

## Morphometry of Renal Artery in Two Sexes of Sheep at Different Ages

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**Abstract:** Renal artery is one of the important vessels that seem the thickness of its lumen and different layers change at different ages and sexes. This study was performed on 24 sheep. After tissue processing and paraffin sectioning, the sections were stained with Green Masson's Trichrom and ocular micrometry were used for study of lumen, tunica intima, tunica media and tunica adventitia in two sexes and ages. The thickness of lumen in male significantly was more than female in adult sheep but tunica intima, tunica media and tunica adventitia in two sexes did not show any significant differences at different ages. The thickness of lumen, tunica media and tunica adventitia in 2 sexes increased from neonate lamb to adult sheep and these increasing were significant.

**Key words:** Renal artery, micrometry, sheep, morphometry

### INTRODUCTION

Renal artery is one of the important vessels of the body because it is located very near the heart and 1/4th to 1/5th of the blood from the heart passes through the kidneys (Guyton and Hall, 2000). The walls of vessels are composed of 3 layers or tunics. The structure of renal arteries has been intensively studied for a number of years.

It has been stated that in the wall of the renal artery in humans, all layers were manifested (Aleckseevskikh, 1968) and the microscopic and ultrastructure study of swine renal artery have been showed that there are mast cells with various sizes and shapes in tunica media of swine's renal artery (Vodenicharov and Cirmuchanov, 1995). Although, there are more reports about histomorphologic study of renal artery, there have been only a few reports of histomorphomeric study of renal artery and other arteries and these have been confined to disease condition. Vascular tree of the kidneys of two cases with a long history of progressive systemic sclerosis- one normotensive, one hypertensive were examined morphometrically (Henrichs and Berry, 1980). In study on some characteristics of the renal artery and abdominal aorta in the rat by stereological method, it has demonstrated that there was an average of 2.7  $\mu$ , of cell surface for 1  $\mu$ m of cell volume in the aorta compare to 1.6

$\mu\text{m}^2/\mu\text{m}^3$  in the renal artery (Osborn-Pellegrin, 1978). In morphometrical study of intracerebral arteries it has been reported that hypertension and age were significant risk factor for medial smooth muscle cell necrosis (Masawa *et al.*, 1994).

We did this study because of the renal artery is one of the important vessels of the body where there is substantial blood pressure here which is needed for the portal system and the filtration process. It seems that thickness of lumen and different layers in renal artery change at different ages and sexes. There have been no reports of these differences in renal artery of sheep.

The aim of the present study is to investigate the thickness of lumen, tunica intima, tunica media and tunica adventitia and percentage of these layers in right renal artery of sheep in different ages and sexes.

### MATERIALS AND METHODS

For this study 24 sheep (12 adult and 12 neonate) in two sexes were used. The right renal artery was dissected from sheeps that were killed with euthanyl (MTC pharmaceuticals, Hamilton, ont).

At first, specimens washed with normal saline to flush out remaining blood and then fixed in 10% formalin. After dehydration through graded alcohols, the samples were cleared in xylol and embedded in paraffin wax.

Section were cut at 5 µm serially and stained with Green Masson's Trichrom before examination. Ocular micrometry was used for study of lumen, tunica intima tunica media and tunica adventitia in 2 sexes and ages.

## RESULTS

Micrometrical examination in male and female adult sheep showed that the thickness of lumen and tunica adventitia in male is more than female and the thickness of tunica media in female is more than male and there aren't any difference in the thickness of tunica intima of adult sheep in two sexes. There weren't any significant difference between male and female except in lumen. Tunica media had most percentage of layers in 2 sexes of adult sheep (Table 1).

Table 1: Mean and standard error of thickness of lumen and different layers and percentage of different layers in right renal artery of male and female adult sheep

	Lumen	Tunica intima	Tunica media	Tunica adventitia
Adult male	192±1005	28±2	295±40	98±52
Percentage		7.2%	68.7%	24.1%
Adult female	103±852	28±3	325±98	95±16
Percentage		8.8%	69.5%	21.7%

\*Shows significant differences between male and female adult sheep ( $p \leq 0/5$ )

Table 2: Mean and standard error of thickness of lumen and different layers and percentage of different layers in right renal artery of male and female neonate lamb

	Lumen	Tunica intima	Tunica media	Tunica adventitia
Neonate male	570±252	27±1	172±43	80±9
Percentage		10.7%	60%	29.3%
Neonate female	464±53	27±2	136±20	79±15
Percentage		10%	61%	29%

\*Shows significant differences between male and female neonate lamb ( $p \leq 0/5$ )

Table 3: Mean and standard error of thickness of lumen and different layers and percentage of different layers in right renal artery of adult male sheep and neonate male lamb

	Lumen	Tunica intima	Tunica media	Tunica adventitia
Adult male	1005±192*	28±2	295±40*	98±52*
Percentage		7.2%	68.7%	24.1%
Neonate male	570±252*	27±1	172±43/	80±9*
Percentage		10.7%	60%	29.3%

\*Shows significant differences between adult and neonate male sheep ( $p \leq 0/5$ )

Table 4: Mean and standard error of thickness of lumen and different layers and percentage of different layers in right renal artery of adult female sheep and neonate female lamb

	Lumen	Tunica intima	Tunica media	Tunica adventitia
Adult female	852±103*	28±3	325±98*	95±16*
Percentage		21.7%	69.5%	8.8%
Neonate female	464±53*	27±2	136±20*	79±15*
Percentage		10%	61%	29%

\*Shows significant differences between adult and neonate female sheep ( $p \leq 0/5$ )

Lumen, tunica media and tunica adventitia showed more thickness in male compare to female in neonate lamb. Tunica intima had same thickness in 2 sexes. There were not any significant difference in thickness of lumen and different layers of male and female neonate lamb. Tunica media showed most percentage of layers in male and female neonate lamb (Table 2).

In male and female sheep the thickness of lumen and all of layers increased from neonate lamb to adult sheep and the thickness of lumen, tunica media and tunica adventitia had significant difference between adult and neonate in two sexes.

The percentage of tunica media was more than tunica intima and tunica adventitia in adult sheep and neonate lamb of 2 sexes (Table 3 and 4).

## DISCUSSION

The present study demonstrated that the thickness of lumen in male is more than female. This is so for this reason that the volume of blood in male is more than female because of existence of testosterone hormone after maturation in male (Guyton and Hall, 2000). But in neonate lamb there isn't difference in volume of blood between male and female so the thickness of lumen and different layers don't show any significant difference in bout of sexes, male and female. Lumen, tunica media and tunica adventitia were in adult significantly more than neonate. Maybe the reason of increasing of lumen's thickness in adult compare to neonate is increasing of volume of blood with increasing the age. With growing and increasing the blood the requirement for contraction and relaxation become more and the increase of the tunica media and tunica adventitia thickness are required. This increasing from neonate to adult is significant.

Muscular arteries are characterized by a thick tunica media (Dellmann and Eurell, 2006). In comparison of percentage of different layers in renal artery of adult sheep and neonate lamb in two sexes we showed that tunica media had most percentage of layers and tunica adventitia had more percentage in comparison with the tunica intima after tunica media. It is because of the muscular artery has the ability to alter the size of its lumen by contraction or relaxation of smooth muscle cells in its wall especially in tunica media (Inderbir and Jaypee, 2002).

## CONCLUSION

In this study we confirmed that the thickness of lumen in male significantly was more than female in adult sheep this is so for this reason that the volume of blood in male is more than female because of existence of

testosterone hormone in male after maturation but tunica intima, tunica media and tunica adventitia did not show any significant differences. The volume of blood in adult sheep is more than neonate lamb so the thickness of lumen, tunica media and tunica adventitia in two sexes increase from neonate lamb to adult sheep and these increasing were significant. Tunica media had most percentage of layers because of the muscular artery has the ability to alter the size of its lumen by contraction or relaxation of smooth muscle cells in its wall especially in tunica media.

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