

Microscopic and morphometric study in trachea and lungs of adult Iraqi pigeon (*Columba livia*)

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Abstract

The study applied light to investigate the microscopic and macroscopic results of the trachea and lungs in adult Iraqi pigeons (*Columba livia*). Age of the pigeons was (8-12) months. Our study was carried out 12 adult pigeons. These pigeons were supplement from local market of Baghdad city, Iraq. The morphological study of adult pigeon observed that the trachea included long tube of cartilaginous structure is extended from larynx until enters to left and right lungs with runs alongside the esophagus inside the thoracic cavity. This trachea was characterized by flexible bulk, non folded ring and numerous series of thin complete cartilage ring. The statistics analysis was used for grossly morphological organs, where was number of thin cartilage rings average range (67-70) complete rings. The study used the morphometric measurements for length of the trachea was (10±0.6) cm. and diameter of ring lumen about (0.6±0.12) cm.. Either the lungs results of adult pigeons were showed pink color, spongy mass and trapezium-like. The lungs were located inside thoracic cavity and connected by ribs with appearance costal impressions on the dorsal surface of the lungs. The morphometric study were included statistic analysis of lungs, weight of lungs were about (6±0.01) mg. and length was (3.32±0.2) cm. . Histological study showed tracheal ring of *Columba livia* was thin complete. The study observed histological layers included tunica mucosa, submucosa and adventitia, the first portion of mucosa is called epithelia, it's characteristic by ciliated pseudostratified columnar epithelium with goblet cells, lamina properia has loose connective tissue which it is rich blood vessels. Submucosa is a beneath layer of mucosa, and contains tracheal cartilaginous tube, large blood vessels and numerous seromucous glands. Pigeon's lungs were formed than parabronchi, it's located in center of pulmonary lobule and separated by septa (connective

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tissue) named interlobular wall, which is originated from secondary bronchi and united with other. The epithelia lined the parabronchi by simple squamous cells to help gaseous exchange inside the lungs .

INTRODUCTION

The respiratory system of birds considered one of the important organs in the inspiration and expiration of operation, where function lead to exchange of oxygen and carbon dioxide. Also work on regulation of temperature inside the living organism. Air enters on way nostrils opening to nasal cavity, trachea accordingly to lung [1,2] . Morphologically, the trachea is cartilaginous tube structure runs alongside with esophagus. The respiratory tract is resemble to some rather with mammals, but there are different with trachea in birds will be complete tracheal ring [3]. Generally, the trachea is lined by ciliated pseudocolumnar epithelium with mucous glands. Either lamina propria and sub mucosa are represented by connective tissue and supported tissue know the cartilage with surrounding blood vessels [4]. The anatomical features of avian lungs are different in size from bird to others according to avian breeding. The lungs are appeared consistent strongly, spongy like and adhesion with ribs lead to appear lungs impressions [5,6]. The lungs position are lied craniodorsal aspect inside thoracic cavity, begin from 2nd rib to 6th rib toward caudally [7,8,9]. Shape of lungs are contrast between birds, where appear as flatten rectangular, wedge- aspect in horizontal section while it's appear elongated parallel and trapezium structure during chicken, turkey and duck respectively [3]. Histologically, the mass of the bird lungs consist of parabronchi occupied pulmonary lobules center which it's separated via inter parabronchi septa and anastomising with some them [10]. In Ostrich, the lungs are lost to interparabronchial barrier [11]. The parabronchial wall are including three coats; cuboidal or squamous epithelia none- secretory units, lamina propria is represent loose connective tissue no cartilage while the third layer is named muscularis has smooth muscle fibers [12,13,14].

MATERIALS AND METHODS

Experimental design

In this experiment, 12 adult pigeons were used, bought from Ghazalia market of Baghdad Iraq. The age was (8-12) months with weight range between (300-360) g. and put inside the cages, the pigeons were anesthetized and kindly killed, then trachea and lungs were removed and washed by normal saline for the morphometric measurements and histological preparations. The weights of pigeons were measured by sensitive electron balance, while length of trachea and lungs were measured by electric caliper. Then the specimens put inside formalin 10.%. percentage so that ready to histological technique. The stains were used for slides Hematoxylin and Eosin, masson's trichroms for connective tissues^[15].

RESULTS AND DISCUSSION

The current study showed morphological results of trachea and lungs in Iraqi pigeons (*Columba livia*). Where the study showed the trachea of pigeons was long

cartilaginous tube structure, included flexible, non folded ring and series of complete cartilage rings. Position of the trachea was connected with larynx runs away toward left and right lungs, enter into lungs by bifurcate of primary bronchi and continuously with esophagus during thoracic cavity (Fig. 1A,B). The study was used the statistics analysis for grossly morphological organs, where was number of thin cartilage rings average range (67-70) complete rings (Fig. 1A and 2). Also the study was included length of trachea was (10±0.6) cm. and diameter of ring lumen about (0.6±0.12) cm.. These results were no parallel with [16] whom said that the trachea have incomplete cartilage ring and numbers of rings about (15-17) ring, while accept with them whom state about that the trachea were divided into bifurcate primary bronchi in Naked-Rumped tomb bat (*Taphozous nudiventris*). Our study accepted with [17] whom said for the cervical trachea was attached with two ventral sides by the thyroid muscle, and it surrounded by longitudinal muscle. Either the lungs of pigeons were pink in color, spongy bulk and trapezium- like. The lungs were located inside thoracic cavity and connected by ribs therefore the costal impressions will appeared on dorsal view of lungs. These results corresponding with [18] whom wrote that lungs shape were elongated- triangular, pink color and extended from 1st to 6th vertebral ribs inside thoracic cavity in Turkey (*Meleagris gallopava*). The morphometric study were included statistic analysis of lungs, weight of lungs were about (6±0.01) mg. and length was (3.32±0.2) cm. . Histological study showed tracheal ring of *Columba livia* was complete (Fig. 2). The study observed histological layers consist of tunica mucosa which is included the epithelia, it's lined by ciliated pseudostratified columnar epithelium with goblet cells, lamina propria has loose connective tissue which contains collagen and elastic fibers with rich blood vessels. Submucosa is a beneath layer of mucosa, and contains tracheal cartilaginous tube, large blood vessels and numerous seromucous glands (Fig. 3, 4 and 5). These the findings were paralleled with [19] whom said that the trachea was lined via ciliated pseudostratified columnar epithelium with spread goblet cells and has three tunics, mucosa, sub mucosa and adventitia during coot bird and guinea fowl and gees. The histological features of lungs in pigeons were formed parabronchi which is located in center of pulmonary lobule that disconnected by barrier of the connective tissue named interlobular septa, which is originated from secondary bronchi and emerge with other. The study observed that parabronchi was lined by simple squamous epithelia to easily gaseous exchange inside the lungs and blood vessels which surrounded by connective tissue (Fig. 6A,B). These observations accepted with [7,8,9] whom that said parabronchial was lined squamous cells and separated by inter lobular septa, also the study was conflicted with [11] whom stated that inter parabronchial septa is absence in Ostrich.

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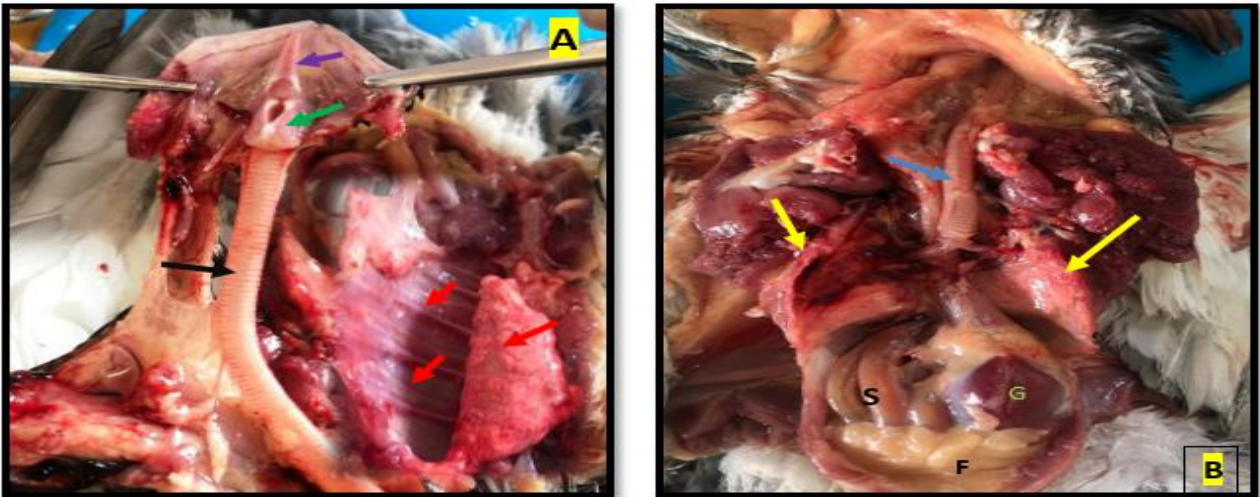


Figure 1. A, B, ventral view of pigeon shows trachea (blue arrow), left and right lung (yellow arrow), costal & lung impressions (red arrow), tongue (purple arrow), larynx (green arrow), thin complete rings (black arrow) and coelomic cavity including gizzard (G) and small intestine (S) with fatty tissue (F).

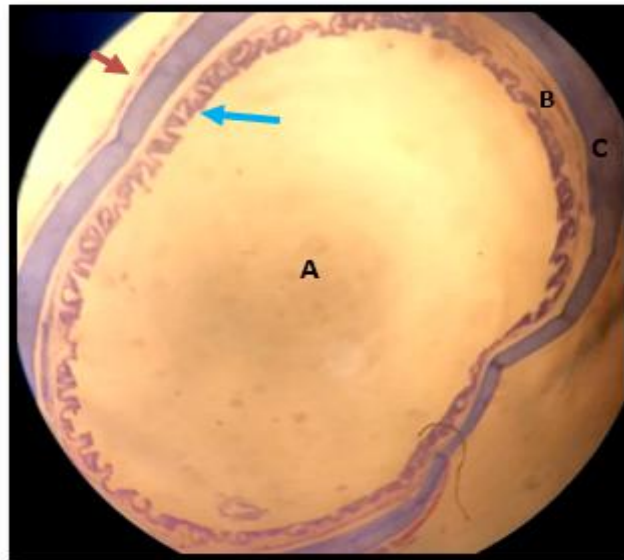
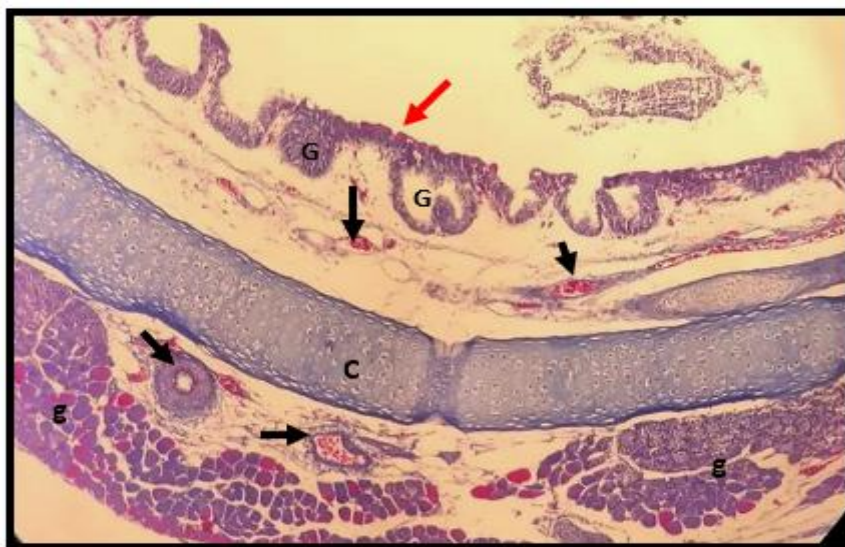


Figure 2. Cross histological section of pigeon's trachea shows complete tracheal ring, lumen of ring (A), mucosa (pseudostratified columnar epithelium (blue arrow)), submucosa (B), hyaline cartilage (C), adventitia (red arrow) 4x masson's trichrom stain



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Figure 3. Cross histological section of pigeon's trachea shows epithelia (red arrow), goblet cells (G), blood vessels (black arrow), hyaline cartilage (C) and seromucous glands (g), 10x masson's trichroms stain

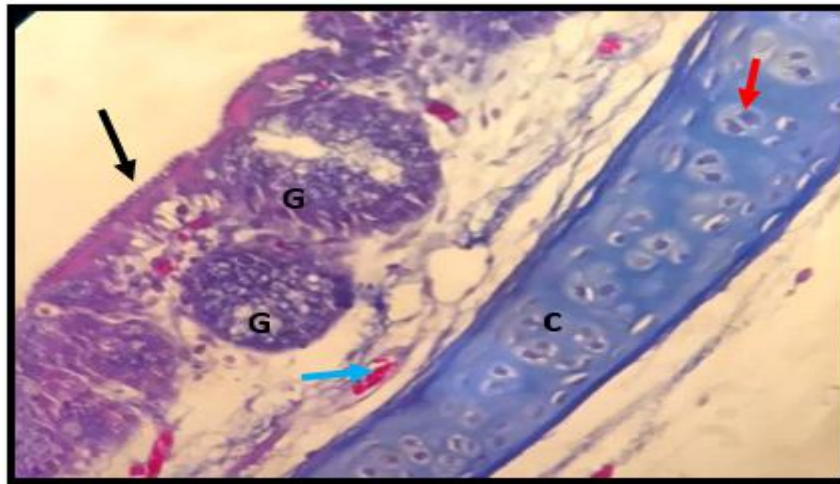


Figure 4. Cross histological section of pigeon's trachea shows ciliated pseudostratified columnar epithelia (black arrow), goblet cells (G), blood vessels (blue arrow) and tracheal cartilage (chondrocytes) (red arrow), 40x masson's trichroms stain

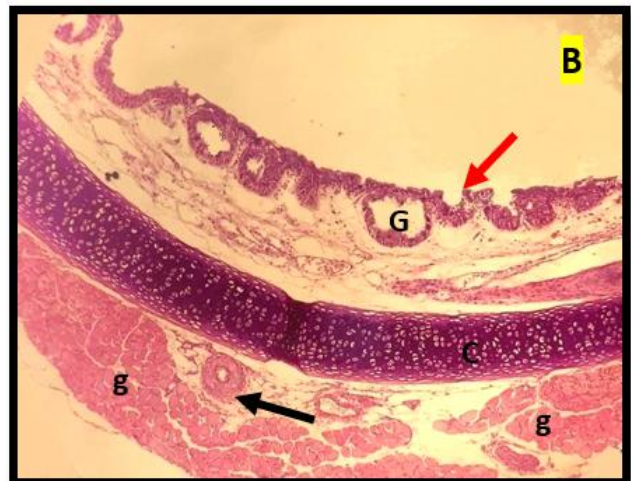
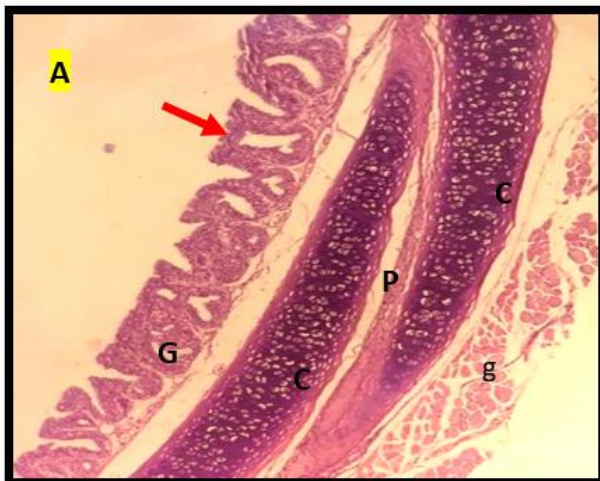
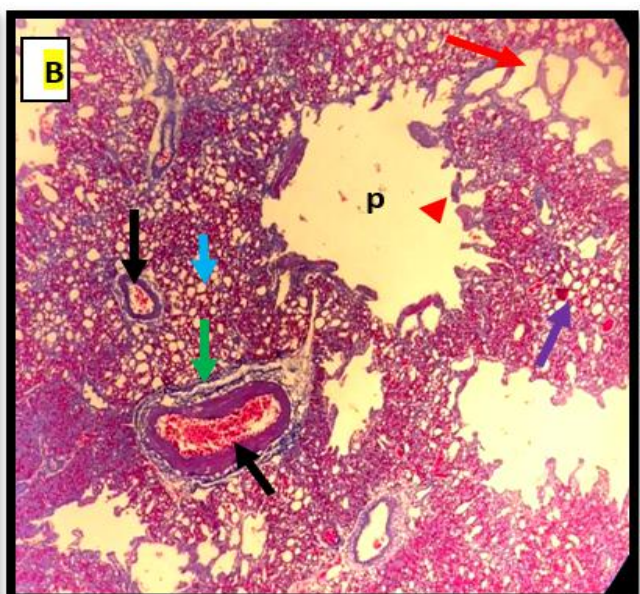
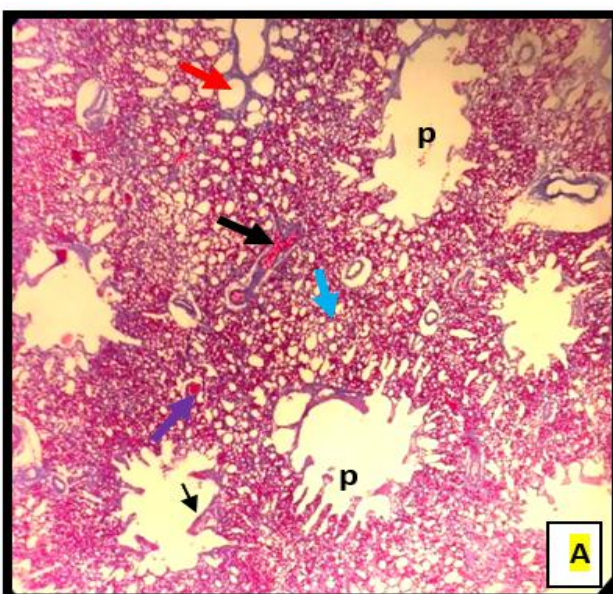


Figure 5. A, B. Cross histological section of pigeon's trachea shows epithelia (red arrow), goblet cells (G), hyaline cartilage (C), blood vessels (black arrow) and tracheal glands (g) and perichondrium (p), 10x H and E stain



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Figure 6. A, B, Cross histological section of pigeon's lungs shows parabronchial lumen (p), simple squamous epithelia (head arrow), blood vessels (black arrow), atria (red arrow), air capillaries (blue arrow), blood capillaries (purple arrow) and dense regular connective tissue (green arrow), 10 x masson's trichroms stain

CONCLUSIONS

- 1- In adult pigeon's trachea had a good developed and formed at numerous thin complete cartilaginous ring.
- 2- pigeon's lungs were fixed and adhesion on costal ribs with appearance of lungs impressions.

Ethical Clearance

This research acquires ethical approval from the Central Approval Committee of Research Ethics in Baghdad University.

Conflict of Interest

Non.

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