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COMPARATIVE ANATOMICAL AND METRICAL STUDIES ON THE LARYNGEAL CARTILAGES OF GOAT AND SHEEP IN MOSUL - IRAQ

(With 10 Tables and 9 Figrues)

By

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دراسات تشريحية وقياسية مقارنة

على غضاريف الحنجرة للماعز والأغنام في الموصل - العراق

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استهدف البحث دراسة تشريحية وقياسية مقارنة على غضاريف الحنجرة لعشرين حنجرة للماعز والأغنام (عشرة لكل نوع) جلبت من مجزرة الموصل وبعد تنظيفها جيدا تم دراسة كل غضروف طوبوغرافيا وأجريت المقارنة لكل غضروف على انفراد بين كلا النوعين المستخدمين في الدراسة. أظهرت الدراسة الطوبوغرافية للغضاريف بأن هناك اختلافات جوهرية بين الماعز والأغنام . وأظهرت الدراسة القياسية بأن غضاريف الحنجرة في الأغنام بعد قياسها أكبر بالمقارنة مع نظيراتها في الماعز باستثناء طول الصفيحة الفتخية في الماعز كانت أطول كما أوضحت الدراسة بأن غضاريف الحنجرة للذكور في كلا النوعين كانت أكبر من نظيراتها في الإناث ماعدا قطر الغضروف القرني فقد ظهر أنه أكبر في الإناث عما هو عليه في الذكور. بالاضافة لذلك فان معدل طول وعرض الغضروف المزمارى في كلا الجنسين تقريبا متساويا في القياس وتمت مقارنة النتائج مع الحيوانات الأخرى بالاعتماد على الأبحاث السابقة لهذا البحث .

SUMMARY

This study was carried out on the laryngeal cartilages of 20 larynx of adult healthy goat and sheep ranging from 3-10 years old. Half of these specimens were of male animals and the rest of female ones of the two species. The cartilages were studied anatomically and various measurements were taken from the inner surface. From the present study we can conclude that: the laryngeal cartilages of goat differed anatomically from those of sheep. The various measurements in the laryngeal cartilages were somewhat larger in sheep as compared to goat except the length of the lamina of the cricoid cartilage. They also were larger in male as compared to female except the diameter of the corniculate, length and breadth of epiglottic cartilages, their average was about equal in both sexes of the same species.

There was no definite correlation with total body length and age of the animal.

INTRODUCTION

The larynx as a portion of the air passage way must remain open except when it is reflexly or voluntarily closed. It is surrounded by cartilages that prevent its collapse and also give attachments to its muscles. The available literature whatever original papers or books (MAY, 1970; HARE, 1975 and NICKEL, SCHUMMER & SEIFRLE, 1979) studied only the anatomy and the relations of these cartilages to each other. On the other hand, recent interest in the condition of subglottic stenosis and post intubational stenosis of the lower respiratory tract led to a search through the literature and to determine the measurements of the various cartilages of the larynx. However, morphometric studies on the laryngeal catilages in domestic animals are scarce except the work of SCHREIBER (1916) on the cartilages of the castrated and non castrated horses and bulls as well as ABDEL-RAHMAN (1990) on the laryngeal cartilages of the donkey, goat and dog. Moreover, some measurements concerning man have been mentioned by WARWICK and WILLIAMS (1973) as well as AJMANI; JAIN and SAXENA (1980).

This work is decided to make a study to achieve the normal data including anatomical and metrical studies for the laryngeal cartilages of goat and sheep in Mosul-Iraq as nothing was given about them in this country.

MATERIAL and METHODS

The materials for the present study consisted of laryngeal cartilages of 20 larynx of adult healthy goat and sheep obtained from Mosul slaughter house. The age of these animals ranged from 3-10 years. Half of these specimens were of male animals and the rest of female ones of both goat and sheep. The total body length and age of each animal were listed before slaughtering. The specimens were refrigerated, then by dissection the cartilages were separated very carefully from each other and cleaned. In preparation the refrigerated specimens were easier to hand than the fresh and formalized ones. Then the specimens were studied anatomically. Various measurements were taken from the inner surface with the help of a divider. The specimens were later kept formalized in 10% formalin solution. The formalization did not appear to alter the measurements significantly.

The nomenclature used in this study was that adopted by the N.A.V. (1983) as it was possible.

RESULTS

The skeleton of the larynx in both goat and sheep was composed of the following cartilages: The unpaired cricoid cartilage caudally, the unpaired thyroid cartilage ventrally and laterally, the paired arytenoid and corniculate cartilages dorsally and the unpaired epiglottic cartilage rostrally. The cuniform cartilages were absent.

Thyroid Cartilage :

The thyroid cartilage in both goat and sheep was a shield shaped opened dorsally and forms the greater part of the larynx. The two lateral laminae fused ventrally

forming the body. Each lamina was in the form of a broad quadrilateral plate which extended further caudally than it did rostrally. In goat the rostral border of the lamina was convex and notched by the rostral thyroid notch. The caudal border was concave and setted obliquely. The rostral cornu was short and straight (Fig 1,2A/1) while the caudal one was long and its most caudal part curved slightly vetnrally (Fig. 1,2A/2). It was noticeable that, the rostral and caudal cornua of the laminae of the thyroid cartilage in goat lay on one line with the dorsal border i.e the dorsal border was straight (Fig. 1A/6). The thyroid fissure was bridged by connective tissue to form a narrow thyroid foramen (Fig. 1A/7). The muscular line of the lamina of the thyroid cartilage was faint. The laryngeal prominence was prominent and situated approximately 1 cm. rostral to the caudal border (Fig. 1A/5).

In sheep, the rostral cornu was longer and curved ventrally (Fig. 1.2B/1). The caudal cornu was more longer and curved strongly ventrally (Fig. 1.2B/2). It was noticeable that, in sheep the caudal cornu of the thyroid lamina was situated more higher than the rostral one. So a notch was formed between the rostral and caudal cornua i.e the dorsal border of the lamina was notched and not straight (Fig. 1B/6). The thyroid fissure ventral to the rostral cornu not bridged by connective tissue and was deep (Fig. 1B/3). The caudal border of the lamina setted more obliquely (Fig. 1B/9), so a fissure can be formed between this border and the caudal cornu (Fig. 1B/4). The suggested name for this fissure is the caudal thyroid fissure (Fig. 1B/4). The rostral thyroid notch was more deeper (Fig. 2B/3). The laryngeal prominence was less prominent and situated more caudally about 0.5 cm. rostral to the caudal border (Fig. 1B/5).

In the thyroid cartilage, length and breadth of both the laminae (Fig. 9A, N-M; a-b), length of rostral and caudal cornua (from tip to its base) (Fig. 9A, W;Z), distance between the two caudal borders of the laminae (Fig. 9A, c-d) and depth of rostral thyroid notch (Fig. 9A, K) in both goat and sheep were measured and recorded with their averages in table (1) and (2) respectively.

Table (1) and (2) showed that, different measurements were larger in sheep as compared to goat and were larger in male as compared to female in the same species. The differences in various measurements of the two sides in either species and sexes were approximately the same.

Cricoid Cartilage :

The cricoid cartilage in goat and sheep is shaped like a signet ring. It was described as having a dorsal lamina and ventral arch. The lamina was roughly quadrilateral in outline while the arch compressed laterally and its ventral part was narrow.

In goat, the dorsal surface of the lamina presented a well marked median muscular process rostrally while it was subsided or absent caudally (Fig. 3,4A/2). The rostral border was thick and had on either sides two small oval convex facets for articulation with the ipsilateral arytenoid cartilage. Between the articular facets the border was notched by a well marked notch (Fig. 4A/3). Caudolaterally at the junction with the arch the lamina has two rounded facets for articulation with the caudal

cornu of the thyroid cartilage. The caudal border of the lamina of the cricoid cartilage was thin and sloped slightly caudoventrally. It was continued caudally by a cartilagenous plate which extended to the level of the third tracheal ring (Fig. 3A/4).

The lateral surface of the arch of the cricoid cartilage in goat was less concave and its rostral border was setted slightly obliquely (Fig. 3A/5).

In sheep, the muscular process of the lamina of the cricoid cartilage was very prominent rostrally and extended caudally along its dorsal surface (Fig. 3,4B/2). The cartilaginous plate attached to the caudal border was shorter and reached only the second tracheal ring (Fig. 3B/3). The rostral facets for articulation with arytenoid cartilages were more larger and the notch between them was ill marked (Fig. 4B/3). On the other hand, the caudal facets were more rounded and projected more laterally.

The lateral surfaces of the arch were more concave and its rostral border setted more obliquely (Fig. 3B/5). Its ventral part was more narrower (Fig. 3B/6).

In the cricoid cartilage, length of the lamina (Fig. 9B, X-Y), longitudinal and transverse diameters of the cricoid cartilage (Fig. 9B, e-f; 9-h) and breadth of the arch at the junction with the lamina (Fig. 9B, T) were measured in goat and sheep and listed in table (3) and (4) respectively. Tables (3 &4) showed that, with the exception of the length of the lamina of the cricoid cartilage different measurements and their averages were more larger in sheep as compared to goat and larger in male than female as well as the longitudinal diameter of the cricoid cartilage was more longer than the transverse diameter.

Arytenoid Cartilage :

The arytenoid cartilages in goat and sheep were paired and have the shape of a three-sided pyramid. The apex of which pointed rostrodorsally and its base faced the cricoid cartilage. The base was narrow from side to side and formed by the crest-shaped muscular process laterally, vocal process ventrally and articular surface for the cricoid dorsomedially.

From the anatomical points of view the main differences between arytenoid cartilage in goat and sheep can be summarized in the following: The apex in goat was convex while in sheep was somewhat concave or straight. On the other hand, the base in goat is more curved than in sheep. Generally speaking the medial surface of the arytenoid cartilage in sheep was more concave than in goat (Fig. 6B).

The muscular process was sharp in goat (Fig. 5,6A/3) and blunted in sheep (Fig.5,6B/3). On the lateral surface of this process there was a small depression which more deeper in sheep than goat. This depression divided this surface into two unequal portions. Attached to the muscular process dorsomedially a third process which more pointed in goat (Fig. 5A/3') than sheep (Fig. 5B/3'). The area between muscular and third processes was more curved in goat than sheep.

The vocal process in goat was more pointed than sheep (Fig. 5, 6A/4) and its medial surface was grooved in sheep (Fig. 6B). The cricoid articular surface was

oval and somewhat concave in goat while triangular and more concave in sheep.

In the arytenoid cartilages, length and breadth (Fig. 9c, r-s; u-v) on both sides were measured in goat and sheep. These measurements and their averages were tabled in table (5) and (6) respectively. The above observations revealed that, the length and breadth of arytenoid cartilages were somewhat more larger in sheep than goat and more in male as compared to female and they were the same on two sides.

Corniculate Cartilage :

They were two horn shaped plates with an apex and base. The base of each horn was attached to the apex of the ipsilateral arytenoid cartilage while the rest of the horn was curved dorsocaudally and medially, so that its apex (tip) came to lay close to that of the opposite cartilage. This apex (tip) was more pointed and curved dorsocaudally in goat than sheep (Fig. 5A/7).

In corniculate cartilage, the diameter of each cartilage on both sides (Fig. 9E) was measured in goat and sheep. The measurements with their averages were recorded in table (7) and (8). It was noticed that, the diameter was longer in sheep than goat, there was slight difference in both sexes on both sides and the diameter was larger in female as compared to male in the two animals.

Epiglottic Cartilage :

The epiglottic cartilage was shaped like a cordate leaf in goat (Fig. 7A) and an abovate leaf in sheep (Fig. 7B). The apex was pointed and more curved rostrally in goat (Fig. 7,8A/1) while rounded in sheep (Fig. 7, 8B/1). From side to side the lingual and laryngeal surfaces were more concave in goat while from apex to base they were more convex in sheep. In sheep the petiolus was more rounded and clear than goat (Fig. 8B/2).

The length and breadth of the epiglottic cartilage were measured in goat and sheep (Fig. 9D, j-1; o-q). These measurements and their averages were recorded in table (9) and (10). From the above results we conclude that, length and breadth of epiglottic cartilage were larger in sheep than goat. There was slight differences in these measurements on both sides. The average of these measurements was about equal in both sexes of each animal.

DISCUSSION

According to HARE (1975) in ruminants the thyroid cartilage is relatively shorter and its laminae are relatively higher in sheep and goat than in ox. In addition, and in agreement with MAY (1970) in sheep the thyroid cartilage forms the skeleton of a large part of the lateral walls of the larynx. The present study shows that the rostral cornu in goat is short and straight while it is long and curved ventrally in sheep. This is in disagreement with that mentioned in ruminants by HARE (1975) and NICKEL, SCHUMMER & SEIFERLE (1979) as well as in sheep by MAY (1970) who mentioned that the rostral cornu is short and straight. However, our results are in agreement

with that stated by the above mentioned authors concerning the caudal cornu. According to the above mentioned authors in ruminants the thyroid fissure is bridged by connective tissue to form the thyroid foramen. In the recent investigation this foramen was shown only in goat while sheep resembles dog in the absence of this foramen as mentioned by MILLER, CHRESTENSEN and EVANS (1964). The rostral thyroid notch is more deeper in sheep than goat. This notch is shallow in ruminants and sheep as mentioned by NICKEL et al. (1979) and MAY (1970) respectively. On the other hand, and as mentioned by NICKEL et al. (1979) an exceptionally deep caudal thyroid notch and a shallow one was formed in horse and ruminants respectively. This notch was not observed in the present study. The caudal thyroid fissure described here in sheep and the third process of the arytenoid cartilage in goat and sheep were not reported by any of the above mentioned authors in any of the domestic animals.

The slight laryngeal prominence found on the ventral surface in dog, older pig and man is observed in goat and sheep but is more prominent in goat than sheep. In agreement with that mentioned by MAY (1970), HARE (1975) and NICKEL et al. (1979) in sheep and ruminants and in contrary to that described by GRAY (1973) in man the laryngeal prominence is more caudally placed and according to MAY (1970) this prominence can be palpated in living sheep.

The present study shows that, the caudal portion of the lamina of the cricoid cartilage slopes caudoventrally resembles that mentioned by NICKEL et al. (1979) in ruminants and MAY (1970) in sheep, they did not mention its extension by the cartilaginous plate but MAY (1970) mentioned that the caudal border projecting over the dorsal part of the first tracheal ring.

As mentioned by HARE (1975) and NICKEL et al. (1979) the lateral surface of the cricoid arch are slightly concave in ruminants which resembles that observed in goat while it is more concave in sheep. In goat and sheep the rostral border of the arch is setted obliquely but the obliquity in the present work is more developed in sheep than goat.

The present investigation shows a third process attaches to the muscular process of the arytenoid cartilage which is sharp in goat and blunt in sheep. This process was not mentioned by any of the above mentioned authors in animals as well as by GRAY (1973) in man.

The epiglottic cartilage is shaped like a cordate leaf in goat and an abovate leaf in sheep while according to MAY (1970) it is petal shaped in sheep.

In this study the laryngeal cartilages of goat and sheep have been studied for their various measurements in both sexes. It is observed that, all the measurements of the thyroid cartilage i.e length and breadth of laminae, length of rostral and caudal cornua and depth of rostral thyroid notch are larger in sheep than goat and more in male than female in the same species. According to ABDEL-RAHMAN (1990) the rostral border of the thyroid cartilage of the goat and donkey is shorter than the caudal one while in the dog it is relatively longer. In general the caudal cornu is long

and the rostral one is short, the same findings have been observed in the present study, but in donkey the rostral cornu is longer than the caudal one (ABDEL-RAHMAN, 1990). In man all the measurements of the thyroid cartilage except length of superior horn are longer in male than female (WARWICK and WILLIAMS, 1973). In case of cricoid cartilage the longitudinal diameter is longer than the transverse diameter and in contrary to man in which the transverse diameter is longer than the anteroposterior diameter is longer than the anteroposterior diameter. As stated by ABDEL-RAHMAN (1990) the length and breadth of the laminae of the cricoid cartilage are nearly the same in the dog and donkey. In the goat and due to the presence of a caudal process, the length of the cricoid lamina is half time more than its breadth which is in agreement with that mentioned in the present work. With the exception of the length of the lamina of the cricoid cartilage all measurements of this cartilage are larger in sheep as compared to goat and they are longer in male than female. Similarly in arytenoid cartilage length and breadth are larger in sheep than goat and in male than female. In the donkey the length is slightly longer than its height but shorter in the dog and goat (ABDEL-RAHMAN, 1990). In epiglottic cartilage length and breadth are larger in sheep than goat but their average is about equal in both sexes of the same species. But according to ABDEL-RAHMAN (1990) the length of the epiglottis exceeds the breadth in the goat and donkey but both dimensions are nearly equal in the dog. The diameter of the corniculate cartilage is more in sheep than goat and in female than male animals. According to AJMANI et al. (1980) the length and breadth in arytenoid and epiglottic cartilages are more in male than in female and in the arytenoid cartilage the measurements vary with the age. The corniculate cartilage is more frequently absent in man.

LEGENDS OF FIGURES

Fig. (1): Thyroid cartilage, Lateral aspect.
A- Goat, B- Sheep.
1. Rostral cornu
2. Caudal cornu
3. Rostral thyroid fissure
4. Caudal thyroid fissure
5. Laryngeal prominence.
6. Dorsal border
7. Thyroid foramen
8. Rostral border
9. Caudal border

Fig. (2): Thyroid cartilage, ventral aspect.
A- Goat, B- Sheep.
1. Rostral cornu
2. Caudal cornu
3. Rostral thyroid notch

Fig. (3): Cricoid cartilage lateral aspect.
A- Goat, B- Sheep.
1. Cricoid lamina.
2. Muscular process (median crest)
3. Cartilagenous plate
4. Cricoid arch
5. Lateral surface of cricoid arch
6. Ventral part of cricoid arch

Fig. (4): Cricoid cartilage, rostral aspect.
A- Goat, B- Sheep.
1. Cricoid lamina.
2. Muscular process (median crest)
3. Notch of the cricoid lamina
4. Cricoid arch

Fig. (5): Arytenoid and corniculate cartilages, lateral aspect.
A- Goat, B- Sheep.
1. Apex
2. Base
3. Muscular process
3. Third process
4. Vocal process
5. Corniculate cartilage
6. Base of corniculate cartilage
7. Apex of corniculate cartilage.

Fig. (6): Arytenoid and corniculate cartilages, medial aspect.
A- Goat, B- Sheep.
1. Apex
2. Base
3. Muscular process
4. Vocal process
5. Corniculate cartilage
6. Base of corniculate cartilage
7. Apex of corniculate cartilage

Fig. (7): Epiglottic cartilage, rostral aspect.
A- Goat, B- Sheep.
1. Apex
2. Base

Fig. (8): Epiglottic cartilage, lateral aspect.
A- Goat, B- Sheep.
1. Apex
2. Petiolus

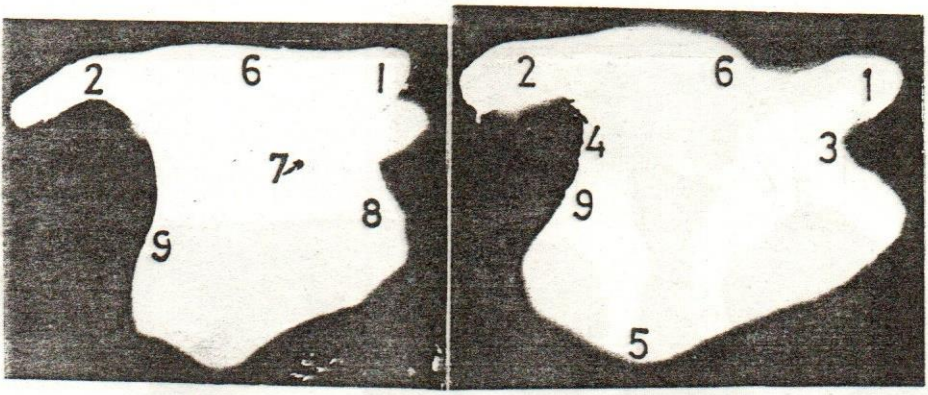
Fig. (9): **A**- Thyroid cartilage:
K = Rostral thyroid notch
c-d = Distance between two laminae
W = Rostral thyroid cornu
Z = Caudal thyroid cornu
a-b = Breadth of thyroid lamina
N-M = Length of thyroid lamina

B- Cricoid cartilage.
X-Y = Length of cricoid lamina
T = Breadth of cricoid arch
e-f = Longitudinal diameter
g-h = Transverse diameter

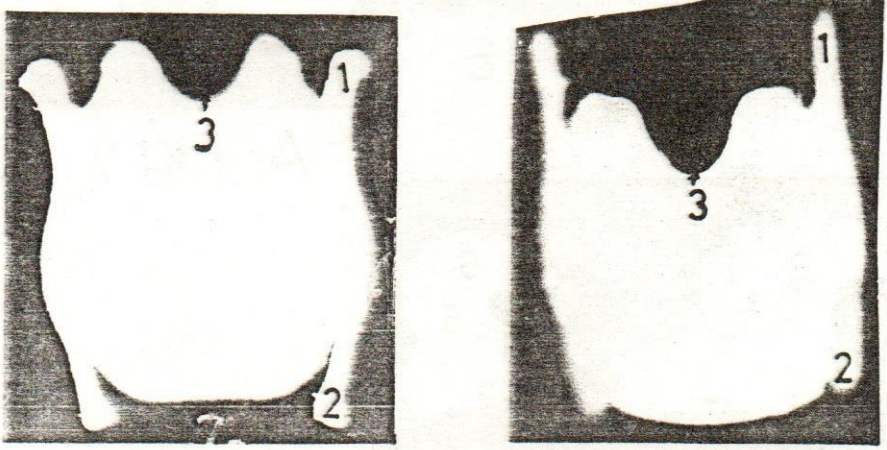
C- Arytenoid cartilage:
u-v = Breadth of arytenoid cartilage
r-s = Length of arytenoid cartilage

D- Epiglottic cartilage:
j-1 = Length of epiglottic cartilage
o-q = Breadth of epiglottic cartilage

E- Corniculate cartilage
Diameter = ip + mn / 2



A Fig 1 B



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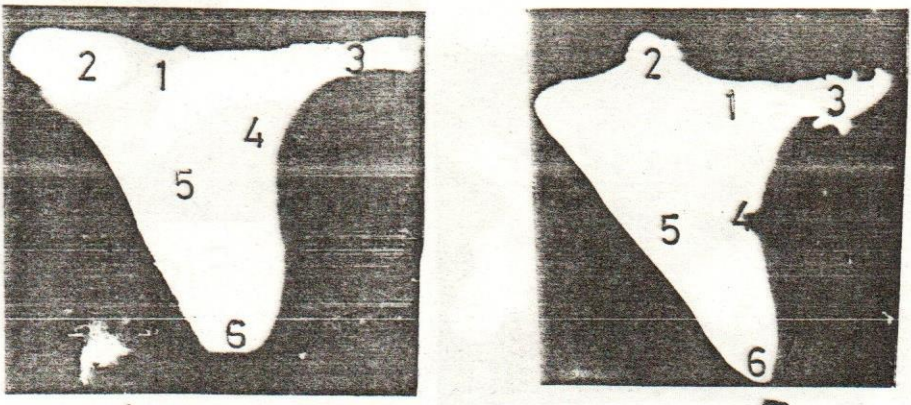
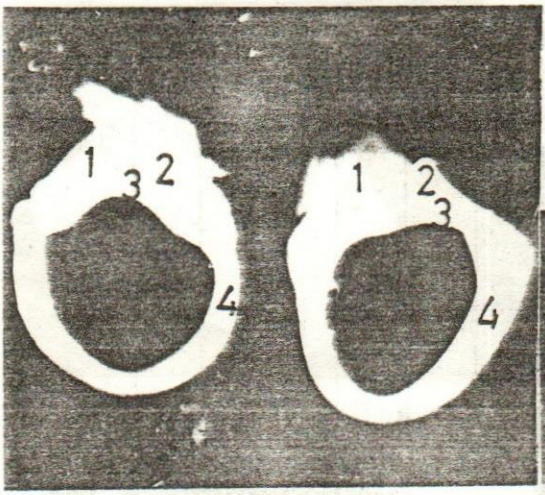
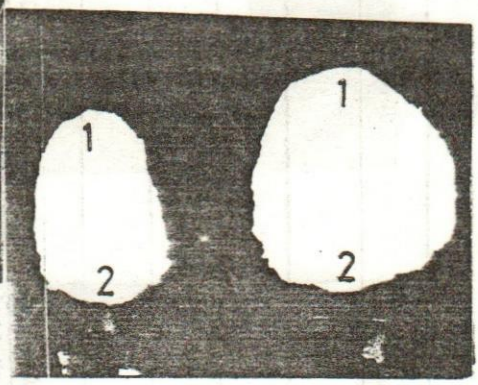


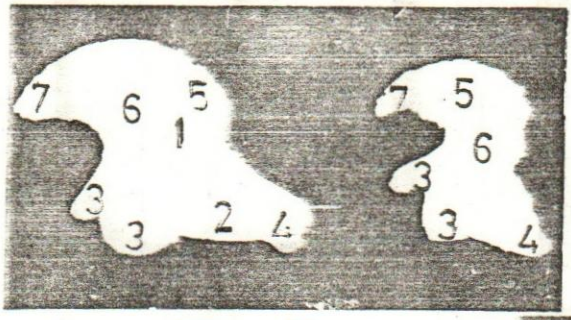
A Fig 3 B



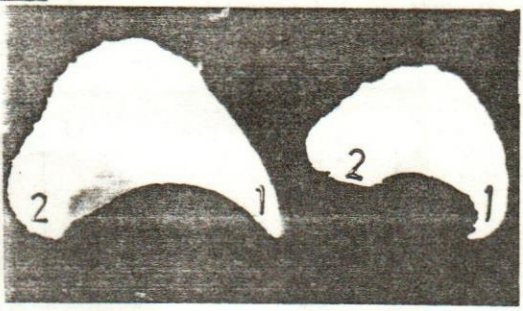
A Fig 4 B



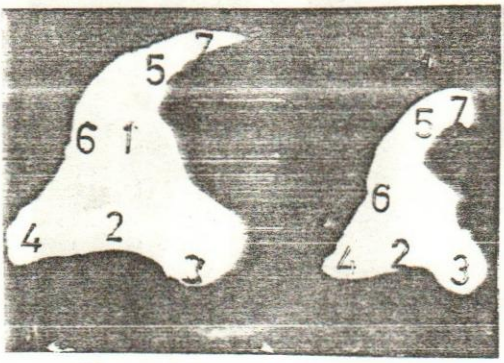
A Fig 7 B



B Fig 5 A



B Fig 8 A



B Fig 6 A

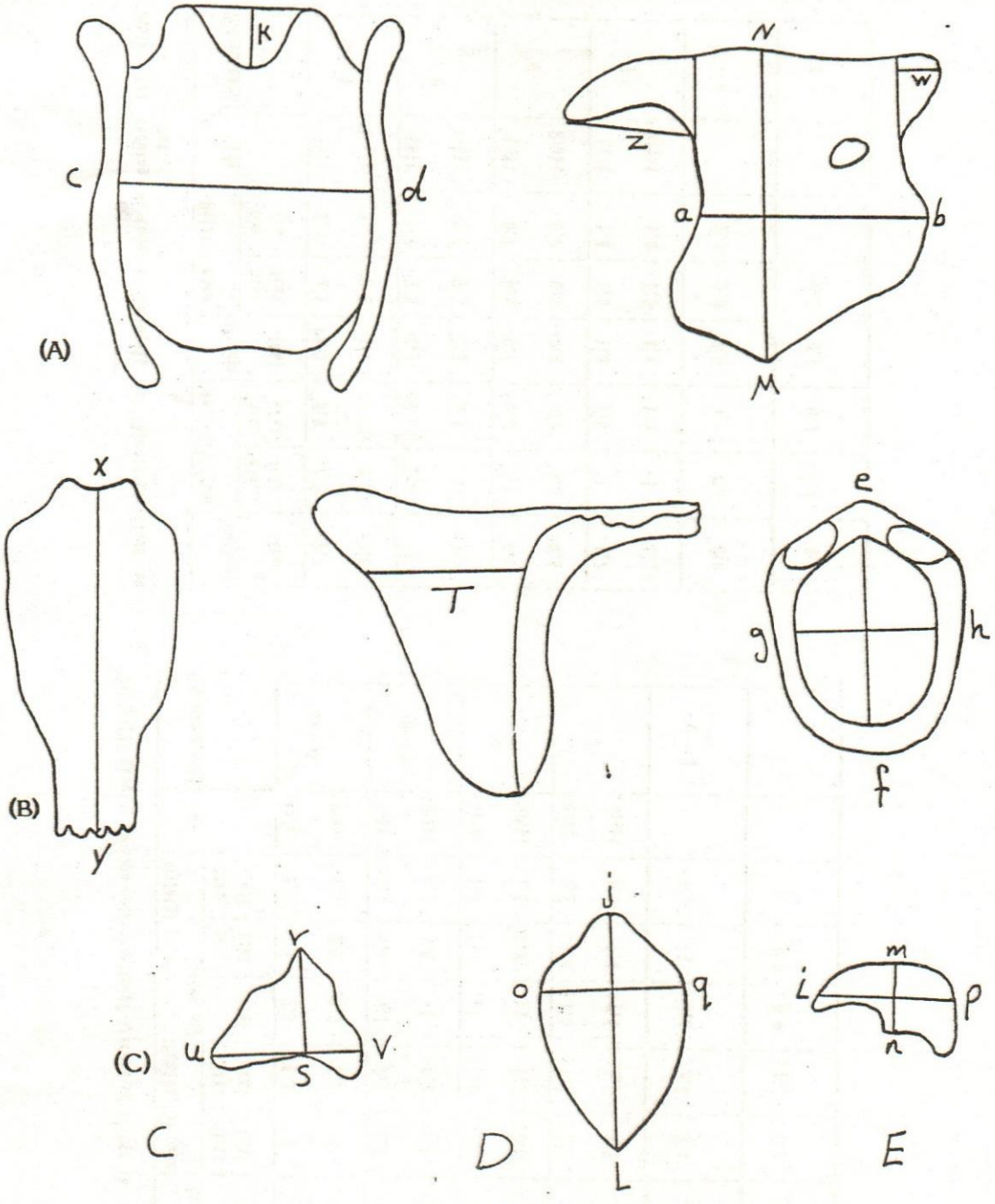


Fig. 9

Table (1) showing various measurements of Thyroid cartilage in goat.

Measurement	Side	Male(5) case		Average	Female(5) case		Average
		Max. (cm)	Min. (cm)	(cm)	Max. (cm)	Min. (cm)	(cm)
a - b	Left	3.5	3.1	3.3	3.3	2.5	2.7
	Right	3.4	3.1	3.2	2.8	2.5	2.6
N - M	Left	3.9	3.5	3.7	3.6	2.6	3
	Right	3.8	3.5	3.6	3.6	3	3.2
W	Left	0.7	0.8	0.7	0.8	0.6	0.6
	Right	0.7	0.9	0.8	0.8	0.5	0.6
Z	Left	1.4	1.5	1.4	1.5	1	1.2
	Right	1.4	1.5	1.4	1.5	1	1.2
c - d		2.9	2.8	2.8	3.1	2.5	2.8
K		1	0.5	0.7	0.7	0.4	0.5

Table (2) showing various measurements of Thyroid cartilage in sheep.

Measurements	Side	Male(5) case		Average	Female (5) case		Average
		Max. (cm)	Min. (cm)	(cm)	Max. (cm)	Min. (cm)	(cm)
a - b	Left	4.3	3.5	3.9	4.2	4	4
	Right	4.3	3.5	3.9	4.2	4	4
N - M	Left	4.3	3.8	4.1	4.2	3.9	4
	Rihgt	4.2	3.8	4	4.2	3.8	3.9
W	Left	1.2	1	1	1.1	0.8	0.9
	Right	1.1	0.9	1	1.2	0.8	1
Z	Left	1.9	1.4	1.5	1.7	1.3	1.4
	Right	1.6	1.4	1.5	1.5	1.3	1.4
c - d		4.7	3	3.6	3.6	3.4	3.5
K		1	0.8	0.9	1.1	0.6	0.9

Table (3) showing various measurements of Cricoid cartilage in goat.

Male-5 case , Female-5 case.

Measurement	Sex	Max. (cm)	Min. (cm)	Average (cm)
X - Y	Male	3.7	3.7	3.7
	Female	3.9	3	3.5
T	Male	1.5	1.3	1.4
	Female	1.4	1.2	1.3
g - h	Male	1.8	1.7	1.7
	Female	1.7	1.4	1.5
e - f	Male	3	2.6	2.8
	Female	2.5	1.8	2.2

Table (4) showing various measurements of cricoid cartilage in sheep.

Male-5 case , Female-5 case.

Measurement	Sex	Max. (cm)	Min. (cm)	Average (cm)
X - Y	Male	3.6	2.9	3.4
	Female	3.4	2.8	3
T	Male	1.7	1.3	1.5
	Female	1.6	1	1.4
g - h	Male	2.2	1.8	1.9
	Female	2	1.8	1.9
e - f	Male	3.4	2.9	3.1
	Female	3.2	2.7	2.9

Table (5) showing various measurements of Arytenoid cartilage in goat.

Male-5 case, Female-5 case

Measurement	Male	Max. (cm)	Min. (cm)	Average (cm)	Female	Max. (cm)	Min. (cm)	Average (cm)
r - s	Left	2	1.7	1.8	Left	1.2	1.1	1.1
	Right	2	1.6	1.8	Right	1.2	1.1	1.1
u - v	Left	2	1.7	1.8	Left	1.7	1.4	1.5
	Right	2	1.7	1.8	Right	1.7	1.4	1.5

Table (7) showing various measurements of corniculate cartilage in goat.

Male-5 case , Female-5 case .

		Max. (cm)		Min. (cm)		Average (cm)	
		Left	Right	Left	Right	Left	Right
Diameter	Male	1.2	1.2	1.2	1.1	1.2	1.1
	Female	1.5	1.5	1.1	1.1	1.2	1.2

Table (6) showing various measurements of Arytenoid cartilage in sheep.

Male-5 case, Female-5 case .

Measurement	Male	Max. (cm)	Min. (cm)	Average (cm)	Femal	Max. (cm)	Min. (cm)	Average (cm)
r - s	Left	2	1.9	1.9	Left	1.9	1.5	1.7
	Right	2.2	1.9	2	Right	1.9	1.5	1.7
u - v	Left	2.2	1.9	2	Left	2.1	1.9	1.9
	Right	2.2	1.8	2	Right	2	1.8	1.9

Table (8) showing various measurements of corniculate cartilage in sheep.

Male-5 case , female-5 case.

		Max. (cm)		Min. (cm)		Average (cm)	
		Left	Right	Left	Right	Left	Right
Diameter	Male	1.6	1.5	1.2	1.2	1.4	1.3
	Female	1.8	1.6	1.3	1.3	1.4	1.4

Table (9) showing various measurements of Epiglottic cartilage in goat.

Male-5 case, Female-5 case.

Measurement	Sex	Max. (cm)	Min. (cm)	Average (cm)
j - l	Male	2.7	2.5	2.6
	Female	2.7	2.3	2.5
o - q	Male	2.4	2	2.2
	Female	2.3	1.8	2

Table (10) showing various measurements of Epiglottic cartilage in sheep.

Male-5 case , Femal-5 case.

Measurement	Sex	Max. (cm)	Min. (cm)	Average (cm)
j - l	Male	3.4	2.9	3
	Female	3.6	2.8	3.2
o - q	Male	2.8	2.3	2.4
	Female	2.9	2.3	2.5

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