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SOME MORPHOLOGICAL STUDIES ON THE HYOBRANCHIAL APPARATUS AND LARYNX IN OSTRICH (STRUTHIO CAMELUS)

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ABSTRACT

The present study was conducted on twelve ostrich heads of both sexes, aging from 1.5-2 years.The specimens were collected from the abattoirs of ostrich in Ismaelia Province-Egypt, immediately after slaughtering. Ten specimens were fixed in 10% formalin, 1%glycrine and 1%thymol, and dissected for detailed description of the hyobranchial apparatus and the cranial larynx.For the fine dissection,a magnifying glass x8was used. Two heads were fixed in neutral buffered formalin for the light micro-scopic observation of the larynx. The laryngeal specimens were subje-cted to the ordinary histological technique. 5-7 um thick serial sections were obtained and stained with different stains.The present study reve-aled that, the skeleton of the hyobranchial apparatus of ostrich was formed from, dagger like basibranchial cartilage with a clear flexible cornue of paraglossal process, ceratobranchial bone and epibranchial cartilage. The skeleton of the cranial larynx was formed from four cartilages; single cricoid, single procricoid and paired arytenoids.

INTRODUCTION

Recently the attention is paid toward the ostrich owing to the highly economic value of its meat and by-products such as hide and feathers. Nowadays, in Egypt the number of the ostrich farms is greatly increased, in a trial to face the progressive demand of the ostrich products in the local markets and for the export. The general basic anatomical features of hyo-

branchial apparatus and the larynx of the domestic birds are studied by several authors as, ***Tindall (1975); Nickel, Schummer and Seiferel (1977); McLelland (1990); Abdalla (1994); Dyce, Sack and Wensing (2002)***. The available literatures about the morphology of the hyobranchial apparatus and the cranial larynx of ostrich are meagre.

Accordingly this work is carried out to throw light on the anatomical aspects of these important structures, in a trial of playing a part in the effforts of government to encourage the breeding of this bird in Egypt.

MATERIAL AND METHODS

The present study was carried out on twelve heads of apparently healthy ostrich of both sexes,aging from 1.5-2 years.The specimens were collected from the abattoirs of ostrich in Ismaelia Province-Egypt, immediately after slaughtering. Ten specimens were fixed in10% formalin, 1% glycrine and 1%thymol, and dissected for description of the hyobranchial apparatus and the larynx. For the fine dissection, a magnifying glass x8 was used.

For the light microscopic observation of the larynx, two heads were used and fixed in neutral buffered formalin.The laryngeal specimens were subjected to the ordinary histological technique.5-7 um thick serial sections were obtained and stained with Haematoxylin & Eosin and Alcian blue / periodic acid Schiffs reaction according to ***Bancroft and Stevens(1996).***

Along the course of this work, the nomenclatures used in this study were those adopted with ***Nomina Anatomica Avium (1979)*** as if it was possible.

RESULTS

A- <u>The hyobranchial apparatus in ostrich:</u>

<u>I- Skeleton of hyobranchial apparatus:</u>

The skeleton of the hyobranchial apparatus in Ostrich was formed of three elements;the basibranchial cartilage,the ceratobranchial bone,and the epibranchial cartilage**(Fig. 1)**.The hyobranchial apparatus was attached to the skull and the first two cervical vertebrae by a sheath like fascia (Fascia vaginalis).

Basibranchial cartilage:

The basibranchial cartilage was formed of two parts; oral basibranchial (basihyal) cartilage and aboral basibranchial (urohyal) cartilage. It was dagger-like in outline.

1- Oral basibranchial (basihyal) cartilage:

The basihyal cartilage was plate like and nearly quadrilateral in shape. Rostrally it was dipped into the tongue where it extended to its apex. The rostral end of it was thin, concave and had two small facets which articulated with the cornua of paraglossal cartilage. The latter cornua were thin flexible cartilages, of about two cm. Length, and directed caudolaterally along the borders of the tongue. The middle part of the basihyal cartilage was widen and broaden caudally where it beared on both sides an articular facet on each side these facets were articulated with the ceratobranchial bone by a clear synovial joint. The caudal end of basihyal cartilage was continued by the urohyalcartilage.

2-Aboral basibranchial (urohyal) cartilage:

The urohyal carilage was the caudal extension of the basihyal cartilage.It was extended along the ventral aspect of the first ten tracheal rings. It appeared as an elongated pencile- like cartilage.

Ceratobranchial bone:

The ceratobranchial bone was the ossified part of the hyobranchial skeleton. It extended caudally as a cylindrical elongated bar, measured about 7.5-8.0 cm. length. It was concave dorsally and convex ventrally. It was thickened at both ends,where it articulated rostrally with the basihyal

cartilage by a synovial joint,and caudally with the epibranchial cartilage by a fibrous joint.

Epibranchial cartilage:

The epibranchial cartilage was the caudal extension of the ceratobranchial bone forming a cylindrical elongated bar of cartilage with tapered end which extended caudally till the level of the second cervical vertebra.

II- Muscles of hyobranchial apparatus:

The muscles of hyobranchial apparatus in Ostrich were divided into extrinsic and intrinsic muscles according to its origin and insertion.

Extrinsic muscles of the hyobranchial apparatus:

1- M. intermandibularis (Fig.2):

The intermandibular muscle was in the form of thin sheet of muscle fibres, nearly filled the entire length of the intermandibular space except the most rostral part. Its rostral part was thin, then gradually thickened to become more fleshy caudally at the ventral aspect of the first tracheal ring. It was originated from the splenial surface of the mandible and was terminated by meeting its fellow, of the opposite side, at a median raphe. This muscle partially covered the urohyal cartilage.

2- M. basibranchialis mandibularis (Fig.3):

The mandibular basibranchial muscle was originated from the caudal process of the mandible. The muscle was subcutaneously located and its fibers were directed ventrally and rostrally. Opposite to the lateral aspect of the trachea this muscle was attached to the ventral aspect of the ceratobranchial bone. Its rostral part was deeply related to the caudal part of the oropharynx. Moreover the muscle was deepened under cover M. intermandibularis, where it divided, by the ceratobranchial bone, into two parts; Pars medialis and Pars lateralis.

Pars medialis: The length of this part ranged from 3.5-4.0 cm. and the width ranged from 0.8-1.0 cm.Its fibres were directed medially meeting its fellow in a ventral median raphe covering the caudal part of urohyal cartilage.

Pars lateralis: This part was extended rostromedially undercover the intermandibular muscle. Some muscle fibers were blended with the fascia covering the oropharynx. The muscle fibers of the right and left part of this muscle met at the median plane where it covered the middle part of the basihyal cartilage.

3- M. epibranchialis mandibularis (Fig.4):

The mandibular epibranchial muscle was originated by a wide origin about four cm. length, from the ventral, medial and lateral aspects of the mandible. It was covered partially by the superficial part of M. basibranchialis mandibularis.It was related deeply to the caudal part of oropharynx. This muscle enveloped the medial,ventral and lateral aspects of the caudal part of ceratobranchial bone and the rostral part of the epibranchial cartilage to which it was attached.The muscle fibres were directed obliquely caudoventrally and medially, it measured about 6.0-6.5 cm. in length and 1.4-1.6 cm. width.

4- M. cricoceratobranchialis ventralis (Fig.5):

The ventral cricoceratobranchial muscle was a flat triangular muscle, occupying the angle between the ceratobranchial bone and the urohyal cartilage. The narrow end of this muscle originated in common with the medial part of M. basibranchialis mandibularis from the ventrolateral aspect of the middle convex part of ceratobranchial bone. Its fibers were directed obliquely rostrally and medially, from the medial border of ceratobranchial bone,to be inserted in the ventral surface of the cricoid lamina and the cricotracheal ligament in this aspect, separated from the same muscle on the other side by the urohyal cartilage.

5- M. cricoceratobranchialis dorsalis (Fig.6):

The dorsal cricoceratobranchial muscle was a thin muscle originated from the dorsomedial surface of the rostral end of ceratobranchial bone, then it was directed rostromedially in an oblique manner to be inserted in the aboral border of the cricoid arch. The muscle fibres were appeared pale in color and was about one third of the previous muscle. It was related to the ceratobranchial bone laterally,the previous muscle ventrally and the cricoid lamina dorsally.

6- M. cricobasibranchialis (Fig.6):

The cricobasibranchial muscle was originated from the rostral end of basihyal cartilage,then extended obliquely and directed caudally between M. paraglosso-ceratobranchialis laterally and the rostral end of ceratobranchial bone ventrally.The muscle was related dorsally to the fold in between the rostral end of arytenoids cartilage and the rostral process of cricoid cartilage.

7- M. tracheobasibranchialis (Fig.6):

The tracheobasibranchial muscle was originated from the tracheal muscle over the first ten tracheal rings, it was in the form of a thin and pale strip fibers.The muscle became thick along the right and left borders of urohyal cartilage at which it was inserted.

8- M. paraglosso-mandibularis (Fig.7):

The mandibular paraglossal muscle was a flat and narrow pale muscle.It was located along the median plane under the mucous membrane of the oropharynx and distal to lateral part of M.basibranchialis mandibularis. It was attached to the mandibular symphysis, and extended caudally till the ventral aspect of the middle broad area of basihyal cartilage where it reflectd dorsally and rostrally to gain its attachement between the mucous membrane of the ventral aspect of the tongue and the basihyal cartilage, then it was divided into two fan shaped parts which ended along the medial border of the paraglossal cornua of hyobranchial skeleton.

II- Intrinsic muscles of hyobranchial apparatus:

1- M. paraglosso-ceratobranchialis (Fig.6):

The paraglosso ceratobranchial muscle was a thin elongated muscle, measured about 3.5-4.0 cm.length and about 0.5 cm.width.It was attached to the dorsolateral surface of the rostral part of the ceratobranchial bone in common with the medial part of M.basibranchialis mandibularis, Then, it passed medially between the paraglossal cornu laterally and M.crico basibranchialis medially to be ended by a fine tendon in the caudal end of the latter cornu.

2- M. basi ceratobranchialis (Fig.6):

The basi-ceratobranchial muscle was pale and thin muscle. It was attached to the ventral surface of the middle wide part of basihyal cartilage near its articulation with the ceratobranchial bone. Then it was directed obliquely to be inserted in the medial border of the articular rostral end of ceratobranchial bone.

B-The larynx in ostrich:

The larynx was projected dorsally from the floor of the oropharynx. It seemed to be compressed dorsoventrally.

The V-shape laryngeal opening was located at the caudal part of the floor of the oropharynx just caudal to the base of the tongue and at a level caudal to the choanal opening in the roof of the oropharynx, its apex was rounded and caudally situated. The laryngeal opening measured about 2.5-3.0 cm. length. Its greatest width was about 3.0 cm. at its base. The opening was bounded laterally by the two longitudinal folds of the arytenoid cartilages, rostrally by a fold formed in between the rostral rounded end of the arytenoids and the cricoid lamina,and caudally by the procricoid cartilage **(Fig.8a)**.

The laryngeal opening was covered by cutaneous mucous membrane (stratified squamous epithelium)which contained mucous glands and rows of keratinized papillae. The cutaneous mucous membrane was extended

into the cavity of the larynx,to some extent, and then continued by the respiratory mucous membrane.

The average length of the laryngeal cavity was about 1.3 cm.(**Fig.8b),** the vocal folds were not observed in the interior of the laryngeal cavity in all dissected speciemens.

I-The skeleton of the larynx:

The skeleton of the larynx was formed of a prominent and clear configuration resemble the laryngeal mound in domestic fowl. In ostriches there were four laryngeal cartilages; median single cartilages, the cricoid and procricoid and paired lateral arytenoid cartilages **(Figs.9&10)**. All these cartilages were of hyaline type.

The cricoid cartilage:

The cricoid cartilage was unpaired cartilage, placed ventrally and shaped like an oblique ring. The cartilage was formed of rostral lamina and caudal arch.

The rostral lamina was plate like with elongated blunt rostral process, and clear caudal notch.The rostral process was ossified,and situated dorsal to the basihyal cartilage at the base of the tongue. It was covered by the mucous membrane of the dorsal pouch of the tongue.

The rostral lamina was continued caudolaterally by the cricoid arch. The ventral border of the cricoid cartilage was joined to the first tracheal ring by the cricotracheal ligament. The caudal median part of the cricoid arch wass articulated by two facets to the procricoid cartilage **(Fig.11)**.

The arytenoid cartilages:

The paired arytenoid cartilages were located dorsal to the cricoid cartilage. It was projected laterally and connected to the cricoid arch by the cricoarytenoid ligament and muscle. It was an irregular flat cartilage. It had two surfaces, two borders, and two ends.

The dorsal oral surface was smooth and covered by the mucous membrane of the oropharynx. The ventral laryngeal surface was related to the laryngeal cavity. The lateral border was marked by two processes separated by a deep notch, the rostral process was more prominent than the caudal one. The medial border carried two stiff longitudinal folds which extended from the procricoid cartilage caudally to the rostral process of the cricoid lamina rostrally. The two rostral ends of this cartilage shared with the above mentioned folds in the formation of a band connecting it to the rostral process of the cricoid lamina. The two caudal ends of arytnoid cartilages were articulated with both sides of procricoid by a fibrous joint **(Fig.12)**.

The procricoid cartilage:

The procricoid cartilage was presented caudally at the apex of the laryngeal opening. It was median in position and placed dorsal to the cricoid arch, between the caudal ends of the arytenoid cartilages. It was triangular in cross-section and measured about 1.0 cm. length and 0.5-0.6mm width, giving it a wedge shape appearance.

The procricoid had an apex and base. The apex formed the median caudal prominence of the larynx. The base had four facets; two lateral facets articulated with the corresponding facets on the cricoid arch at its median plane, and two lateral facets articulated with the caudal end of the arytenoid cartilages, **(Figs.9, 10, 11&12)**.

II- The laryngeal muscles:

The muscles of the larynx were formed of extrinsic and intrinsic muscles.

I- Extrinsic muscles of the larynx:

The Extrinsic muscles of the larynx comprised four muscles; M.cricoceratobranchialis dorsalis, M.cricoceratobranchialis ventralis, M. cricobasibranchialis, (these three muscles were described with the muscles of hyobranchial apparatus)and M.sternotracheolaryngeus lateralis.The latter

muscle (right & left) was originated from the craniolateral process of the sternum,then,each muscle ascended till reach the rostral part of the trachea where they spread over the dorsolateral and ventrolateral surfaces of the trachial rings. After that, they were inserted in the right and left sides of the cricoid arch and the cricotracheal ligament, this insertion was covered by M.crico ceratobranchialis dorsalis and ventralis.

II- <u>Intrinsic muscles of the larynx</u>:

1- M. aryprocricoid (Fig.13):

The aryprocricoid muscle was thin and fan shaped muscle. It was attached to the dorsal aspect of the arytenoid cartilage, covered by the mucous membrane. The two muscles on either sides ended at the dorsal aspect of the procricoid cartilage near its median process. They played a role in narrowing and closing the laryngeal opening.

2- M.cricoarytenoid medialis (Fig.14):

The medial cricoarytenoid mmuscle was originated from the dorsal surface of the cricoid arch, passed outward then directed rostrally under the projected part of the lateral border of the arytenoid cartilage,over M.cricoarytenoid lateralis. The muscle was directed rostrally to be inserted in the ventral surface of the arytenoids cartilage just at the oral part of the lateral border.

3- M.cricoarytenoid lateralis (Fig.14):

The lateral cricoarytenoid muscle was originated from the lateral border of the cricoid process and the cricoid arch. It ended in the ventral projected part of the arytenoid cartilages and the lateral aspect of the procricoid,filling the space between the arytenoids and cricoid cartilages.This muscle was covered internally by the laryngeal mucous membrane and the cricoarytenoid ligament,and externally by M.cricobasibranchialis and M.cricoarytenoid medialis.

Histologically, the whole larynx of ostrich was covered by stratified squamous non keratinized epithelium.The lamina propria gave rise to numerous papillary bodies iterdigitated with clear epithelial pegs**(Fig.15)**.The

core of the two longitudinal folds of the arytenoids cartilage were built of highly vascularized connective tissue,endowed with compound tubuloalveolar laryngeal salivary glands with a wide lumen **(Fig. 16)**. They opened onto the surfaces by wide openings.The glandular lobules were separated by well distinct interlobular connective tissue septa.The laryngeal salivary glands gave partial alcianophilic secretory cells alternated with PAS positively reacted cells **(Fig.17)**.

LEGENDS OF FIGURES

Fig.(1): The skeleton of hyobranchial apparatus in ostrich; Oral basibranchial cartilage(a),aboral basibranchial cartilage(b),cornua of paraglossal cartilage(c), ceratobranchial bone (d) and epibranchial cartilage(e).

Fig.(2): The ventral surface of the lower jaw in ostrich head showing; M. intermandibularis(a), trachea(b) and the oesophagus(c).

Fig.(3): The ventral surface of the lower jaw in ostrich head showing; M. intermandibularis(reflected), M. basibranchialis mandibularis pars superficialis(a), pars medialis(b), pars lateralis(c), trachea(d) and the urohyal cartilage(1).

Fig.(4): The ventrolateral aspect of the ostrich head showing; M. basibranchialis mandibularis pars superficialis(reflected), M. mandibularis epibranchialis(a),ceratobranchial bone(1),epibranchial cartilage(b) and IX,X,XII cranial nerves.

Fig.(5): The ventral surface of the lower jaw in ostrich head showing; M. intermandibularis(a),M.basibranchialis mandibularis pars superficialis(b), pars lateralis(c), pars medialis(d), oropharyngeal mem-brane(e) and M. cricoceratobranchialis ventralis(f).

Fig.(6): Ventral view of the hyobranchial apparatus and tongue in ostrich showing; M.cricoceratobranchialis dorsalis(a), M. cricobasibranchialis(b), M. tracheobasi- branchialis(c),M. paraglossoceratobranchialis(d) and M. Basiceratobranchialis(e).

Fig.(7): The ventral surface of the floor of the oropharynx in ostrich showing; the oropharyngeal membrane(a) and M.paraglossomandibularis(b).

Fig.(8a): Dorsal view of the floor of ostrich oropharynx showing; tongue (a),arytenoid cartilage(b),tow longitudinal folds of the arytenoid cartilage(c)and a clear triangular laryngeal opening(d).

Fig.(8b): Longitudinal section of the interior of the cranial larynx (a) in ostrich.

Fig.(9): The laryngeal cartilages;cricoid(a),arytenoid(b)and procricoid(c).

Fig.(10): The articulation between the laryngeal cartilages of ostrich.The cricoid cartilage(a), arytenoid cartilage(b) and the procricoid cartilage(c).

Fig.(11): Dorsal view of the laryngeal cartilages;cricoid(a),arytenoids(b), with clear longitudinal fold(c) and procricoid(d).

Fig.(12): Ventral view of the laryngeal cartilages;cricoid(a),arytenoids(b) and procricoid(c).

Fig.(13): Dorsal view of the ostrich larynx showing; M. aryprocricoid(a), cricoid cartilage(b),arytenoids cartilage(c), and procricoid cartilage(d).

Fig.(14): Lateral view of the ostrich larynx showing; M. cricoarytenoid medialis(a) and lateralis(b).

Fig.(15): A sagittal section of ostrich larynx showing; the covering epithelium of stratified non keratinized (a), procricoid hyaline cartilage (b) and the laryngeal muscle (c). H&E stain, Obj. X4.

Fig.(16): A sagittal section of ostrich larynx showing; the covering epithelium[(a),epithelial pegs (b),papillary bodies (c),lamina propria (d),blood vessels(e)and lobules of the laryngeal salivary glands (f). H&E stain, obj.X10.

Fig.(17): A sagittal section of ostrich larynx showing;the different staining affinity of the laryngeal salivary glands (a) and the interlobular connective tissue (b). AB /PAS technique, obj. X4.

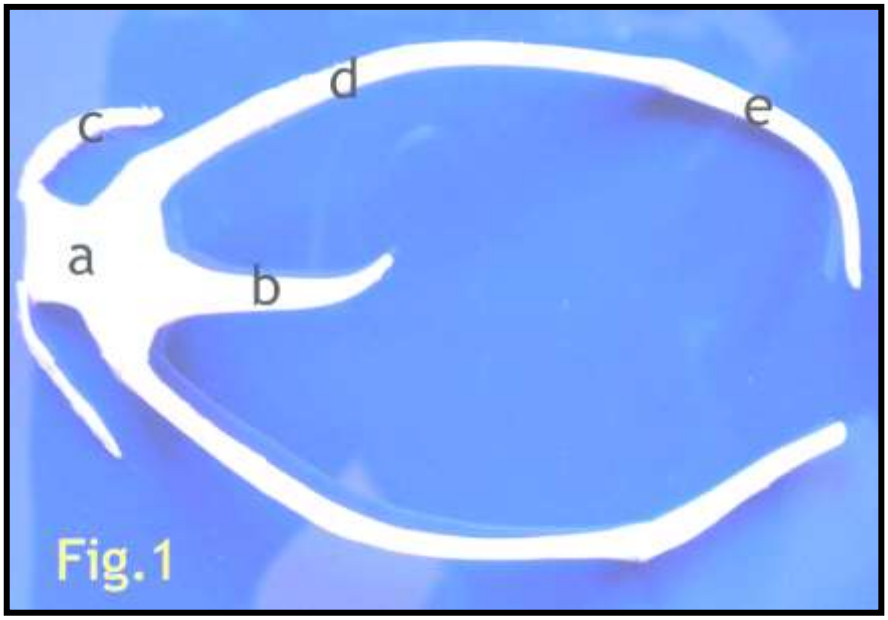
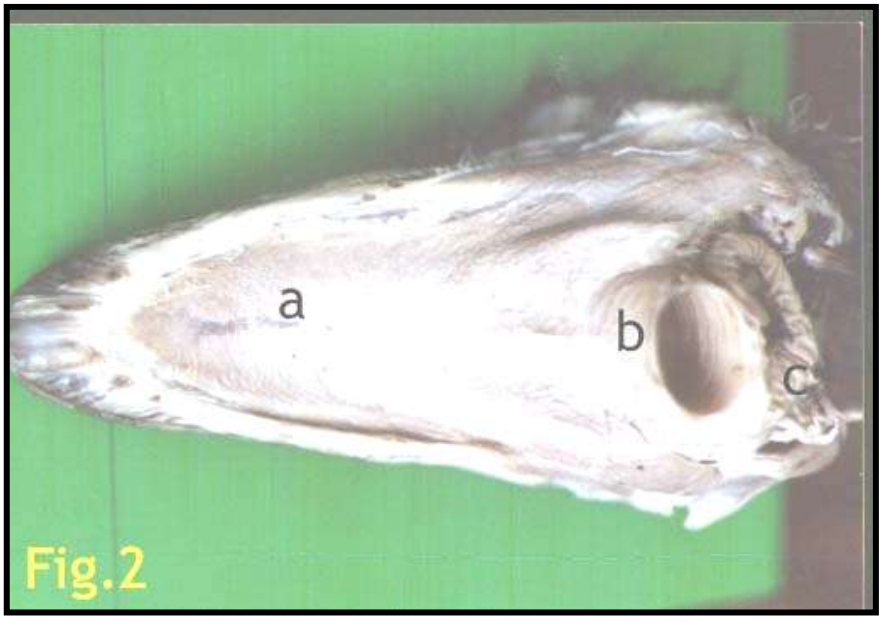


Fig.1



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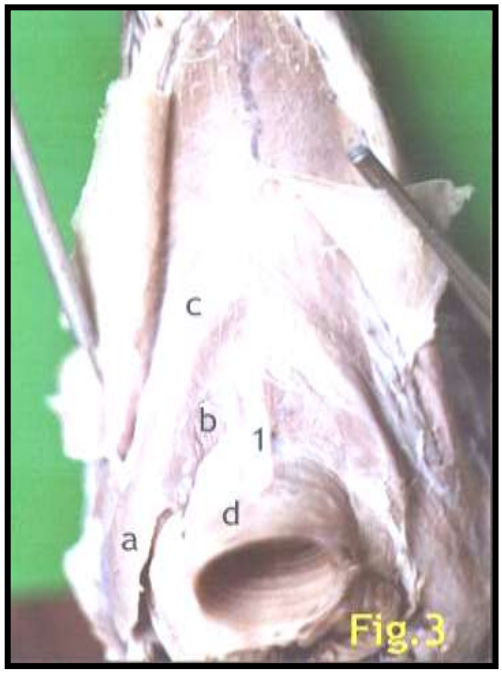
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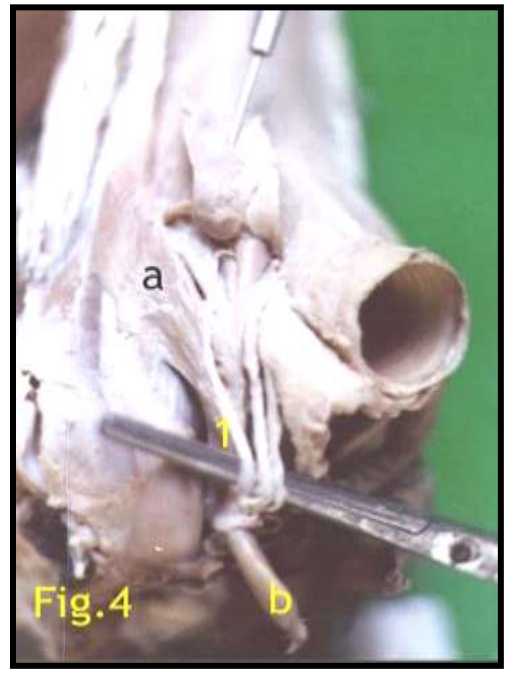
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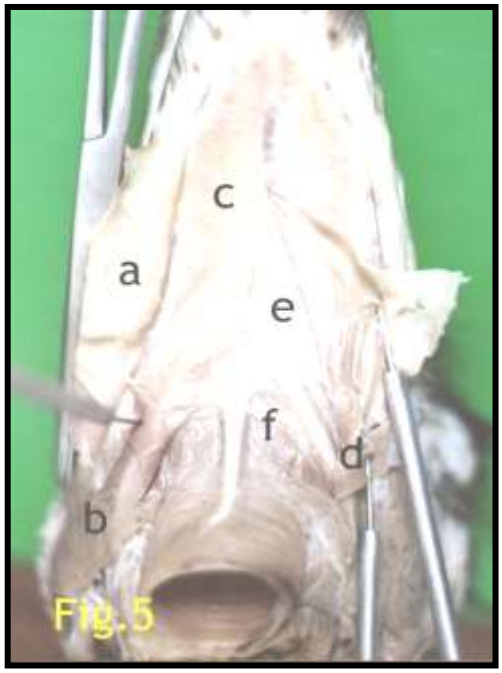
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Fig.5


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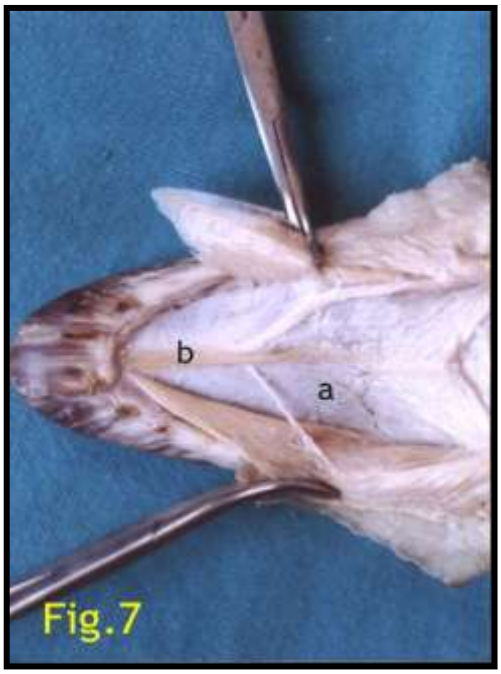

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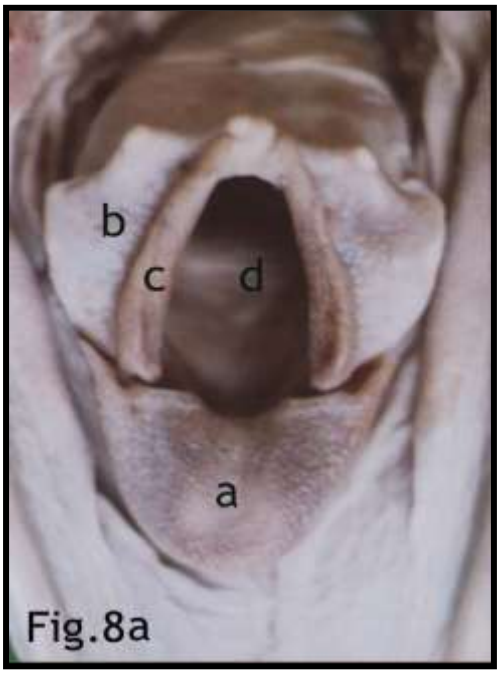
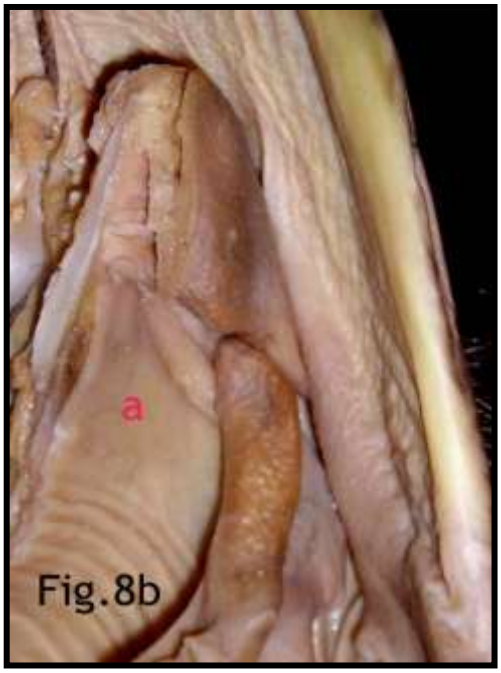


Fig.8a



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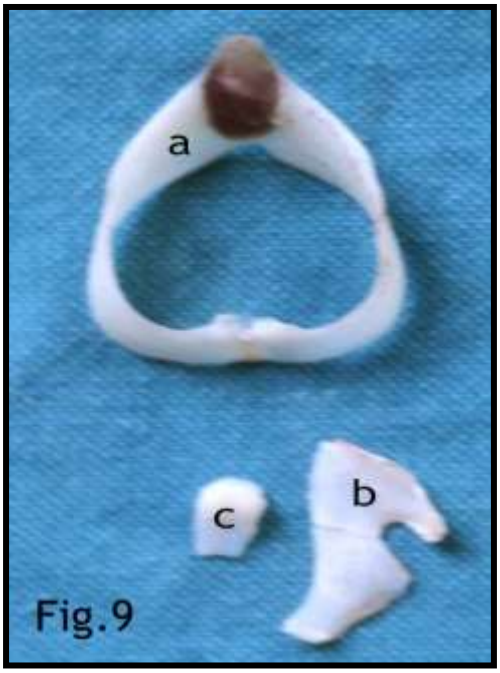
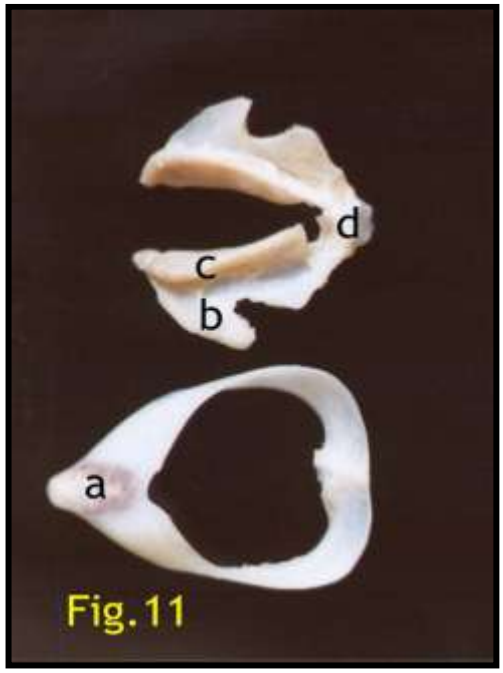


Fig.9

Fig.10



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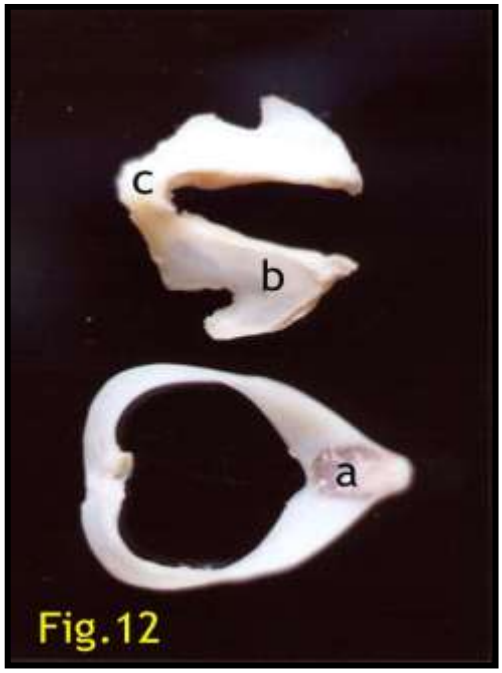

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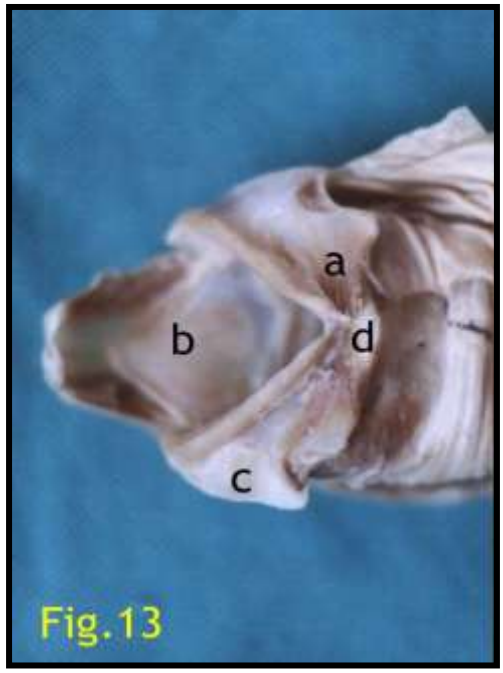
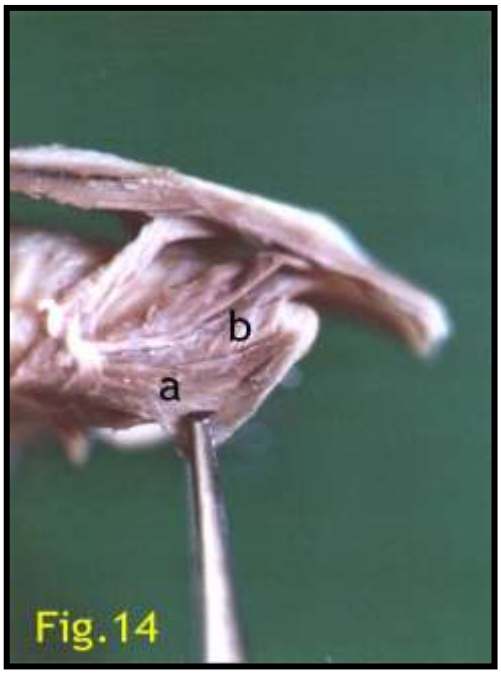


Fig.13



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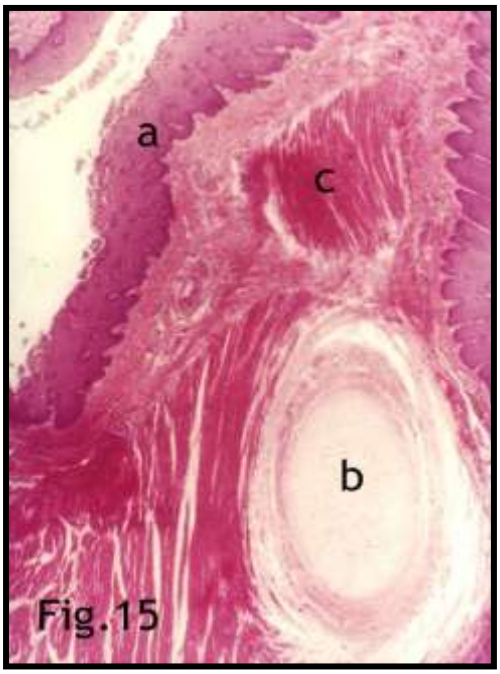

Fig.15

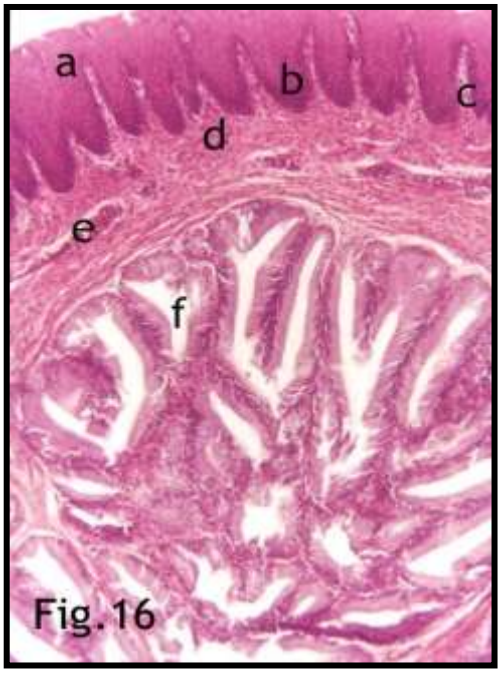

Fig.16

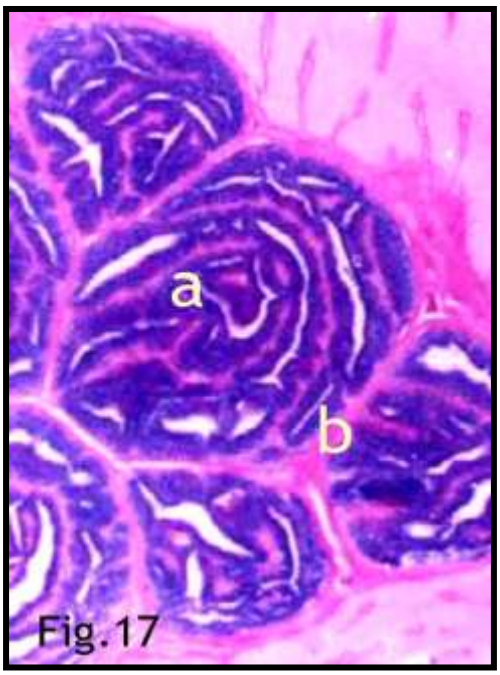

Fig.17

DISCUSSION

In ostrich the present study revealed that the paraglossal cartilage was absent,however a large,flexible cornua of it was present and directed caudolaterally along the lateral border of the tongue, and joined the rostral end of basihyal cartilage.On the contrary,***El Morsi et al.,(2002)***in ostrich described the paraglossal cartilage as unpaired central cartilage in the skeleton of the tongue with the presence of unnamed lateral cornua. the paraglossal cartilage was triangular unpaired median cartilage in fowl ***(McLelland,1975*** *and* ***Abdalla and Salma,1994)***,and shovel-like in duck and goose ***(Nickel et al., 1977)***.

Moreover,***McLelland(1975)***in aves and ***Abdalla and Salma(1994)*** in chicken and goose recorded that,there was a synovial joint between the paraglossal cartilage and the rostral basibranchial cartilage.The latter authors added that, this joint was uniaxial in chicken and biaxial in goose. ***McLelland (1975); Nickel et al.,(1977)*** and ***Dyce et al.,(2002)*** coincided that, the rostral basibranchial bone joined the caudal basibranchial bone in a synarthrosis or synostosis. The present study revealed that these two parts were fused together and acts as one unit, and appeared as a dagger in its shape.

In accordance with ***McLelland (1975); Nickel et al.,(1977)*** and ***Dyce et al., (2002)*** in birds, the ceratohyoid bone formed a movable joint with the body of the hyobranchial apparatus. ***Tindall(1975)***recorded that, the two hyobranchial cornua (ceratobranchial and epibranchial)were very long in birds like wood peckers which had an extraordinary protrusible tongue. While, ***Petrak (1982*****)** observed short branchial horns in parrots, therefore they limited the tongue protrusion. ***Fowler (1993)*** in ratite and ***Abdalla*** and ***Salma (1994)*** in chickens and goose, observed a relatively short horns where the tongue of these birds was non-protrusible.

Arnall and Keymer (1975), Tindall (1975) and ***McLelland (1990)*** described the hyobranchial apparatus as a delicate framework of bones supports the tongue and responsible for its movement except in parrots,

swallowing, breathing and voice production. ***Korzun,Erard and Gase (2004)*** added that, the mutual movements of the jaws enhanced by the fact of, particular disposition of the hyoid apparatus rise the tongue and the supporting items high up into the buccal cavity, facilitate an effective clamping of items that can be moved along the jaws.

In agreement with ***Vanden Berge (1975)***in aves and ***Bezuidenhout (1999)*** in ostrich, the muscles of the hyobranchial apparatus formed from two groups; extrinsic and intrinsic muscles. The extrinsic muscles were Mm. intermandibularis; basibranchialis mandibularis pars superficialis, pars medialis and pars lateralis; mandibularis epibranchialis. Mm. cricoceratobranchialis ventralis and dorsalis; trachiobasibranchialis; cricobasibranchialis; paraglossomandibularis were not reviewed in any of the available literature.

The present work clarified that, there were two intrinsic muscles for the hyobranchial apparatus could be detected; Mm. paraglosso ceratobranchialis and basiceratobranchialis. These finding were disagreed with ***Vanden Berge(1975)*** in aves as he stated that these muscles were;paraglossoceratobranchialis, interceratobranchialis and paraglossobasibranchialis medialis and lateralis.

The present study showed that, the laryngeal skeleton consisted of four cartilages; cricoid, procricoid and paired arytenoid. It was closely similar to that mentioned by ***King(1975)*** in aves.In contrast,***Nickel et al., (1977)*** reported that the supporting structures of the avian cranial larynx were only, the cricoid and paired arytenoid cartilages. ***Kent and Miller (1997)*** recorded that, most tetrapodes below the mammals had two pairs of laryngeal cartilages; arytenoid and cricoid.***Bezuidenhout (1999)*** detected two cricoid and two arytenoid cartilages in ostrich.

In the present work, the laryngeal opening was V-shape,bounded by the two longitudinal ridges of the arytenoid cartilages. It situated caudal to the chonae. In this respect, ***Bezuidenhout (1999)*** in ostrich added that,

the above mentioned ridges when opposed by muscle action close off the laryngeal cavity and the respiratory pathway can not be excluded from the buccal cavity.The laryngeal opening appeared as a narrow slit like opening ***Tindall (1975), King (1975)*** and ***Nickel et al., (1977)*** in birds.

White (1995) described the laryngeal mound as a conspicuous elevation carrying the opening into the larynx,which was absent in the present study.

The present study indicated that the laryngeal muscles were divided into extrinsic and intrinsic ones.The extrinsic were cricoceratobranchialis dorsalis and ventralis,cricobasibranchialis and sternotracheolaryngeus.The intrinsic muscles were aryprocricoid and cricoarytenoid medialis and lateralis. In this respect, ***White (1975)*** in chicken described the laryngeal muscles as a complex group of muscles. They were two paired intrinsic, two paired extrinsic and a dorsal mass.He added that the intrinsic muscles were divided into superficial and deep.The extrinsic muscles were dorsal, caudolateral and caudomedial.

Nickel et al., (1977) recorded that, in addition to hyolaryngeus and sternothyreoideus muscles, the laryngeal opening was controlled by two pairs of muscles;cricoarytenoid lateralis act as a dilator and cricoarytenoid medialis as a constrictor.The latter two muscles were similar to that suggested in the present study in controlling the opening and closing the laryngeal opening during the act of swallowing.

The covering epithelium of the larynx was similar to that recorded by ***El. Morsi et al., (2002)*** in ostrich tongue. The laryngeal salivary glands were compound tubuloalveolar glands in the present study and their secretion was mucous in nature. The latter secretion might be associated with the action of swallowing of diet. While, the lingual salivary glands were ranged from simple branched to compound tubuloalveolar ***(El. Morsi et al., 2002).***

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بعض الدراسات الشكلية للجهاز اللامى الخيشومى والحنجرة الأمامية فى النعام

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أجريت هذه الدراسة على إثنى عشرة رأسا من رؤوس النعام ، من كلا الجنسين ، ويتراوح أعمارها مابين سنه ونصف وسنتين ، وقد تم الحصول عليها من مزارع النعام بمحافظة الشرقية بجمهورية مصر العربية. قسمت العينات إلى مجموعتين ، المجموعة الأولى وتشمل عشرة رؤوس تم تثبيتها بحقنها بخليط من محلول الفورمالين 10% والجلسرين1% والثيمول1% عن طريق الشريان السباتى العام، ثم بعد ذلك غمرت فى محلول الفورمالين لمدة 72 ساعة. شرحت العينات بعناية لعمل الدراسة التشريحية العيانية للأعضاء مجال البحث.

أما المجموعة الثانية كانت مكونة من رأسين ثبتت فى محلول فورمالين منظم متعادل 10% لمدة 72 ساعة. وقد تم الحصول من هذه المجموعة على عينات تمثل الأجزاء المختلفة للجهاز اللامى الخيشومى والحنجرة الأمامية، ومررت هستولوجيا وتم صبغ القطاعات التى تم الحصول عليها وفحصت مجهريا لدراسة التركيب الدقيق لهذه الأشياء.

ومن أهم هذه النتائج التى تم التوصل إليها ، أن هيكل الجهاز اللامى الخيشومى مكون من الغضروف الخيشومى القاعدى وهو خنجرى الشكل ، ومتصل به ناتئ جار لسانى على هيئة قرن مرن ، وأيضا العظمة القرن لاميه ، والغضروف الفوق خيشومى. أما هيكل الحنجرة الأمامية فيتكون من أربعة غضاريف ، منها الفردى وهى الغضروف الحلقانى والغضروف السابق للحلقانى ، ومنها المزدوج وهو الغضروف الطرجهالى. ويتحكم فى تحريك هذه الغضاريف والعظام مجموعه من العضلات التى قسمت إلى مجموعه ضمنيه وأخرى خارجية المنشأ.

وقد سجلت النتائج ونوقشت مع مثيلاتها فى نفس الطائر وكذلك فى الطيور الأخرى والمسجلة فى المراجع التى تم الحصول عليها.