

## **COMPARATIVE HISTOLOGICAL STUDY OF TRACHEA IN GUINEA FOWL AND COOT BIRD**

Shaima khazaal Waad

Department of anatomy & Histology, Veterinary Medicine College, University of Basra,  
Basra, Iraq.

(Received 25March 2015 ,Accepted 31 May 2015)

**Keywords:** Coot birds, Trachea, Syrinx

### **ABSTRACT**

The present study was done at the department of anatomy and histology of the college of veterinary medicine, University of Basra. In this study, sixteen males of guinea fowl and coot birds were used and they were allocated into two groups of eight animals to each. The aim of the study was to investigate the differences of the histological structures of the trachea of guinea fowl and coot birds. The results revealed that the mucosal layer of the trachea in coot birds characterized by the transformation of the pseudostratified columnar epithelium into stratified squamous epithelium near the syrinx region due to the presence of ossification at the submucosal layer at this region while the mucosal layer in guinea fowl is of pseudostratified columnar nature along the trachea. The thickness of the cartilage of submucosal layer was more higher significant in guinea fowl than that of coot bird and there was no ossification area in it.

### **INTRODUCTION**

Major functions of the avian respiratory system are oxygen and carbon dioxide exchange, and balance of body temperature. Air inspired during respiration passes from the nasal cavity to the larynx and continues via the trachea and enters the syrinx and bronchi (1) and (2).

Trachea is a long tube runs alongside the esophagus. In birds is very similar to that of mammals. The trachea bifurcates into two main bronchi, the principal difference is that the hyaline cartilage rings are complete in birds (3). Histologically it is lined with a ciliated columnar epithelium, containing numerous simple alveolar mucous glands .

In the posterior portion of the trachea, the glands are replaced by goblet cells. A lamina propria and sub mucosa are present, each consists of dense connective tissue and cartilage. The sub mucosa are rich in elastic fibers (4). The histological structure of trachea in coot birds and Guinean fowl has not been described in detail, so that the determination of comparative of the structure of the trachea in the tow species are the aims of the present study.

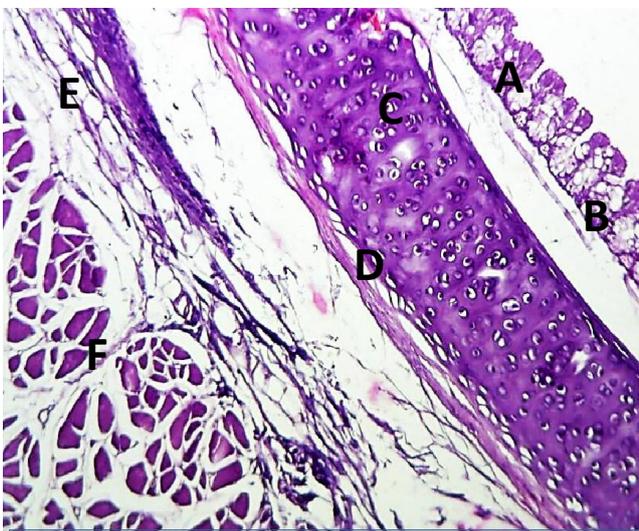
## **MATERIALS AND METHODS**

Trachii of sixteen adult males of coot birds and Guinea fowl of the same age (eight for each group) were collected for histological study, then they were fixed in formalin 10%. Different concentrations of alcohol (ethanol) were used for dehydration (70%, 80%, 90%and 100%), then clearing process was done by using xylene. These samples were embedded in paraffin wax and sections of 5-6 thickness were made by microtome and were stained by routine stain of Hematoxline & Eosin stains (5). Micrometrical parameters like thickness of cartilaginous ring were recorded in the two species of birds, using ocular micrometer. The statistical analysis was done by the use of independent-samples t-test supported by SPSS program version 20 (6).

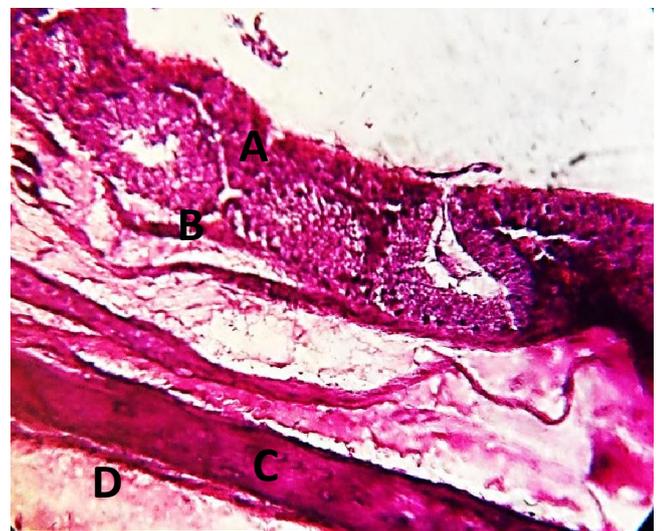
## **RESULTS**

The present study shows that the trachii of coot birds and guinea fowl consists of mucosa, sub mucosa and adventitia (pictures, 1and2). Mucosal layer of coot bird lined with psedostratified ciliated columnar epithelium with oval nuclei with presence of intraepithelial goblet cells and characterized by transformation into stratified squamous epithelium near the syrinx (picture, 3). There are high numbers of mucous glands at the anterior part of trachea and becomes fewer in the posterior which has acini. In guinea fowl the mucosal layer has numerous crypts lined with pseudostratified ciliated columnar epithelium which is housed with numerous goblet cells where its nuclei near the surface, the glands are simple alveolar mucous glands (picture, 1). In coot birds and guinea fowl epithelium lies on basement membrane contains basal cells which have flattened nuclei that separate it from the underlying lamina propria. In coot birds lamina propria is thin consists of loose connective tissue , and heavy accumulation of lymphocytes, while in

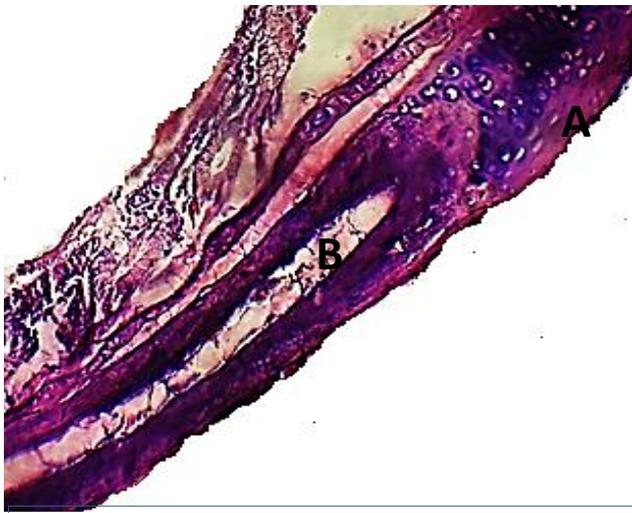
guinea fowl lamina propria consists of loose connective tissue and fibers, with presence of blood vessels, and sub mucosa that consists of complete cartilaginous rings. The latter were ossified and contains scattered lacunae which consists of osteocytes (picture, 4), while in guinea fowl the cartilage is also complete ring but there is no ossification. Cartilage thickness is thicker than of coot birds (table, 1). In both guinea and coot bird the smooth muscles were attached to trachea and were surrounded by sternotrachialis (skeletal muscle) and adipose tissue. The last layer is adventitia which contains loose connective tissue, blood vessels and nerves but in guinea fowl consists of clear nerve fascicles with blood vessels (pictures, 5 and 6).



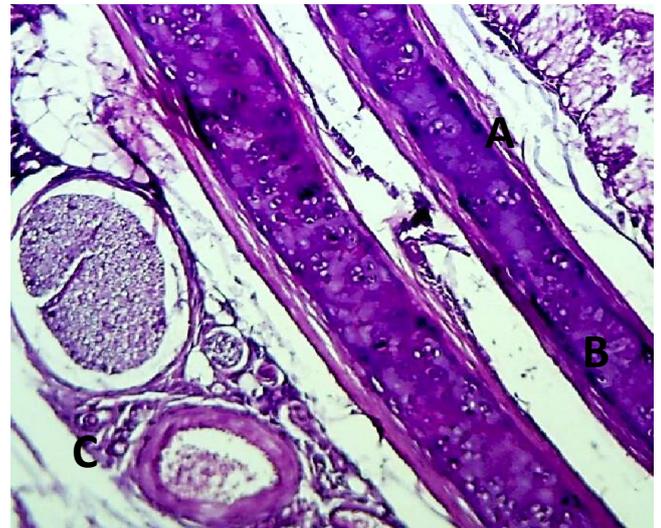
Picture (1). Trachea of guinea fowl. Mucosa with glands(A), lamina propria(B), cartilage(c), elastic fiber(D), adipose tissue(E), skeletal muscle (F). 100X(H&E stain)..



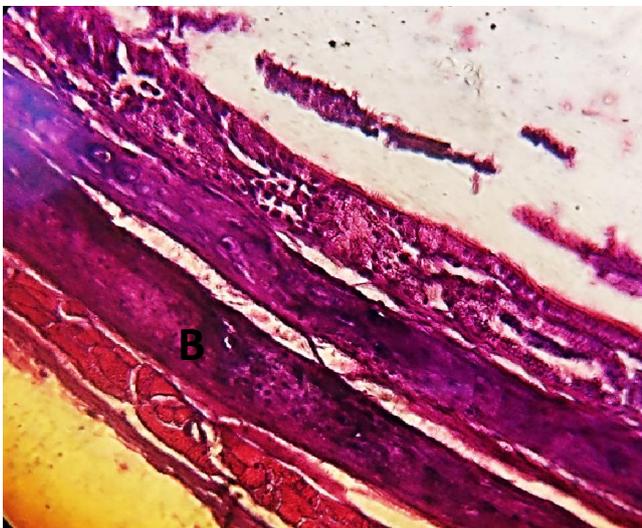
Picture (2). Trachea of coot bird. Mucosa with glands(A), lamina propria(B), cartilage(c), elastic fiber(D), adipose tissue(E). 100X(H&E stain).



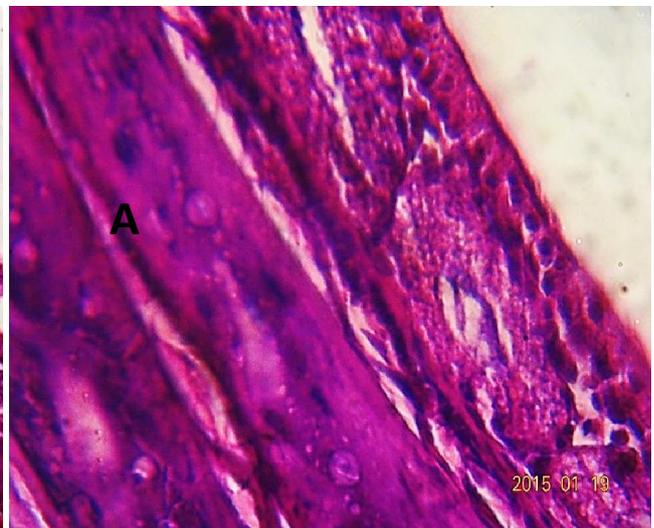
Picture (4). Trachea of coot bird. Cartilage (A), ossification(B). 400X(H&E stain)..



Picture (3). Trachea of coot bird. Stratified squamous epithelium (A), pseudo stratified columnar epithelium (B), ossification (C). 400X(H&E stain).



Picture (6). Trachea of coot bird. adventitia (A),. 400X (H&E stain).



Picture (5). Trachea of guinea fowl. adventitia (A), nerve fascicle(B). 400X (H&E stain).

**Table(1). The difference between the thickness of trachea cartilages of guinea fowl and coot bird.**

Group	Thickness of tracheal Cartilage
Guinea Fowl	310.7 ± 40.5 <sup>a</sup>
Coot Bird	151.9 ± 10.5 <sup>b</sup>

The different letters refer to significant difference between groups. The numbers represent the mean ± standard deviation. Independent samples test ( $t = 11.3$ ,  $df = 10.2$ ,  $p < 0.001$ )

## DISCUSSION

In the present study, the trachea of coot birds is lined by stratified columnar ciliated cells rich with goblet cells that agreed with (7) in their review on birds, (8) in their study on Japanese quail, (9) and (10) in their study on goose. This may be because ciliary movement by a mucus layer (mucociliary system) is believed to perform a cleaning function by removing foreign bodies (bacteria, virus, dust etc.) from the respiratory tract (11) and (12). In guinea fowl mucosal layer has very clear crypts lined with respiratory epithelium which houses number of goblet cells. This agrees with (4) that intraepithelial mucous glands are abundant in the trachea of the chicken. Lamina propria of coot birds has loose connective tissue with heavy accumulation of lymphocyte while in guinea there are less infiltration of lymphocyte this agree with (13) that lamina propria consists of large bundles of collagen fibers and numerous aggregations of lymphocytes.

The submucosal layer is made of cartilage which is thicker in guinea fowl than that of coot bird. Besides, in coot birds the cartilage began to transform into ossified region wherever it become close to the syrinx. The transformation of the submucosal layer into cartilaginous one comes in accordance with what was mentioned by (4) who mentioned

that the submucosal layer of chicken in general is transformed into ossified region near the syrinx

### دراسة مقارنة للتركيب النسيجي للقصبه الهوائية في دجاج الماء ودجاج غينيا.

شيماء خزل وعد

فرع التشريح والأنسجة، كلية الطب البيطري، جامعة البصرة، البصرة، العراق.

#### الخلاصة

أجريت الدراسة في فرع التشريح والأنسجة في كلية الطب البيطري ، جامعة البصرة. في هذه الدراسة تم استخدام ستة عشر ذكرا من طيور دجاج الماء ودجاج غينيا وقسمت الى مجموعتين بواقع ثمانية طيور لكل مجموعة. كان الهدف من الدراسة هو مقارنة التركيب النسيجي للقصبه الهوائية في كلا النوعين. أظهرت النتائج ان طبقة المخاطية للقصبه الهوائية في طيور دجاج الماء تتميز بتحول الظهارة من مطبقة عمودية كاذبة الى ظهارة حرشفية مطبقة قرب منطقة حنجرة التغريد وذلك لوجود منطقة تعظم في طبقة تحت المخاطية في هذه المنطقة بينما ظهرت طبقة المخاطية في دجاج غينيا مطبقة كاذبة عمودية على طول القصبه الهوائية. اظهر سمك الغضروف للطبقة تحت المخاطية فرقا معنويا كبيرا مما هو عليه في دجاج الماء وعدم وجود التعظم فيه.

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