

## Intrarenal Segmentation of the Renal Arteries in the Kangal Dog

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### Summary

This study was carried out to determine intrarenal segmentation of the renal arteries of kidney of Kangal dog. Corrosion cast method has been carried out on 10 kidneys. The left renal artery was longer than the right one. The renal arteries divided into the dorsal and ventral branches. Both dorsal and ventral branches gave off the interlobar, arcuate and interlobular arteries, respectively. The right dorsal branch gave off 5 to 6 segmental arteries, the right ventral branch 4 to 6 segmental arteries, left dorsal branch 5-7 segmental arteries and the left ventral branch 6 to 8 segmental arteries. No anastomoses were seen between the renal arteries and their branches.

**Keywords:** *Kangal Dog, Kidney, Renal artery*

## Kangal Köpeğinde Arteriae renales'in Intrarenal Segmentasyonu

### Özet

Bu çalışma, Kangal köpeği böbreğinde kan damarlarının dallanma modelini ortaya çıkarmak amacıyla yapıldı. 10 adet böbreğe korozyon kast metodu uygulandı. Sol a. renalis, sağ a. renalis'ten daha uzundu. Aa. renales, dorsal ve ventral dallara ayrılmaktaydı. Hem dorsal hem de ventral dallar, sırasıyla aa. interlobares, aa. arcuata ve aa. interlobulares'i vermekteydi. Sağ ramus dorsalis'in 5-6, sağ ramus ventralis'in 4-6, sol ramus dorsalis'in 5-7, sol ramus ventralis'in ise 6-8 aa. interlobares verdiği tespit edildi. Aa. renalis ve dalları arasında anastomoz görülmedi.

**Anahtar sözcükler:** *Kangal köpeği, Ren, A. renalis*

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## INTRODUCTION

Anatolian Shepherd (Kangal) Dog as it is sometimes called in its native Turkey, is a breed that has existed in a specific area of Turkey from ancient times <sup>1</sup>.

Though numerous papers have been published on the segmentation of the renal arteries on various species; cat <sup>2</sup>, dog <sup>3-5</sup>, rabbit <sup>6</sup>, goat and sheep <sup>7-8</sup>, bovine <sup>9</sup>, pig <sup>10</sup>, monkey <sup>11</sup> and some wild animals <sup>12-14</sup>, there are no reports on the details of segmentation of the renal arteries of the Kangal dogs. In this study, we aimed at demonstrating the intrarenal segmentation of the renal arteries. This study will contribute to in many kidney diseases that it essential knowledge about the ramification for the renal arteries when the segmental or partial resection is to be required.

## MATERIAL and METHODS

The kidneys of five adult Kangal dogs (three males and two females) were used in this study. They were average 3-4 years old and average 50-60 kg weight. Corrosion cast method <sup>15-16</sup> was applied to the materials. The animals were anesthetized with xylazin HCl (Rompun, Bayer; Istanbul, Turkey) and ketamin HCl (Ketalar, Parke-Davis; Istanbul, Turkey). Opening the abdomen under deep anesthesia cut the abdominal aorta. Heparin (5000 IU/ml) was also injected venae saphena for prevent coagulation. The vessels were washed with 0.9% saline solution via a cannule placed into the abdominal aorta. The kidneys were obtained along with the renal arteries, followed by the injection of the takilon prepared in 20% powder monomethyl-methacrylate and 80% liquid polymethyl-methacrylate. They were kept at room temperature for 24 hours for polymerization. They were corrosion casted in 30% KOH at 60°C for 24-48 hours, washed with tap water, and photographed.

## RESULTS

The right and left renal arteries emerged from the abdominal aorta. The right renal artery arose slightly cranial to the left one and was longer. These arteries originated from the both sides of the abdominal aorta and ran towards the hilus of the kidneys. Both divided into the dorsal and ventral branches before arriving at the hilus. The right renal artery gave rise to the dorsal and ventral branches 2-2.5 cm far from the hilus, and the left renal artery 2.2-2.7 cm (*Figs. 1-2*).

The right dorsal branch gave off 5 to 6 right

interlobar arteries (*Fig. 3*). The right ventral branch ramified as 4 to 6 right interlobar arteries (*Fig. 4*). The left dorsal branch gave off 5 to 7 left interlobar arteries (*Fig. 1*). The left ventral branch ramified as 6 to 8 left interlobar arteries (*Fig. 5*).

At the medulla-cortex junction, the right interlobar arteries and the left ones were arised the bases of the medullary pyramids (*Figs. 1-5*). The arcuate arteries gave rise to a number of right interlobar arteries and the left ones with larger number than the arcuate arteries, and they were distributed to all over the kidney. No anastomosis was present between any of the subbranches of the renal arteries.

## DISCUSSION

In the present study, it was observed that the renal arteries originated from each side of the abdominal aorta, in relation with the literature <sup>2,9,12,14,17</sup>. However, Ghoshal <sup>18</sup> determined their origins to be from the ventral surface of the aorta.

The renal arteries were divided into the dorsal and ventral branches in this study. Aslan and Nazli <sup>8</sup> and Jain and Singh <sup>9</sup> have also similar findings in their study. Although, some researchers <sup>2,3,12</sup> reported that there was a third branch, which was observed in the some materials.

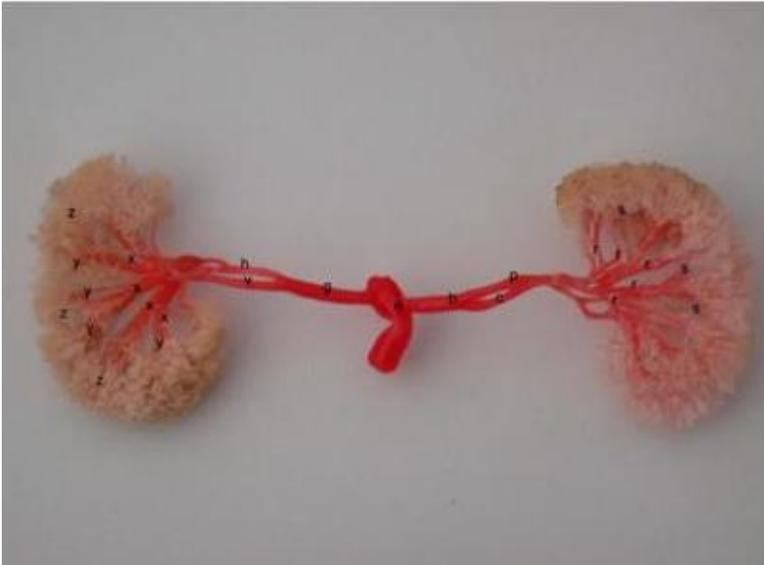
Aslan <sup>3</sup> and Aksoy and Ozudogru <sup>2</sup> showed in their study, the dorsal branch gave off two interlobar arteries for the ventral surface and the ventral branch sent one interlobar artery for the dorsal surface. Our study displayed no interlobar artery of the ventral branch going to the dorsal surface.

Aslan and Nazli <sup>8</sup> reported that an anastomosis between the dorsal and ventral branches in one material and two interlobar arteries originating directly from the renal artery in two materials. We have not encountered such findings in the study.

Aksoy and Ozudogru <sup>2</sup> demonstrated that the right dorsal branch gave off 3 to 5 segmental arteries, the right ventral branch 4 to 6 segmental arteries, the left dorsal branch 3 to 6 segmental arteries, and the left ventral branch 3 to 4 segmental arteries in the cat. Although, Fuller and Huelke <sup>19</sup> stated that 4 segmental arteries emerged from both the dorsal and ventral branches in the cat. In this study, it was found that the right dorsal branch gave off 5 to 6 segmental arteries, the right ventral branch 4 to 6 segmental arteries, left dorsal branch 5-7 segmental arteries and the left ventral branch 6 to 8 segmental arteries.

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**Fig 1.** Dorsal view of the intrarenal branches of the renal arteries

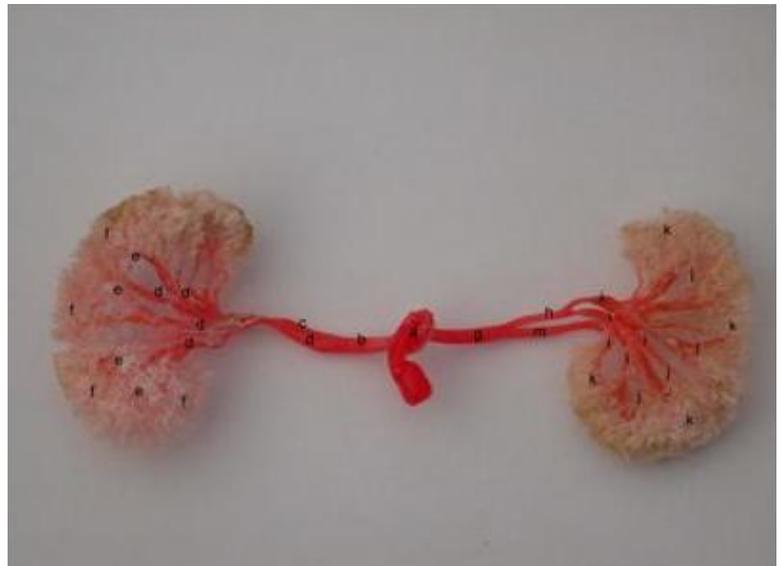
**Şekil 1.** Renal arterlerin intrarenal dallarının dorsal görünümü

- a-abdominal aorta,
- b-right renal artery,
- c-right ventral branch,
- p-right dorsal branch,
- r-right dorsal interlobar artery,
- s- right dorsal arcuate artery,
- t- right dorsal interlobular artery,
- g-left renal artery,
- h-left ventral branch,
- v-left dorsal branch,
- x-left dorsal interlobar branch,
- y- left dorsal arcuate artery,
- z- left dorsal interlobular artery

**Fig 2.** Ventral view of the intrarenal branches of the renal arteries

**Şekil 2.** Renal arterlerin intrarenal dallarının ventral görünümü

- a-abdominal aorta,
- b-right renal artery,
- c-right ventral branch,
- d-right dorsal interlobar artery,
- e- right dorsal arcuate artery,
- f- right dorsal interlobular artery,
- g-left renal artery,
- h-left ventral branch,
- m-left dorsal branch,
- i-left ventral interlobar branch,
- j- left ventral arcuate artery,
- k- left ventral interlobular artery





**Fig 3.** Dorsal view of the right renal artery

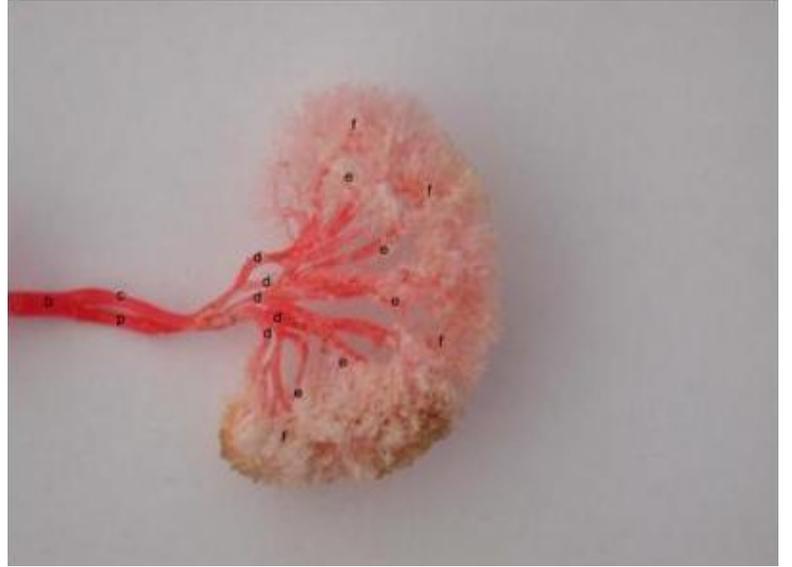
**Şekil 3.** Sağ renal arterin dorsal görünümü

b-right renal artery,  
p-right dorsal branch,  
c-right ventral branch,  
r-right dorsal interlobar artery,  
s- right dorsal arcuate artery,  
t- right dorsal interlobular artery

**Fig 4.** Ventral view of the right renal artery

**Şekil 4.** Sağ renal arterin ventral görünümü

b-right renal artery,  
c-right ventral branch,  
p-right dorsal branch,  
d-right dorsal interlobar artery,  
e- right dorsal arcuate artery,  
f- right dorsal interlobular artery



**Fig 5.** Ventral view of the left renal artery

**Şekil 5.** Sol renal arterin ventral görünümü

g-left renal artery,  
h-left ventral branch,  
v-left dorsal branch,  
i-left ventral interlobar artery,  
j- left ventral arcuate artery,  
k- left ventral interlobular artery

