

Comparative study of the auricle and external acoustic meatus of the cattle and buffalo

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Abstract

The present work was design to study the anatomical features and radiographic appearance of auricle and external acoustic meatus of cattle and buffalo, collected from (12) sample of heads were used in this study, there were equally divided into three groups: first group to study the shape, position and relation of cartilage, muscles and ligament of auricle in both animals, second group to study the measurements of external acoustic meatus, and the third group study morphological and radiographical of external acoustic meatus in both animal, the study revealed that the auricle is a flapy flashy appendage attached to the side of the skull by muscles and ligaments, the auricle is funnel shape, distally is wide open, but more proximally, it is rolled up to form a tube that bend medially to be connected to the external acoustic meatus, the auricle in both animals is composed of three cartilage: the part auricular, scutiform and annular cartilage also auricular muscle and ligament which support the external ear. The result of this study shows that intrinsic auricular muscles is more developed in buffalo, while the greater parts of the extrinsic auricular muscles are developed in both animals. The present work shows that the frontoauricular muscles are distinguish into two parts in buffalo and cattle on the other hand the interscutularis muscle thin fibers and attached with scutuloauricularis prefunds muscle in buffalo, also the parotidauriculares narrower and thicker in cattle, but a ribbon -like muscle thin and wide in buffalo. The external acoustic meatus begins where the rolled up part of the annular cartilage narrows and ends, the meatus has cartilaginous and osseous parts it is lined with skin the study provided that acoustic meatus about 5.667 ± 0.0816 cm of length in cattle and 6.500 ± 0.126 cm in buffalo, the aim of present work is to report more detailed information about the auricle and meatus in both animal for value importment can easily examined by the speculum the shortness of the meatus should be courses of the risk of injuring of the tympanic membrane and to be able to pass the otoscope tube through the external meatus and to recognize the eardrum when it is seen, to know the surgical anatomy of auricle and acoustic meatus and to know the relationship of vessels and nerve that must be avoid during surgery and to be able to recognize all parts of the temporal bone on radiographs.

Keywords: Auricle; External meatus; Cattle; Buffalo.

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دراسة مقارنة لصيوان الأذن والميزاب السمعي الخارجي في الإبقار والجاموس

سمية الساعدي وعدنان حسو

فرع التشريح، كلية الطب البيطري، جامعة الموصل، الموصل، العراق

الخلاصة

استهدفت هذه الدراسة اعطاء وصف للصورة التشريحية والشعاعية لصيوان الأذن والميزاب السمعي الخارجي وقد استخدمت لهذا الغرض (12) رأس من الإبقار والجاموس وقسمت عينات البحث الى ثلاثة مجاميع: المجموعة الاولى درست شكل و موقع وعلاقات غضاريف وعضلات واربطة صيوان الأذن في حيواني البحث والمجموعة الثانية درست قياسات الميزاب السمعي والمجموعة الثالثة درست عيانيا وشعاعيا مدى استقامة الميزاب السمعي في الإبقار والجاموس وبينت الدراسة ان صيوان الأذن عبارة عن قمع مائل ملحق

بالراس ويتكون من لفافات غضروفية مرنة تتصل بالجمجمة بواسطة الاربطة والعضلات ويلتف الصيوان الاذن ليكون تركيب انبوبي يتصل بالميزاب السمعي ويكون الفتحة الخارجية للاذن والتي تكون عريضة في كلا الحيوانين ويتكون صيوان الاذن من ثلاث غضاريف (اذني وترسي وحلقي) وكذلك عضلات اذنية (داخلية وخارجية) تكون الداخلية اكثر تطورا في الجاموس بينما العضلات الاذنية الخارجية متطورة في كلا الحيوانين وتنقسم العضلة الاذنية الجبهية الى جزأين واضحين في الابقار والجاموس بينما تكون العضلة الاذنية النكفية شريطية الشكل وسميكة في الابقار وعريضة في الجاموس، واتصلت الالياف الرقيقة للعضلة بين الترسية مع الالياف العضلة الترسية الاذنية الغائرة عند الجاموس ويتغذى صيوان الاذن بثلاثة فروع من الشريان الصواني الخلفي في حيواني البحث. ويبدأ الميزاب السمعي الطبلي في كلا الحيوانين بجزء انبوبي ملفوف من الغضروف الحلقي وينتهي عند طبلة الاذن ويتكون من جزئين غضروفي وعظمي ومغطى بالجلد واوضحت الدراسة كذلك قصر واستقامة الميزاب السمعي في حيواني البحث. علما بان طول الميزاب السمعي في الابقار يصل 5.667 ± 0.0816 سم وفي الجاموس يصل 6.500 ± 0.126 سم والهدف من الدراسة الحصول على وفرة من المعلومات حول صيوان الاذن والميزاب السمعي لاهميتها الكبيرة في معرفة مدى طول واستقامة الميزاب السمعي ولما له اهمية تشريحية وجراحية حيث يمكن فحص التجويف الطبلي بسهولة وان قصر الميزاب السمعي يدعو الى توقع الانتشار السريع لاي تلوث او جروح للغشاء الطبلي وكذلك للمساعدة في ادخال الناظور خلال الميزاب السمعي لمعرفة التشريح الجراحي والاختلافات التشريحية بين حيواني البحث وتجنب الاوعية الدموية والاعصاب اثناء العمليات الجراحية في تلك المنطقة و لما للدراسة الشعاعية اهمية في معرفة موقع الميزاب السمعي في العظم الصدغي.

Introduction

The ear or organ of hearing and equilibrium is almost highly developed as the eye, the auricle which collects the sound waves together with the external acoustic meatus which conveys these waves to the tympanic membrane (1,2), the knowledge about the auricle and the external meatus can be help in medicine most often a response chronic inflammation for chronic proliferative otitis externa, another common problem in domestic species the narrowing of the acoustic meatus due to swelling, hyperplasia of the skin (3,4). The shape of the auricle is determined by supporting the auricular cartilage in most domestic animals, this is sufficiently by stiff to keep the auricle erect at all time (5). A complex set of auricular muscles is responsible for the movement of the ear these muscles from the various points on the skull and adjacent fascia and attach to the base of the auricle and two named parts of the rolled up auricular cartilage the tragus and antitragus are found caudal to the tragic notch, the tragus and anti tragus are useful surgical land.

Materials and methods

Twelve heads six from cattle and six buffalo dromedaries of same sex and aged form (3-5) years old ranging in weight (550-720) kg were collected from the slaughter house of Mosul used for this study, four heads were preserved in 10 % formalin solution, four heads were treated by the usual methods for the preparation demonstration of the bone, then were studying the shape, position and dimensions of the meatus were subject to careful morphological examination, the measurements of external acoustic meatus were down as following: length of meatus is distance between the base of lowest point of

annular ligament to the internal acoustic meatus, diameter of external acoustic meatus is distance between the two lateral line of attachment with depth of external acoustic meatus, all the measurement down by using digital veirenear calipers and tap, computerized statistical analysis was performed using the SPSS and the use of values reported, and \pm SE, results were using T-test with p values less than (0.05) considered significant, less than (0.01) considered highly significant (6).

The others heads were used to the radiographic picture were performed in lateromedial (90°) and caudocranial (180°) direction, the values used were (85) KVP (14) m AS and (0.6) sec the morphological picture was fully described after examination of the films, the nomenclature used was adopted by Nomina Anatomica Vetrerinarian (2005).

Results

If there is no any difference in the results between cattle and buffalo the results will illustrated under the name of both animal and if there is different between them will define in cattle and buffalo, the anatomical study of auriculares or (pinna) auricle as it is the stick out from the head composed of elastic cartilage covered with skin closely adherent and connected to the surrounding parts by muscles and ligaments, the auricle is inclined laterally the apex and middle part is much wider in buffalo than that cattle, the parts of the auricular cartilage determines the shape of pinna like lopsided funnel.

The margin of auricle (helix) is divided into two crura the medial is larger than lateral, the rostral border of the auricle is divided into two parts are approaches the ear opening (auricular conchae) The medial part forms a prominent ridge on the inside of the ear cavity, the rolled

up auricular cartilage, the tragus is rectangular and separated from antitragus by antitragus notch, the anthlix in both animals is a transverse ridge on the concave (rostral) surface, the arrangements of the blood vessels and nerves are in associated with ridges on the concave surface.

The auricular cartilage is a funnel- shaped the outer part composed of elastic cartilage, bends toward the skull by annular cartilage through which the auricle attached to the external acoustic meatus.

The scutiform cartilage is a diamond plate in cattle and triangular plate in buffalo (Fig. 1,2) situated on the cranium with the a concave surface in contact with the fat and temporal muscle.

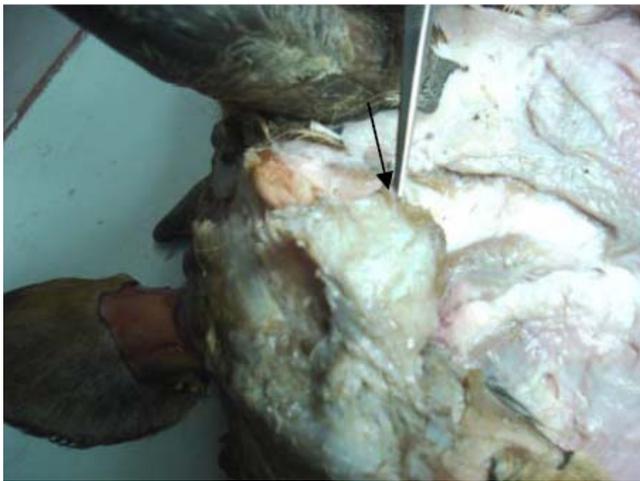


Fig. 1: shows scutuloform cartilage in cattle.



Fig. 2: scutuloform cartilage t in buffalo.

The annular cartilage is quadrilateral plate curved to form a ring and united by elastic tissue and rolled into

short tube (Fig. 3,4) it connects the proximal end of the auricular cartilage to the acoustic meatus that forms the lower part of the auricular cartilage and the cartilaginous part of the external acoustic meatus.

The auricular muscles consists of two sets, the extrinsic which connect it with the skull and move the auricle as a whole and intrinsic which extends from one part of the auricle to another.

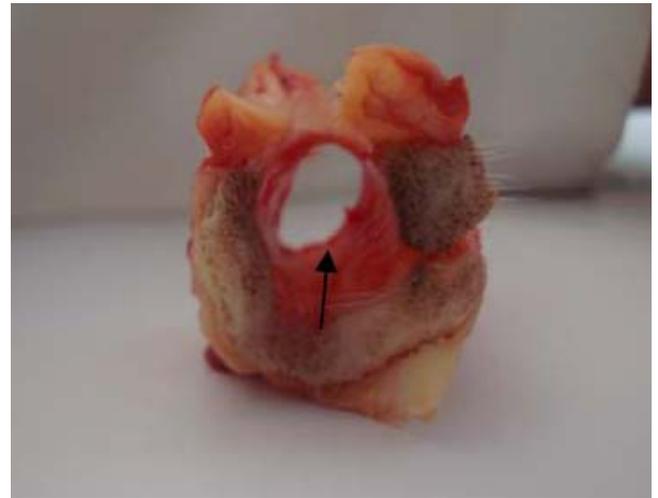


Fig. 3: shows annular cartilage in cattle

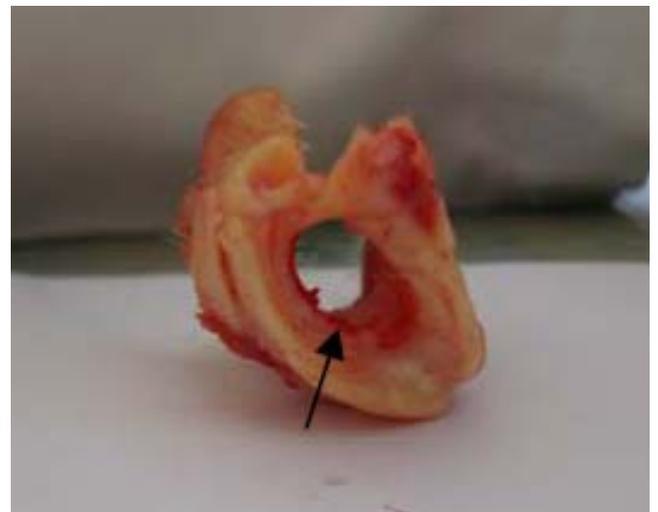


Fig. 4: shows annular cartilage in buffalo.

**The extrinsic auricle muscles consist of:
auriculars dorsales**

Interscutularis is a cutaneous muscle arises from the base of the corneal process and the frontal crest in both animals and is inserted to the medial part of the scutiform cartilage of the other side (Fig. 5).

Parietoauricularis it arises from temporal line and the nuchal ligament, where it inserts on the convex surface of the base of the auricular cartilage (Fig. 6).

Auriculars ventrales

Parotidauricularis is superficial muscle but it is narrow and thick in cattle a ribbon-like muscle, and it is thin and wide in buffalo (Fig. 7,8) it is origin from the parotid gland and inserted to the auricular cartilage.

Styloauricularis it is closely attached to the parotidauricularis in both animals it lies over the parotid gland and it is originate from styloid process inserted to the auricular cartilage (Fig. 7).



Fig. 5: Shows 1- Interscutularis and 2-frontoauricularis muscle in buffalo.



Fig. 6: Shows parietoauricularis muscle in buffalo.

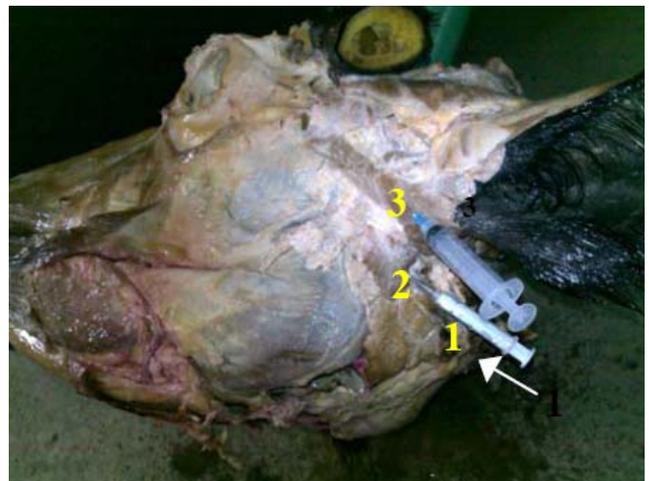


Fig. 7: shows 1- styloauricularis, 2- parotidauricularis and 3- zygomaticoauricularis muscle in buffalo.

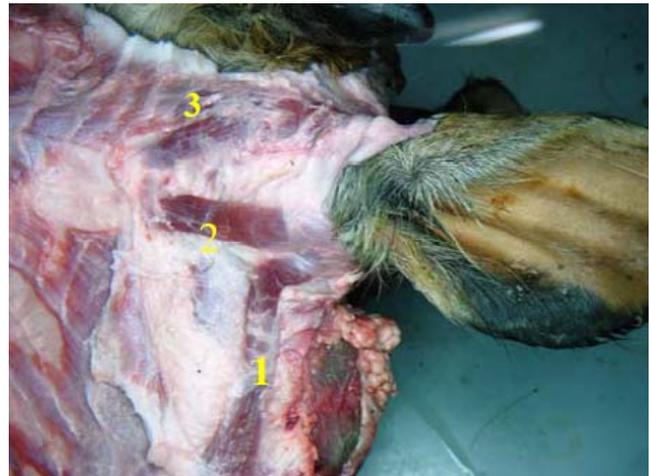


Fig. 8: shows 1- parotidauricularis, 2- zygomaticoauricularis and frontoauricularis muscle in cattle.

Auricularis caudales

Cervicoscutlaris it lies nuchal ligament and inserts in the scutiform cartilage (Fig. 9).

Cervicoauricularis superficial in both animals well development muscle it is originated from the atlantal fascia inserts to the auricular cartilage (Fig. 10).

Cervicoauricularis medius is a small muscle which arise from the atlanto axial fascia insert to the auricular surface (Fig. 10).

Cervicoauricularis profundus can be distinguished into two parts both of which origin from occipital bone and insert in the caudal aspect of the auricular cartilage (Fig. 10).



Fig. 9: shows cervicoscutularis muscle in cattle.

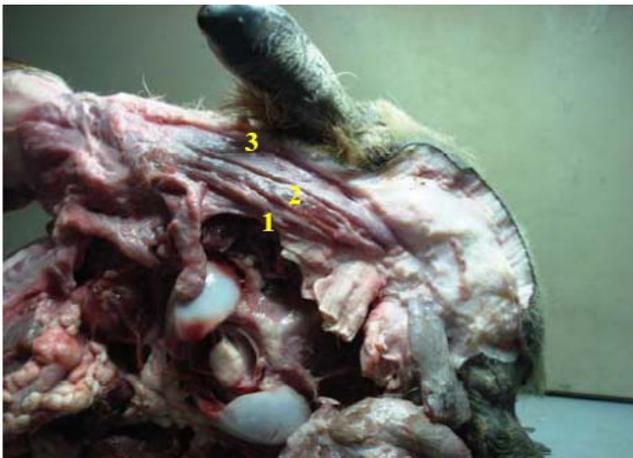


Fig. 10: 1- cervicoauricularis superfiscial 2 - cervicoauricularis medius and 3- cervicoauricularis profundus in cattle.

Auicularis rostrales

Zygomatic auricularis is arises from zygomatic arch and is inserted to the lateral prominent of the auricular cartilage in common some of fibers fuse with scutiformauricularis (Fig. 7).

Scutiformauricularis superficial origin it is partly cover by interscutularis, it is aspect of the auricular cartilage (Fig. 11).

Scutiformauricularis profundus it has two parts and both are well development the origin from deep surface of the scutiform cartilage and inserted to the auricularis cartilage (Fig. 12).

Frontoscutularis it has two parts (frontal and temporal) which arise from the zygomatic arch and temporal line and inserted in the rostral border of the scutiform cartilage (Fig. 7).



Fig. 11: 1-scutuloform auriculars covered with 2- interscutuloform in buffalo.

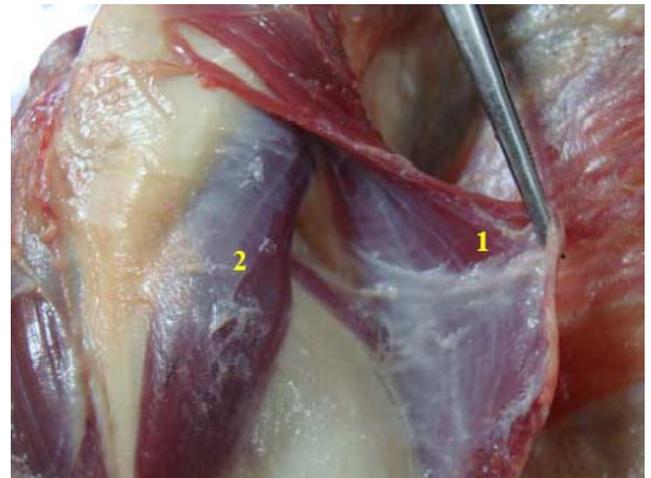


Fig. 12: 1- scutuloform auriculars superficial and 2- scutuloform auriculars profundus in buffalo.

The intrinsic auricle muscle consist of three muscles; Antitragicus is a short and thin fan shaped, band of the two border between auricle and annular cartilage (Fig. 13). Helicis the smallest of three it leis on the cranial border of auricle cartilage and curve backward below the annular ligament (Fig. 13). Transverses and oblige auriculares consist of two or three fleshy parts, they are covered by the insertion of the cervicoauricular superficial (Fig. 14).

The ligament of the auricle consist of the extrinsic connecting it to the side of the skull and intrinsic connecting various part of its cartilage together.

The extrinsic and intrinsic are two in number (cranial and caudal) the cranial extrinsic ligament extend from the

antitragus to the zygomatic process while the caudal extrinsic ligament passes from the concha to the mastoid process (Fig. 15).

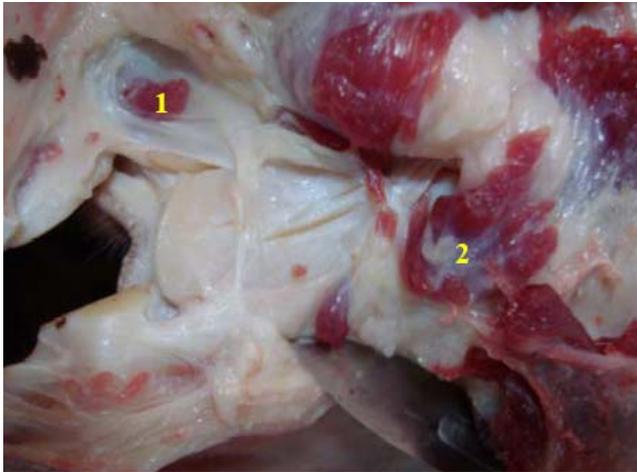


Fig. 13: 1- antitragi's and 2- helices muscle in buffalo.

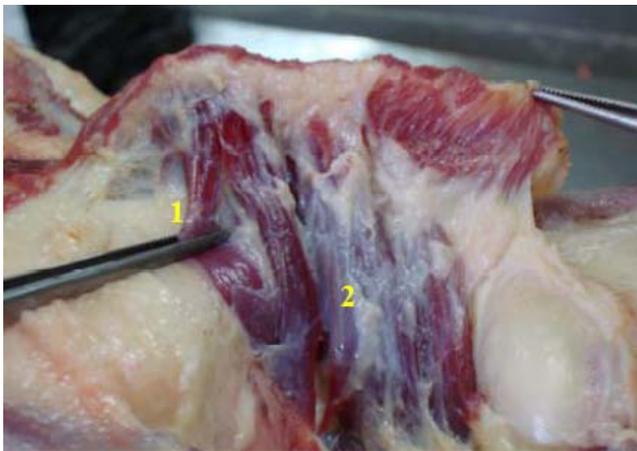


Fig. 14: 1- transverse auriculars and 2- oblique auriculars muscle in buffalo.

The cranial intrinsic ligament are strong fibers bounded the scutiform and auricle cartilage, the caudal intrinsic ligament encircling the boundary of the concha.

Eternal acoustic meatus (Meatus caustic externa) or ear canal is the tube extend from the concha (ear opening) to the tympanic membrane it is formed by cartilage portion and osseous portion, it is the large opening caudal to the zygomatic arch where the external ear attaches, in life its cover by ear drum, it forms the rest of the meatus and is formed by the temporal bone (Fig. 16,17) the meatus in buffalo is oval in shape and about (6.500 ± 0.0816) cm. while in cattle is circular in shape about (5.667 ± 0.126) cm., data presented in table (1,2)

show the length and diameter of the a caustic meatus in both animals, the present data show that the average length and diameters of a caustic meatus in buffalo more than in cattle.



Fig. 15: extrinsic auricular ligament in cattle.



Fig. 16: external acoustic meatus in buffalo.

The most commonly occurred radiological findings (Fig. 18,19) the external a caustic meatus were straight in both animals the external a caustic meatus is first directed ventrally and then rostomedially, lined by skin it is supported by the rolled up part of the auricle cartilage. The meatus are related laterally and ventrally to the parotid gland and the facial nerve crosses the ventral surface of the a caustic meatus deep to the gland (the parotid salivary gland which covers the proximal of the vertical portion of the external a caustic meatus), the

facial nerve detaches a caudal auricular nerve and a branch to the interior of the acoustic meatus, the auricular muscles are innervated by the auricular branches of the facial nerve, the arteries lies more deeply the external carotid having detected the caudal auricular artery (Fig. 20) there are three arteries on the convex surface of the auricle, the medial, intermediate and lateral auricle branches of the caudal auricular artery, maxillary and superficial temporal arteries, the caudal auricular vein comes from the maxillary, it gives off lateral auricular and intermediate auricular vein in both animals.

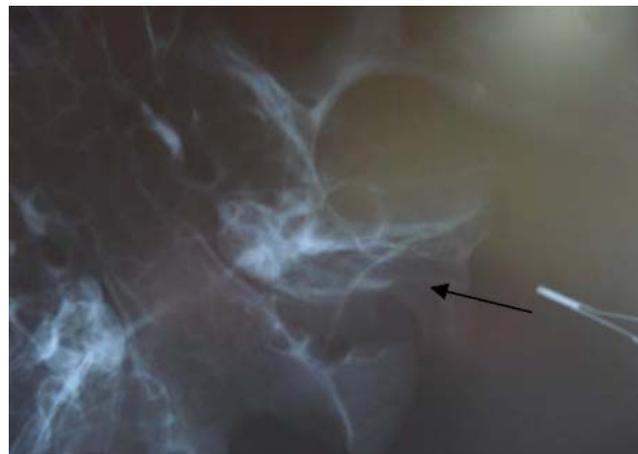


Fig. 19: shows the acoustic meatus in cattle by x-ray.



Fig. 17: external acoustic meatus in cattle.



Fig. 20: shows three branches of the caudal auricular artery in cattle.

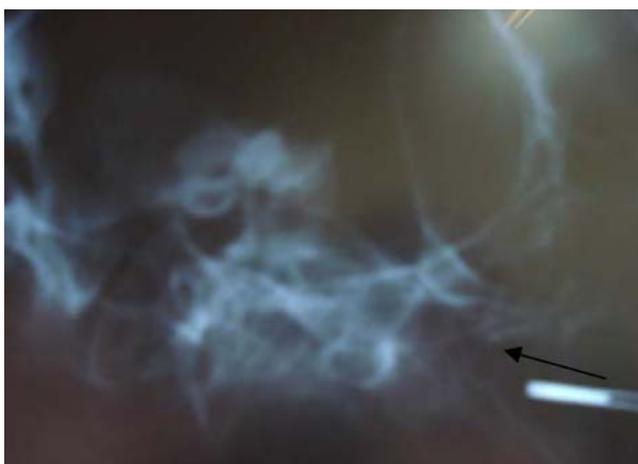


Fig. 18: show the acoustic meatus in buffalo by x-ray.

Table 1: show the length and diameter/ cm of the acoustic meatus of the ear in cattle and buffalo.

Samples (cm)	Cattle		Buffalo		
	length	diameter	length	diameter	
1	Right ear	5.6	0.82	6.4	1.2
	Left ear	5.7	0.79	6.5	1.2
2	Right ear	5.6	0.83	6.3	1.12
	Left ear	5.6	0.83	6.3	1.15
3	Right ear	5.7	0.83	6.5	1.1
	Left ear	5-6	0.84	6.6	1.1
4	Right ear	5.6	0.72	6.4	1.3
	Left ear	5.7	0.71	6.5	1.2
5	Right ear	5.6	0.83	6.6	1.2
	Left ear	5.6	0.82	6.6	1.15
6	Right ear	5.7	0.85	6.5	1.3
	Left ear	5-6	0.86	6.6	1.2

Table 2: show the mean \pm SD with T –test of length and diameter of the a caustic meatus of the ear in cattle and buffalo at P= 0.001.

Group name	Mean	SD	T. test
length of the a caustic meatus in cattle	5.667	0.0816	0.494
length of the a caustic meatus in buffalo	6.500	0.126	
diameter of the a caustic meatus in cattle	0.828	0.0323	0.516
Diameter of the a caustic meatus in buffalo	1.150	0.0224	

Discussion

The present work in both animals showed that the margin of auricle (helix) divided into two crura of which medial larger than lateral, the rostral border of auricle divides into two parts as it approaches the ear opening (auricular conchae), the medial part forms a prominent ridge on the inside of the ear cavity, the rolled up auricular cartilage the tragus and antitragus, the tragus is rectangular and separated from antitragus by antitragus notch the anthlix in both animals is a transverse ridge on the concave surface similar finding was observed by (8) in ruminant.

This work it has been demonstrated that the basal part of the auricular cartilage is coiled so as to form a tube which encloses the cavity of the concha and the annular cartilage curved to form about three-four of a ring similar observation were reported by (9) who showed that external acoustic meatus consist of two structure different parts cartilaginous and osseous. Some authors (10,11) have described the annular cartilage in cattle, sheep and goat while non described by (12).

The origin and insertion of the parotid auricularis and styloauricularis are fused therefore the styloauricularis appears to be absent morphology similar results were also report by (13) frontoscutularis it has two parts (frontal and temporal) which is mention by the present result, was not observed by (13). In our results found the interscutularis is well developed muscle in cattle and buffalo, however (13) observed that this muscle distinct in the ox.

The present work revealed that the external acoustic meatus is short in length and striated while in sheep, goat and dog is curved (8) According to the length and

diameter of external acoustic meatus in buffalo more than in cattle, the measurements were not reported by any of the above mentioned authors in any of the domestic animals, the acoustic meatus are long due to the external ear in domestic mammals varies greatly in size and shape between species and on the other hand the arrangement of the intrinsic muscle that observed by present study similar to that is reported by (13).

The major structure to be avoided are the parotid salivary gland which covers the proximal one third of the vertical portion of the canal (8), otitis externa and calcification of the ear canal are most common ear diseases in veterinary practice and it is essential to identify diagnosis of that disease by radiographic is of value in some case to determined the extent of disease (14).

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