Some anatomical and histological studies on the pharynx of the Goat (Capra-Hircus)

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1.Abstract

The present work was carried out to give complete information on the anatomy and histology of the pharynx in the goat which might be helpful for further studies to both under and post graduate studies. Twenty four heads from adult apparent healthy goats of both sexes were collected from Giza governorate. The results showed that the pharynx of the goat had an irregular funnel shape. It extended from the caudal end of the horizontal lamina of the palatine bone caudoventrally up to the level of the caudal border of the wing of the atlas. The pharyngeal fornix was smooth and concave and divided by the septum pharyngis into two deep narrow cavities. The pharyngeal opening of the auditory tube was crescent slit like situated at the caudodorsal part of the lateral wall of the nasopharynx. Both the Tonsilla pharyngea and the Tonsilla tubaria observed microscopically only. The oropharynx was short, wide and dilatable. The palatine tonsil was located on the caudal third of the lateral wall of the oropharynx. The pharynx of the goat received its arterial blood supply via the ascending pharyngeal, ascending palatine arteries, and the pharyngeal branches of the cranial thyroid, cranial laryngeal and Rr.musculares of the lingual artery. The soft palate was vascularized through lesser palatine artery in addition to the branches of the pterygoid artery of the maxillary artery. The results obtained were discussed with the available literatures in the different animals

Key words: Goat, Nasopharynx, Oropharynx, Palatine tonsil,Tubal tonsil, Blood supply

2. Introduction

Goats were the first farm animals to be domesticated. As indicated by the archaeological evidence, they have been associated with man in a symbiotic relationship for up to 10,000 years [1].
In the last few decades, the anatomy of the goat has attracted the attention of several veterinary anatomists. The goat was used for many purposes including biomedical research, meat and milk production.
In Egypt, there are more than three million heads of goats raised primarily in three regions; Upper Egypt, Nile delta and in the desert range- lands [2].
The importance of the pharynx as an organ disposed between two important systems. Food and air cross through the pharynx in their way to the oesophagus or larynx and also during regurgitation of food in ruminants pharynx plays an important role in directing them to their right way and prevent chocking [3].
The pharynx could also be attributed to the presence of tonsils and solitary lymph nodules, which performed an essential defense mechanism against the ingested or inhaled pathogenic microorganism [4].
On revising what has been written on the pharynx of the goat, we found it was inadequate, so the present work was carried out to overcome the information defect about goat's pharynx.

3. Materials and methods

The morphological studies of the pharynx entailed the collection of twenty-four heads together with first two cervical vertebrae from adult apparent healthy goats of both sexes from Giza governorate. Eight

heads were washed by normal saline (0.9%) through the common carotid artery then injected using 10% formalin solution and left for 4 days before manual dissection. Four heads were sawed into two lateral halves to investigate the pharyngeal cavity and soft palate. Eight heads were injected by 60% gum milk latex colored red with Rotraing Ink for study the arteries of the pharynx. Four heads were sectioned in median plane, Tissue pieces were collected from different regions of the pharynx and soft palate then fixed in 10 % neutral buffered formalin. Samples were trimmed and processed by dehydration in serial grades of ethanol, cleared in Xylene, synthetic wax infiltration and embedding into paraplast tissue embedding media, 5-6 µm thick tissue sections were cut by rotatory microtome and fixed to glass slides. The sections were stained by 1- Haematoxylin and Eosin as a general examination staining method for histological evaluation, 2-Masson's Trichrome stain for demonstration of collagen fibres.

3- Alcian blue stain for evaluation of Mucins. The above mentioned staining methods were adopted from those described by [5,6].

The nomenclature was adopted according to [7].

The Institutional Animal Care and Use Committee Vet. Cu. IACUC approved the protocol Vet. CU. 06202019056.

4. Results

4.1-Topography:

The pharynx of the goat (Fig.1) had an irregular funnel shape, it extended from the caudal end of the horizontal lamina of the palatine bone on a level with the last molar tooth caudoventrally up to the caudal border of the wing of the atlas opposite to the caudal border of the cricoid cartilage. The length of the pharynx ranged from 6-8.5 cm as measured from the choanae to the Aditus oesophagus.

The pharyngeal cavity (Fig.2) was wide rostrally measuring about 3-4 cm in height as it connected to the nasal and oral cavities. It was reduced towards the isthmus pharyngis reaching about 1.4 to 1.7cm, then rapidly narrowed to 0.5 – 0.7 cm at the Aditus oesophagus.

The rostral part of the pharyngeal cavity was divided by the soft palate (Fig. 2/i) into a dorsal Pars nasalis and a ventral Pars oralis while the narrow caudal portion was called Pars laryngea.

The nasopharynx (Fig.2/d) presented the longest part of the pharynx. It extended caudodorsally from the concave caudal end of the horizontal part of the palatine bone up to the middle of the basilar part of the occipital bone. It was ranged from 5.2-6.4 cm in length measured from the choanae to the end of the pharyngeal recess (Fig.2/g). The mucous membrane became folded in the caudal part and on the dorsal surface of the soft palate. In width, it ranged from 1.7 -2 cm in the middle part and decreased gradually reaching 0.6 -0.8 cm at the caudal part.

The nasopharynx communicated with the nasopharyngeal meatus via the choanae (Fig.2/c), the latter were two long narrow openings; bounded dorsally by the vomer and the persphenoid bones, ventrally by the caudal border of the horizontal part of the palatine bone, laterally by the perpendicular part of the palatine bone, both were separated completely by the well-developed pharyngeal septum. The Septum pharyngis (Fig. 2/U, 3/A) represented the membranous continuation of the nasal septum. It was wide rostrally than caudally. In height, it ranged from 1.6-2 cm and decreased gradually to terminate by pointed narrow end at the pharyngeal recess reaching about 0.3- 0.5 cm. Both right and left surfaces of the pharyngeal septum were smooth.

The pharyngeal fornix (Fig.3/A) was smooth and concave and divided by the Septum pharyngis into two deep narrow cavities.

The pharyngeal opening of the auditory tube (Fig.2/e) was a crescent slit like situated at the caudodorsal part of the

lateral wall of the nasopharynx about 3.5-4 cm from the choanae. It was covered medially by a thin mucosal fold (salpingo-pharyngeal fold) (Fig. 2/f). Histologically, it had hyaline cartilage in the lamina propria (Fig.4, 5, 6/E). It was ranged from 0.5-0.7cm in length.

The pharyngeal recess (Fig.2/g) represented by the narrow caudal extension of the nasopharynx beyond the opening of the auditory tube. It was bounded medially by the caudal end of the pharyngeal septum and laterally by the auditory tube. In Length, the pharyngeal recess ranged from 1.5-1.7cm measured from the caudal end of the pharyngeal opening of the auditory tube to the end of the pharyngeal septum.

The Pharyngeal tonsil (Fig.4, 5, 6/C, D) was located at the caudolateral wall of the nasopharynx and in the caudal part of the nasal septum. It was not distinct by the naked eye and histologically appeared as a diffuse lymphocytic infiltration in the lamina propria.

The Tubal tonsil (Fig.4, 5, 6/B) was located in the medial and lateral laminae of the Ostuim pharyngea tubae auditivae. It was not observed macroscopically while histologically appeared as a diffuse lymphocytic infiltration in the lamina propria.

Histologically, the nasopharynx (Fig. 4, 5, 6) was lined by pseudo stratified columnar epithelium with goblet cells (E), supported by collagen fibers (C.f) and containing lymph nodules (L.N), Alcian blue positive seromucoid gland (G).

The oropharynx (Fig.2/k) was short, wide and dilatable extending from the initial part of the palatoglossal arch to the base of the epiglottis. It was ranged from 2.8-3.5 cm in length. Its width at the initial part 1.2 cm at the level of the palatine tonsil measured 1.5 cm while at the terminal part at the base of the epiglottis 0.5-0.7 cm. It was communicated with the oral cavity via the Isthmus faucium (Fig.8/A, A') which appeared as a narrow oval to rounded orifice, bounded dorsally by the soft palate, ventrally by the root of the tongue and laterally by the palatoglossal fold. The palatine tonsil projected into its cavity. Its mucous membrane was folded.

The palatine tonsil (Fig.2/L,7/a) was located on the caudal third of the lateral wall of the oropharynx. It was composed of numerous irregular follicles differing in shape from oval, rounded to elliptical. Each follicle opened at its apex by one or more rounded to elongated slits. It was ranged from 0.8- 1 cm in length and about 0.2 mm in height. Histologically, it appeared as a tonsil with crypt lined by stratified squamous non keratinized epithelium supported by collagen fibers and containing lymph nodules with seromucoid gland.

The Paraepiglottic tonsil (Fig.9, 10, 11/E) could not be investigated macroscopically in the goat. Histologically in 25% of the examined specimens it appeared as aggregations of lymph nodules in the lamina propria.

The laryngeopharynx (Fig. 8D,Lp) constituted the narrowest and shortest part of the pharyngeal cavity. It was extended from the pharyngeal isthmus caudally above and around the Aditus laryngis to be terminated at the Aditus oesophageus dorsal to the cricoid cartilage. It was communicated with the larynx via Aditus laryngis which bounded by the epiglottis cartilage cranially and by the corniculate cartilage caudally and laterally by the aryepiglottic fold.

The piriform recess (Fig.8B/i) was narrow shallow passage between the oropharynx and oesophagus bounded medially by the aryepiglottic fold and laterally by the palatopharyngeal fold, its depth was about 2 -3mm.

Histologically, the oropharynx (Fig.9,10,11) was lined by stratified squamous non keratinized epithelium (E), supported by collagen fibers (C) and containing lymph nodules (L.N), Alcian blue positive seromucoid gland(G).

The Aditus oesophagus (Fig.8C, C'/l) was represented by a nearly rounded opening, lined by numerous longitudinal

folds (Fig 8C'/m), located dorsal to the caudal border of the cricoid lamina.

The soft palate (Fig. 2/i) was represented by a musclo-membranous fold projecting into the rostral portion of the pharynx dividing it into Pars nasalis dorsally and Pars oralis ventrally. It was extended from the concave free border of the horizontal part of the palatine bone proceeded caudoventrally to terminate in front of the corniculate cartilage. It was measured about 3.5 – 4 cm in length.

The Arcus palatinus (Fig.8,c/J) was concave form the rostral margin of the intrapharyngeal opening, it measured about 2.5-3 cm in width 0.2mm in thickness. Both dorsal and ventral surfaces were folded and with numerous scattered lymph nodules (Fig.3/B).

The palatoglossal fold (Fig.2/ j , 8A,A'/b) appeared as a short thin fold extending from the lateral border of the initial part of the soft palate rostroventrally to the root of the tongue, it form the lateral boundary of the Isthmus faucuim. It ranged from 1.8 to 2.2 cm in length.

The palatopharyngeal folds (Fig.8B/g) constituted the caudal continuation of the lateral parts of the palatine arch on the lateral wall of the pharynx; they form the lateral boundary of the piriform recess. Each proceeded caudomedially on the lateral wall of the laryngeopharynx to meet its fellow of the opposite side at the Aditus oesophagus .It measured about 3.5 -4.1 cm in length.

The intrapharyngeal opening (Fig. 8/C) had a triangular form bounded rostrally by the concave palatine arch and laterally and caudally by the palatopharyngeal folds. It was present just above and around the laryngeal prominence. It measured about 2.5- 3.2 cm in longitudinal diameter and 1.5- 2.5 cm in transverse diameter.

M. constrictores pharyngis rostrales:

The pterygopharyngeal muscle (Fig.1 A, B/3) arose from the medial surface of the hamulus of the pterygoid bone and pterygoid process of the sphenoid bone located on the rostrodorsal part of the nasopharynx. It was related medially to the ventral portions of the Mm. Tensor and Levator veli palatini. The fibers passed caudally crossing the ventral part of the M. Levator veli palatini, and then curved dorsally to be inserted into the rostral part of the pharyngeal raphe (Fig. 1C/15).

The palatopharyngeal muscle (Fig.1,B/7) was thin, flat muscle originated from the medial surface of the ventral end of the great cornu of the hyoid bone and the pharyngeal wall of this region covered by the M. hyopharyngeus. Its fibers proceeded caudally and slight dorsally under the Mm. hyopharyngeus and stylopharyngis rostralis and its fibers were intermingled with those muscles to the pharyngeal raphe (Fig.1C/15).

The rostral stylopharyngeal muscle (Fig.1A, B/4) was thin muscle originated from the rostral border and deep surface of the Os stylohyoideum, and the adjacent part of the lateral pharyngeal wall. It continued oblique caudodorsally to be inserted in the pharyngeal raphe (Fig.1C/15) caudal to pterygopharyngeal muscle.

M.constrictor pharyngis medius:

The hyopharyngeus muscle (Fig.1A,B/6) was thin muscle originated from the lateral surface and caudal border of thyrohyoid bone. The fibers passed caudodorsal in front of the M. thyropharyngeus and caudal to the Os stylohyoideum, to be inserted at the pharyngeal raphe (Fig.1C/15) in front of thyropharyngeal muscle.

M. constrictores pharyngis caudales:

The thyropharyngeus muscle (Fig.1A,B/8) was the largest of the constrictors muscles of the pharynx, it originated from the lateral surface of the dorsal third of the lamina of the thyroid cartilage. The fibers passed craniodorsally and deviated medially to be inserted in the pharyngeal raphe caudal to the M. hyopharyngeus. It separated from the M .hyopharyngeus by the cranial laryngeal nerve and artery. It was covered partially by the medial retropharyngeal lymph node at its dorsal part. It was crossed dorsolaterally

by the vagosympathetic trunk and common carotid artery.

The cricopharyngeus muscle (Fig.1,A/9) was thin and short muscle originated from the lateral surface and the caudal border of the arch of the cricoid cartilage. It passed obliquely craniodorsal and medially to be inserted in the caudal part of the pharyngeal raphe (Fig. 1/C).

M. dilatores pharyngis:

The caudal stylopharyngeal muscle (Fig.1A,B/5) was thin narrow muscle originated from the dorsal two third of the medial surface of the stylohyoid. The fibers ran rostroventral, and then continued ventrally crossing the deep face of the M.stylopharyngis rostralis to be inserted at the rostroventral wall of the oropharynx

The tensor veli palatini muscle (Fig.1A,B/1) was flattened and thin, dorsally had a glistening tendon arose from the muscular process of the tympanic part of the temporal bone and the adjacent part of the sphenoid bone. It passed ventrorostrally medial to the M.pterygoideus medialis to be inserted in the rostral part of the lateral wall of the soft palate. It was covered partially by pterygoid process of pterygoid bone.

The levator veli palatini muscle (Fig.1A,B/2) originated from the medial surface of the muscular process of the temporal bone. It passed rostroventrally, lateral to the auditory tube and nasopharynx and ventromedial to the tensor veli palatine muscle to be inserted at the dorsolateral wall of the soft palate ventral to the tensor veli palatine muscle and deep to the M. pterygopharyngeus.

The palatinus muscle (Fig.3C/2) was thin, rounded present below the dorsal mucous membrane of the soft palate. It originated from the concave free border of the horizontal lamina of the palatine bone. It proceeded caudoventrally along the entire length of the soft palate and terminated at the palatine arch.

4.2. Arterial blood supply:

The pharynx of the goat received its arterial blood supply via the ascending pharyngeal, ascending palatine arteries, and the pharyngeal branches of the cranial thyroid, cranial laryngeal and Rr. musculares of the lingual artery. The soft palate is vasularized through lesser palatine artery in addition pterygoid branch artery of the A.maxillaris.

The ascending pharyngeal artery (Fig.12A, B/ 7) arose from the dorsomedial aspect of the common carotid artery just before its division into occipital and external carotid arteries (in 20% of the specimens it arose from the occipital artery). It proceeded ventrorostral crossing the lateral surface of the medial retropharyngeal lymph node, detaching 1-2 fine branches to it (In 20% of the specimens it pierced the lymph node) and continued rostroventral giving several fine branches to the dorsal part of the M. pterygopharyngeus. Then, it was divided into 2 branches distributed to the M. levator veli palatini and M.pterygopharyngeus and continued to the lateral wall of the nasopharynx.

The ascending palatine artery (Fig.12A, B/ 6) arose from the rostral aspect of the lingual artery. It passed rostrally on the dorsal part of the M. stylopharyngeus rostralis, M. pterygopharyngeus and terminated by dividing into two fine branches distributed to them. About 1cm from its origin, it detached a ventral branch which passed ventral and slightly rostral for a short distance (0.5cm) to supply the M. palatopharyngeus, palatine tonsils and palatoglossal fold.

The cranial thyroid artery (Fig.12A,B/2) arose from ventrolateral aspect of the common carotid artery; at first it passed rostrally for a short distance then curved caudoventral to enter the deep surface of the thyroid gland with the cranial thyroid vein. Before reaching the gland it gave rise to the pharyngeal and the laryngeal branch. The pharyngeal branch (Fig.12A,B/2') proceeded rostrodorsal on the initial part of the esophagus, dorsal part of the cricopharyngeal and thyropharyngeal muscles detaching several twigs to these

structures and terminated by dividing into two fine branches anastomose with those of the of the cranial laryngeal artery. The laryngeal branch (Fig.12 A,B/2'') continued rostrally releasing muscular branches to the sternothyroid muscle, caudal parts of the cricopharyngeus, thyropharyngeus and thyrohyoid muscles.

The cranial laryngeal artery (Fig.12A,B/3) arose from the ventromedial aspect of common carotid artery at the level of occipital artery, it descends along the lateral wall of the pharynx in a gap between M .hyopharyngeus cranially and M. thyropharyngeus caudally. It terminated as a laryngeal branch (Fig. 12A,B/3'') which divided into an external and an internal branch. The external branch passed on the dorsal aspect of the thyrohyoid supplying it and the cricothyroid muscle. The internal branch entered the thyroid notch between the M .hyopharyngeus, M. thyropharyngeus and M.thyrohyoideus with the cranial laryngeal nerve. During its course it detached several muscular branches to the later muscles in addition to the pharyngeal branch. The pharyngeal branch (Fig.12A,B/3') continued caudally on the dorsolateral part of the M. thyropharyngeus supplying it and cricopharyngeus muscle then terminated by splitting into two branches anastomosed with those of the R. pharyngis of the cranial thyroid artery. In 20% of specimens, the cranial laryngeal artery was absent and its pharyngeal branch compensated by a branch detached from the caudal aspect of lingual artery which proceeded caudally on the lateral surface of the M. thyropharyngeus to which it detached several twigs before reaching the cricopharyngeus muscle and terminated by dividing into 2 fine branches anastomosed with the branches of the ramus pharyngeus of the cranial thyroid A.

The pterygoid branch (Fig.12B/9) was given from ventromedial aspect of the A. maxillaris. It proceeded ventrally for about 1-3 cm then divided into several muscular branches distributed to the pterygoid muscle and detached several twigs to the muscles of soft palate and rostral portion of the nasopharynx and cranial constrictors of the pharynx .

The lesser palatine artery (Fig.12D/13) was a small vessel originated from ventral aspect of the descending palatine artery during its course on the dorsal part of the lateral surface of medial pterygoid muscle. It proceeded rostroventrally on the lateral surface of the M. pterygoideus medialis accompanied by the homonymous nerve, then curved around the rostral border of the medial pterygoid muscle and ramifies to the muscles, tonsils and mucous membrane of the soft palate during its course it gave several twigs to the lateral surface of the medial pterygoid muscle.

5. Discussion

In the goat; the pharynx presented an irregular funnel shape. Similar result was observed in sheep [8], buffalo [4], equines [9] and canines [10]. In the camel, it was presented an irregular funnel shaped with two diverticulae [3]. In ruminants [9, 11] and buffalo [12] it was short and tubular.

The pharynx extended from the caudal end of the horizontal lamina of the palatine bone caudoventrally up to the caudal border of the wing of the atlas. Such result was reported by [4] in the buffalo and [13] in the camel. In ruminants [11] and camel [3, 14], it extended caudally up to the middle of the axis. In equines, [9, 10] agreed that it did not exceed the level of the base of the skull. In the canines [9, 15], reported that it extended caudally to the level of second cervical vertebrae.

In the present work the length of the pharynx was ranged from the 6.5-8 cm as measured from the choanae to the Aditus oesophageus. It measured about 6.5 cm in sheep [8], 10 cm in ox [16], 20-27 cm in the camel [3, 14] and 15 cm in horses [17].

In agreement with the findings in sheep[8], in ruminants[18], [9] in domestic animals and [19] in the camel, the nasopharynx presented the longest part of the pharynx.

Regarding the pharyngeal fornix in the goat, it was smooth, concave and divided by the septum pharyngis into two deep narrow cavities. The septum pharyngis represented the caudal continuation of the nasal septum. Such results were seen by [11] in swine, [8] in sheep, [3] in the camel and [4] in the buffalo. In ruminants [10], it was mentioned that the fornix is incompletely divided. Such division was complete in goat.

Similar to that reported by [8] in the sheep, the nasopharynx was irregular in shape and comprising a main cavity and a dorsal recess. In the goat, the pharyngeal recess was represented by a narrow caudal extension of the nasopharynx beyond the opening of the auditory tube. Similar description was recorded in the camel [3] and Buffalo [4].

In the goat, the pharyngeal opening of the auditory tube was crescent slit like in shape. Similar observation was seen by in sheep [8], in the ox and horse [17] and [20] in carnivores.

In agreement with findings in buffalo [4], the pharyngeal opening of the auditory tube was situated at the caudodorsal part of the lateral wall of the nasopharynx, On the other hand, it was located on the dorsolateral wall of the cranial compartment of the nasopharynx in the camel [3] and at the lateral wall of the pharyngeal recess in the ox [17]. In accordance with findings in buffalo [4] and in horse [17], it was covered medially by a thin mucosal fold (salpingo-pharyngeal fold) which was supported by the extension of the cartilage of the auditory tube. The histological studies showed that the cartilage was of hyaline type.

In the present work, the pharyngeal tonsil was not distinct macroscopically, while histologically it appeared as diffuse lymphocytic infiltration in the lamina propria at the caudolateral wall of the nasopharynx and caudal part of the nasal septum. Similar results mentioned in goat [21]. In the buffalo [4], the Tonsilla pharyngea was represented by an oval prominence present just ventral to the caudal end of the septum pharynges, while in the camel [3], it was represented by numerous scattered small irregular lymph nodules at the caudal portion of the dorsal and lateral aspects of the nasopharynx.

In agreement with findings in buffalo [4], the tubal tonsil could not be observed macroscopically. On the other hand, it was reported microscopically in goat [22], that it appeared as diffuse lymphocytic infiltration in the lamina propria. Such result was observed in the present work.

The oropharynx in the present study and that of other ruminants [9, 18] and buffalo [4] was short, wide and dilatable extending from the initial part of the palatoglossal arch to the base of the epiglottis. In the camel [3] it was long wide and dilatable. While in equines it was narrow [10]. In Sheep [8], added that the ventral part of the pharyngeal cavity could be further subdivided into oral and laryngeal parts. All the above mentioned authors agreed that the oropharynx was communicated with the oral cavity via the isthmus faucium.

In agreement with findings in buffalo [4], in ruminants [10] and in the dog [23, 24], the lateral wall of the oropharynx presented the palatine tonsil which projected into its cavity.

In the present work, the palatine tonsil appeared as oval, rounded to elliptical structure composed of numerous irregular lymph follicles. It was bean shape in ruminants [18], triangular in the camel [3] and elongated oval in buffalo [4].

In agreement with findings in the goat [25], the histological investigation showed that the palatine tonsil was lined by a stratified squamous non keratinized epithelium with irregular finger-like projections in addition to the presence of the lymphocytic infiltration in the lamina propria.

Regarding the paraepiglottic tonsil it was described in the camel [3] and in the buffalo [4] as a follicular tonsil located on either sides of the base of the epiglottis. Such tonsil could not be seen in the goat

macroscopically. In 25% of cases the paraepiglottic tonsil appeared histologically as an aggregation of lymphoid nodules in the lamina propria such result was recommended in the minority of the goat [26] who mentioned that the paraepiglottic tonsil can only be found in the using histology.

Concerning the Ostium intrapharyngeum it was bounded rostrally by the palatine arch, laterally and caudally by the palatopharyngeal arches. This was in accordance with findings in domestic animals [11], in ruminants [18], in the dog [27], in the camel [3] and in the buffalo [4]. In agreement with findings in the camel [4], the Ostium intraphryngeum was triangular in shape, while it appeared oval in domestic animals [9] and irregular rounded in buffalo [4].

In the present work, the piriform recess appeared as a narrow and shallow passage between the oropharynx and esophagus .On the other hand it was described as a deep passage in ruminants [11], ox, pig [9], camel [14] and buffalo [4].

In the present study, the cranial constrictor group include the Mm. pterygopharyngeus, palatopharyngeus and stylopharyngis rostralis, similar observations were reported in the camel [3] and buffalo [4] while In the sheep [8] , equines [11] and dog [10] the cranial constrictor group were the pterygopharyngeal and palatopharyngeal muscles.

In the goat, the M. constrictor pharyngis meduis was represented by the undivided M. hyopharyngeus. Similar result was seen in the buffalo [4] and in dog [10]. While in the sheep [8] and camel [3] reported that the M. constrictor pharyngis meduis included the Mm. ceratopharyngeus and chondropharyngeus.

In the goat as in other domestic animals [10] the caudal constrictor group included the Mm. thyropharyngeus and cricopharyngeus.

Similar to other domestic animals [9] the M. dilatores pharyngis was represented by the M. stylopharyngeus caudalis. On the other hand, in the camel [3] added the presence of the M. atlantopharyngeus as a dilator muscle of the pharynx. Such muscle was absent in the goat.

In the goat, the M. palatinus was thin, rounded present below the dorsal mucosa of the soft palate. It originated from the concave free border of the horizontal lamina of the palatine bone and terminated at the palatine arch. Similar results were reported in domestic animals [17] and in buffalo [4]. In the camel [3], it continued within the palatopharyngeal arch. Such continuation was absent in the present work.

In the present study, the ascending pharyngeal artery was given from the common carotid artery (in 80% of the examined specimens). Similar origin was observed by [28] in the same animal, in sheep [8], and in the domestic animals [29, 30]. On the other hand, it arose from the lingual artery in buffalo [4, 31], camel [3, 32] and pig [29, 33]. Meanwhile, the origin of the ascending pharyngeal artery was from the cranial thyroid artery in equines [29, 34], in mules [35] and in the donkeys [36] or from the external carotid artery in dog [29, 37]. In 20% of cases it was detached from the occipital artery. In goat [28] observed its origin from the lingual artery in 20% of the specimens which could not detected in the present study.

The ascending palatine artery arose from the lingual A. Similar origin was reported in the camel [3] and dog [38].On the other hand, it arose from the common carotid artery in sheep [8] and small ruminants [29]. While it originated from occipital artery in buffalo [4] and large ruminant [10] but it originated from the lingofacial trunk in equines, [29] and in mules [36].

In the present study, the cranial thyroid artery arose from the ventrolateral aspect of common carotid artery. Similar observation

was given by in the camel [3] and in the buffalo [4]. It gave a pharyngeal branch which supplied Mm cricopharyngeus and thyropharyngeus and laryngeal branch which supplied sternothyroid, cricopharyngeus, thyropharyngeus and thyrohyoid muscles. Same distribution was recorded in camel [3] and in domestic animal by [29].

In agreement with findings in the sheep [8], in the goat [28], and in domestic animals [29, 30], the cranial laryngeal artery arose from the ventromedial aspect of common carotid artery while it arose from the cranial thyroid artery in the mule [35] and in the buffalo [4] and from the external carotid artery in the dog [37, 39]. The present work revealed that the pharyngeal branch of the cranial laryngeal artery proceeded on the dorsolateral aspect of M. thyropharyngeus supplying it by several twigs and terminated by splitting into two branches anastomose with those of the R. pharyngeus of cranial thyroid A. In 20% of the specimens the cranial laryngeal artery was absent and the pharyngeal branch was compensated by a branch from the lingual artery.

Regarding the R. pterygoideus, in the present study it arose from the ventromedial aspect of maxillary artery with similar origin was detected by in the goat [28], in the sheep [8], in the camel [32], in the buffalo [31] and in ruminants [29]. It proceeded ventral for about 1-3 cm then divided into muscular branches supplying medial pterygoid muscle, muscles of the soft palate, rostral portion of nasopharynx and the cranial constrictors of the pharynx, similar observations was recorded in camel [3] .

In the present work, the minor palatine artery arose from ventral aspect of descending palatine artery. Same origin was observed in the sheep [8], in small ruminants [30], and in 20% of the cases in buffalo [4, 31], in the horse [17] , in the mule [35], in dog [37] and in domestic animals except cat [29]. On the other hand it arose from the greater palatine artery in 80% of the cases in buffalo [4, 31] and in the ox [30]. While it originated from the maxillary artery in the domestic animal [10] and in the dog [15].

5.conclusion

In conclusion, the present study showed detailed anatomical and histological structure of the pharynx and soft palate in the goat. In addition to their arterial blood supply. The results obtained were discussed with those of the other domestic animals.

6.Acknowledgement:

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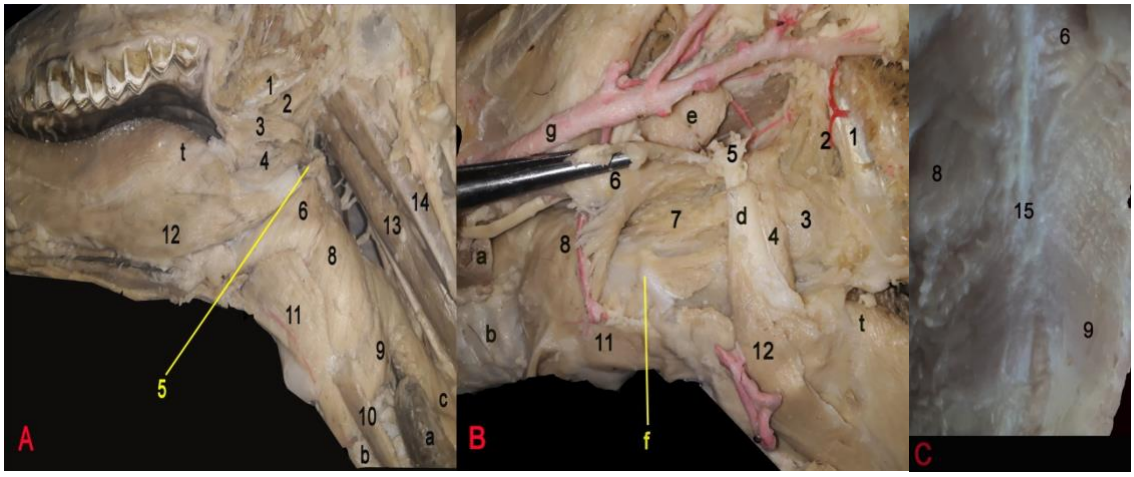

Fig (1/ A, B, C) showed the pharyngeal muscles and the pharyngeal raphe in the Goat:

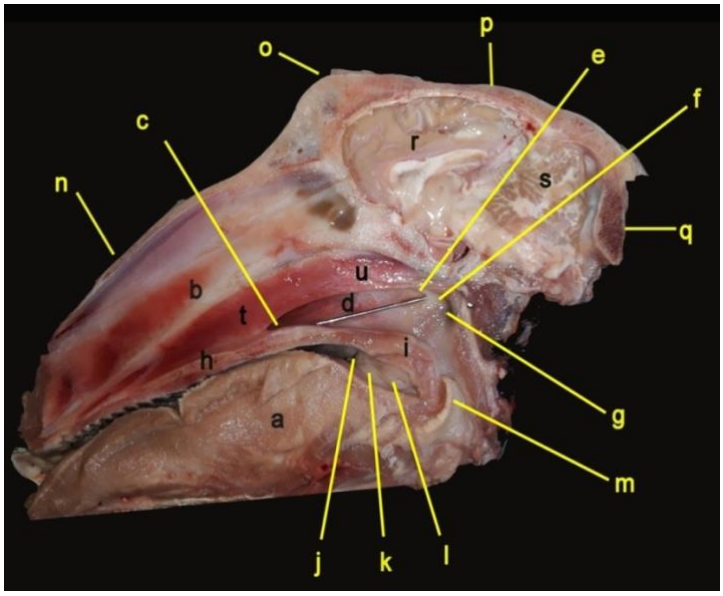

Fig (2) showed the pharyngeal cavity of the Goat

Fig (3/A, B, C) : A, showed the pharyngeal septum and the pharyngeal fornix of the Goat

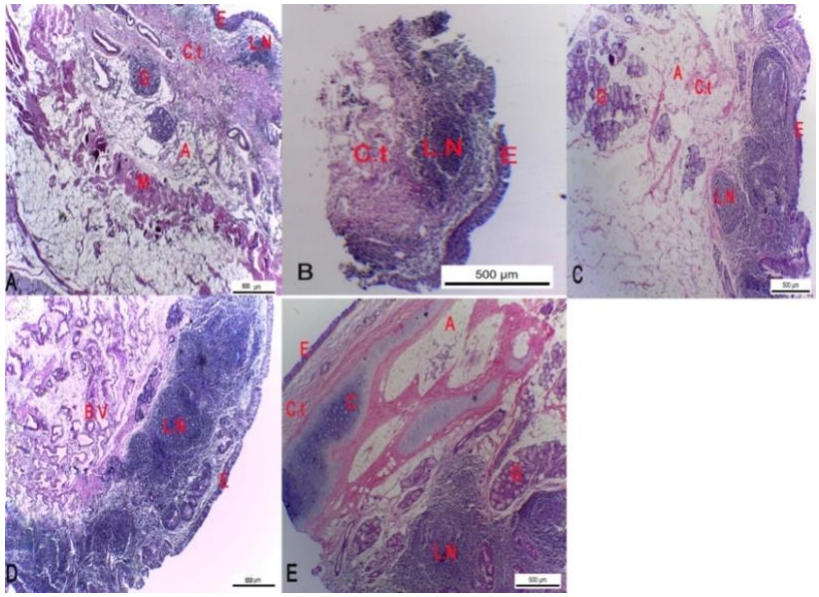

Fig (4) showed different parts of the nasopharynx stained with H&E x-40

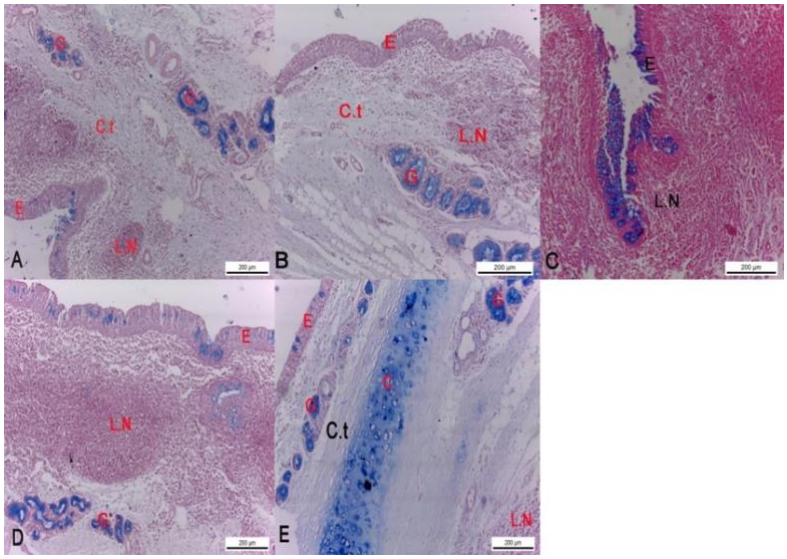

Fig (5) showed different parts of the Nasopharynx stained by Alcian blue x-100.

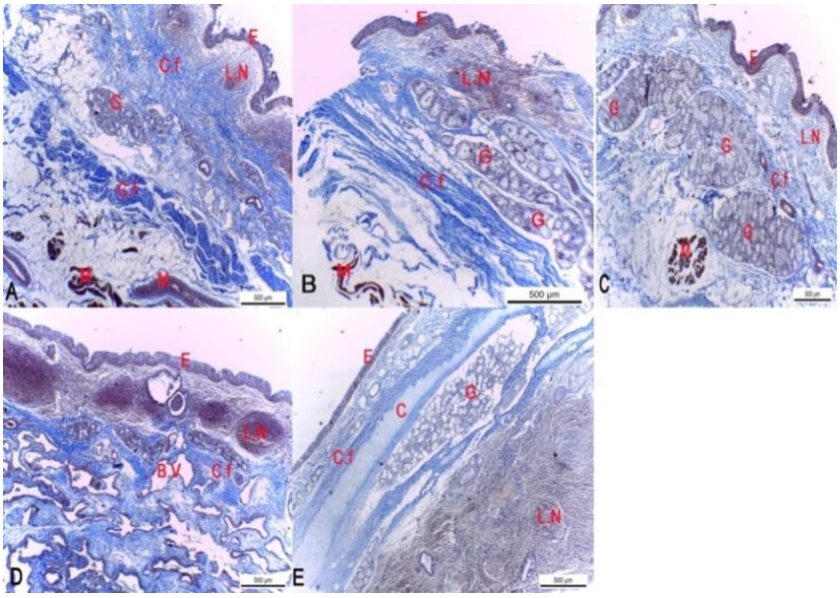

Fig (6) showed different parts of the Nasopharynx stained by Masson's Trichrome x-40

Fig (4,5,6) A) dorsal wall of the soft palate . B) Tubal tonsil (tonsil without crypt). C) lateral wall of the nasopharynx showing the pharyngeal tonsil. D) pharyngeal septum showing the pharyngeal tonsil. E) salpingo-pharyngeal fold

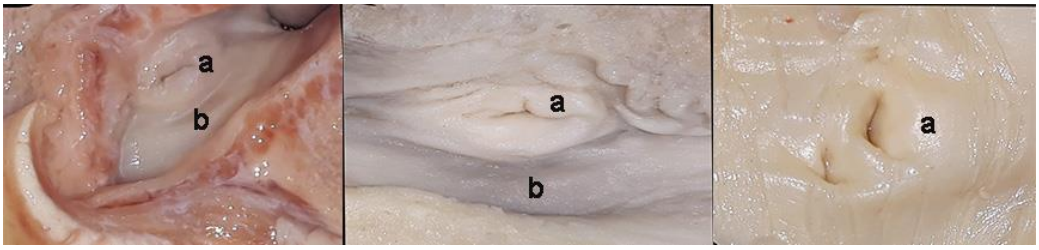

Fig (7) showed the palatine tonsil and the tonsillar sinus

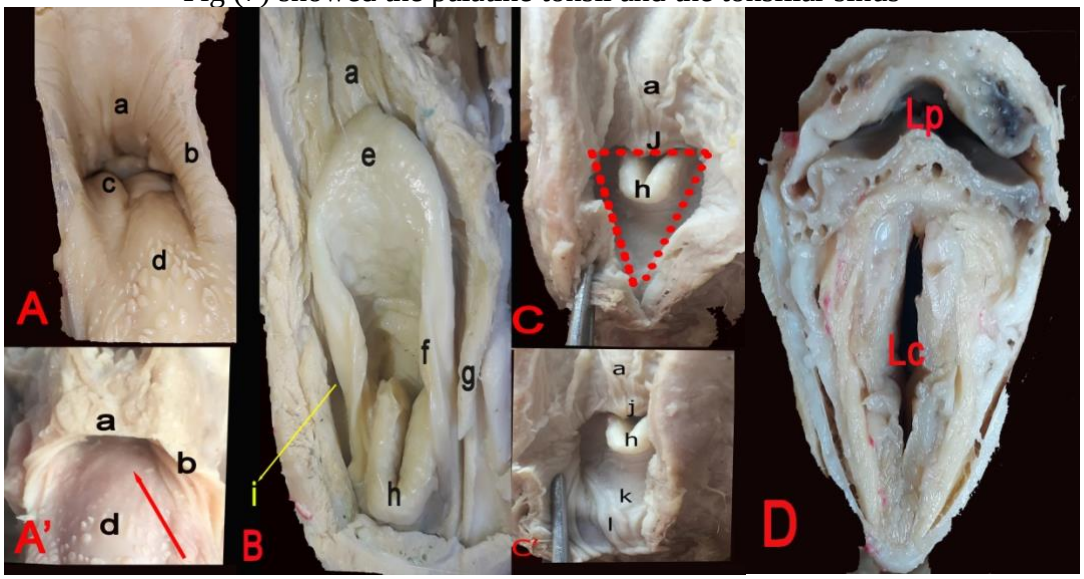

Fig (8) :A,A' showed the Isthmus faucuim , B: showed the aditus laryngis ,C,C': showed the intrapharyngeal opening ,D: Pars laryngea pharyngis.

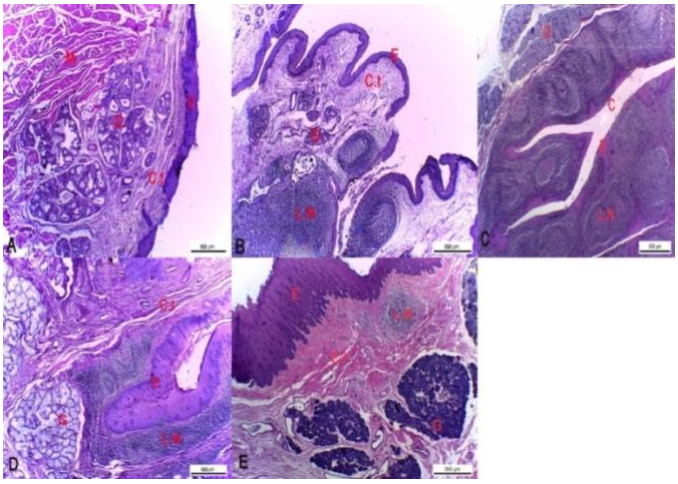

Fig (9) showed different parts of the Oropharynx of the Goat stained by H&E x-40

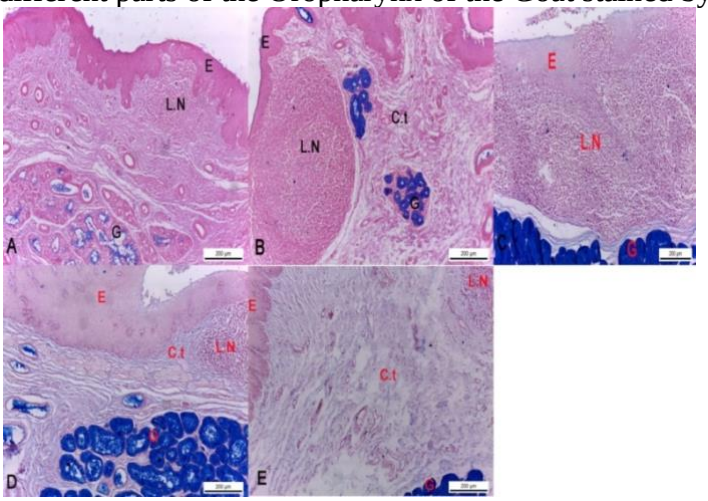

Fig (10) showed different parts of the Oropharynx stained by Alcian blue x-100

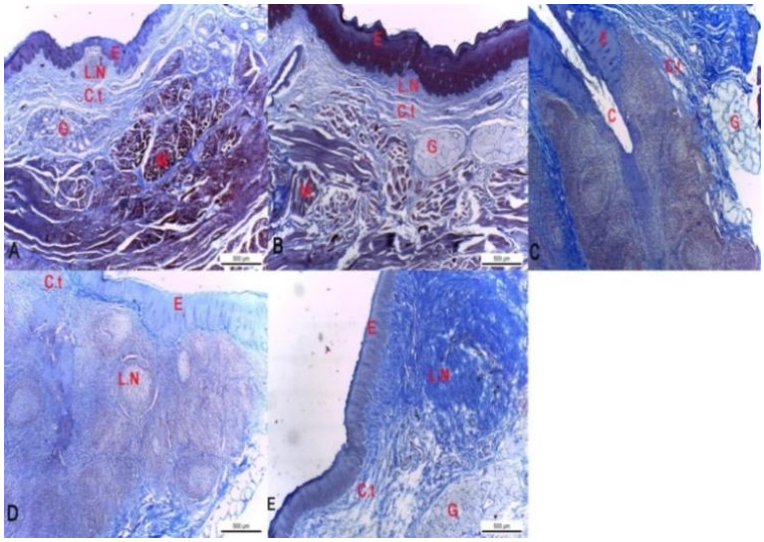

Fig (11) showed different parts of the Oropharynx stained by Masson's Trichrome x-40.

Fig (9,10,11) A)laryngeopharynx, B)oral surface of the soft palate ,C)Palatine tonsil D) palatoglossal fold, E)paraepiglottic tonsil.

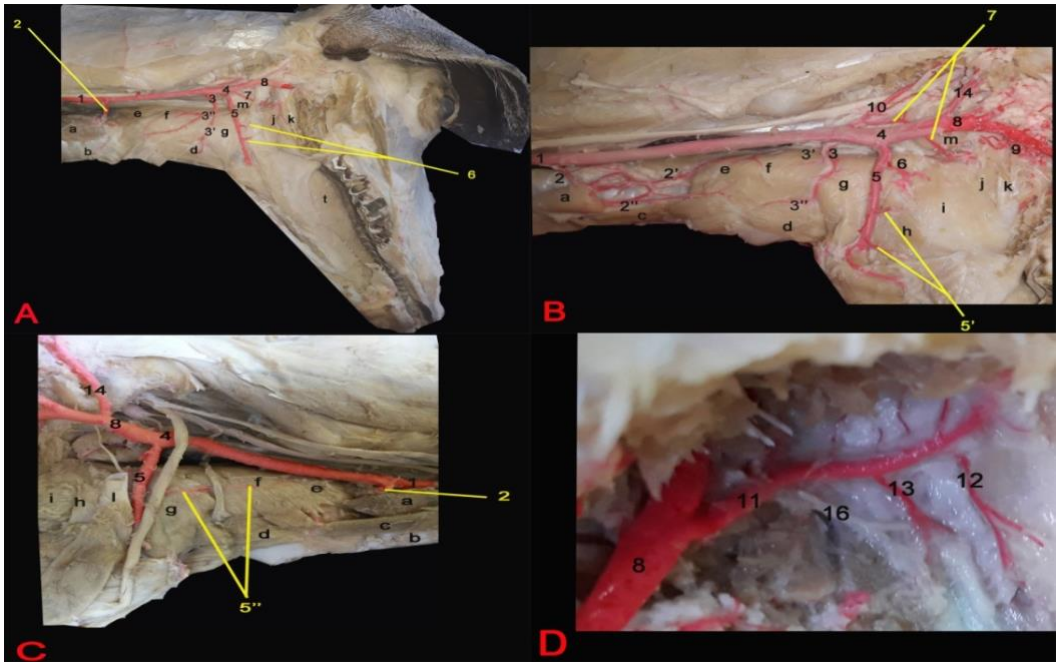

Fig (12/A) showed the arterial blood supply of the pharynx