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RELATION OF ARTERIAL VASCULARIZATION OF THE KIDNEY AND THE ADRENAL GLAND OF THE GERMAN SHEPHERD DOGS

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Alman çoban köpeklerinde böbreklerin ve böbreküstü bezlerinin arteriyel vaskularizasyon ilişkisi

Özet: Bu çalışmanın amacı Alman çoban köpeklerinde böbreklerin ve böbreküstü bezlerinin arteriyel vaskularizasyonunu ortaya çıkarmaktır. Çalışmada materyal olarak Gemlik Askeri Veteriner Okulu ve Eğitim Merkez Komutanlığı köpek takımından temin edilen ve yaşları altı aylık ila bir yıl arasında değişen erkek ve dişi karışık olmak üzere (beş erkek üç dişi) sekiz adet Alman çoban köpeği kullanılmıştır. Renklendirilmiş latex enjekte edilerek bulunan sonuçlarda; böbreklerin aorta abdominalis'ten sağlı sollu ayrılan a. renalis dextra et sinistra tarafından; böbreküstü bezlerinin ise bu damarlardan ve aa. phrenicoabdominales'in kollarının vermiş olduğu rr. suprarenales tarafından kanlandırıldığı ve bu durumun literatür bilgileriyle benzeştiği tespit edilmiştir.

Anahtar Sözcükler: Alman çoban köpeği, a. renalis, a. suprarenalis.

Summary: Arterial vascularization of the kidney and the adrenal gland of the German shepherd dog was the subject of the present study. A number of eight German shepherd dogs regardles of sex with the age of six months to one year, provided from Gemlik Military Veterinary School and Education Center Commendership, were used in the study. The results obtained by injecting colored latex through the aorta have showed that the right and the left kidneys are supplied by the right and left renal arteries, a. renalis dextra et sinistra, respectively. The adrenal glands have also been shown receiving blood via the braches from the both renal and the both phrenicoabdominal arteries, a. phrenicoabdominalis dextra et sinistra, as indicated in the literature.

Key Words: German shepherd dog, renal artery, suprarenal artery.

Introduction

In dogs, kidneys are supplied by the renal arteries, aa. renis, leaving the abdominal aorta, aorta abdominalis, at different levels. The right renal artery, a. renalis dextra, arises cranial to the left one in conformity with the more cranial location of the right kid-

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ney (3, 7, 8, 9, 12). This vessel is longer than the left one and passes over the caudal vena cava, vena cava caudalis, going into the renal hilus, hilus renalis. Studies in human (2) and dogs (15) have revealed an arterial network between the kidneys and the adrenal glands. Each of the renal artery divides into two or more branches at the level of the renal hilus. These branches, in turn, give rise to interlobar arteries, aa. interlobares, entering into the paranchym. Before this, the branches yield caudal suprarenal rami, rr. suprarenales caudales, for the adrenal gland, r. uretericus for the ureter, and some smaller branches for the adipose capsul, capsula adiposa (1, 4, 8, 12).

In dogs, each of the adrenal gland, gl. suprarenalis dexter et sinister, is located at the cranial aspect of the each kidney, left one lying more caudally (14). The adrenal glands may receive their blood from several small branches of the vessels around including aorta, renal, lumbal, phrenicoabdominal, and cranial mesenteric arteries (6, 12, 13). These vessels cross the dorsal surface of the left gland, cranial border of the right gland (14). Blood perfusing the adrenal glands is gathered in a central vena from which vv. emissaria are arisen. These venae take the blood to the hilus and to the caudal vena cava.

Rr. suprarenales craniales that may take their origins from the phrenicoabdominal, the cranial mesenteric, or the celiac arteries vascularize the cranial part of the gland. Likewise, the medial suprarenal artery, a. suprarenalis media, arises from the abdominal aorta, just caudal to the origin of the cranial mesenteric artery, carrying blood to the middle part of the gland (6). Rr. suprarenales caudales are originated from the branches given by the renal arteries at the level of the renal hilus, nourishing the caudal part of the gland. Hence, the suprarenal glands may receive blood from the rr. suprarenales originated from the first and the second lumbal arteries (11, 13).

In the present study, situation, distribution, variation among the species and individual (if there is), of the renal and suprarenal arteries of the German shepherd dogs.

Material ve Method

In the present study, a number of eight German shepherd dogs regardles of sex with the age of six months to one year, provided from Gemlik Military Veterinary School and Education Center Commendership, were used. Thoracal cavities, cavum pectoris, of the dogs that were gently deeply anastized by choloral hydrate were opened, the hearts were cut off from the apex, and blood was emptied. The vessels were cleaned with serum physiologic with 0.9% through the aorta as indicated in the literature (5). Colored latex (ZPG 582-G) was injected through the abdominal aorta. The specimens were waited at room tempreture in 10% fromaldehyde for 2-3 days for the freezing of the latex. The vessels nourishing the kidneys and the adrenal glands were dissected and their pictures are taken.

Nomina Anatomica Veterinaria (10) were used for anatomical nomenculature.

Results

Locations of the right and left kidneys are shown in the figure 1 (Figure 1; A, B). Approximate diameter of the renal arteries (Figs. 1 and 2; 2, 3) in the specimens used was determined to be nearly 3 mm. The left renal artery was seen arising from the abdominal aorta (Figure. 1 and 2; 1) nearly 6-8 cm far from the origin of the cranial mesenteric artery, dividing into a dorsal and a ventral branch approximately 1.7-1.8 cm far from its origin(Figure 1; 3a, 3b). Hence, these branches were observed giving rise to 2-

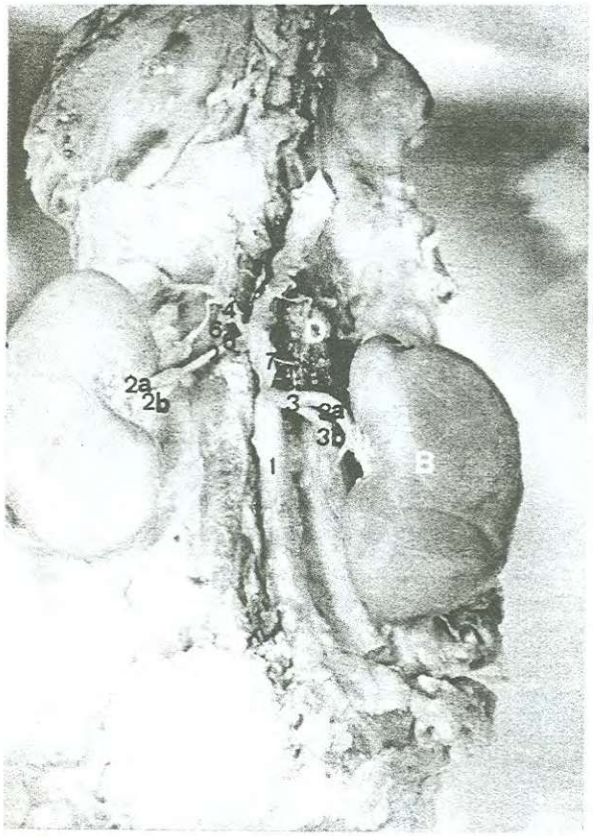

Figure 1. Exposure of the kidneys and the suprarenal glands, and relation of their arterial vascularization in the German shepherd dog.
A- right kidney, B- left kidney, C- right adrenal gland, D-left adrenal gland, 1- abdominal aorta, 2- right renal artery (2a- dorsal branch, 2b- ventral branch), 3- left renal artery (3a- dorsal branch, 3b- ventral branch), 4- right phrenicoabdominal artery, 5- right suprarenal artery, 6- right suprarenal ramus, 7- median suprarenal artery.

Resim 1. Alman çoban köpeğinde böbrek ve böbreküstü bezleri ve arteriyel vaskularizasyon ilişkilerinin görünüşü.
A- ren dexter, B- ren sinister, C- gl.suprarenalis dexter, D- gl. suprarenalis sinister, 1- aorta abdominalis, 2- a. renalis dexter (2a- dorsal dal, 2b- ventral dal), 3- a. renalis sinister, (3a- dorsal dal, 3b- ventral dal), 4- a. phrenicoabdominalis dexter, 5- a. suprarenalis dexter, 6- r. suprarenalis dexter, 7- a. suprarenalis media.

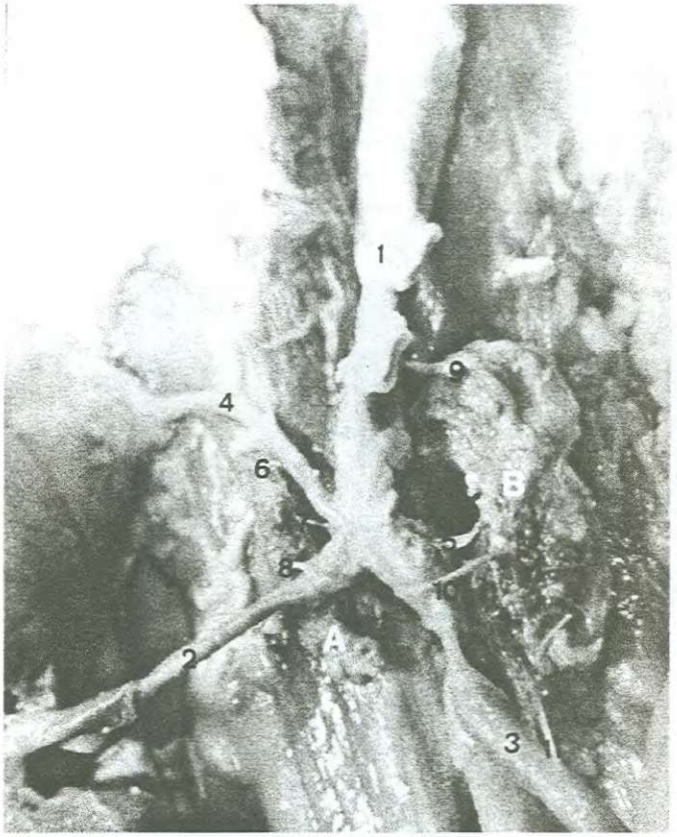

Figure 2. Exposure of the kidneys and the suprarenal glands, and relation of their arterial vascularization in the German shepherd dog (With slightly higher magnificaiton).
A- right adrenal gland, B- left adrenal gland, 1- abdominal aorta, 2- right renal artery, 3- left renal artery, 4- right phrenicoabdominal artery, 5- left phrenicoabdominal artery, 6- right suprarenal ramus, 7- right median suprarenal ramus, 8- right suprarenal artery, 9- left cranial suprarenal ramus, 10- median suprarenal artery, 11- right caudal suprarenal rami.

Resim 2. Alman çoban köpeğinde böbrek ve böbreküstü bezleri ve arteriyel vaskularizasyon ilişkilerinin görünüşü (Resim 1'deki görüntünün büyütülmüş şekli).
A- gl. suprarenalis dexter, B- gl. suprarenalis sinister, 1- aorta abdominalis, 2- a. renalis dexter, 3- a. renalis sinister, 4- a. phrenicoabdominalis dexter, 5- a. phrenicoabdominalis sinister, 6- r. suprarenalis dexter, 7- r. suprarenalis media dexter, 8- a. suprarenalis dexter, 9- r. suprarenalis cranialis sinister, 10- a. suprarenalis media, 11- rr. suprarenalis caudales dexter.

3 subbranches near the renal hilus. Each of them, in turn, divides into interlobar arteries for each renal lobe.

The right renal artery was also determined dividing into a dorsal and a ventral branch nearly 2.3-2.5 cm far from the abdominal aorta (Figures 1; 2a, 2b). This vessel was again seen giving the right suprarenal artery for the caudal and the lateral parts of the right suprarenal gland (Figures 1; 5 and 2; 8).

In a cadaver, the right renal artery was observed giving off the left renal artery approximately 0.6-0.7 cm far from its origin. In this species, a second right renal artery with a diameter of nearly 1.5-1.7 mm was seen arising from the abdominal aorta nearly 2.5 cm far from the origin of the first one for the right kidney.

In another cadaver, the left renal artery was determined dividing into a dorsal and a ventral branch approximately 0.5 cm far from its origin, entering the renal hilus.

The left adrenal gland (Figures 1; D and 2; B) was seen under the origin of the left phrenicoabdominal artery (Figures 2; 5), left to the abdominal aorta, veiling the origin of it. On the other hand, the right adrenal gland was located more cranially, right to the caudal vena cava (Figsures 1; C and 2; A).

The left phrenicoabdominal artery was determined arising from the abdominal aorta nearly 0.3-0.4 cm later from the origin of the left suprarenal rr. (Figures 2; 9). The left phrenicoabdominal artery was seen dividing into two branches right after leaving the abdominal aorta; one, a. phrenica, running cranially nearly 2 cm and giving the suprarenal ramus for the cranial border of the left adrenal gland, the other, a. abdominalis cranialis, giving off the suprarenal rami for the lateral and medial parts of the left adrenal gland. The median suprarenal artery were observed leaving the abdominal aorta supplying the medial part of the right left adrenal gland (Figures 1; 7 and 2; 10). The left caudal suprarenal rr. (Figures 2; 11) for the caudal surface of the left adrenal gland were seen arising from the origin of the left renal artery.

The right phrenicoabdominal artery (Figsures 1 and 2; 4) was determined to be leaving the abdominal aorta nearly 4-5 cm later from the origin of the cranial mesenteric artery, giving off the suprerenal r. (Figures 1 and 2; 6) for the cranial part of the right adrenal gland. From just opposite to that was seen the median suprarenal artery leaving the abdominal aorta approximately 0.2-0.3 cm later from that, supplying the ventral and medial surface of the left adrenal gland.

At the level of the origin of the right renal artery a vessel (r. suprarenalis media dextra, Figures 2; 7) was observed leaving the abdominal aorta for the mid-medial surface of the right adrenal gland. Again an arter (r. suprarenalis caudalis dextra) was determined leaving the abdominal aorta nearly 0.7-0.8 cm later from the right kidney for the caudal border of the right adrenal gland.

The right phrenicoabdominal artery was defined as leaving the abdominal aorta nearly 0.5-0.7 cm later from the right adrenal gland, right after dividing in to a. phrenica and a. abdominalis cranialis. Suprarenal ramus leaving the a. phrenica was observed supplying the craniomedial, and suprarenal rami arising from the a. abdominalis cranialis vascularizing the dorsal and middle, surfaces of the gland.

Discussion

In dogs, kidneys are nourished by the renal arteries arising from the abdominal aorta with a 90° angle. The right renal artery leaves it more cranially. Arterial vasculari-

zation of the kidneys in different species has deeply been searched by several researchers (3, 6, 8, 9, 12). These studies have showed each renal artery running to the renal hilus after leaving the abdominal aorta with the 90° angle, dividing into two or more branches at this level. On the other hand, a few studies have mentioned the renal arteries not giving off any branches until entering the kidney (9, 12). Those branches have, in turn, been known dividing into interlobar arteries, and giving too some small branches for the adrenal glands.

In this study done on German shepherd dogs, arterial vascularization of the kidneys and the adrenal glands has been revealed. The approximate diameter of the renal arteries was measured as 3 mm.

The left renal artery was observed dividing into a dorsal and a ventral branch nearly 1.7-1.8 cm far from its origin. These branches as mentioned in the literature (9, 12) were determined going into the renal hilus, terminating as interlobar arteries, after giving 2-3 suprarenal rami for the lateral and caudal parts of the left adrenal gland.

Similarly, the right renal artery was shown dividing into a dorsal and a ventral branch, also giving the suprarenal arteries for the lateral and caudal parts of the right adrenal gland both before and after this division. The branches of that artery was also observed entering the renal hilus giving rise to the interlobar arteries.

Differences on the pattern of the both right and left renal arteries in some species are thought to be due to the species variation.

The phrenicoabdominal artery in the literature is shown arising from the abdominal aorta bilaterally, dividing into the phrenic and the cranial abdominal arteries (4, 9, 12). In the present study the phrenic artery was determined supplying the ventrocaudolateral surface of the crus of the diaphragm. Additionally, the cranial abdominal artery was observed vascularizing the cranial parts of the abdominal muscles. These arteries were also determined giving some small branches for the cranial and middle parts of the each adrenal gland.

The left phrenicoabdominal artery in the present study was observed giving the suprarenal ramus for the cranial surface of the adrenal gland via the phrenic artery, and the suprarenal rami for the cranial and lateral surfaces of the gland via the cranial abdominal artery.

The right phrenicoabdominal artery in the study was too shown dividing into the phrenic artery from which the suprerenal ramus arises supplying the craniomedial, and the cranial abdominal artery from which the suprarenal rami leaves vascularizing the dorsal and middle, surfaces of the adrenal gland.

Finally, in the present study done on German shepherd dogs the kidneys were shown to be supplied by the left and right renal arteries. The caudal part of the left adrenal gland was observed to be vascularized by the suprarenal ramus leaving the left renal artery, the middle and cranial parts of that by the suprarenal rami arising from the branches of the left phrenicoabdominal artery. Similarly, the lateral and the caudal parts

of the right adrenal gland were determined to be supplied by the suprarenal arteries arising from the right renal artery, the cranial, middle and dorsal surfaces of the left adrenal gland by the suprarenal rami leaving the right phrenicoabdominal artery.

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