

イヌの肺動・静脈分布

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Distribution of the Pulmonary Artery and Vein in the Dog Lung

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Abstract. Twenty dog lungs were examined. The right pulmonary artery runs across the ventral side of the right cranial lobe bronchiole, then across the dorsal side of the right middle lobe bronchiole. Thereafter, the right pulmonary artery runs along the dorso-lateral side of the right bronchus. During its course, the right pulmonary artery gives off arterial branches that run mainly along the dorsal or lateral side of each bronchiole. The left pulmonary artery runs across the dorsal side of the left middle lobe bronchiole, and thereafter has the same distribution as that in the right lung. The pulmonary vein runs mainly along the medial or ventral side of the bronchiole, and between the bronchioles. In the right lung, the right cranial and middle lobe veins form a short common trunk, when enter the left atrium. The right accessory lobe vein enters the right caudal lobe pulmonary venous trunk. The right caudal lobe pulmonary venous trunk enters the left atrium. In the left lung, the left middle lobe vein has two branches. Both enter the left atrium, forming a short common trunk. In addition to these veins, the left caudal lobe pulmonary venous trunk enters the left atrium.

Key words: bronchial tree, dog, lung, pulmonary artery, pulmonary vein.

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The present author has already described the bronchial tree and lobular division of the horse¹⁾ and dog²⁾ lungs, bronchial tree, lobular division and blood vessels of the cow (Holstein) lung³⁾ and the bronchial tree, lobular division and blood vessels of the pig lung⁴⁾. In present report further describes the distribution of the pulmonary artery and vein of the dog lung.

Materials and Methods

Twenty dog lungs were examined. Various

colored celluloid solutions were injected into the bronchial tree, pulmonary artery and vein through the trachea and heart. Then they were placed in water until the celluloid solution had completely coagulated. The soft tissues were treated with concentrated hydrochloric acid, and the lung models were obtained after washing in running water. This report describes the pulmonary artery and vein on the basis of the bronchial tree of the dog detailed in the previous report²⁾ which in turn was described on the basis of the fundamental structure of the bronchial

ramification of the mammalian lung⁵⁻⁶⁾.

Results

Bronchial ramification (Figs. 1-2): First, it is important to understand the bronchial ramification to grasp the distribution of the pulmonary artery and vein. Therefore, an outline of the bronchial ramification of the dog lung is given here.

The trachea divides into the right and left bronchi. Both bronchi give off the four bronchiole systems - dorsal(D), lateral (L), ventral (V) and medial (M) - from the corresponding sides of the bronchi, respectively. The right cranial lobe bronchiole arises from the dorso-lateral side of the right bronchus and divides into cranial (a) and caudal (b) branches, the latter being small. This bronchiole corresponds to the first bronchiole (D₁) of the dorsal bronchiole system. The right middle lobe bronchiole arises from the ventro-lateral side of the right bronchus and forms the right middle lobe. This bronchiole corresponds to the first bronchiole (L₁) of the lateral bronchiole system. The right accessory lobe bronchiole is the first bronchiole (V₁) of the ventral bronchiole system. This bronchiole arises from the ventro-medial side of the right bronchus and forms the right accessory lobe. The remaining bronchioles of the dorsal (D), lateral (L), ventral (V) and medial (M) bronchiole systems constitute the right caudal lobe. Consequently, the right lung consists of the cranial, middle, caudal and accessory lobes.

In the left lung, the left cranial lobe bronchiole is lacking. The left middle lobe is formed by the

first bronchiole (L₁) of the lateral bronchiole system. This bronchiole arises from the ventro-lateral side of the left bronchus and divides into the cranial (a) and caudal (b) branches, each of which forms a lobule. These two lobules constitute the left middle lobe, and their dorsal portions are united with each other. The remaining bronchioles of the four bronchiole systems constitute the left caudal lobe. Consequently, the left lung consists of a bilobed middle and a caudal lobe.

Distribution of the pulmonary artery (Figs. 1-2): The pulmonary artery divides into the right and left pulmonary arteries after arising from the heart. The right pulmonary artery is larger than the left. The right pulmonary artery runs obliquely across the ventral side of the trachea, then runs across the ventral side of the right cranial lobe bronchiole. Thereafter, the right pulmonary artery runs across the dorsal side of the right middle lobe bronchiole, and then along the dorso-lateral side of the right bronchus, between the dorsal (D) and lateral (L) bronchiole systems, along the right bronchus and gradually comes to run along the dorsal side of the right bronchus.

The right cranial lobe artery arises from the dorso-lateral side of the right pulmonary artery with two branches. The first branch is large and initially runs along the dorso-medial side of the cranial branch (a). It then runs along the dorso-lateral side of the cranial branch (a) after appearing on the lateral side between the first and the second side branches arising from the dorsal side of the cranial branch (a). This artery further gives off small branches on the dorsal and ventral sides, which run along the lateral side of

Distribution of the Pulmonary Artery and Vein in the Dog Lung

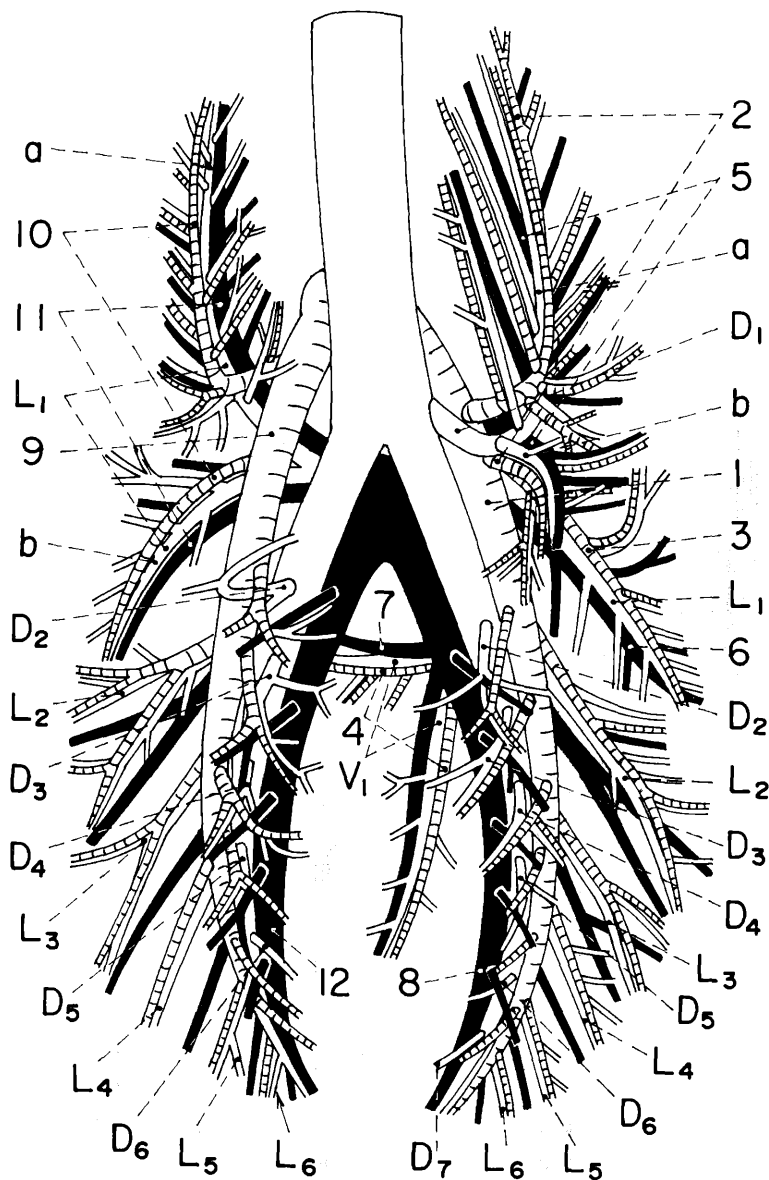


Fig. 1 Relationships among the bronchial tree, pulmonary artery and vein of the dog. Dorsal aspect.

Abbreviations.

Fig.1-2:

- D - dorsal bronchiole system.
- L - lateral bronchiole system.
- V - ventral bronchiole system.
- M - medial bronchiole system.
- D₁ - cranial lobe bronchiole I.
- L₁ - middle lobe bronchiole.
- V₁ - accessory lobe bronchiole.

The remaining bronchioles of the four bronchiole systems constitute the caudal lobe.

- 1 - right pulmonary artery.
- 2 - right cranial lobe artery.

- 3 - right middle lobe artery.
 - 4 - right accessory lobe artery.
 - 5 - right cranial lobe vein.
 - 6 - right middle lobe vein.
 - 7 - right accessory lobe vein.
 - 8 - right caudal lobe pulmonary venous trunk.
 - 9 - left pulmonary artery.
 - 10 - left middle lobe artery.
 - 11 - left middle lobe vein.
 - 12 - left caudal lobe pulmonary venous trunk.
- The other arteries and veins are distributed in the caudal lobe.

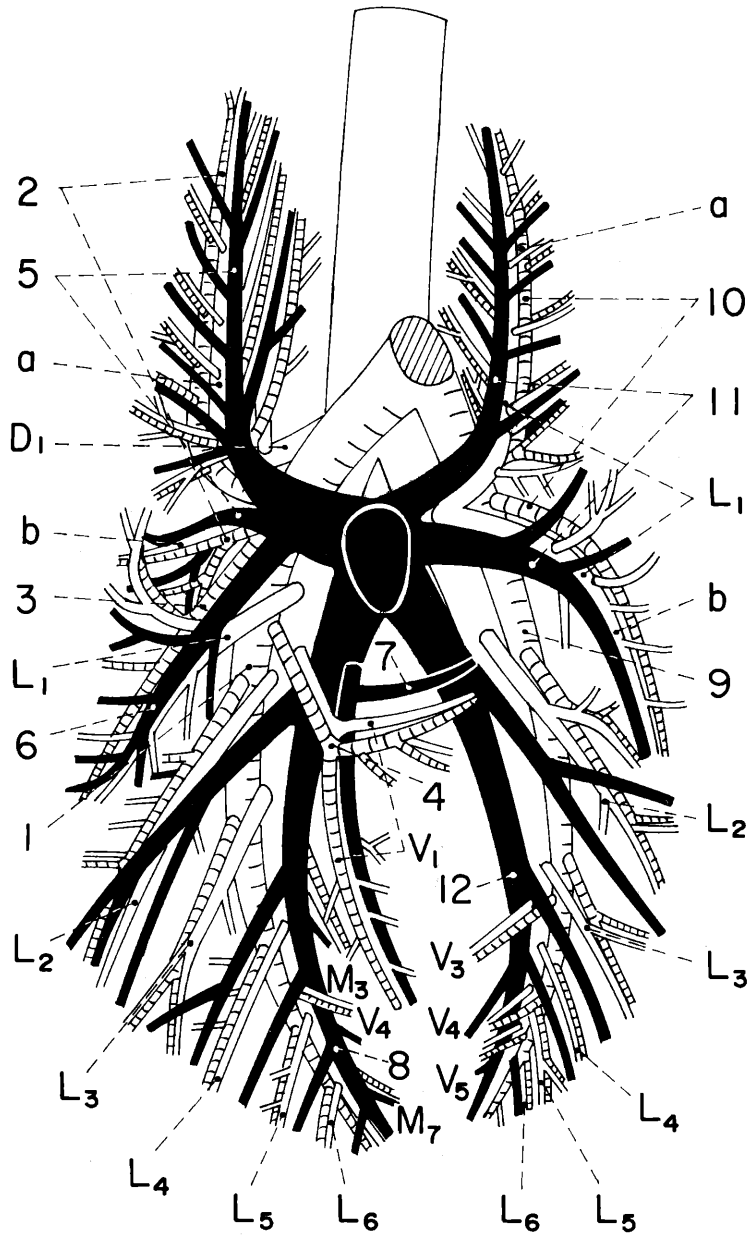


Fig. 2 Relationships among the bronchial tree, pulmonary artery and vein of the dog. Ventral aspect. In this specimen, the medial bronchiole system is lacking in the left lung.

each side branch, except for the first one. The arterial branch runs along the medial side of this side branch. The second branch runs along the medial side of the caudal branch (b) after arising

from the dorsal side of the right pulmonary artery. The right middle lobe artery arises from the ventro-lateral side of the right pulmonary artery and runs along the lateral or cranio-lateral

side of the bronchiole. This artery also gives off a comparatively large branch running along the first side branch arising from the caudo-lateral side of the middle lobe bronchiole. The right accessory lobe artery arises from the ventro-medial side of the right pulmonary artery and runs along the ventral side of the bronchiole.

In the right caudal lobe, each bronchiole receives an arterial branch from the right pulmonary artery. In the dorsal bronchiole system (D), the arterial branch arises from the dorsal or dorso-medial side of the right pulmonary artery and runs along the dorsal or dorso-lateral side of the bronchiole. In the lateral bronchiole system (L), the arterial branch arises from the ventro-lateral side of the right pulmonary artery and runs along the lateral or cranio-lateral side of the bronchiole. In the ventral bronchiole system (V), the arterial branch arises from the ventral or ventro-medial side of the right pulmonary artery and runs along the ventral side of the bronchiole after running obliquely across the ventral side of the right bronchus. In the medial bronchiole system (M), the arterial branch arises from the medial side of the right pulmonary artery and runs along the dorsal side of the bronchiole after running across the dorsal side of the right bronchus.

The left pulmonary artery runs across the dorsal side of the left middle lobe bronchiole, then runs along the dorso-lateral side of the left bronchus. During its course, it gives off the arterial branch, as in the right lung.

The left middle lobe artery arises from the left pulmonary artery with two branches. One arises from the lateral side of the left pulmonary artery

and appears on the lateral side between the first and the second side branches arising from the dorsal side of the cranial branch (a). It then runs along the dorso-lateral side of the cranial branch (a), and gives off arterial branches running along the lateral side of each side branch, except for the first side branch arising from the dorsal side of the cranial branch (a). In this side branch, an arterial branch runs along the medial side of the side branch. In the caudal branch (b) of the left middle lobe bronchiole, the arterial branch arises from the ventro-lateral side of the left pulmonary artery and runs long the lateral or cranio-lateral side of the caudal branch (b). The distribution pattern of the pulmonary artery in the left caudal lobe is the same as that in the right caudal lobe.

Distribution of the pulmonary vein (Figs. 1-2): The right cranial lobe vein arises from the areas of the cranial (a) and caudal (b) branches of the right cranial lobe bronchiole (D). In the area of the cranial branch (a), the pulmonary vein forms two large veins running along the ventro-medial side of the cranial branch (a). These veins finally form a large common trunk. This trunk further forms a large and short common trunk with the pulmonary vein arising from the area of the caudal branch (b), i. e. the common trunk of the right cranial lobe vein. The right middle lobe vein arises from the area of the right middle lobe and forms a large vein running along the medial side of the bronchiole. This vein forms a common trunk together with the right cranial lobe vein and enters the left atrium. The right accessory lobe vein arises from the area of the right accessory lobe bronchiole and runs along the dorsal side of the bronchiole, finally entering the

right caudal lobe pulmonary venous trunk.

In the lateral bronchiole system (L) of the right caudal lobe, the pulmonary vein arises from the area of each bronchiole and enters a large vein running between the areas of the bronchioles. It enters the ventro-lateral side of the right caudal lobe pulmonary venous trunk running closely along the ventro-medial side of the right bronchus. In the dorsal bronchiole system (D), the pulmonary vein arises from the area of each bronchiole and enters the large vein running between the bronchioles. It empties into the dorsal side of the right caudal lobe pulmonary venous trunk. In the ventral bronchiole system (V), the pulmonary vein runs between the areas of the bronchioles. In the medial bronchiole system (M), the pulmonary vein runs between the bronchioles. Both venous branches enter the right lower lobe pulmonary venous trunk.

The left middle lobe vein arises from the areas of the cranial (a) and caudal (b) branches of the left middle lobe bronchiole (L₁). In the area of the cranial branch (a), the pulmonary vein runs along the medio-ventral side of the main trunk of the bronchiole and receives small venous branches running between the side branches. In the area of the caudal branch (b), the main pulmonary vein runs along the medial side of the bronchiole and receives the small venous branch from between the side branches. There are three types of the entry patterns of these two pulmonary veins. 1) Both veins arise from the areas of the cranial branch (a) and caudal branch (b), forming a short common trunk before entering the left atrium. 2) Both veins enter the left atri-

um independently. 3) The pulmonary vein arises from the area of the cranial branch (a) and enters the left atrium, and the pulmonary vein from the area of the caudal branch (b) enters the left caudal lobe pulmonary venous trunk.

In the left caudal lobe, the distribution pattern of the pulmonary vein is the same as that in the right caudal lobe.

Discussion

In this report and the previous reports by the author, the term "bronchiole" has been used instead of "bronchus" to clearly discriminate the lobular bronchus or segmental bronchus from the right and left bronchi.

The left middle lobe bronchiole, as termed by the present author^{2,6)} corresponds to the common trunk of the left apical and cardiac lobes of the dog described by Ellenberger and Baum⁷⁾. At present, in veterinary anatomy, this common trunk is termed the left cranial lobe bronchiole (bronchus).

The present author has already reported on the distribution of the pulmonary artery and vein of the cow (Holstein)³⁾ and pig⁴⁾ together with their bronchiole ramifications. The distribution pattern of the pulmonary artery and pulmonary vein of the dog are fundamentally the same as those of the domestic cow and pig. However, there is a difference between them and dog. In the lateral bronchiole system of the caudal lobe cow and pig, pulmonary veins closely run along the caudo-medial side of the bronchioles, whereas in the dog, the pulmonary veins run the medial side of the bronchiole, and between the bron-

chioles.

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イヌの肺動・静脈分布

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要 約

20例のイヌの肺を使用した。肺動脈は主として気管枝の外側または背側に沿って走る。右肺動脈は右前葉気管枝の腹側を通り，右中葉気管枝の背側を越えて背側気管枝系と外側気管枝系の間を右気管支の背外側に沿って後方に走る。その経過中，4気管枝系の各気管枝に沿って走る肺動脈枝を分枝する。左肺動脈は左中葉気管枝の背側を越えて右肺の場合と同様に分布する。肺静脈は主として気管枝の内側または腹側で気管枝と気管枝の間を走り，右肺では右前葉静脈と右中葉静脈は共同幹を形成して左心房に注ぎ，この他に右後葉肺静脈幹が流入する。右副葉静脈は右後葉肺静脈幹に注ぐ。左肺では左中葉静脈は2枝あり，短い共同幹を形成して左心房に注ぐ場合と，別々に注ぐ場合がある。この他に左後葉肺静脈幹が左心房に注ぐ。

—キーワード：気管支枝，イヌ，肺，肺動脈，肺静脈