

A macroanatomic investigation on the arterial vessels of the canine thymus

° H. YALÇIN and ° S. TIPIRDAMAZ

° Department of Anatomy, University of Selçuk, Veterinary Medicine, 42031 Konya, Turkey

SUMMARY

Eight healthy one-month puppies from both sexes, were used in this study. After bleeding, red colored latex was injected into the common carotid artery. After opening the thoracic cavity, the course and distribution of the thymic arteries and their branches were investigated.

It was observed that the brachiocephalic trunk gave two branches to the canine thymus at the level of its origin. Pericardiophrenic artery gave a slender branch to the right cranial pole of the organ.

As a result, thymus was supplied by four branches from the internal thoracic artery, by two branches from the brachiocephalic trunk and by one branch from pericardiophrenic artery at left side ; besides, by one branch from the pericardiophrenic artery and one branch from the internal thoracic artery at right side. The results have revealed the canine thymic lobes are supplied by nine arterial vessels.

KEY-WORDS : thymus - thymic arteries - anatomy - dog.

RÉSUMÉ

Recherche macro-anatomique sur les vaisseaux artériels du thymus chez le chien. Par H. YALÇIN and S. TIPIRDAMAZ.

Huit chiots sains, des deux sexes, âgés d'un mois, ont été utilisés dans cette étude. Après saignée, du latex coloré en rouge a été injecté dans l'artère carotide commune. Après ouverture de la cavité thoracique, le trajet et la distribution des artères thymiques et de leurs collatérales ont été étudiés.

On a observé que le tronc brachio-céphalique a donné deux branches au thymus canin, au niveau de son origine. L'artère péricardiophrénique a donné une branche mince au pôle crânial droit de l'organe.

En conséquence, le thymus a été irrigué par quatre branches à partir de l'artère thoracique interne, par deux branches du tronc brachio-céphalique et par une branche de l'artère péricardiophrénique pour le lobe gauche ; en outre, par une branche de l'artère péricardiophrénique et une branche de l'artère thoracique interne pour le lobe droit. Au total les lobes thymiques canins sont irrigués par neuf vaisseaux artériels.

MOTS-CLÉS : thymus - artères thymiques - anatomie - chien.

Introduction

Thymus is a lymphoid organ which has endocrine function [3]. It also plays a very important role in the immune system [1]. The organ is situated in the ventral part of the cranial mediastinum, between the first and sixth intercostal space, on the sternum [4, 11]. The organ consists of two yellowish lobes, one is named right lobe, the other left lobe. [3, 8, 11, 17]. In the newborn animals it is well developed [3, 11, 13, 14, 17]. Prior to the prepubertal period and lacteal dentition, thymus is completely developed. Then, involution process begins [3]. In the first 3-6 months of the life it gradually develops. In 6-12 months aged dogs, thymic involution appears at different stages [17].

Thymic arterial vessels arise from the subclavian artery at the left side in babon [7] and frequently, from brachiocephalic artery at the right side in dogs [3]. Thymus is supplied by the middle thymic artery in the newborns of humans (medial

thymic artery - principal thymic artery and superior thymic artery) [10, 15], the thymic branch arises from the brachiocephalic trunk in cattle fetus [2].

The thymic branches arise from the internal thoracic artery, in the mouse [9] ; in the rat [5, 6, 16] ; in the bovine fetus [2] ; in the dog and in the horse [4, 11].

During its course in the thoracic cavity, pericardiophrenic artery gives rise to thymic arteries supplying thymus at the second and third intercostal spaces in the rat [16] and in dogs [3].

There have been many reports on the thymic development [1, 3, 8, 11, 13, 17], morphology and the involution processes, but this paper is restricted to the points concerning its arterial vessels distribution pattern.

The purpose in the present report was to give a gross description of the arterial blood supply of the thymus in the dog.

Materials and methods

Eight healthy dogs from both sexes, one-month puppies, were used in this study. The animals were anaesthetized with Ketalar. After bleeding the dog was perfused with heparin via the common carotid artery. The vessels were rinsed with 0.9 % physiological saline. Following, red coloured latex (Red dye was added to latex : Latex Injection Kit from Griffin and George, at a concentration of 0.1 %, Setacolor-Peboo cardinal red No : 24) was injected into the common carotid arteries. Then arteries after opening the thoracic cavity, were dissected and the course and distribution of arteries of thymus and their branches were investigated. Nomina Anatomica Veterinaria [12] terminology was used.

Results

It was seen that the thymus was in a position situated at the second and sixth intercostal spaces in the precardial mediastinum on the sternum, in dogs. It was a pale yellowish-gray colored organ. (fig. 1-2/T).

- The left thoracic lobe of the thymus (Fig. 1).

Two branches of brachiocephalic trunk were observed to arise from its origin and from a point that close to the aortic arch. (fig. 1/C). The first branch supplied the caudal pole of the thymus and the second one supplied the cranial pole of thymus in dog (fig. 1/a-b).

It was also found that left internal thoracic artery (fig. 1/D) gave rise to the pericardiophrenic artery (fig. 1/F), accompanying the left phrenic nerve (fig. 1/E). The pericardiophrenic artery releases a thin branch (fig. 1/c) to the cranial pole of the left thoracic lobe of the thymus. Then, three thymic arteries arose from the internal thoracic artery coursing at caudoventral direction.

It was observed that fourth and sixth branches of thymic arteries (fig. 1/d,f), were slender and supplied the cranial pole of the left thoracic lobe, but the fifth branch (fig. 1/e) was more larger and supplied the medium of the left thoracic lobe.

In addition to these branches, the left internal thoracic artery gave rise to a large branch to the caudal pole of the left thoracic lobe (fig. 1/g).

- The right thoracic lobe of the thymus (Fig. 2).

In our study, we have observed that the right thoracic lobe of the canine thymus is supplied by two thymic arteries arising from the right internal thoracic artery. After originating from the right internal thoracic artery, the pericardiophrenic artery gave a slender branch to the cranial pole of the right thoracic lobe (fig. 2/h). During its course to crossing the sternum caudoventrally, it gave a branch supplying the caudal pole of the right thoracic lobe (fig. 2/i).

Discussion

Although LUCKHAUS [7] have stated that, in the left side, the thymic arteries arise directly from the subclavian artery in babons, and similarly EVANS and CHRISTENSEN [3] clai-

med the same course in dogs, the canine thymic arteries were observed to arise from the left internal thoracic artery in the present study.

We have also observed that a branch arising from internal thoracic artery that supplies the canine thymus, as MOGI [9] stated it for mice ; GREENE [5], YAMASAKI [16], HEBEL and STROMBERG [6] for rat ; DENIZ [2] for bovine fetuses ; GETTY [4] and NICKEL *et al.* [11] for dog and horse. In this study it was observed that the thymus of the dog was finally supplied by nine thymic arterial branches arising from the internal thoracic artery, brachiocephalic artery, and pericardiophrenic artery. Therefore, it was determined seven branches at the left side and two branches at the right side of the thymus.

EVANS and CHRISTENSEN [3] in the dog and YAMASAKI [16] in the rat have observed that the cranial pole of the canine thymus is supplied by a branch from the left and right pericardiophrenic arteries. Our findings are parallel with the results of the previous researchers.

Similar to the results of the studies by MORIN *et al.*, [10] in human, (as thymic principal artery and superior thymic artery), YAMASAKI [15] in the human fetus (as thymic median artery), DENIZ [2], NICKEL *et al.* [11] in bovine fetus, EVANS and CHRISTENSEN [3] frequently in the dog, it was observed that a branch from brachiocephalic trunk supplies thymus. In addition to these findings, it is seen that two thick branches arise in front of the aortic arch and one of them supplies caudal lobe of the canine thymus. The other branch also, supplies cranial the lobe of the canine thymus.

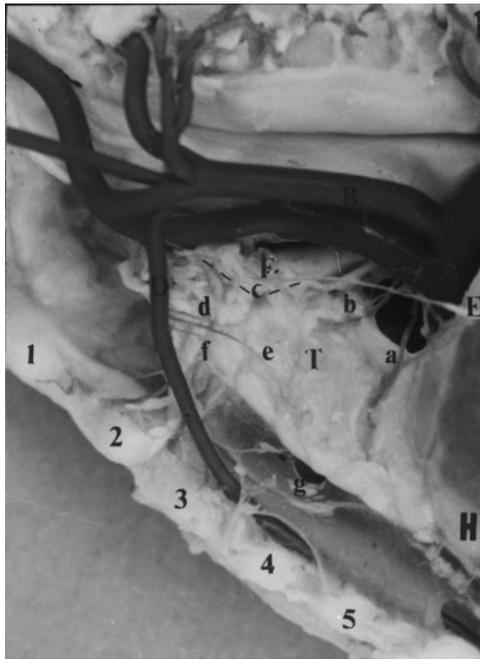
Although it was reported that a branch arises from brachiocephalic trunk in a previous study [3], we have not observed similar finding. In contrast, at the right side of thymus, two branches arised in our study. A branch in dorsal side arose from the pericardiophrenic artery, as reported by YAMASAKI [16] for rat ; besides, it was seen that ventral branch arose from the internal thoracic artery and reached at the caudal lobe of thymus.

As a result, it was observed that the canine thymus was supplied by nine arteries entirely arising from the thoracic internal arteries, pericardiophrenic arteries and the brachiocephalic trunk at right and left surfaces of thymus. Compared to the literature, our findings showed that the vessel has many variations.

Thus, it is believed that results of this study will be beneficial for the surgeons operating and both on the canine thymus and the region.

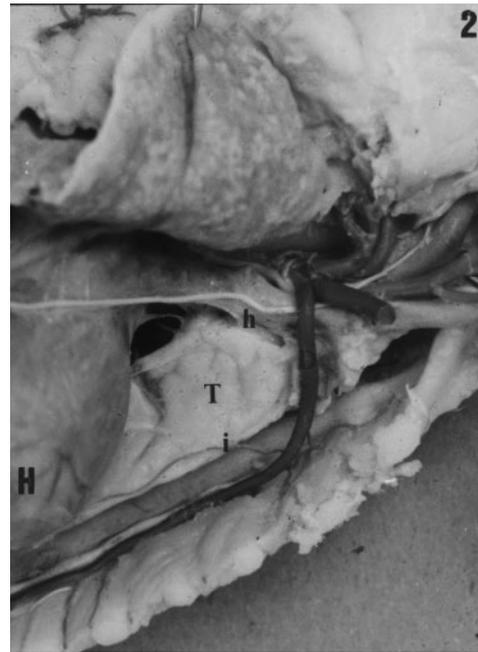
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A. Aortic arch
 B. Left subclavian artery
 C. Brachiocephalic trunk
 D. Internal thoracic artery
 E. Phrenic nerve

FIGURE 1. — Branches of arterial vessels of thymus. (Intrathoracic- Left view).



F. Pericardiophrenic artery
 H. Heart
 T. Thymus
 a.b.c.d.e.f.g.h.i. Rami thymici
 1.2.3.4.5. Sternebrae

FIGURE 2. — Branches of arterial vessels of thymus. (Intrathoracic- Right view).

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