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Studies on renal arteries origin from the aorta in respect to superior mesenteric artery in Polish population

Studies on renal arteries origin from the aorta in respect to SMA in Polish population

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Abstract

Background: The aim of the study was to determine the location of the branching of the renal arteries from the aorta in respect to superior mesenteric artery.

Materials and methods: 324 vasculo-renal samples were collected from corpses (180 male and 144 female), and subject to x-ray contrasting and preparation. The distance between the branching of selected arteries from the superior mesenteric artery (SMA) was measured. Results were subject to statistical analysis.

Results: Results were presented in group A (191/324;58.9%) considering subjects with bilateral, single renal arteries, as well as group B(133/324; 41.1%) considering patients with multiple renal arteries. The average distance between SMA and the renal artery in group A, male patients was 0.6 ± 0.57 cm, while in group B 1.3 ±2.03 cm (p=0.0001). In case of female A patients results amounted to 0.66 ± 0.58 cm and 1.12 ± 1.7 cm, respectively (p=0.006). The above mentioned left- sided distance in male group A was 0.89 ± 56 cm, while the right- sided distance 0.73 ± 0.94 cm(p=0.382). In case of female A patients 0.80 ± 0.50 cm and 0.71 ± 0.89 cm, respectively (p=0.615).In case of left- sided group B male patients the distance amounted to 0.87 ± 0.70cm, and the right–sided distance 0.71 ± 0.60cm (p=0.291). Considering female patients results were as follows: 0.82 ± 0.51 cm(left) and 71 ± 1.21cm (right), respectively (p=0.706).

Conclusions: Knowledge of the described topography of renal artery branching from the aorta should be considered in the preoperative planning of vascular kidney system radiology examinations, as well as retroperitoneal surgical and urological procedures, especially endoscopic kidney transplantations.

Key words: renal arteries, topography, superior mesenteric artery, Polish population

Introduction

Knowledge of the topography of renal artery branching from the aorta is important, considering diagnostics and therapy. Preoperative x-ray examinations, selective renal angiography, renal artery stenting, renal artery reconstructive procedures, as well as laparoscopic kidney transplantations require good knowledge of the topography of renal artery branching [3,5,7,9,10,25,28,32].

The branching off the renal arteries from the aorta is usually located between the lower 1/3 of L1 and upper 1/3 of L2, slightly below the SMA [3,16,32]. Both renal arteries in the adult population are located below those observed in the pediatric population, being localized at the level of 1/3 T12 and 1/3 L 1 [2,4].

Since the average renal arteries diameter is approximately 4-5 mm and accessory arteries are considered to be smaller, up to 15% of vessels can be missed by 1-4 detector row CTA [15]. CT-angiography images and surgical findings agreed in 93% by Kawamoto et al. [17].

Based on our own material we decided to determine the topography of the branching off the renal arteries, considering the Polish population.

Material and methods

The study group comprised 324 corpses, including 180 male (55.6%), aged between 0.1 – 88 years ($\bar{x}$=51.75 ± 20.1 years), as well as 144 female (44.4%), aged between 1.5 – 90 years ($\bar{x}$=49.78 ± 23.5 years) (p=0.79) (approval of the Bioethical Committee: Nr. 2/BOPD/2017 DIL).

The vasculorenal samples were collected from the corpses " en bloc" during routine diagnostic sections performed at the Department of Pathomorphology. The arteries were subject to x-ray contrasting and preparation (Fig. 1 – 4), according to previously described details [29]. The distance between the branching off each renal artery from the SMA were performed by means of a rigid ruler parallel to the aorta in centimeters. In case of numerous arteries the most distant vessel from the SMA was measured. There were 2.77% of cases in which the renal arteries (exclusively, multiple renal arteries) originated above the SMA (0.1 – 1.0 cm, $\bar{x}$= 0.33 ± 0.25 cm), so their distance could be considered as negative, being rounded to the level of the SMA, equaling 0. The obtained data were subject to statistical analysis (MS

Excel 2013 and Statistica 12 software: Student's t test, Chi-square test, analysis of variance (ANOVA),nonparametric ANOVA-Kruskal Wallis test and Turkey/s test)

Results

Results were presented in two main groups, and both subgroups. Group A comprised cases of bilateral, single renal arteries (191/324) (58.9%) (Tabl.1), while in group B additional renal arteries were observed (133/324 (41.1%) (Tabl.2). Considering both groups, the main renal arteries branched off the aorta at the same level- isotopic, or at different levels- heterotopic. In men, the distance between the branching off the renal arteries from the SMA, considering group A, ranged between 0.0 and 5.5 cm ($\bar{x}$= 0.68±0.57 cm), while in group B, between 0.0 and 12.0 cm ($\bar{x}$= 1.3 ± 2.03 cm) (p-0.0001). In women, the distance between the branching off the renal arteries from the SMA, considering group A, ranged between 0.0 and 4.5cm ($\bar{x}$= 0.66 ± 0.58 cm), while in group B, between 0.0 and 12.0 cm ($\bar{x}$=1.12 ± 1.70 cm) (p= 0.006). Considering group A females the distance was always statistically insignificantly lower, as compared to male samples (Tabl.1). In case of group B, considering the isotopic position, the above-mentioned average distance was significantly greater in men ($\bar{x}$=0.65 ± 0.38cm), as compared to female samples ($\bar{x}$=0.50 ± 0.27 cm) (p=0.012). Also, the average distance of the branching off additional renal arteries from SMA in men was statistically greater ($\bar{x}$=3.05±2.86cm), as compared to women ($\bar{x}$=1.94±2.09cm) (p=0.0374). Apart from specified cases, no other significant differences were observed, considering the average distance of renal artery branching from the aorta, as compared to SMA. It was demonstrated, however, regardless gender, considering both groups and subgroups, that the average distance of renal artery branching in relation to SMA was insignificantly greater on the left side, as compared to the right. In group A men, it amounted to 0.89±0.56 cm, and on the right side- 0.73±0.94cm (p=0.382). In women, the above-mentioned was 0.80±0.50cm and 0.71±0.89 cm, respectively (p=0.615). In case of group B men, the left-sided distance was 0.87±0.70cm, as compared to the right side -0.71±0.60cm (p=0.291). In women, the above-mentioned was 0.82±0.51cm , and 0.71±1.27 cm, respectively (p=0.706). The average distances of renal artery branching off to the SMA in relation to age, presented in tables 3 and 4, were stable. Only in group A, between the young (0-20 years) and the elderly patients (above 60 years), one observed a statistically significant difference (right side: p=0.034, and left side: p=0.05). The classic one – way ANOVA test showed no significant difference between age categories ,considering group B (Tabl.4).

Considering the study material, accessory renal arteries branched off the lateral side of the aorta in 54.12% of cases, from the anterolateral side in 40.72%, and anterior side in 5.15%. The topography was insignificantly differentiated, depending on gender. Accessory renal arteries branched off the lateral side of the aorta in 57.02% of male and 49.32% of female cases; from the anterolateral surface in 37.16% of male and 46.58% of female cases; from the anterior surface in 5.79% of male and 4.11% of female cases (p=0.509); details are given in diagrams 1-4.

Discussion

The localization of renal artery branching off was determined on the basis of x-ray examinations in relation to the vertebral bodies [7,9,25,31,34], and anatomically in relation to SMA [1,2,4,22,25], as well as to the abdominal aortic bifurcation [14].

Considering our current studies, similar to other Authors [19] SMA was used as the reference point for the measurement of the distance of the branching off renal arteries from the aorta. The above mentioned artery is relatively thick, and easily visualized during clinical procedures, while in anatomical samples an ideal reference point for conducting such measurements.

In our studies, we showed that the average distance between renal arteries and SMA branching depends, on whether we are dealing with samples of one artery or multiple arteries. Both in men and women the average distance was significantly lower, considering the presence of one artery, as compared to samples with multiple renal arteries (p= 0.0001 and p=0.006).

In case of adult samples, renal arteries branched off the aorta at the L1/L2 level [1,3,25,33], and in children slightly higher (T 12/L1) [2,4].

According to Danek [7], only 30% of the renal arteries branched off at the above-mentioned level. Keen [18] showed that the branching off the renal arteries at the same level was observed in 32.7% of cases ; according to Kosinski in 16% [19], Garcier at al [10] in 44,7%, Beregi et al.[3] in 50% , Danek in 80% [7], and finally in our own material in 58%. The location of the branching off the right renal artery was usually higher than that of the left artery [1-3,10,18,19,22,25,32]. Beregi et al. [3] showed that the right renal artery branched off the aorta on the average 14,5 mm, and the left- 18 mm below the SMA. In case of fetuses, the right artery branched off at a higher level than the left artery in 47,4% [2]. In our study, as mentioned by the cited authors, the left renal artery in both sexes, branched off the aorta insignificantly lower in relation to SMA, as compared to the right artery. Accessory renal

arteries branch off the aorta at, either a low or high level [32], usually between T 11 and L4 [33]. As compared to the diameter of the aorta, the branching off the renal arteries was in different locations. The right artery usually originated anterolateral, while the left-posterolateral of abdominal aorta wall [8,18,24]. Verschuyl et al [34] showed, that 93% of right ostia and only 20% of left ostia were in anterolateral location. In case of fetuses, the right renal artery branched off laterally in 73%, and anterolateral in 26.9% of cases, while the lateral and anterolateral wall origin percentages of the left renal artery were 90,3% and 9,6% respectively [4]. In our study, the branching off the accessory renal arteries differed, depending on gender, although being statistically insignificant. It is worth noting, that in 2.7% of cases, the accessory renal arteries branched off the aorta above the SMA (Fig.4). Ödman and Ranniger [24] observed such a location in 4 of the 86 examined kidneys (4.7%).

The distribution and variation of the branching off the renal arteries from the aorta is most easily explained by the complex development of the genitourinary system arteries [5,14]. The 7mm mesonephros receives symmetrical numerous arteries from the aorta, included in three groups. Cranial, whose branches lie on the dorsal surface of the adrenal glands; central, whose arteries run through the adrenal glands, and caudal, whose branches run anteriorly to the adrenal glands. The different groups supply blood to the diaphragm, adrenal glands, kidneys, and reproductive system. These vessels form the "rete arteriosum urogenitalne". The process of formation and ascending of the mesonephros might lead to various deviations in the development of the main renal artery. The consequence of the above-mentioned, is the erroneous location of the ostium, as well as persistence of additional (accessory) mesonephrotic arteries. Literature data has numerous descriptions of such situations. We are well aware of the branching off the renal arteries from SMA [20], and as a common trunk with the SMA [6]), originating of inferior mesenteric artery [12,13], and as a common trunk with the inferior mesenteric artery [21], the high-branching off the renal arteries from the aorta (T 11) [30], on the branching off the renal arteries from the celiac trunk [11], from a common trunk of low aortic origin [23], gonadal arteries arising from renal arteries [26,27], and finally a renal artery arising from the left testicular artery [16]. Shoja et al. [26] observed a statistically significant dependency, between the occurrence of multiple renal arteries, and branching off the testicular artery from some of the above-mentioned.

Knowledge of the described anatomy is a prerequisite in the proper use of correct angionephrographic techniques, and assessment of obtained x-ray images, as well as performance of surgical procedures on the vascular renal bundle [3,7,9,10,15,25,28].

Conclusions

The average distance between the branching off the renal arteries from the aorta, in relation to SMA is significantly greater in patients with multiple renal arteries, as compared to patients with bilateral, single, renal arteries. The branching off the left renal artery in relation to SMA, independently of gender, is insignificantly lower, as compared to the right artery. Topographically, considering both sexes, the branching off the renal arteries is insignificantly differentiated between the above-mentioned, being observed on the lateral and anterolateral, and least often on the anterior surface of the aorta. These moments should be considered before planned angionephrography, as well as during procedures on the vascular kidney bunch.

References

1. Anjamrooz S H, Taghavi M M, Abedinzadeh M et al. (2013) Coexistence of multiple arterial variations in the genitourinary sytem. Ital J Anat Embryol.118: 128 – 35.
2. Aragão J A, de Oliveira Pacheco J M, Silva L A et al. (2012) Frequency of multiple renal arteries in human fetuses. Surg Radiol Anat.34: 133 – 136.DOI:10.1007/s00276-011-0860-4
3. Beregi J P, Mauroy B, Willoteaux S et al. (1999) Anatomic variation in the origin of the main renal arteries: spiral CTA evaluation. Eur Radiol 9: 1330 – 133.
4. Çiçekcibaşi A E, Ziylan T, Salbacak A et al. (2005) An investigation of the origin, location and variations of the renal arteries in human fetuses and their clinical relevance. Ann Anat 187: 421 – 427 DOI:10.1016/j.aanat.2005.04.011
5. Cocheteux B, Mounir-Vehier C, McFadden V et al. (2001) Rare variations in renal anatomy and blood supply: CT appearances and embryological background. A pictorial essay. Eur Radiol 11: 779 – 786.
6. Dalçik C, Colak T, Özbek A et al. (2000) Unusual origin of the right renal artery: a case report. Surg Radiol Anat 22: 117 – 118
7. Danek Z (1973) Radiologic anatomy of single renal artery on the basis of aortonephrography. Folia Morphol (Warsz) 32: 433 – 443
8. Engelbrecht H E E, Keen E N, Fine H (1969) The radiological anatomy of the parenchymal distribution of the renal artery- a revised approach. S Afr Med J 43: 826 – 834

9. Famurewa OC, Asaleye CM, Ibitoye BO et al. (2018) Variations of renal vascular anatomy in a nigerian population: A computerized tomography study. Niger J Clin Pract 21: 840- 846. DOI: 10.4103/njcp.njc-237-17
10. Garcier J M, De Fraissinette B, Filaire M et al. (2001) Origin and initial course of the renal arteries: a radiological study. Radiol Anat 23: 51 – 55
11. Garti I, Meiraz D. (1980) Ectopic origin of main renal artery. Urology 15: 627 – 629
12. Garti I, Nissenkorn I, Lerner M (1986) Common origin of inferior mesenteric and main renal artery. Eur Urol 12: 215 – 216
13. Gease A P (2007) Rare origin of supernumerary renal vessels supplying the lower pole of the left kidney. Ann Anat 189: 53 – 58.DOI:10.1016/j.aanat.2006.06.012
14. Gillaspie C, Miller L I, Baskin M.(1916) Anomalous renal vessels and their surgical significance . Anat Rec 11: 77 – 86
15. Gulas E, Wysiadecki G, Szymański J et al. (2018) Morphological and clinical aspects of the occurrence of accessory (multiple) renal arteries. Arch Med Science 14:442-453.DOI:10.5114/aoms.2015.55203.Epub 2016 Mar 17
16. Kami K, Morishita T (1983) An autopsy case of double inferior vena cava accompanied by atypical lateral branches of the abdominal aorta – with special consideration to the embryology. Okajimas Fol Anat Jpn 59: 387 – 403
17. Kawamoto S, Montgomery R A, Lawler L P et al. (2003) Multidetector CT angiography for preoperative evaluation of living laparoscopic kidney donors. Am J Radiol 180: 1633 – 1638
18. Keen E N.(1981) Origin of renal arteries from the aorta. Acta Anat 110: 285 – 286
19. Kosinski H. (1994) Variability of places of origin of the human renal arteries. Folia Morphol (Warsz) 53: 111 – 116
20. Lacout A, Thariat J, Marcy P - Y (2012) Main right renal artery originating from the superior mesenteric artery. Clin Anat 25: 977 – 978
21. Loukas M, Aparicio S, Beck A et al. (2005) Rare case of right accessory renal artery originating as a common trunk with the inferior mesenteric artry. Clin Anat 18: 530 – 535
22. Młynarczyk L, Woźniak W, Kiersz A (1966) Varianten in der Anzahl und Verlauf der Nierenarterien. Anat Anz 118: 67 – 81
23. Nathan H, Glezer I (1984) Right and left accessory renal arteries arising from a common trunk associated with unrotated kidneys. J Urol 132: 7 – 9

24. Ödman P, Ranniger K (1968) The location of the renal arteries. An angiographic and postmortem study. Am J Roent Rad Ther Nucl Med 104: 283 – 288
25. Özkan U, Oğuzkurt L, Tercan F et al. (2006) Renal artery origins and variations: angiographic evaluation of 855 consecutive patients. Diagn Interv Radiol 12: 183 – 186
26. Shoja M, Loukas M, Etemadi J et al. (2011) Letter: Multiple renal vessels associated with testicular vessels. Surg Radiol Anat 33: 557.DOI:10.1007/s00276-011-0811-0
27. Soni S, Wadhwa A, (2010) Multiple variations in the paired arteries of abdominal aorta – clinical implications. J Clin Diagn Res 4: 2622 – 2625
28. Staśkiewicz G, Jajko K, Torres K et al. (2016) Supernumerary rena vessels: analysis of frequency and configuration in 996 computed tomography studies. Folia Morphol (Warsz) 75: 245 – 250.DOI:10.5603/FM.a2015.Epub 2015 Sep 18
29. Sośnik H, Sośnik K (2017) Investigations on renal vascularization pathology in the Polish population. 1 Incidence of multiple kidney arteries .Folia Morphol (Warsz) 76: 226 – 231 DOI:10.5603/FM.a2016.0073
30. Talovic E, Voljevica A (2013) An unusual renal accessory artery originating from the thoracic aorta and its potential clinical implications. Acta Madica Academica 42: 80 – 82 DOI: 10.5644/ama 206- 124.74
31. Tran T, Heneghan J P, Paulson E K (2002) Preoperative evaluation of potential renal donors using multidetector CT. Abdom Imaging 27: 620 – 625 DOI:10.1007/s00261-001-01392
32. Türkvatan A, Özdemir M, Cumhur T et al. (2009) Multidetector C T angiography of renal vasculature: normal anatomy and variants. Eur Radiol 19: 236 – 244 DOI:10.1007/s00330-008-1126-3
33. Urban B A, Ratner L E, Fishman E K (2001) Three- dimensional volume- rendered CT angiography of the renal arteries and veins: normal anatomy, variants, and clinical applications. RadioGaphics 21: 373 – 386
34. Verschuyl E J, Kaatee R, Beek F J A et al. (1997) Renal artery origins: Location and distribution in the transverse plane at CT. Radiology 203: 71 – 75

Table 1. Distance of single (isotopic and heterotopic) renal artery (AA) to superior mesenteric artery (SMA)

No.	Subject	Male					t test	Female					Summary	
		N.B	N.AA.	Distance of AA to SMA in cm				N.B	N.AA.	Distance of AA to SMA in cm				
				Min	Max	$\bar{x} \pm SD$	P			Min	Max	$\bar{x} \pm SD$	N	%
1	Isotopic AA	64	128	0.0	1.5	0.60±0.39	0.846	55	110	0.0	2.0	0.59±0.45	119	62.3
2	Right-side heterotopic AA	36	36	0.0	5.5	0.73±0.94	0.919	36	36	0.0	4.5	0.71±0.89	72	37.7
	Left side heterotopic AA		36	0.0	2.0	0.89±0.56	0.440		36	0.0	2.2	0.80±0.50		
3.	Total	100	200	0.0	5.5	0.68±0.57	0.701	91	182	0.0	4.5	0.66±0.58	191	100

Explanations: N.B- number of bodies, N.AA.- number of arteries, min- minimal value, max. – maximal value, $\bar{x} \pm$ SD -mean plus minus standard deviation

Table 2. Distance of the main (isotopic and heterotopic) and accessory renal arteries (AA) to superior mesenteric artery (SMA)

No.	Subject	Male					t test	Female					Summary	
		N.B	N.AA.	Distance of AA to SMA in cm				N.B	N.AA.	Distance of AA to SMA in cm				
				Min	Max	$\bar{x} \pm SD$	P			Min	Max	$\bar{x} \pm SD$	N	%
1	main AA isotopic	41	82	0.0	1.5	0.65±0.38	**0.012**	28	56	0.0	1.0	0.50±0.27	69	51,9
	accessory AA		60	0.0	12.0	1.50±2.53	0.699		33	0.0	12.0	1.72±2.67		
2	main AA heterotopic right-side	39	39	0.0	2.2	0.71±0.60	0.997	25	25	0.0	6.5	0.71±1.27	64	48.1
	main AA heterotopic left-side		39	0.0	2.5	0.87±0.70	0.744		25	0.1	2.0	0.82±0.51	64	
	accessory AA		61	0.0	10.5	3.05±2.8	**0.0374**		40	0.0	8.5	1.94±2.09	101	

						6								
	Total	80	281	0.0	12.0	1.39±2.03	0.138	53	179	0.0	12.0		133	100

Explanations: see tab.1.

Table 3. Mean distance (cm) between main renal artery and SMA in case of bilateral single renal artery according to age categories (group A)

Main artery	Age category [years]	0-20	21-40	41-60	61+
	N	22	22	38	56
right side	mean± SD [cm]	0.33±0.25	0.60±0.52	0.53±0.44	0.78±0.86
left side	mean± SD [cm]	0.41±0.37	0.61±0.49	0.68±0.45	0.74±0.51

Explanation: N- number of arteries, mean – mean value, SD – standard deviation.

Table 4. Mean distance (cm) between renal arteries and SMA in case of main and supernumerary renal arteries according to age categories (group B)

Main artery	Age category years	0-20	21-40	41-60	61+
right side	N	11	16	33	34
	Mean ± SD	0.39±0.28	0.81±0.36	0.49±0.48	0.81±1.09
left side	N	11	16	33	34
	mean± SD [cm]	0.53±0.31	0.73±0.53	0.58±0.53	0.76±0.46
Ad.	N	4	9	17	18
	mean± SD [cm]	0.88±0.63	0.76±0.55	2.31±2.81	2.14±2.51
A.s.	N	9	10	25	24
	mean± SD	0.93±1.20	1.10±0.69	2.22±2.45	2.26±2.80

Explanation : N-number of arteries, mean –mean value, SD – standard deviation,

Ad.: accessory arteries o the right side, As: accessory renal arteries on the left side.

Figures:

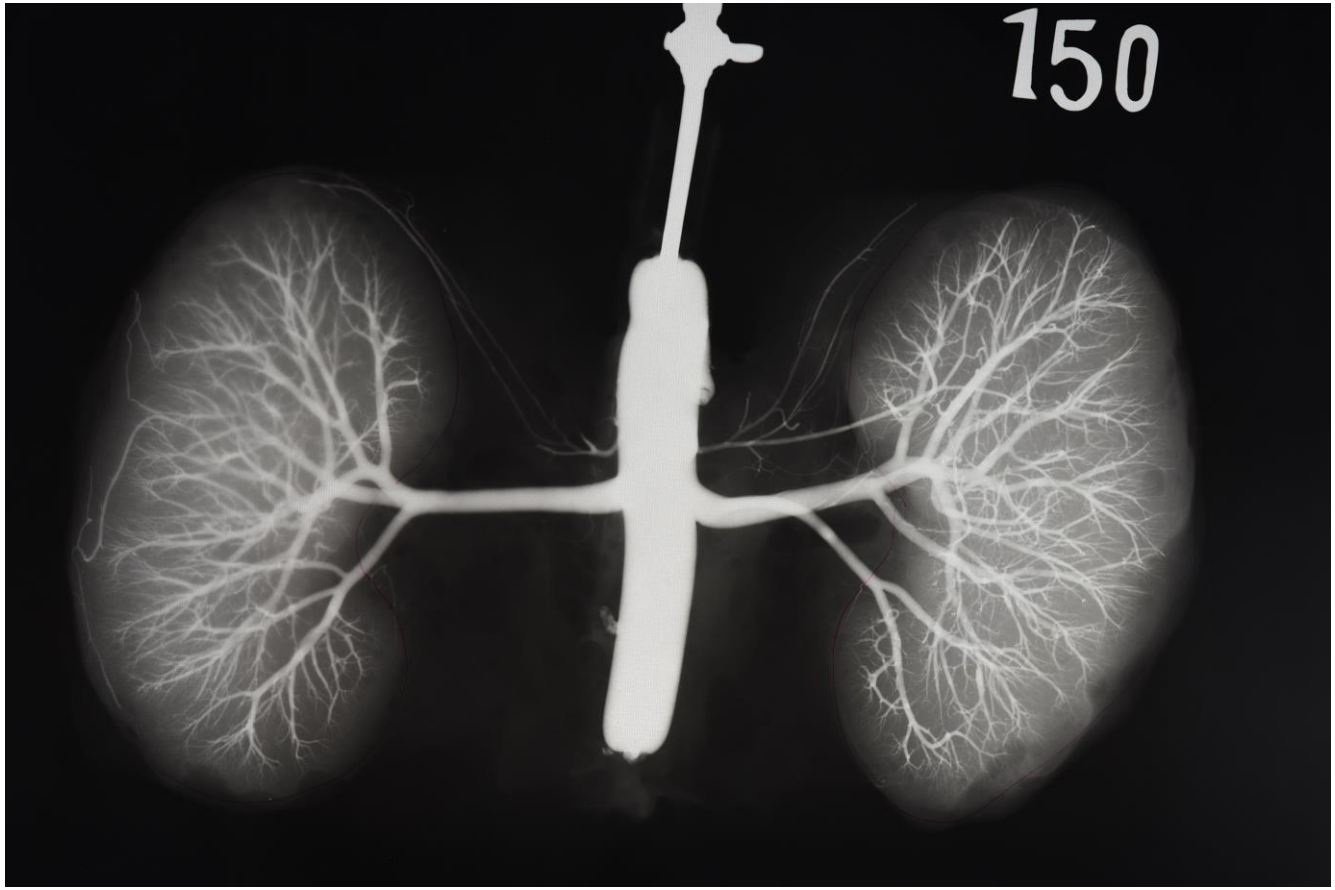


Fig.1. Aortonephrogram “extra- situ” with both renal arteries in the isotopic position.

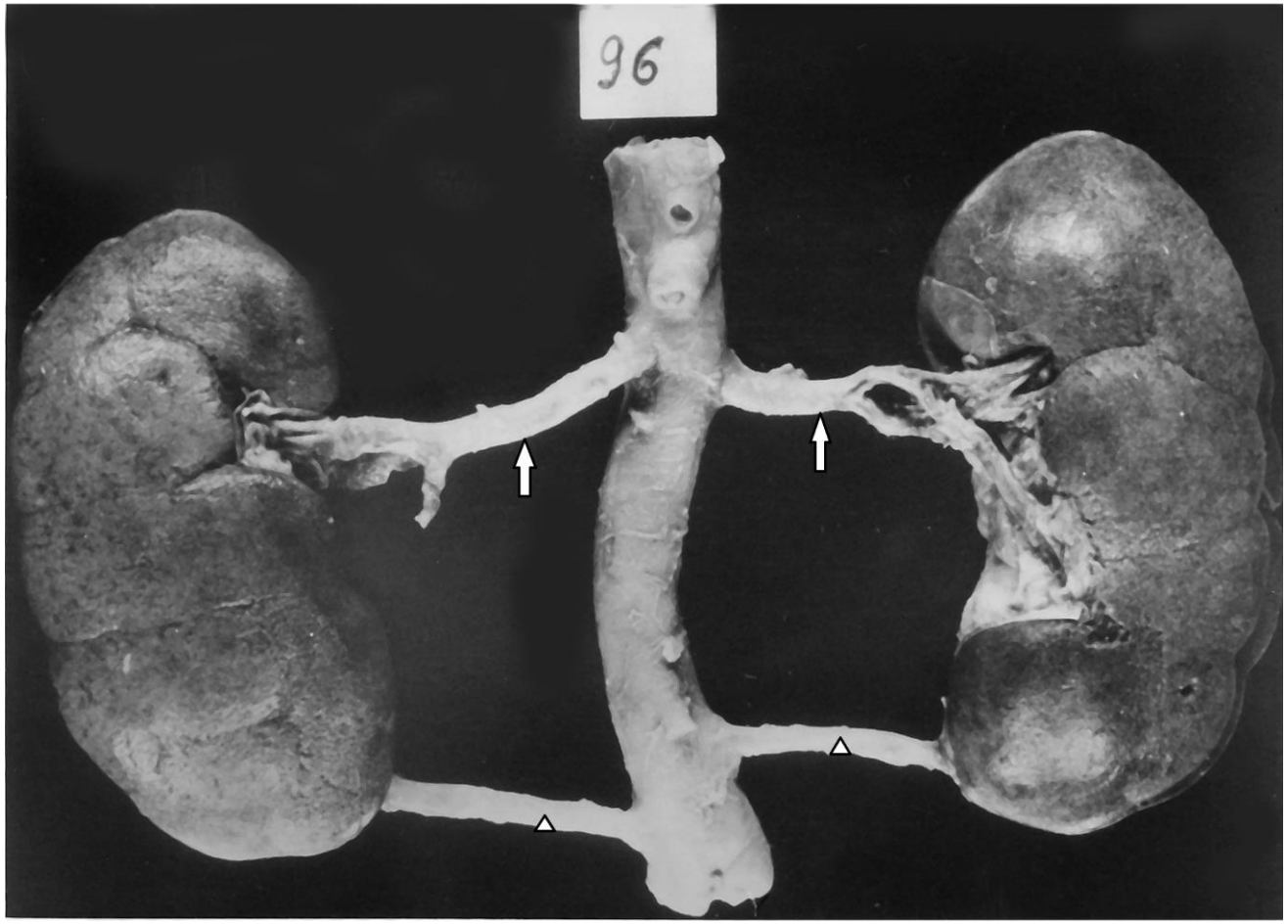


Fig.2. Vasculorenal sample in the AP position with isotopic branching off main renal arteries (arrow) and bilateral, accessory renal arteries (arrowhead), running into the inferior pole of the kidneys.

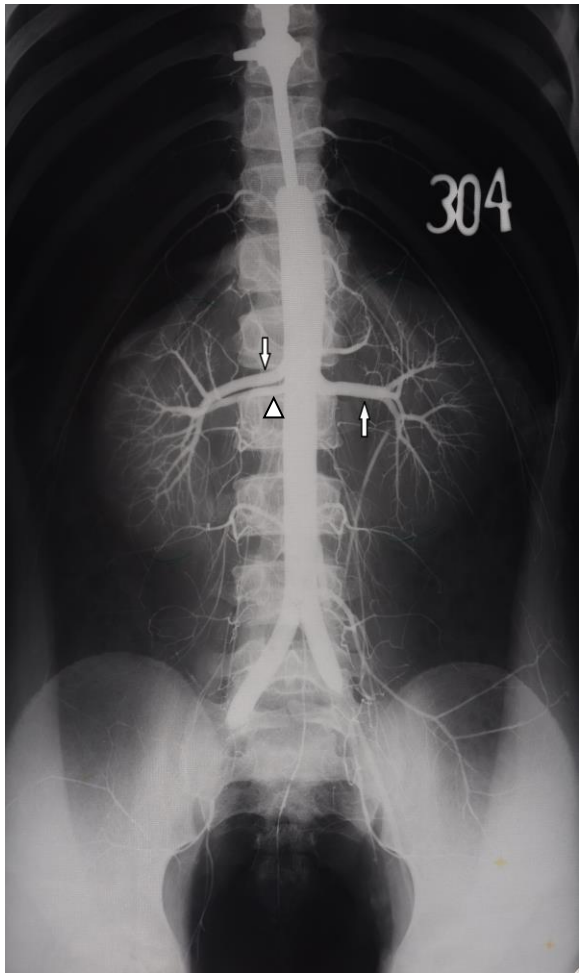


Fig.3. Postmortal aortonephrogram „in situ" with the heterotopic branching off the main renal arteries (arrow) and with an accessory artery (arrowhaed) on the right side in a three-year old girl.

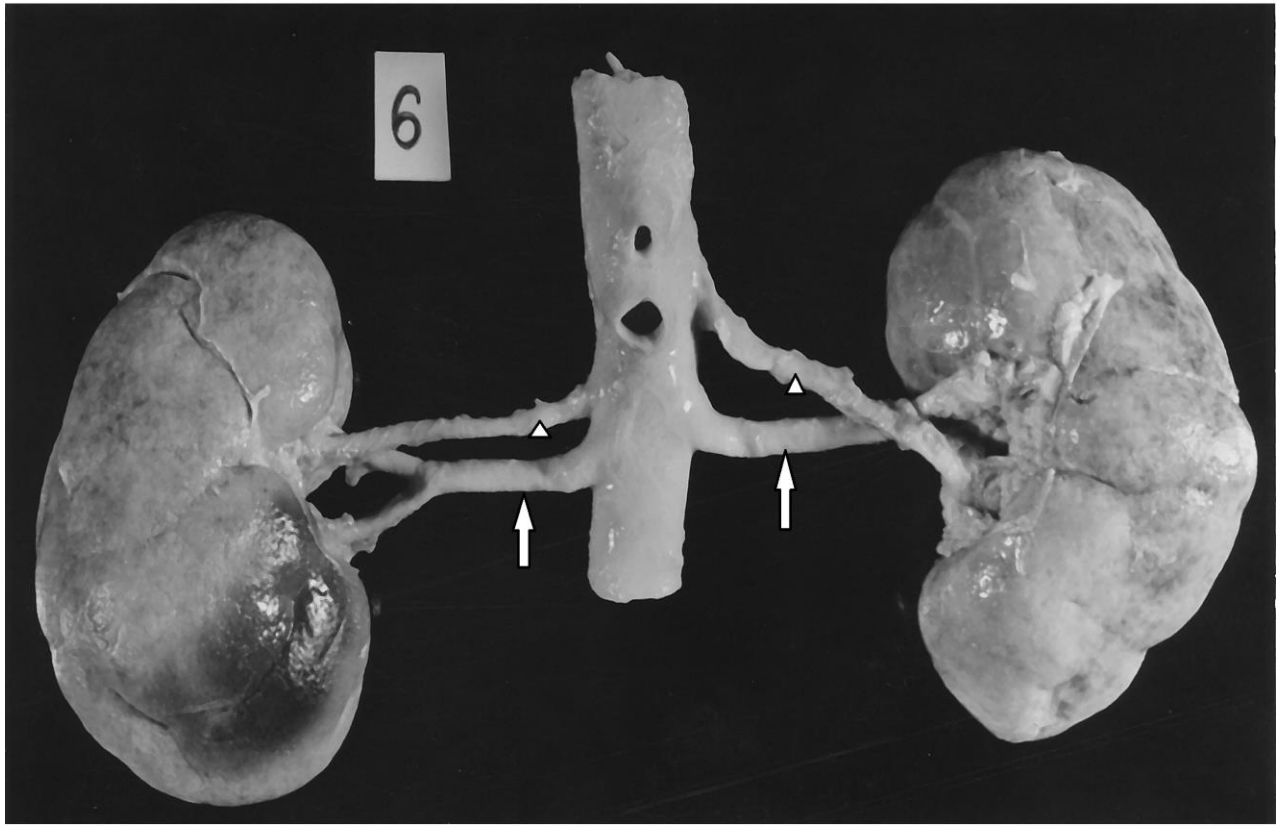
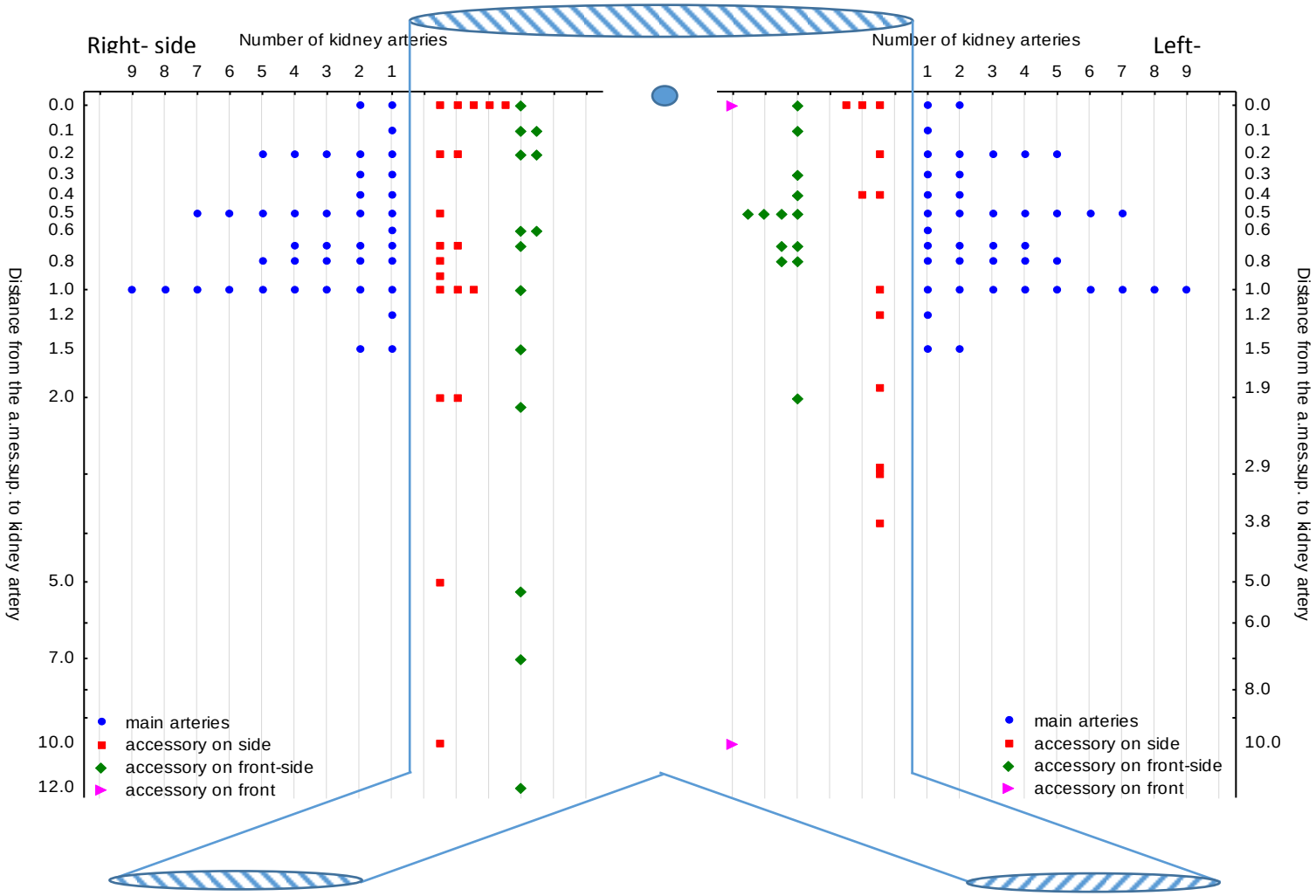


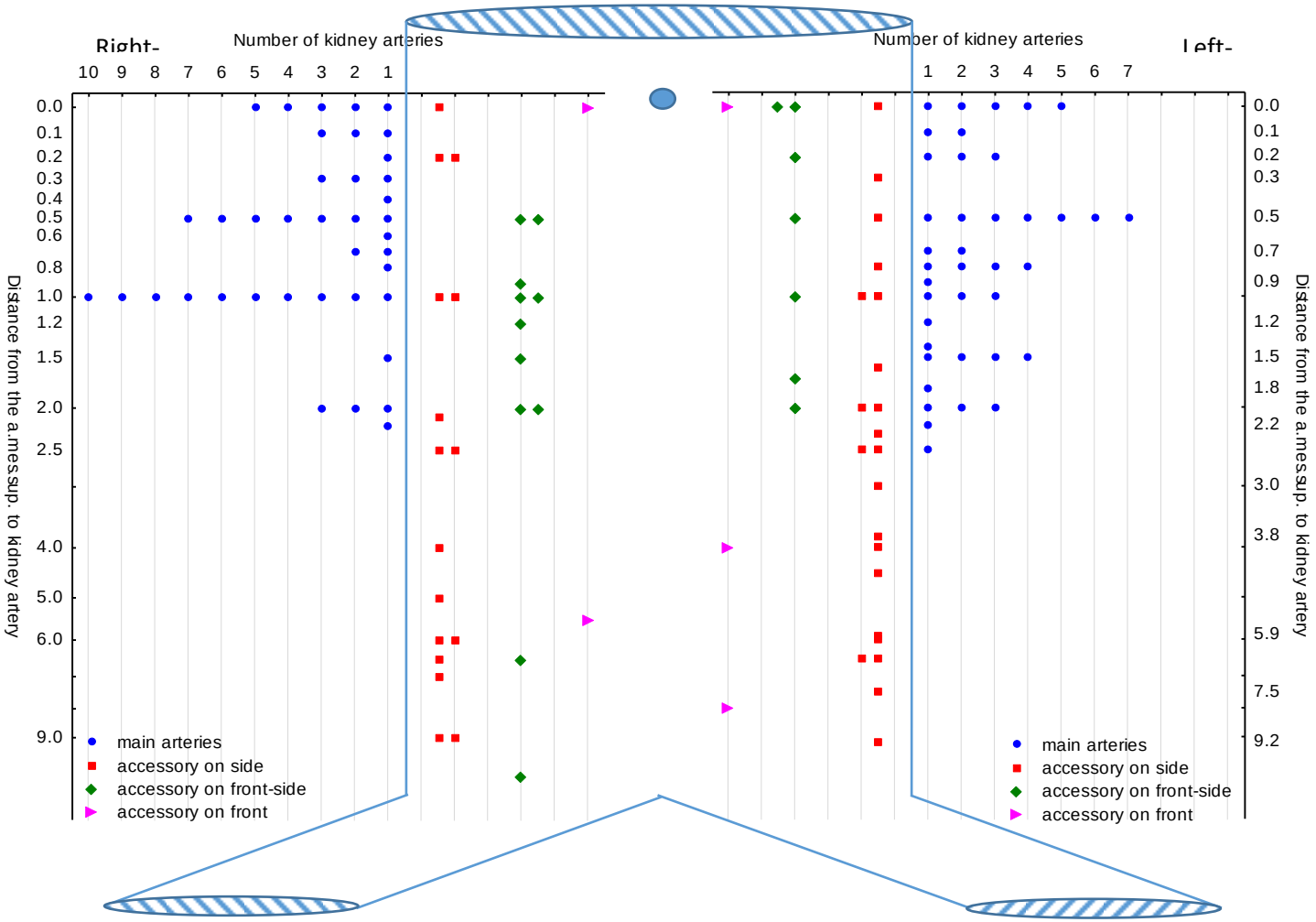
Fig.4. Vasculorenal sample in the AP position with heterotopic branching off the main renal arteries (arrow) and bilateral presence of accessory renal arteries (arrowhead). The left accessory renal artery branching off above the SMA and running into the inferior region of renal hilum.

Diag.1. Distance of the main isotopic and accessory renal arteries (AA) to superior mesenteric artery (SMA)(cm) in males (N=41).

31.7% multiple renal arteries branched off the lateral part of the aorta on the right and 20% on the left side; 23.3% branched off the ante-lateral side of the aorta right and 21.7% on the left side; 0%off the anterior side on the right and 3.3% on the left side of the aorta.

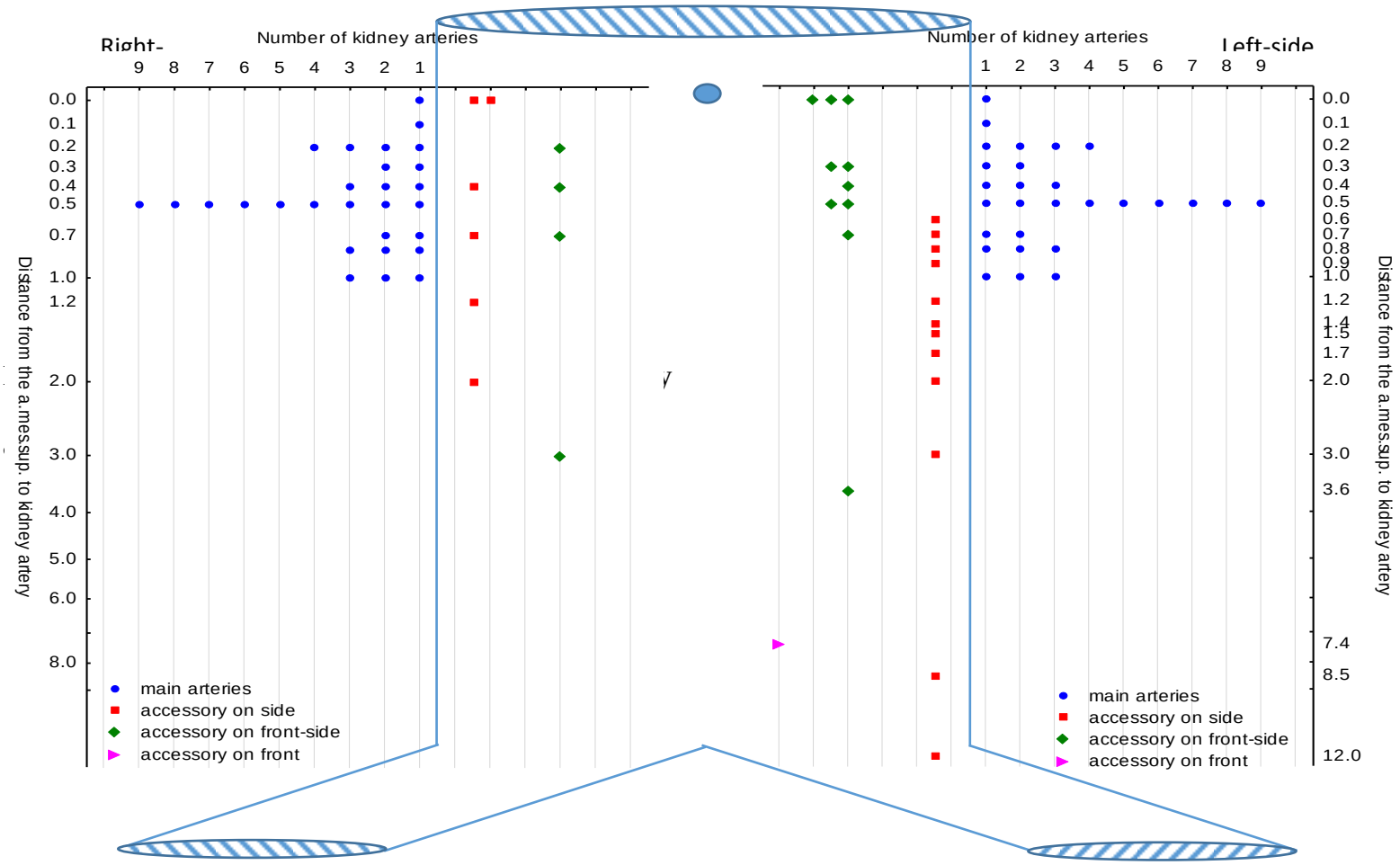


Diag. 2. Distance of the main (heterotopic) and accessory renal arteries (AA) to superior mesenteric artery (SMA) (cm) in males (N=39)
26.7% multiple renal arteries branched off the lateral part of the aorta on the right ad 35% on the left side; 18.3% branched off the anterio- lateral side of the aorta right and 11.7% on the left side; 3.3% off the aorta anterior side on the right and 5% on the left side of he aorta.



Diag. 3. Distance of the main (isotopic) and accessory renal arteries (AA) to superior mesenteric artery (SMA) (cm) in females (N=28)

18.2% multiple renal arteries branched off the lateral part of the aorta on the right and 36.4% on the left side; 12.1% branched off the ante – lateral side of the aorta right and 30.3% on the left side; 0% off the anterior side on the right and 3.04% on the left side of the aorta.



Diag. 4. Distance of the main (heterotopic) and accessory renal arteries (AA) to superior mesenteric artery (SMA) (cm) in females (N=25).
25 % multiple renal arteries branched off the lateral part of the aorta on the right and 20 % on the left side; 22,5 % branched off the ante – lateral side of the aorta right and 27,5 % on the left side; 5 % off the anterior side on the right and 0 % on the left side of the aorta.