



Macroanatomical Investigations on Renal Arteries of Southern Karaman Sheep

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ABSTRACT

In this study, it was aimed to investigate the arterial vascularization of the kidneys in the South Karaman sheep breed. Twelve South Karaman sheep kidneys were used in the study. The course of the renal arteries in the kidney was examined by means of dissection and corrosion cast techniques. The kidneys were vascularized with right renal artery and left renal artery to the arteries originating from the abdominal aorta. Right renal artery was seen to be slightly more prominent than the left renal artery. Left renal artery was measured longer and thicker than the right renal artery. The renal artery entering the renal hilus, dorsal and ventral part of the renal artery were detected. However, in several materials, the left renal artery was shown to have a third branch. The dorsal and ventral branches gave interlobar artery with numbers ranging from 2-5. Each interlobar artery had multiple arcuate artery. These arteries ended by giving the interlobular artery. Anastomosis was not observed between the renal arteries. Although there were some important variations in the distribution of renal arteries of South Karaman sheep, similar findings were reported in the literature.

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Introduction

Sheep breeding livestock and rural economy in terms of Turkey is very important. A significant portion of the total red meat and milk production in Turkey is from sheep.

South Karaman sheep is cultivated in South Taurus region. Southern Karaman sheep are black, brown, and gray, white or black (Tufan and Akmaz, 2001).

The excretory system consists of a pair of kidneys, ureters carrying urine, urethra that urinates and urethra which exudes urine (Dyce et al., 2002). The main functional part of the urinary system is the kidneys. Kidneys remove the residues and excess water formed as a result of metabolic activity from the body (Dursun, 2008; Konig and Liebich, 2007).

To know the distribution of renal arteries, urological and surgical techniques in the implementation, kidney transplant operations provide convenience. The aim of this study was to investigate the anatomical distribution of renal arteries in Karaman sheep.

Materials and Methods

Twelve South Karaman sheep kidneys were used as research material. The kidneys were taken together with their arteries, then 20% powdered monomethyl-methacrylate and 80% liquid polymethyl-methacrylate was prepared by injection of the prepared takilon. The casting corrosion method (Nerantsiz et al., 1978; Tompset, 1970) was applied these materials. For polymerization, the materials were kept at room temperature for 24 hours. They were exposed to corrosion in 30% KOH at 60°C for 24 hours. After dissolving soft tissues, the remainder was removed from the corrosion casts in running water. The corrosion casts were dried at room temperature. Data on prepared casts were recorded using digital caliper and digital camera (Olympus Camedia 4000 Japan). This study was conducted in accordance with ethical principles of animal experiments.

Results

In South Karaman sheep, each kidney was found to originate from the ventral wall of the abdominal aorta. The origin of the right renal artery was found to be cranial on the origin of the left renal artery. Left renal artery was found to be longer and thicker than the right renal artery. The average diameter of abdominal aorta was 10.15 mm. The average length between the right and left arteries was 11.32 mm (Figure 1-2).

The length of the right renal artery was 24.5-49.7 mm, and the length of the left renal artery was 36.8-65.3 mm. The mean right renal artery diameter was 3.56 mm and the mean left renal artery diameter was 4.04 mm. Each renal artery was divided into dorsal and ventral branches (Figure 3-4).

The diameter of the right dorsal branches was about 2.40 to 3.34 mm and the length were 6.53 to 13.31 mm. Ramus dorsalis had three or six interlobar artery (Figure 3). The diameter of the left dorsal branches was approximately

2.51 to 3.31 mm and the length were 10.05 to 17.50 mm. It had four or six interlobar artery (Figure 4). The diameter of the right ventral branch was approximately 2.46 to 3.40 mm and its length were 7.10 to 13.16 mm. It had four to six interlobar artery (Figure 5). The diameter of the left ventral branch was approximately 2.43 to 3.62 mm and the length were 8.99 to 16.71 mm. It had three to four interlobar artery (Figure 6). In a few of the left kidneys, there was a third branch in addition to the dorsal and ventral branches. This third branch had 2-3 interlobar artery (Figure 5-6).

Interlobar artery gave the arteria arcuate passing through the base of the medullary pyramids at the medulla-cortex junction. Arcuate artery from the arteries of the interlobular is, the whole surface of the kidney is feeding. Anastomosis was not observed between the renal arteries.



Figure 1. Dorsal view of the renal arteries.
AA-aorta abdominalis, AD-arteria renalis dextra,
AS-arteria renalis sinistra.



Figure 2. Ventral view of the renal arteries.
AA-aorta abdominalis, AD-arteria renalis dextra,
AS-arteria renalis sinistra.

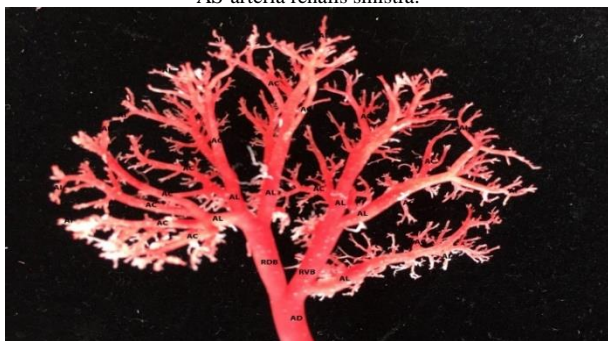


Figure 3. Dorsal view of the right renal artery.
AD- arteria renalis dextra, RDB-right dorsal branch, RVB-right ventral
branch, AL-interlobar artery,
AC-arcuate artery, AI- interlobular artery.



Figure 4. Ventral view of the right renal artery.
AD-arteria renalis dextra, RDB-right dorsal branch, RVB-right ventral
branch, AL-interlobar artery,
AC-arcuate artery, AI- interlobular artery.



Figure 5. Dorsal view of the left renal artery.
AS- arteria renalis sinistra, LDB-left dorsal branch, LVB-left ventral
branch, JB-An artery that feeds both the dorsal and ventral surfaces of the
kidney, AL-interlobar artery, AC-arcuate artery, AI- interlobular artery.



Figure 6. Ventral view of the left renal artery.
AS- arteria renalis sinistra, JB-An artery that feeds both the dorsal and
ventral surfaces of the kidney, LDB-left dorsal branch, LVB-left ventral
branch, AL-interlobar artery,
AC-arcuate artery, AI- interlobular artery.

Discussion

Renal artery originates from different parts of the abdominal aorta. In the literature, it has been reported that the renal artery, the ventral (Shively, 1978; Ghoshal, 1975), lateral (Atalar and Yilmaz, 2004), ventrolateral (Cakir, 1991), or both sides of the abdominal aorta (Yoldas et al, 2014; Aksoy et al., 2004; Nickel et al., 1981; Mohamed, 2014). In this study, it was observed that the renal artery from the ventral side of the abdominal aorta.

In the rabbits (Mazensky et al., 2012; Nowicki et al., 2010), the renal artery is present only as double renal arteries on the left side, whereas in the dogs (Shively, 1978; Christensen, 1952; Wiland and Indykiewicz, 1999; Kurtul et al., 2002) the renal artery are present as double renal arteries in both sides of the aorta. Loukas et al. (2005) indicated that three renal artery on the right side and there was an accessory renal artery which appeared as a common body with an inferior mesenteric artery on the right side. In this study, double renal artery was found in any material.

There are several reports about the length of the right and left arteries. In some sources (Mohamed, 2014; Nickel et al., 1979; Aksoy and Ozudogru, 2003; Ozudogru and Ozdemir, 2005; Ozudogru et al., 2018), the left renal artery was reported to be longer and in some other sources (Aksoy et al., 2004; Nickel et al., 1979; Ozdemir et al., 2009; Paryani, 2012) the right renal artery was longer. In all of the materials examined, it was determined that the left renal artery was longer than the right renal artery.

It was observed that the renal arteries from the renal hilus were divided into dorsal and ventral branches. Subsequently, the dorsal and ventral branches gave more than one interlobar artery. The interlobular arteries gave the arcuate artery at the medulla-cortex junction. Findings related to the branching of kidney arteries are in parallel with the literature (Yoldas et al., 2014; Aksoy et al., 2004; Ozudogru and Ozdemir, 2005; Ozdemir et al., 2009). Mazensky and Flesarova (2017) reported that the renal artery was divided into two, three or four branches.

The right dorsal branch was divided into three interlobar branches and the right ventral branch was divided into four interlobar branches. On the other hand, the left dorsal branch was divided into four to five branches and the left ventral branch to four to five branches. Left renal artery, dorsal and ventral branch as well as a third branch was given. This branch was also dorsal and ventral subbranches. Aksoy et al. (2004) reported that the right dorsal branch was divided into three interlobar artery, the right ventral branch divided into four interlobar artery, the left dorsal branch divided into three interlobar artery and the left ventral branch gave three or four interlobar artery. In the right kidney of the Tuj sheep, it was reported that an interlobar artery originating from the dorsal branch of the dorsal and ventral branches of the kidney, feeding the dorsal surface of the kidney and feeding the last part of the ventral surface in the left kidney.

In many studies on the distribution of renal artery (Aksoy et al., 2004; Aksoy and Ozudogru, 2003; Ozudogru and Ozdemir, 2005; Ozdemir et al., 2009; Evan et al., 1996; Marques-Sampaio et al., 2007; Pereira-Sampio et al., 2009), anastomosis was not observed between the arteries. However, it is reported that Morkaraman sheep (Aslan and Nazli, 2001) and anastomosis in rat (Nur and Yoldas, 2011) kidneys. No anastomosis was observed between the renal arteries.

In conclusion, this study, in which the renal arteries were examined, could be used as a reference to the surgeons in anatomical terms in order to prevent damage to these arteries during renal transplantation in urological areas.

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