# Macroscopic and Morphometric Studies of the Extrapulmonary Primary Bronchi and Lungs of the indigenous adult Male Pigeon (*Columba domestica*)

Aqeel Mohsin Mahdi AL-Mahmodi

Veterinary Anatomy and Histology Department, Veterinary Medicine College, AL-Kufa University

**Abstract:**

Macroscopical account of the extrapulmonary primary bronchi and lungs in the ten of the indigenous adult male pigeons (*Columba domestica*) collected from the Diwanyia city markets. It is expect that this work will provide a pivot for future research and subsequent clinical applications as regards the biology of the pigeons. After complete bleeding the target organs recognized then the shape, position, dimensions of each specimen were record. The building units of the pulmonary primary bronchi were C-shaped hyaline cartilages. Medial bronchial wall connecting all cartilages ends together. The mean length of right and left bronchi was (0.76±0.04 cm) (0.64±0.24cm) respectively. Lungs appear as pyramidal-shaped brilliant pink color; extend from the first to the sixth ribs. Each lung contain three surfaces (costal, vertebral, and septal) the dorsal border of the costal surface contain six deep grooves origin by embedded the first to the sixth ribs lead to divided the lung to seven lobes. The mean length of right and left lungs was (3.1± 0.66cm), while the mean width of right and left lungs was (3.1± 0.66cm).

# دراسات عيانيه وقياسات شكلية للقصبات الأولية خارج الرئة ولرئتي الحمام البالغ المربى محليا (*Columba domestica*)

عقيل محسن مهدي المحمودي

فرع التشريح والأنسجة، كلية الطب البيطري، جامعة الكوفة

**الخلاصة:**

الوصف التشريحي للقصبات الرئوية الأولية والرئتين لعشرة من ذكور الحمام (*Columba domestica*) البالغة المربى محليا جمعت من أسواق مدينة الديوانية . والمتوقع من هذا العمل أن يكون محورا للأبحاث المستقبلية والتطبيقات السريرية اللاحقة فيما يتعلق بعلم أحياء الحمام. بعد اكتمال النزف شخصت الأعضاء المستهدفة ثم سجل شكل وموقع وأبعاد كل عينة. الوحدة البنائية للقصبات الرئوية الأولية هي الغضاريف الزجاجية بشكل حرف C. يربط جدار القصبات ألأنسي كل نهايات الغضاريف مع بعضها. وبلغ متوسط طول القصبات اليمنى واليسرى (0.76±0.04cm). الرئتان هرميتا الشكل ذات لون وردي لامع؛ وتمتد من الضلع الأول إلى الضلع السادس. و تحتوي كل رئة

على ثلاثة سطوح (ضلعي وفقاري وحاجزي)، تحتوي الحافة الظهرية للسطح الضلعي على ستة شقوق عميقة بسبب انطباع الأضلاع من الأول إلى السادس مؤدية إلى تقسيم الرئتين إلى سبعة فصوص. وبلغ متوسط طول الرئة اليمنى واليسرى (3.1±0.66 cm). بينما بلغ متوسط عرض كل منهما (3.1±0.66cm).

## Introduction:

The bird's respiratory tract composed of two main components, the rigid gas exchanging bronchial lungs, which allow for a union between air and blood and the nonvascularized ventilatory air sacs (1). The respiratory system plays a vital role in thermo-regulation, the sense of smell, and voice are associated with it (2). The avian respiratory system described as non-tidal (3).

In birds the trachea bifurcation at the syrinx to the right and left extrapulmonary primary bronchi (EPPB). Both enter the target lungs via the hilus at septal surface as an intrapulmonary primary bronchus (IPPB). (4; 5; 6; 7**;** and 8).

The primary bronchi are made of a chain of C-shape cartilaginous rings held collectively by annular ligaments. The dimensions of these rings are variable in concerning bird species. The secondary bronchi originate from primary bronchi at dissimilar position with variable number, and named according to the parts of the lung and they supply. They are dividing into Parabronchi (tertiary bronchi), and freely anastomosis with each other. Tiny respiratory air capillaries form extensive networks that interconnecting the tertiary bronchi and permitting gas exchange. (9; 10; 11; 12; 13; 14; 15; 16; 17; and 18).

In Rock dove and Domestic fowl, the opening of the extrapulmonary primary bronchi is narrow at the syringeal end, moderately expanded at the middle. In domestic fowl, it constricted at the origin of the medioventral secondary bronchi, while in Rock dove; it dilated at the origin of the medioventral secondary bronchi (11).

Avian lungs more specialized organ, three important features of this specialization are extension of the respiratory epithelium (Pseudostratified ciliated columnar epithelium), efficient mechanisms for ventilation, and an efficient circulation (18). Moreover, it is very small when compared with the whole body size, and very rigid when entirely inflated. In addition, firmly attachment to the ribs that leaves deep costal impressions. (19; and 20)

The lungs in avian lie in the craniodorsal part of the thorax extend as far as the second rib cranially, to the sixth rib caudally, and very adhere to the ribs causes firmly attached to the thoracic wall (21; 20; 22; and 23).

The lung of the chicken, turkey, and duck appear as flattened rectangular, elongated

parallelogram, trapezium-shaped respectively. In duck the medial border being about twice the length of the lateral border this makes the lung relatively long, narrow, and pointed craniomedially, the medial border bear six impressions for ribs, as well as Parabronchi (9). While (21) describe the lungs of the duck as bright red-triangular or quadrilateral-shape, not divided into lobes, and has in the upper border several rows of grooves caused by embedded the vertebral ribs.

In West African guinea fowl, the lungs are bright red trapezium shape and very small in contrast to the size of the thorax, each lung divide into four parts by ribs impressions, and the dorsal and ventral surface are convex and concave respectively. The primary bronchus, tracheal artery and pulmonary vessels pass through the hilus into the lungs at the medial border (18). The lungs in the chicken, turkey contain vertebral, visceral, Costal surfaces, thick medial, and thin lateral borders. (9; 19; and 23). Nevertheless, in the ducks the costal, vertebral, and septal are the surfaces of the lungs. (21; and 19). While, lungs in Japanese quail come into view as spongy-like bright red in color has no lobes, and has three surfaces (convex costal and medial, and concave ventral surfaces) (17). However, for benefit in the study of the respiratory physiology, histopathology, and the respiratory diseases analyzes.

**Materials and Methods:**

Ten adult male pigeons the mean live weight was (425 ± 33.5 gm) in first year of there age used for this study. The birds obtained from the Diwanyia city markets. Anaesthetized with an intramuscular injection of ketamine (50 mg kg) and xylazine (20 mg kg), then opened the body and well bleeding by puncher of the heart.

For each specimen the extrapulmonary primary bronchi and the lungs observed immediately after complete bleeding, the position in situ, the shape, and the relations with other organs were obvious and recorded, subsequently, the target organs separated from thoracic cavity carefully. In addition, by using the subsequently instruments (ruler, vernier, and amplifier lens (X6 and X12), listed the following data:

1-Length and number of extrapulmonary primary bronchi cartilages.

2- Length, width, and thickness of left and right lungs.

**Results:**

Morphological examination of the extrapulmonary primary bronchi of the indigenous adult male pigeons showed as short tubes; extend caudolaterally from the bronchiosyringeal cartilages to the hilus of the lung at the proximal third of the lung at the septal surface. The structure units of these bronchi were C-shaped hyaline cartilages the opened side medially, connected

together by annular ligaments. The free ends of these cartilages held together by membranous tissue named Medial bronchial wall (Fig.1). The mean length and number of cartilages of right (EPPB) were (0.76±0.04 cm), (6.4±0.24) respectively. While these dimensions in the left (EPPB) were (0.64±0.24cm), (5.4±0.24) respectively. Lungs appear as pyramidal-shaped brilliant pink color; extend from the first to the sixth ribs. Each lung contain costal surface was convex on dorsal border of this surface there are six deep grooves derivation embedded in the first to the sixth ribs guide to separate the lung to seven lobes the first and hindermost lobes smaller than the other lobes. Vertebral surface was convex and septal surface concave contain the hilus on the proximal third (Fig. 2). The mean length of right and left lungs was (3.1± 0.66cm), whereas the mean width of the right and left lungs was (1.94± 0.03cm), while the mean thickness of the right and left lungs were (0.56 ± 0.024cm).

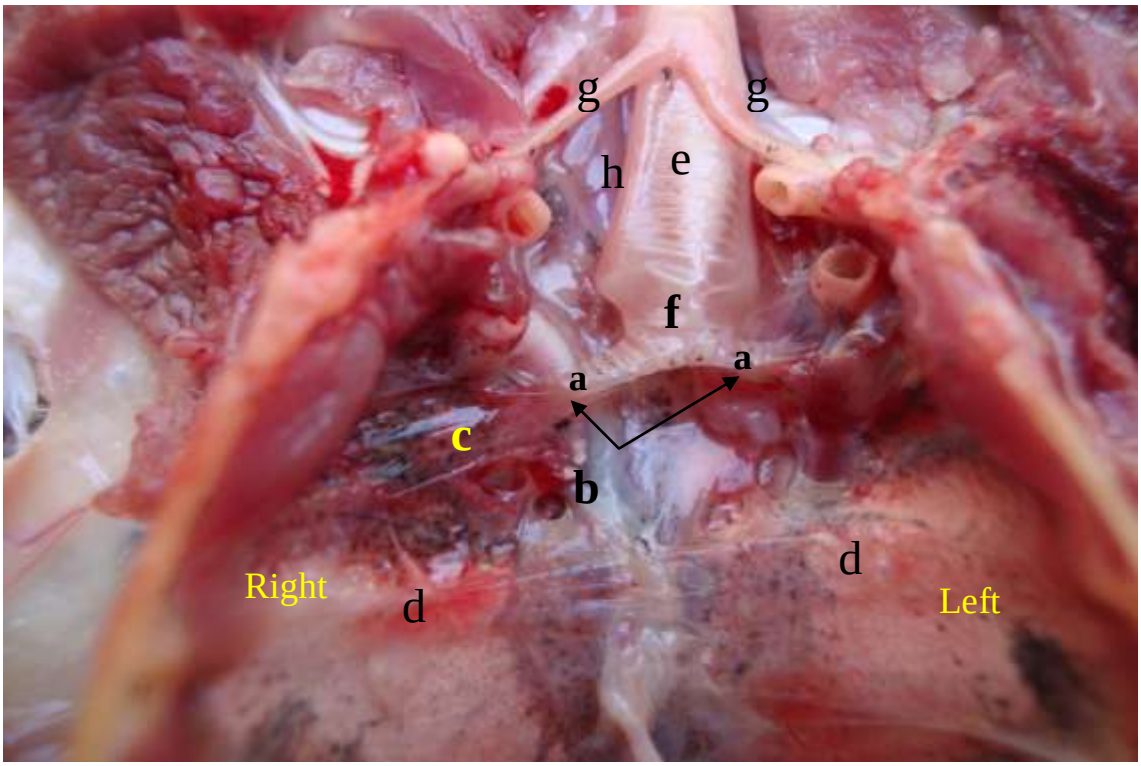


Fig. (1): Ventral view of the thoracic cavity of the pigeon after removal of heart, show the derivation and shape of the extrapulmonary primary bronchi (a), medial bronchial wall (b), hilus of lung (c), right and left lungs (d), distal trachea (e), syrinx (f), sternotrachealis muscles (g), trachiolateralis muscles (h).

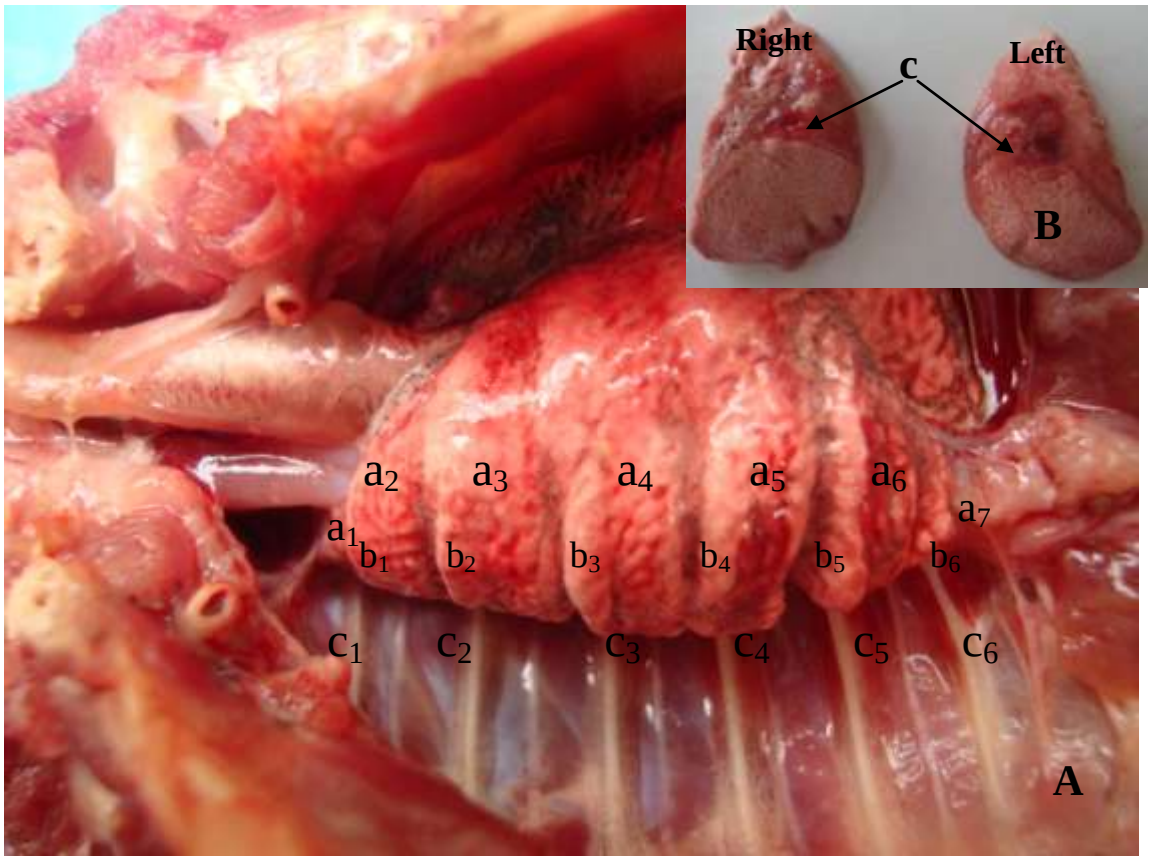


Fig. (2): lungs of pigeon illustrate the (costal view (A) right lung, ventral view (B)right and left lungs): seven lobes of the lung (a) six deep grooves of the costal surface at the dorsal border (b) six costal ribs (c) hilus of the lung (d),

**Discussion:**

The current examinations of the extrapulmonary primary bronchi in indigenous adult male pigeons elucidated that composed of incomplete rings (C-shaped), the dorsal and ventral ends linkage by membranous tissue, which represent the medial wall of the bronchi. These consequences in agreement with (10; 12; 4; 24; 13; 5; 25; 16; 26; 17; 18; 22; and 8) in several types of the birds.

In the present study, the right EPPB was longer than the left one these features not disaccord with (27) in ostriches. While on commutating with (8) who showed , in Male Turkey (*Meleagris gallopava*), the right EPPB was narrower and shorter than the left EPPB . These facts bounce back to different in bird species.

Length of the EPPB in pigeons in this study different with large size birds like ،*Gallus gallus*, and West african guinea fowl (12; and 18); and in ostriches (27) who said that the right EPPB was relatively longer (5cm), and relatively narrower in compared with the left EPPB (4cm).

But coincide with rock dove was (0.7 cm) (12), differences of dimensions of bronchi attributable to qualitative dissimilarities in bird's species. (27; and 16).

Lungs in pigeons appear as pyramidal-shaped brilliant pink color. These results incongruity, with (9) who showed that the lung appeared as flattened rectangular structure, elongated parallelogram, and trapezium-shaped in chicken, turkey, and duck respectively, with (18) who made clear that the lungs were bright red trapezium-shaped in west african guinea fowl . These different colors of the lungs in birds referred to the blood supplied (17), and with (8) explicated that the shape of the lungs in the turkey appeared as elongated triangle shiny-red.

The lungs of pigeon in this study extend from the first to the sixth ribs firmly attachment with it. (23) Assumed that these inflexibility and constant volume throughout the respiratory cycle of the avian lung provide the mechanical foundation for an enlargement of the oxygen exchange surfaces (10 times) larger than the gas exchange surfaces found in mammalian lung. These findings consistence with other authors in avian (18, 20, 22).

The lung of the pigeons in this study similar to other birds like duck and turkey characterized by present three surfaces (Costal, Vertebral, and Septal) (21, 19, 8), but not in agreement, with (11) who named visceral surface in chicken and turkey, and with (17) who explained that there were (costal and medial, and ventral surfaces) in Japanese quail.

Dimensions of right lung parities left one of indigenous pigeons in this study. These results incongruity with (8) who clarified, in Male Turkey (*Meleagris gallopava*), that the mean length of right and left lungs were (6.37 ± 0.24 cm) and (6.72 ± 0.17 cm) respectively, the mean width of the right and left lungs were (3.35 ± 0.4 cm) and (3.68 ± 0.3 cm) respectively, and the mean thickness of the right and left lungs were (0.96 ± 0.06 cm) and (1.025 ± 0.092 cm) respectively Nevertheless, the length and width of the left and right lungs in chicken were (7cm) and (5cm) respectively (9). But.

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