Journal of Animal and Veterinary Advances 9 (20): 2665-2667, 2010
ISSN: 1680-5593

Subgross Investigation of the Blood Vessels Originating from Aortic Arch (*Arcus aortae*) in Spiny Mouse

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Abstract: In this study, 10 adult Turkish Spiny Mice (*Acomys cilicicus*) and 10 adult Cypriot Spiny Mice (*Acomy nesiotes*) were used. After the coloured latex injection, the morphological and morphometrical properties of the dissected vessels were determined. In both mice species, similar to rat and mice, it was seen that 3 main branches including brachiocephalic artery, left common carotid artery and left subclavian artery originated from aortic arch. The morphometric differences between the two species were thought to be caused by the adaptation to the environment of the island and continent forms.

Key words: *Acomys cilicicus*, *acomys nesiotes*, anatomy, aortic arch, spiny mouse, latex injection

INTRODUCTION

Arcus aortae is the convexity of aorta towards cranio-dorsal, posterior to exiting the heart. This part draws attention to itself in the anatomical and physiological researches because it is the origin of the vessels leading to the head, neck and arms (Schummer *et al*., 1981) as well as containing the baroreceptors functional for balancing blood pressure (Taha *et al*., 1983; Kubo *et al*., 1996; Cai *et al*., 2003). Therefore, anatomy of aortic arch and the vessels originating from aortic arch were examined in domestic mammals (Schummer *et al*., 1981), as well as in laboratory animals such as rabbit (Craigie, 1969; Popesco *et al*., 1992; Ozturk *et al*., 2003), rat (Chiasson, 1980; Walker and Homberger, 1998; Ozturk *et al*., 2003), guinea pig (Popesco *et al*., 1992; Kabak and Haziroglu, 2003), mouse (Cook, 1965) and also in rodents like hedgehog (Atalar *et al*., 2003), chinchilla (Ozdemir *et al*., 2008), capybara and squirrel and were seen to have important variations between the species.

Spiny Mouse which takes its name of its spiky skin that covers its back and which is included in the Muridae family has 14 species that are expanding over the palearctic region (Wilson and Reeder, 2005). Among these species *Acomy cilicicus* is an endemic species that expands in a very small place in Turkey (Silifke-Mersin) whereas *Acomys nesiotes* (Bate, 1903) expands in Cyprus. In literature research, even though there have been anatomical researches about vessels in Spiny Mice (Szczurkowski *et al*., 2007) no information about aortic arch or the vessels originating from it were found. The aim of this research is to examine arcus aortae and the vessels originating from it in Turkish and Cypriot Spiny mouse by taking the morphometrical properties into consideration. It is believed that the similarities and differences between the two species will be determined and information backup will be formed for researches done on the species.

MATERIALS AND METHODS

Ten adult Turkish spiny mice and ten adult Cyprus spiny mice obtained from the Project that was named Taxonomy, Biology and Distribution of spiny mouse and was numbered 2003 07 05 074 by the department of scientific investigation of Ankara University were used in the present study. The rib cage of the killed animals were cut open and flipped over.

By cutting off the apex cordis, blood was drained and the heart and vessels washed with 0.9% NaCl via a cannula. Red coloured latex was injected at the same way. Then the cadavers were kept at room temperature for 24 h and fixed 10% formalin solution.

Dissection of the vessels and the whole measurements were performed by stereomicroscope (Leica M16) and automatic calibrated Leica Annovation Suite software programme. The avarage value and standart deviations were calculated statictically. For the nomenclature of the aortic arch and its branches, ICVGAN (2005) was considered.

RESULTS AND DISCUSSION

It was seen that in both species *arcus aortae* is on the median line and is inclined from right to left and cranio-dorsal (Fig. 1a, b). The concavity of the arch was

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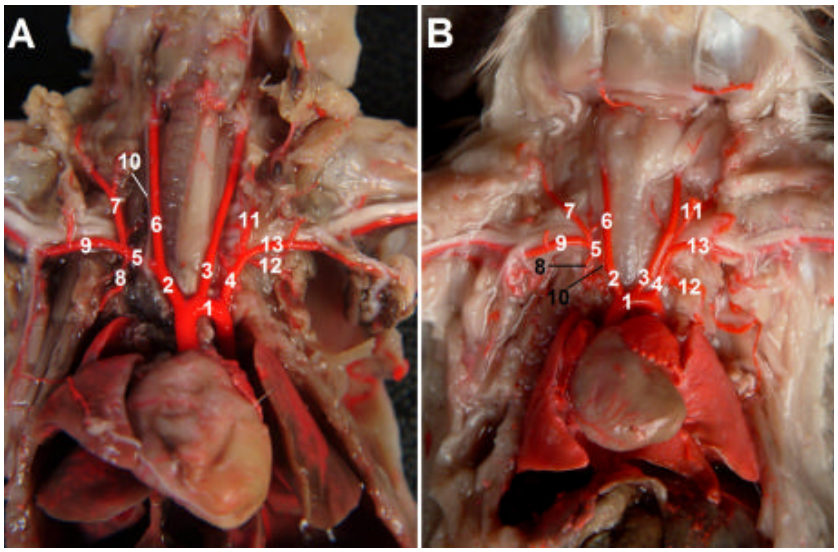

Fig. 1: Ventral view of the aortic arch and its branches in *Acomys cilicicus* (A) and *Acomys nesiotes* (B). 1-Aortic arch, 2-Brachiocephalic trunk, 3-Left common carotid artery, 4-left subclavian artery, 5-right subclavian artery, 6-Right common carotid artery, 7-Right cervical trunk, 8-Right costocervical trunk, 9-Right axillary artery, 10-Vagosympathic trunk, 11-Left cervical trunk, 12-Left costocervical trunk, 13-Left axillary artery

Table 1: Some measurements of the aortic arch in *Acomys cilicicus* and *Acomys nesiotes*

	Acomys cilicicus				*Acomys nesiotes*		
Diamaters and lenghts of the vessels	N	Min.	Max.	$\bar{X} \pm S_{\bar{X}}$	Min.	Max.	$\bar{X} \pm S_{\bar{X}}$
Lenght of the aortic arch	10	3153.90	3481.60	3318.6 ±106.8	3481.90	3834.10	3677±111.2
Diamater of the aortic arch	10	1053.60	1257.40	1162.6±82.6	1120.80	1510.70	1343.8±123
Diamater of the brachiocephalic artery	10	729.70	886.40	801.2±41.4	549.60	927.60	651.2±123.7
Diamater of the left common corotid artery	10	536.10	652.90	600.1±38.5	499.10	627.90	572.5±43.1
Diamater of the left subclavian artery	10	654.90	745.80	698.5±31.2	560.70	833.60	681.9±92.5
Diamater of the ascending aorta	10	1017.00	1199.00	1112.5±78.7	1145.00	1677.00	1489.7±193
Diamater of the descending aorta	10	822.00	1166.00	960.3±102.4	934.00	1199.00	1095.1±93.2
Distance between ascending and descending aorta	10	712.14	1945.73	1001.8±350.7	738.79	2170.76	1221.8±381.9
Angle of the aortic arch	10	48.00	53.50	51±1.79	45.00	57.00	52±3.3

calculated to be approximately 51 degrees in Turkish Spiny mouse and 52 degrees in Cypriot Spiny mouse (Table 1). Related to this, the approximate length, diameter of aortic arch and the approximate distance between ascending and descending aorta of Turkish and Cypriot Spiny Mice were measured, respectively (Table 1). In Spiny mouse from right to left 3 main vessels brachiocephalic artery, left common carotid artery and left subclavian artery were seen to originate from the aortic arch. Brachiocephalic artery was the thickest branch departing from aortic arch. The vessel's diameter at the origin was measured to be 801.2 μm in Turkish Spiny mouse and 651.2 μm in Cypriot Spiny mouse (Table 1). This vessel which continues inclined towards the right in the cranial direction, departs into right subclavian artery and right common carotid artery at the ventral of trachea (Fig. 1a, b). It was observed that right subclavian artery, while progressing immediately above the vagosympathic trunk, cervical trunk departs from the cranial surface, costocervical trunk from the caudal surface and becomes axillar artery and vascularisates the fore arms (Fig. 1a, b). It was noted that right common carotid artery progresses to the head on the right of trachea and on the ventral of vagosympathic trunk. During its course at the neck, it was noticed that there were no considerable branches.

The second vessel departing from left common carotid artery was observed to be proceeding towards the head similar to right common carotid artery, inclined towards the left placed on the left of the trachea and esophageus (Fig. 1a, b). The inclination of the vessel was noted to be noticeably more inclined, even reaching the base of left subclavian artery in Cypriot Spiny mouse (Fig. 1b). According to the measurements at the starting point, the diameter of the vessel was found out to be 600.1 μm in Turkish Spiny mouse and 572.5 μm in Cypriot Spiny mouse (Table 1). It was determined that the last branch to leave the arch, left subclavian artery departs from the left in the cranial direction and at this part the approximate diameter of the vessel is 698.5 μm in Turkish

Spiny mouse and 681.9 μm in Cypriot Spiny mouse (Table 1). It was observed that immediately above clavicula, at the anterior, cervical trunk and at the posterior, costocervical trunk departs from subclavian artery and the vessel continues as axillar artery (Fig. 1a, b).

According to Culau in capybara, only one branch, brachiocephalic trunk originated from the aortic arch as stated by Kabak and Haziroglu (2003) and Orhan in guinea pig and as maintained by Zora in squirrel and according to Ozdemir *et al.* (2008) in chinchilla, two main branches; brachiocephalic artery and left subclavian artery are originated from the aortic arch.

It was proved by Green (1963) in rats and by Cook (1965) in mouse that 3 main branches are originated from the aortic arch; these branches from left to right are anonymous artery, left common carotid artery and left subclavian artery. Results obtained from the research show resemblance to Green (1963) and Cook (1965).

CONCLUSION

As a result with this research it was determined that in Spiny mouse the *Arcus aortae* and the vessels originated from it show similarity to rat and mouse also there is a similarity to the whereabouts of the *Arcus aortae* and its branching between the two species of Spiny Mice. Along with this, it is observed that between the two species, the island form *Acomys nesiotes* is physically larger than the continent form, *Acomy cilicicus*. When both the species body sizes and environmental factors in the expanding region are taken into consideration, the length, concavity of the *Arcus aortae* and the morphometrical differences in the vessels diameters are thought to exist as the solution to the problem of adaptation to physical and environmental factors.

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