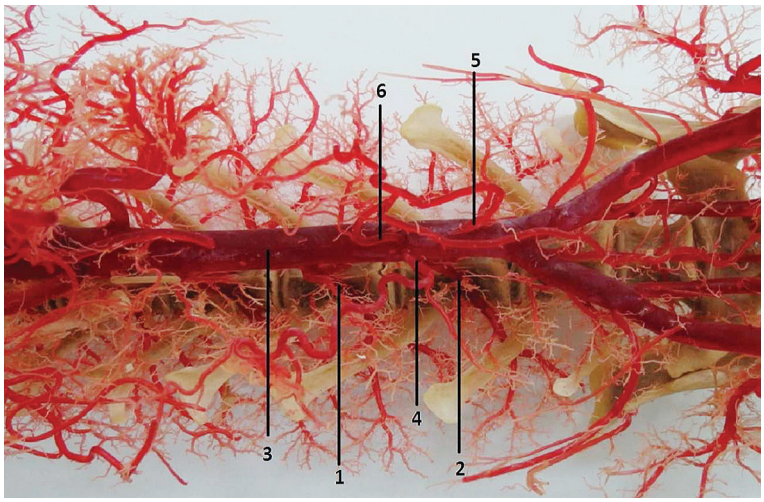

Fig. 4. Origin of the caudal mesenteric artery at the level of the 5th lumbar vertebra in the hare
1 – 4th lumbar vertebra, 2 – 5th lumbar vertebra, 3 – abdominal aorta, 4 – left ovarian artery, 5 – right ovarian artery
6 – caudal mesenteric artery. Macroscopic image, ventral view

The cranial mesenteric artery gave off branches supplying the pancreas, small intestine, cecum and ascending colon. It originated caudally to the origin of the celiac artery. In the rabbit, this artery originated at the level of the first lumbar vertebra in 60 % of the cases; in 20 % of the cases in the middle part of the vertebral body; and in 40 % of the cases at its caudal end (Fig. 1). In the remaining 40 % of the cases, the origin of this vessel was located at the level of the second lumbar vertebra and specifically as follows: at its cranial end in 20 % of the cases; and at the middle part of the vertebral body in 20 % of the cases. In the hare, the origin of this vessel was at the level of the second lumbar vertebra in 90 % of the cases (Fig. 2); at its cranial end in 30 % of the cases; at the middle part of the vertebral body in 50 % of the cases; and at its caudal end, in 10 % of the cases. At the level of the first lumbar vertebra, the cranial mesenteric artery originated in 10 % of the cases.

The third ventrally directed branch of the abdominal aorta was the caudal mesenteric artery supplying the descending colon and rectum. Its origin in the rabbit was at the caudal end of the fifth lumbar vertebra in 40 % of the cases (Fig. 3); and at the level of the cranial end of the sixth lumbar vertebra in 60 % of the cases. In the hare, the origin was positioned at the level of the middle part of the vertebral body of the fourth lumbar vertebra in 10 % of the cases; and in 90 % of the cases, at the level of the fifth lumbar vertebra (Fig. 4) as follows: at its cranial end in 30 % of the cases; in the middle part of the vertebral body in 20 % of the cases; and at its caudal end, in 40 % of the cases.

DISCUSSION

The detailed knowledge of the vascular anatomy plays an important role in the management of several pathologic conditions and treatments of various diseases. They must be considered not only in experimental models but also in surgical practice in laboratory and domesticated animals [8, 11].

The celiac artery in the rabbit was described as the first unpaired ventrally directed branch also in other studies [2, 9]. In the study of Abidu et al. [2], the place of origin of the celiac artery was very variable; in 40 % of the cases between the thirteenth thoracic and first lumbar vertebra; in 36.7 % of the cases between the twelfth and thirteenth thoracic vertebra; in 20 % of the cases at the level of thirteenth thoracic vertebra; and in 3.3 % of the cases at the level of the first lumbar vertebra. In 50 % of the cases, we found the origin at the level of the first lumbar vertebra, and in the rest of the cases, cranially to this vertebra. The comparison of the level of origin of the celiac artery between the rabbit and hare, showed a more caudal origin at the level of the first lumbar vertebra in the hare.

In our study, the second ventrally directed branch arising from the ventral surface of the abdominal aorta

in the rabbit was the cranial mesenteric artery. This observation correlated with the findings of Ahasan et al. and Popesko et al. [3, 9]. It originated at the caudal end of the second lumbar vertebra [12]. On the corrosion casts, we found the origin at the level of the first lumbar vertebra in 60 % of the cases and at the level of the second lumbar vertebra in 40 % of the cases. The origin of the cranial mesenteric artery in the hare was generally caudal to the origin in the rabbit. In 90 % of the cases, it arose at the level of the second lumbar vertebra.

In the rabbit, the origin of the caudal mesenteric artery was described at the level of the sixth lumbar vertebra [12]. In our study, it was at the caudal end of the fifth lumbar vertebra in 40 % of the cases and at the level of the cranial end of the sixth lumbar vertebra in 60 % of the cases. In the hare, the origin was positioned more cranially; at the level of the fifth lumbar vertebra in 90 % of the cases; and at the level of the middle part of the vertebral body of the fourth lumbar vertebra in 10 % of the cases.

The detailed description of the arterial system in the hare is still lacking in the literature. We believe that a better understanding of the differences between familiar species in domesticated and wild species will also increase the anatomical knowledge. Such knowledge is highly significant not only for comparative studies across species but also in everyday veterinary practices [6].

CONCLUSIONS

The results of this study indicated a relatively high variability in levels of the origin of the celiac, cranial mesenteric and caudal mesenteric arteries in the rabbit, with lesser occurrence in the hare. These findings are possibly associated with the different ways of life.

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