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Macroscopic and Microscopic Study of Larynx in the Male Ostrich

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Abstract: There is significant structural differences between the larynx of birds and mamales. The larynx is located in the floor of the oropharyngeal cavity in the birds. The muscles and cartilages form the laryngeal mound. Six male adult ostrich were used to study the larynx including its components the cricoid, arytenoids , glands. This study revealed that these components in ostrich have different feature from other birds. The larynx protrudes from the floor of pharyngeal cavity. The skelton of larynx in ostrich is composed of the unpaired cricoid cartilage and the paired arytenoids cartilages. A wide triangular slit as glottis is formed between the arytenoids cartilage.The joined arytenoids cartilages have irregular triangular shape from which three process originate. Epithelial tissue is nonkeratinized stratified squamous.Penetration of the connective tissue into epithelial tissue is observed in the area of the arytenoids cartilage. Lamina propria and submucosa is dense irregular connective tissue which contain many collagen fibers,fibroblast cell, blood vessels. Epithelial tissue on the surface of the larynx contains intraepithelial unbranched tubulo -alveolar glands.The superficial part of lamina propria contains simple branched tubulo-alveolar which secret mucous. The process is devoid of the glands. Mucosal membrane of the surface of the larynx is devoid of the glands on the posterior part of its.

Key words: Larynx · Ostrich · Microscopic · Anatomy

INTRODUCTION

There is some literature on the macroscopic and microscopic anatomy of the larynx in domestic birds [1]. Study the morphology of the larynx of corvus brachyrhynchos [2], histology of the larynx in fowl [3], the gross anatomy of larynx, trachea, and syrinx in the long - legged buzzard [4], histological and histochemical studies on the lingual , preglottal and laryngeal salivary glands in Japanese quail [5], histology of the larynx of the birds [6], anatomic-histological description of the birds 'singing larynx [7], the ossification of the laryngeal, tracheal and syringeal cartilages of the domestic fowl [8], some comparative information of birds [9], anatomy of domestic animals [10] and birds, their structure and function [11]. Since the information on the macroscopic and microscopic of larynx is scanty , this study was carried out to determine the anatomical and histological details of all structures in the larynx of ostrich.

MATERIALS AND METHODS

Six heads from healty adult male ostriches (1.5-2 years old), immediately after killing , were collected from slaughterhouse. All the heads were cut off at the level of the second cervical vertebra. A piece of wood was put between the upper and lower beaks and then the samples were kept submerged in %10 formalin for 72 h. T0 open the mouth cavity wider, the beak's angles were incised. Then, anatomical position and shape of the larynx were studied in details. Measurements were carried out on larynx by a ruller then the larynx were cut off and cartilages of the larynx seprated and studied separately. For microscopic studying, the samples were kept submerged in 5% formalin for 72 h. The species divided into many parts and after complete fixation, the species were transferred into autotechnikon. Then sections with thickness of 6 micron were obtained. Staining with haemotoxylin eosin for studying of general

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microstructural of the larynx, masson's trichrome for collagen bundle, alcian blue and periodic acid shiff for staining of acidic and neutral mucopolysacharides were used. The sections were studied by Zeiss photomicroscope and prepared photomicrograph.

RESULTS

The larynx protrudes from the floor of pharyngeal cavity. It lies caudal to the tongue with a gap. This gap with 1.9 ±0.17 cm length is occupied by some irregular mucosal plica. There are many mucosal laminae on the floor of oropharynx near to the lateral wall of tongue toward the caudal of larynx (Fig. 1). The skelton of larynx in ostrich is composed of the unpaired cricoid cartilage and the paired arytenoids cartilages. A wide triangular slit as glottis with 3.33 ±0.75 cm length is formed between two arytenoids cartilages. The cricoid cartilage is larger than arytenoids cartilages and forms lateral walls, caudal end and floor of the larynx. It is a complete ring that narrow part of it articulates with arytenoids cartilages dorsocaudally and an ossified ventral plate is pointed rostrally. The arytenoids cartilages meet each other dorsocaudally and form the roof of larynx. The joined arytenoids cartilages have irregular triangular shape from which three process originate. These process extend caudolaterally as rostral, middle and caudal process. The rostral process is elongated, the middle process is circular and the caudal process is a hemisphere projection that articulates with it's counter part. The medial border of each arytenoids cartilage consists of a thick longitudinal crest which makes the border of the glottis.

Fig. 1: Showing the roof and floor of the oropharyngeal cavity in the adult male ostrich.
A) (P), roof of pharynx (TR.), trachea (L), larynx (M L), moucosal lamina (M), esophagus (.), pharyngeal tonsil
B) the floor of the oropharyngeal cavity in the adult male ostrich. (L), larynx (T), tongue (*), moucosal fold (ML), moucosal lamina and bifurcation of the median longitudinal fold

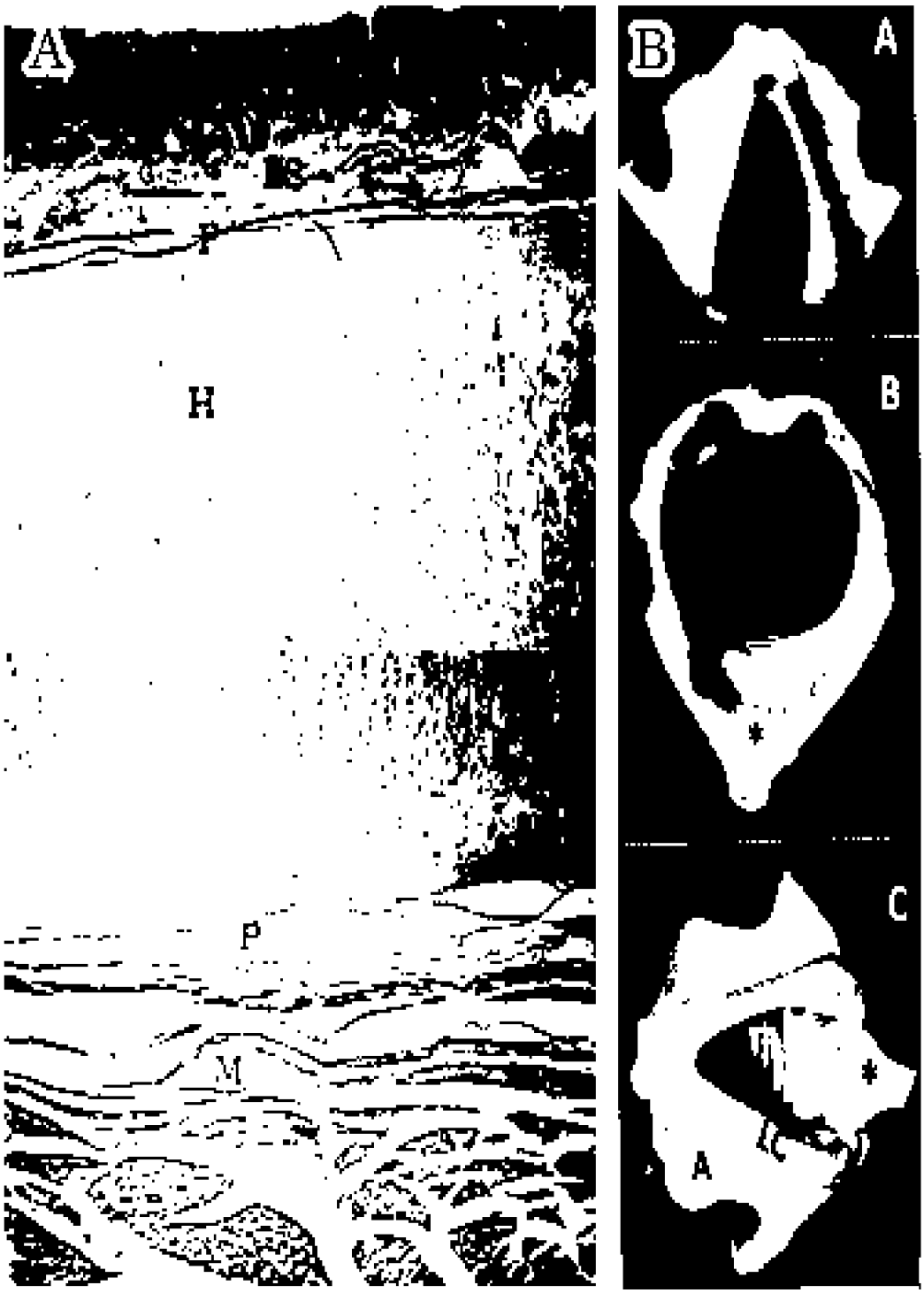

Fig. 2: Showing of the photomicrograph and macroscopic of the laryngeal cartilages in ostrich.

A) (A), dorsal view of arytenoids cartilages. (B), dorsal view of cricoid cartilage with ossified plate (C), craniodorsal view of larynx.

B) The photomicrograph of the larynx in the adult male ostrich with alcian blue staining (× 45). (E), epithelial tissue (L S), lamina propria and submoucosa (G), moucous gland (P), perichondrium (H), arytenoid hyaline cartilage (M), muscular layer

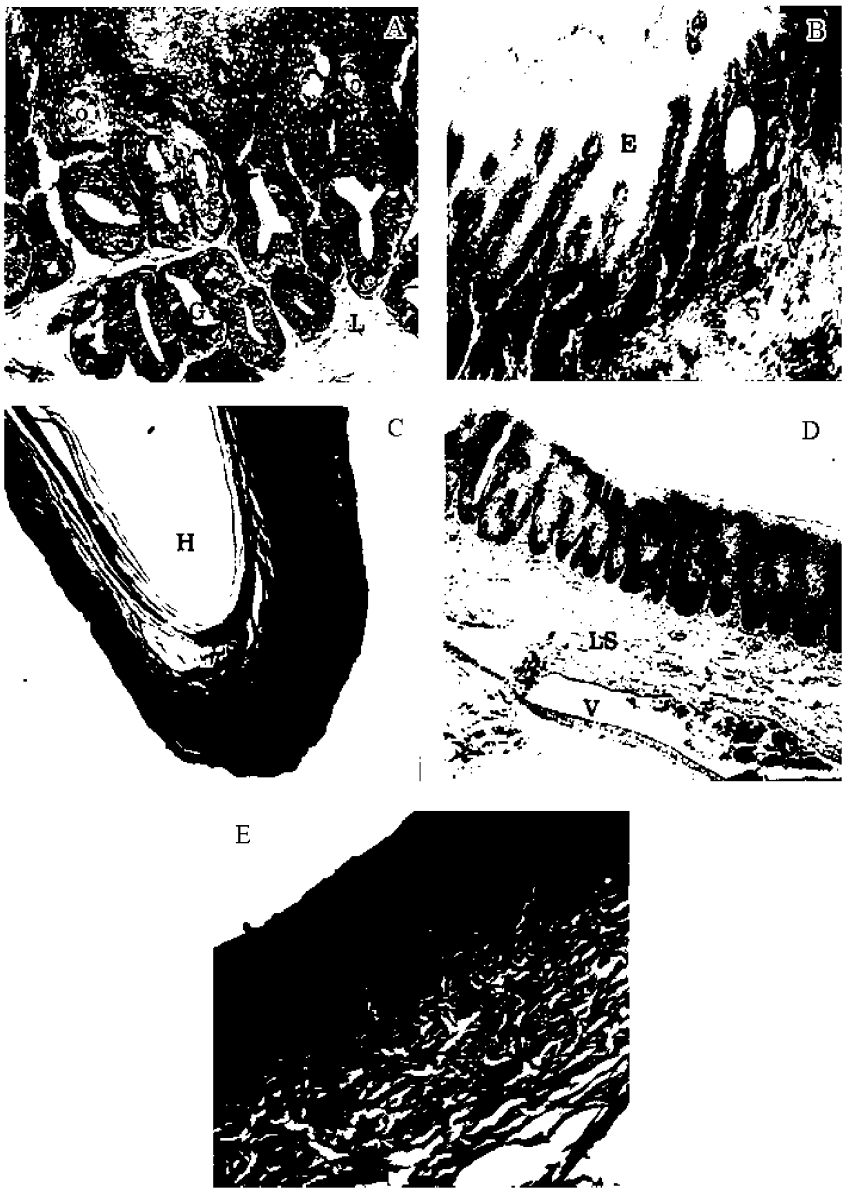

Fig. 3: Showing the photomicrograph of the moucosal membrane of the laryngeal surface in the adult male ostrich with alcian blue staining (×180).

A) (E), nonkeratinized stratified epithelium (L), lamina propria (G), moucosal simple branched tubulo-alveolar glands (O), opening of exit of the secretions.

B) The photomicrograph of the moucosal membrane of the anterior process of the arytenoids showing penetration of the lamina propria (L) into epithelial tissue (E). Staining with green masson' s trichrome (× 180).

C) Photomicrograph of the anterior process of the arytenoids cartilage in the adult male ostrich with green masson's trichrome staining (× 45). (E), epithelial tissue (L S), l amina propria and submoucosa (H), hayaline cartilage of the anterior process.

D) The photomicrograph of the middle process of the arytenoid cartilage of the larynx in the adult male ostrich with green masson's trichrome (× 72). (E), epithelial tissue (L S), lamina propria and submoucosa (V), blood vessels.

E) The photomicrograph of the moucosal membrane of laryngeal surface in the posterior process of the larynx in the adult male ostrich with alcian blue staining (×180). (E), nonkeratinized stratified squamous Epithelium (L S), lamina propria and submoucosa.

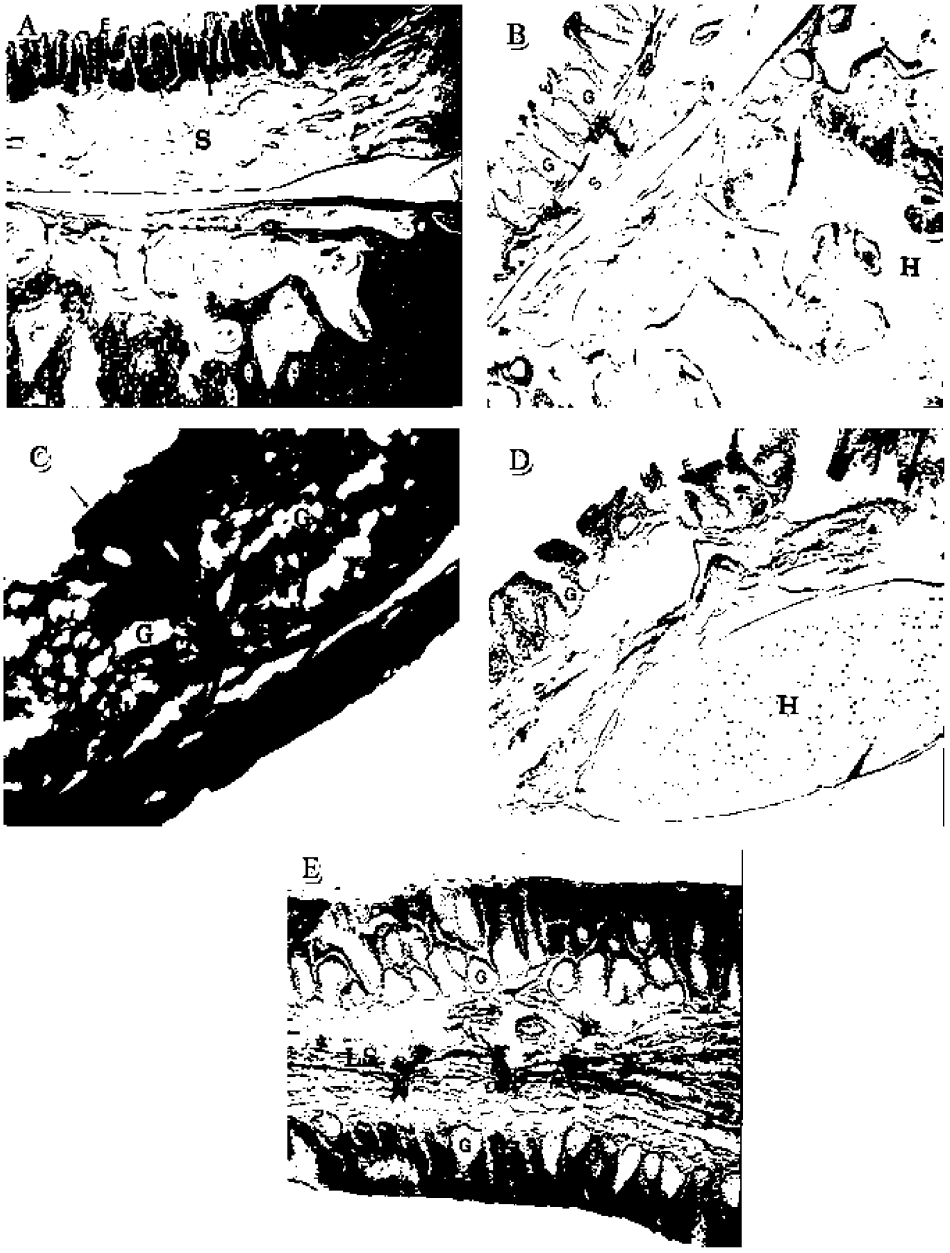

Fig. 4: The photomicrograh of the inlet of the larynx in adult male ostrich

A) Pas staining (×45).

B) Green masson' trichrome staining (×45). (E), pseudostratified ciliated columnarepithelium (L), lamina propria (MM), m uscularis moucosa (G), intraepithelial moucous simple tubular glands (H), showing ossification of the arytenoid cartilage (S), submoucosal layer

C) The photomicrograph of of the moucousal membrane of the vestibule of larynx in adult male ostrich with alcian blue staining (× 720). (E), peudostratified ciliated columnar epithelium (•) , goblet cell (→), cilia (L), lamina propria (G), mucous simple tubular gland (MM), muscularis mucousal layer

D) The internal surface of the larynx in the adult male ostrich with Green masson'trichrome staining (× 72). (E), pseudostratified columnar epithelium (G), intraepithelial moucous simple tubular gland (H), cricoid cartilage

E) Showing the larynx in the front of the longitudinal crest of the arytenoids cartilage with green masson ' trichrome staining (× 72). (E), epithelial epithelium toward the surface of the larynx (E'), epithelial tissue toward inlet of the larynx (G), mucous glands (L S), lamina propria and submucosal layer

This crest forms apex or rostral angle of arytenoids cartilages rostrally (Fig. 2). Moucosal membrane of the larynx contains the crico-arytenoid salivary glands in all part of it. It constitude epithelial tissue, lamina propria, submucosa. Epithelial tissue is nonkeratinized stratified squamous. Penetration of the connective tissue into epithelial tissue is observed in the area of the arytenoids cartilage (Fig.3). Lamina propria and submoucosa is dense irregular connective tissue which contain many collagen fibers,fibroblast cell, blood vessels. Epithelial tissue on the surface of the larynx contains intraepithelial unbranched tubulo-alveolar glands.Superficial part of lamina propria contains simple branched tubulo-alveolar which secret moucous. The process is devoid of the glands. Moucosal membrane of the surface of the larynx is devoid of the glands on the posterior part of its. The cartilage is hyaline type with partly ossified. The muscular layer is thick and striated which is in the form of circular and longitudinal which oriented in different direction but the muscular fibers decrease toward the process and gradually disappear (Figs. 2-4). Epithelial tissue of the inlet of the larynx is changed to the pseudostratified ciliated columnar with goblet cells and continue to the vestibule of the larynx and contains many intraepithelial glands in the form of moucous simple tubular. Moucosal membrane of the vestibule contains not only intraepithelial simple tubular glands but also muscularis moucosa which is smooth. The muscularis layer is thin and striated (Fig. 4). The larynx ,in front of the longitudinal crest on the junction of the floor of the pharynx is devoid of cartilage and muscle. It is formed from a central area of the irregular, fairly dense irregular connective tissue with blood vessels which is surrounded by nonkeratinized stratified epithelium. The connective tissue of the central area is connected to the lamina propria and submucousa which the superficial part of it is moucous simple tubulo-alveolar glands. All of the gland showed positive reaction to the alcian blue and pas staining which is the identification of the neutral and acidic moucopolysaccharides (Figs. 3&4).

DISCUSSION

The general appearance of the larynx in ostrich is different from the other domestic birds [1]. In ostrich the larynx protrudes from the pharynx, contains a wide glottis and the papillae are not visualized on it. But in turkey, fowl, duck and goose [10], Corvus [2] and long -legged buzzard [4] the larynx was observed in the form of a mound as laryngeal mound at the caudal of tongue. It contains the glottis and is covered with a number of caudally projecting papillae. Also, Kirk *et al.* [9] reported that in Kakapo, Kea and Kaka small papillae guard the laryngeal opening. The laryngeal skelton in ostrich consists of three cartilages which become partly ossified.From these cartilages, the cricoid is single and the arytenoids is paired.Whereas in turkey, fowl, duck, goose [7,10,11] and long-legged buzzard [4,8], the laryngeal skelton consists of four different cartilages which the cricoid and procricoid cartilages are single and the arytnoid cartilage is double. Bock [2] reported that in the Corvus, complex of 8 skeltal elements (cartilage, partially or completely ossified) constitue the skelton of the larynx. These are the cricoid, the paired dorsal cricoids,the procricoid, the paired arytenoids and the paired dorsal arytenoids. The larynx in ostrich and other birds prevents the entry of foreign bodies into trachea, acts as the airway during inspiration and assists the ingestion of solid particles by quickly movements. Histological structure of the larynx in the ostrich is formed from cartilage, muscle and epithelial tissue. The epithelial tissue is nonkeratinized stratified and in its inlet and vestibule is pseudo stratified ciliated columnar with goblet cells. The larynx contains many simple unbranched tubulo-alveolar which secret moucous.The process of the arytenoids and caudally part of the larynx is devoid of glands and in its inlet and vestibule contain intraepithelial simple tubular glands. Histolgical structure of the goose and fowl is is similar to the ostrich and only difference is the presence of the keratinized papillae on the surface of the larynx [3,6,11]. In ostrich the salivary glands on the larynx is simple branched tubulo-alveolar. Magority of the secretional unit are tubular and secretion is moucous. In the quails pregloteal salivary glands contain the two lateral part and one middle part which are branched tubulo-alveolar and the cells are with light cytoplasm and flat nuclei. The middle part of gland called laryngeal glands whereas the lateral part of the gland in the submoucosa called lingual preglotteal gland. The ducts open on the posterior surface of the tongue and the laryngeal mound [5]. It is reported that in the adult chicken , there are two groups of the laryngeal salivary glands. The posterior group called cricoarytenoid salivary glands which are located on the posterior area of the laryngeal gland. They are tubulo -alveolei and a row of lateral glands which are on the lateral border of the laryngeal mound are simple tubular [10].

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