

The arteries originating from the aortic arch and the branches of these arteries in red squirrels (*Sciurus vulgaris*)

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ABSTRACT: This study had the aim of investigating the anatomy of the aortic arch in squirrels (*Sciurus vulgaris*). Ten squirrels were studied. The materials were carefully dissected and the arterial patterns of arteries originating from the aortic arch were examined. The brachiocephalic trunk and the left subclavian artery were detached from the aortic arch. The brachiocephalic trunk first gave the left common carotid artery, and then detached to the right subclavian and common carotid artery. In all the examined materials, the left and right subclavian arteries gave branches that were similar after leaving the thoracic cavity from the cranial thoracic entrance. But while the whole branches of the the right subclavian artery were arising from almost the same point the left subclavian artery gave these branches in a definite order, and the branches that separated were the following: the internal thoracic artery, the intercostal suprema artery, the ramus spinalis, the vertebral artery and the descending scapular artery. It also gave the common branch formed by the junction of three of the cervical superficial, the cervical profund and the suprascapular arteries. After the separation of these branches, continuation of the artery gave the external thoracic artery on the external face of the thoracic cavity and then formed the axillary artery. The axillary artery separated into the subscapular and the brachial arteries. Thus, the arteries originating from the aortic arch and the branches of these arteries are different from other rodents and from domestic mammals.

Keywords: arteries; aortic arch; red squirrel (*Sciurus vulgaris*)

The rodents (Rodentia) are the widest order of placental mammals and comprise more than half of the mammals which are known. The red squirrel is a representative of the Sciuridae family, which constitutes a group of the older Rodentia (Karol, 1963; Weichert, 1970; Kuru, 1987; Demirsoy, 1992). There are different studies relating to the aortic arch of both domestic (Getty, 1975; Singh et al., 1983; Lee and Lee, 1984; Tipirdamaz et al., 1998; Dursun, 2000) and laboratory animals (Cook, 1965; Green, 1968; Young et al., 1979; McLaughlin and Chiasson, 1987; Popesko et al., 1990a). In squirrels, the presence and localization of calbindin-D28k in the kidney and cerebellum (Aydin et al., 2005), the morphology of circulus arteriosus cerebri (Aydin, 2008) and the spinal nerves that constitute the plexus lumbosacrales (Aydin, 2010) were studied. But there has been no investigation on the arteries originating from the

aortic arch and the branches of the arteries. Hence, the aim of this study was to investigate the arteries originating from the aortic arch and the branches of the arteries in red squirrels.

MATERIAL AND METHODS

Ten adult squirrels hunted by villagers in Eastern Anatolia were used. After the animals were anaesthetized with pentathol (6 ml/kg), the sternum bones were opened by an incision made for the dissection of the muscles and the skin. The sternum and costae were cut with a costatom, and the thoracic cavity was opened. A plastic pipe 1 cm in diameter and 5–10 cm in length was installed into the left ventriculi of the animals' hearts. After the blood content was drained, coloured latex was

injected by hand into the left ventriculi through this pipe. After storage at +4 °C for one day, the arteries originating from the aortic arch were dissected carefully. The arterial patterns of arteries originating from the aortic arch, the left and right subclavian artery were examined and pictured. For terminology, the Nomina Anatomica Veterinaria (2005) was used (World Association of Veterinary Anatomists).

RESULTS

The aorta formed the aortic arch by running to the vertebral column in a caudodorsal course. Firstly, the brachiocephalic trunk and secondly, the left subclavian artery were separated from the aortic arch. The brachiocephalic trunk gave the left subclavian artery firstly and in continuation, separated into the right subclavian and common carotid artery.

In squirrels, both the left and right subclavian arteries gave branches after leaving the thoracic cavity from the cranial thoracic entrance. The left subclavian artery gave these branches in a definite order and as separate branches: the internal thoracic, the intercostal suprema, the vertebral and the descending scapular arteries and the ramus spinalis. It also gave the common branch formed by the junction of the cervical superficial, the cervical profund and the suprascapular arteries, and from the right subclavian artery, which were arising from almost the same point. On every two sides, after these branches it gave the external thoracic artery while the continuation of the branch formed the axillary artery. The axillary artery separated into the subscapular and the brachial arteries.

From the common root formed by the cervical superficial, the cervical profund and the suprascapular arteries, first the suprascapular artery separated while the continuation of the branch dispersed di-

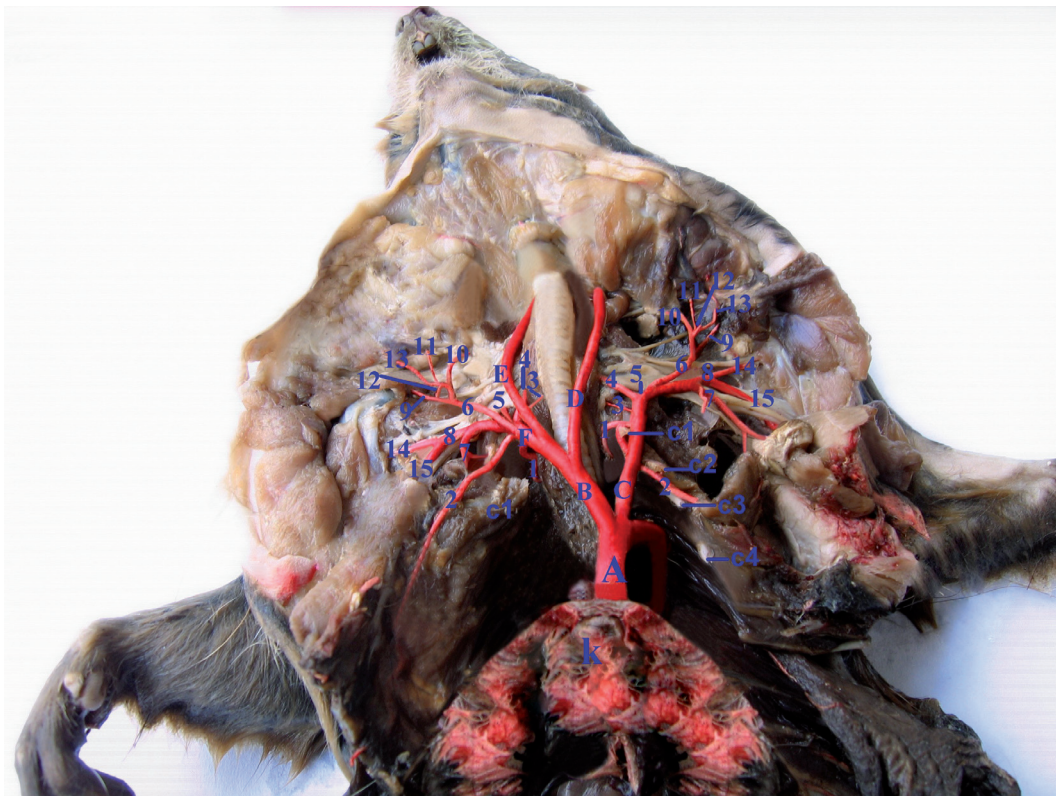


Figure 1. View of the branches of the arteries and the arteries originating from the aortic arch in red squirrels (*Sciurus vulgaris*) A = aorta, B = brachiocephalic trunk, C = left subclavian artery, D = left common carotid artery, E = right common carotid artery, F = right subclavian artery, K = cor, C1 = costa I, C2 = costa II, C3 = costa III, C4 = costa IV; 1 = intercostal suprema artery, 2 = internal thoracic artery, 3 = ramus spinalis, 4 = vertebral artery, 5 = descending scapular artery, 6 = the common root constituted by the junction of the cervical superficial, the cervical profund and the suprascapular arteries, 7 = external thoracis artery, 8 = axillary artery, 9 = suprascapular artery, 10 = ramus transversus, 11 = ramus ascendens, 12 = ramus deltoideus, 13 = ramus prescapularis, 14 = subscapular artery, 15 = brachial artery

rectly into the deltoid and the prescapular rami that were the last branches of the cervical superficial artery, and the transversal and the ascending rami that were the last branches of the cervical profund artery (Figure 1).

DISCUSSION

In squirrels, firstly the brachiocephalic trunk and secondly the left subclavian artery originate from the aortic arch. In other animals, it originates from the aortic arch only from the brachiocephalic trunk in ruminants and equidae (Getty, 1975; Nickel et al., 1981; Dursun, 2000), from the brachiocephalic trunk and the left subclavian artery in pigs (Getty, 1975; Nickel et al., 1981; Dursun, 2000), in carnivorae (Miller et al., 1964; Getty, 1975; Nickel et al., 1981; Singh et al., 1983; Tipirdamaz et al., 1998; Dursun, 2000), in rabbit (Singh et al., 1983; McLaughlin and Chiasson, 1987; Popesko et al., 1990a) and in guinea pig (Cooper and Schiller, 1975; Popesko et al., 1990a), from the brachiocephalic trunk, from the left common carotid artery and the left subclavian artery in rats (Green, 1968; Chiasson, 1980; Popesko et al., 1990b), mice (Cook, 1965; Popesko et al., 1990b), hamsters (Popesko et al., 1990b) and porcupinae (Atalar et al., 2003). The results presented here are similar to those reported for pigs, carnivorae, rabbits and guinea pigs.

In this study the brachiocephalic trunk gave firstly the left common carotid artery and in continuation it detached into the the right subclavian and common carotid artery. In ruminants and equidae firstly the left subclavian artery was given, and secondly the right subclavian artery while the branches which continued constituted the bicarotid trunk (Getty, 1975; Nickel et al., 1981; Dursun, 2000). In pigs it gave firstly the right subclavian artery while the branch that continued was the bicarotid trunk (Getty, 1975; Nickel et al., 1981; Dursun, 2000). In carnivorae also it gave firstly the left common carotid artery, secondly the right subclavian artery while the branches that continued constituted the right common carotid artery (Miller et al., 1964; Getty, 1975; Nickel et al., 1981; Singh et al., 1983; Tipirdamaz et al., 1998; Dursun, 2000). In rabbits (Barone et al., 1973; Singh et al., 1983; McLaughlin and Chiasson, 1987) and in guinea pigs (Cooper and Schiller, 1975), it separated to the right subclavian artery, the right and left common carotid artery at

almost the same point (Popesko et al., 1990a), while in rats (Green, 1968; Chisson, 1980; Popesko et al., 1990b), mice (Cook, 1965; Popesko et al., 1990b), hamsters (Popesko et al., 1990b), and in porcupinae (Atalar et al., 2003) it separated into the right subclavian artery and the right common carotid artery. The present results are in agreements with the reports on carnivorae, rabbits and guinea pigs while differing from anatomical findings from other animals.

In squirrels, after leaving the thoracic cavity the right and left subclavian arteries gave separate branches as the intercostal suprema, the vertebral, the descending scapular, the internal thoracic arteries, the ramus spinalis and the common root constituted by the junction of the cervical superficial, the cervical profund and the suprascapular arteries at the chest entrance (the aperture thoracis cranialis). Whereas in the reports on ruminants and equidae (Getty, 1975; Nickel et al., 1981; Dursun, 2000), on pigs (Getty, 1975; Nickel et al., 1981; Dursun, 2000), on carnivorae (Miller et al., 1964; Getty, 1975; Nickel et al., 1981; Singh et al., 1983; Tipirdamaz et al., 1998; Dursun, 2000), on rabbits (Barone et al., 1973; Singh et al., 1983; McLaughlin and Chiasson, 1987; Popesko et al., 1990a), on guinea pigs (Cooper and Schiller, 1975; Popesko et al., 1990a), on rats (Green, 1968; Chisson, 1980; Popesko et al., 1990b), on mice (Cook, 1965; Popesko et al., 1990b), on hamsters (Popesko et al., 1990b) and on porcupines (Atalar et al., 2003), except the suprascapular artery all the branches detach either directly or indirectly from the subclavian artery in its intrathoracic course, which is in contrast to the findings reported here for squirrels.

In summation, in squirrels the brachiocephalic trunk and the left subclavian artery originate from the aortic arch similarly to the situation in pigs (Getty, 1975; Nickel et al., 1981; Dursun, 2000), carnivorae (Miller et al., 1964; Getty, 1975; Nickel et al., 1981; Singh et al., 1983; Tipirdamaz et al., 1998; Dursun, 2000), rabbits (Singh et al., 1983; McLaughlin and Chiasson, 1987; Popesko et al., 1990a) and guinea pigs (Cooper and Schiller, 1975; Popesko et al., 1990b). With regard to the giving of branches of both the left and right subclavian arteries after leaving the thoracic cavity from the cranial thoracic entrance, and in respect of its unique branch separation of the cervical superficial, the cervical profund and the suprascapular arteries, the squirrel differs from other rodents and mammals.

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