



# Surgical Anatomy of the Esophagus in Cats and Removal of Esophageal Foreign Bodies (Sneeze Spine) Using Laryngoscope Technique



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## Abstract

The aim of the work is to present the surgical anatomy of the esophagus in cats. It helps us how to remove foreign bodies (sneeze spine) through endoscopy technique. The current study is carried out on six cadavers cats of both sexes, and different breed, with weight range from 1-3kg and different breeds. They were collected from veterinary clinical in KSA and Syria. We could knowledge about the numerous layers which cover the esophagus and the topography relation with other structures. Clinical signs, radiography endoscopic examination the most important tools of diagnosis of presence a foreign body embedded in the esophagus walls. The foreign body was successfully removed by using alligator forceps under endoscopic guidance.

**Keywords :** Esophagus; Sneeze spine; Laryngoscope.

## Introduction

The anatomy of the esophagus was previously studied in most mammals. The esophagus was composed of three parts in the cat as typical anatomical animals: cervical, thoracic, and abdominal [1-3]. While in canine the esophagus was consisted of the upper esophageal sphincter, the tubular esophagus, and the lower esophageal sphincter [4]. In canine the first part of esophagus lies dorsal to the trachea but deviates to the left in the middle of the neck and maintains this position through the thoracic inlet [3]. Bremner and Goldberg [5,6] described that, the presence of the transverse esophageal folds is originally a normal anatomic feature of the cat's esophagus while [7] added that the transverse esophageal folds fine in the distal esophagus.

Kook [4] mentioned that the esophageal phase of swallowing begins with relaxation of the upper esophageal sphincter, thus moving the food bolus into the proximal esophagus. Exposure usually occurs because of the playing behaviour of the cat [8]. Ingestion of avian V-shaped bones such as clavícula has been described as a reason of obstruction of the pharynx and proximal esophagus [9]. There is a little literature about the surgical anatomy of the obstruction by foreign bodies in esophagus of cats.

## Material and Methods

The esophagus was studied in seven (3-life and 4-cadavers) cats of both sexes, and of different weights range from 1-3 kg and different breeds. They were collected from the hospital veterinary in the Qassim university, the Veterinary Medical Clinics in Kingdom of Saudi Arabia and Syria. The esophageal lengths measurement was made in situ from the pharynx to the esophago-gastric junction. These were preserved in a solution of 10% neutral formalin to study the topography and relationship of esophagus with the other structures neighboring. Three types of sections were made 1. Longitudinal section was taken from the posterior wall of the cervical esophageal part. 2-cross section was taken from the upper segment of cervical esophageal part 3-cross section was taken from inferior segment of cervical esophagus part. The cat was anesthetized by Ketamine 10% in a dose of 2mg/kg BW and Xylazine HCl in a dose of 0.2mg/kg BW intravenously. This dose was choosing because the time must be short for intervention used Laryngoscope.

## Results

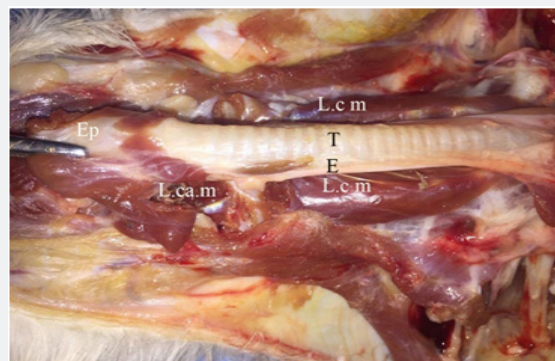
In cat, the esophagus (Figure 1-4) is considered as a complete functional organ. It has an important function in the

body. It transfers food, liquids from the mouth to the stomach. Many slides can be seen before reaching to the esophagus such as; the skin and subcutaneous layer then deep fascia which covers both the trachea. Fascia is followed by the sternohyoideus and mylohyoideus muscles, which are also followed by trachea that lies ventrally to the esophagus. In cats the esophagus begins from the pharynx, extending through the cervical, thoracic and abdominal regions. It is a small, and strong elastic muscular tube, connects the mouth and stomach. The cervical esophagus lies on the dorsal side of the trachea. It courses completely straightly opposite the other animals, at the level of the first to the seven cervical vertebrae. The length of the esophagus in adult cats, varies between 15 and 18cm. (mean 16cm). According to the breeds types. The length of cervical esophagus is about 4 cm. It's about 30% of the length. In generally, its diameter is about 1 cm but it extends through the food course to a certain point. Its elasticity stops due to the extra stretching causing obstruction. The cervical esophageal walls are containing the longitudinal folds in its cranial and middle parts and transverse folds in the caudal part of the cervical part of the esophagus (Figure 3).

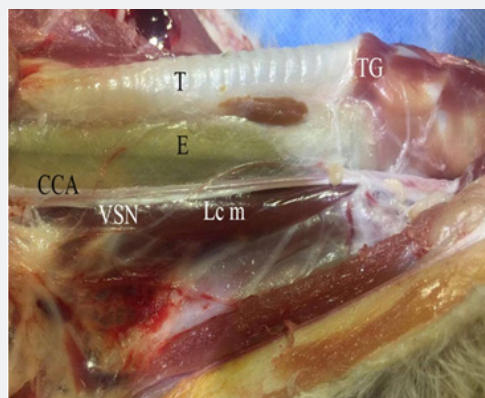
The relationships between the cervical esophagus and other near structure (Figure 1 & 2). The esophagus related to the trachea, (sub vertebral muscles) prevertebral muscles and fascia, thyroid gland, the trachea, vagus nerve and recurrent laryngeal nerve. The cervical esophagus runs within the visceral space of the neck, related to longus colli and longus capitis (sub vertebral) muscles dorsally, and the trachea ventrally Almost completely without any inclination. The thyroid gland is in the upper part and bilateral sides of the cervical esophagus. On the right and left, the esophagus accompanying the right and left, common carotid artery and vagosympathetic trunk. It is easy to recognize the presence of the foreign bodies through symptoms and confirm their diagnosis through the radiograph x-ray (Figure 4) and Laryngoscope. Radiographic images are repeated in lateral view, the foreign bodies are embedded in bilateral esophagus walls tissue.

Laryngoscope in the cat is performed in recumbent position using a flexible Laryngoscope. Laryngoscope of human. In cats, we find many cases of obstruction by foreign bodies such as mass of hair and chicken food bones in esophagus in different side, especially in the first and middle parts of cervical part of esophagus embedded in bilateral esophagus walls tissue as well as stabilized inside it. It results licking hair, speed eating and a large bit food, which can't passes in esophagus causing depression, lack of food. vomiting, and sneezing to try to remove the foreign body (Figure 4 & 5). Many of the foreign bodies had V shape of subclavian or humerus and ulna parts bone. Each spice about 4 cm length and 1 cm diameter with angle 45 degree between them causing obstruction. It was lied nearly 2 cm from the pharynx and embedded inside the walls of the esophagus. The foreign bodies are removed by using a long-grasped forceps under endoscopic guidance.

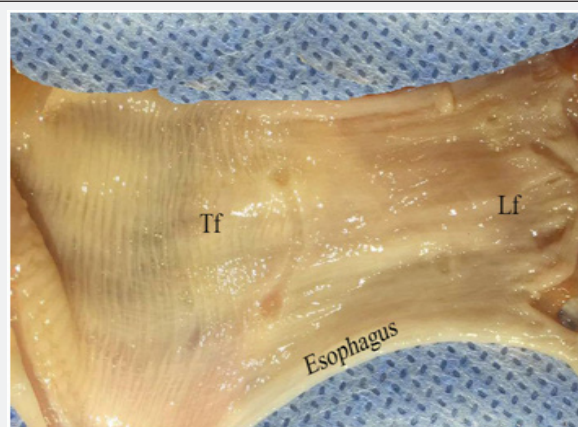
The foreign bodies are removed by using some long-grasped forceps. It can be successful if the foreign body is situated in the proximal part of the digestive tract (pharynx and proximal esophagus) and the shape and size of the foreign body permit this under endoscopic guidance. Endoscopy permits visualization and location of the foreign body and majority can be extracted without recourse to surgery.



**Figure 1:** The photograph shows the esophagus in situ, esophagus (E), trachea (T), epiglottis cartilage (Ep), Longus colli muscle (L.c.m) and Longus capitis muscle (L.ca.m)



**Figure 2:** The photograph shows the structure accompany of the esophagus in situ, trachea (T), esophagus (E), Thyroid gland (TG), Common carotid artery (CCA), Vagosympathetic nerve (VSN) and Longus colli muscle (L.c.m).



**Figure 3:** The photograph shows the internal wall of the esophagus (E) contained longitudinal (L.F) and transverse folds (T.F).



**Figure 4:** Lateral view shows the foreign body (F B) V shape in the proximal part of the esophagus in cat.



**Figure 5:** Image most of the foreign body which was removed from the esophagus in cat.

## Discussion

The present study has shown that the esophagus was covered by many slides including the skin and the subcutaneous layer, deep fascia which was followed by the sternohyoideus and mylohyoideus muscles and trachea, these slides were arranged. These slides haven't recorded in previous studies. The current study revealed that the esophagus was divided into three parts. They were the cervical, thoracic and abdominal. This result agrees with [10,11,12] in cats and dogs. While [1,2,3] in domestic animals. But [4] in canine mentioned that the esophagus was consisted of the upper esophageal sphincter, the tubular esophagus, and the lower esophageal sphincter. On the other; hand the esophagus was functionally, consisting of the upper esophageal sphincter; the esophageal body; and the lower esophageal sphincter [10].

In the present study, the cervical esophagus was lied on the dorsal side of the trachea. It was coursed completely straightly on the dorsal surface of trachea at the level of the first to the seven cervical vertebrae. These results disagree with [1,2,3] in canine and domestic animals. mentioned that the first part of the esophagus lay dorsal to the trachea but deviated to the left in the middle of the neck and maintained this position through the thoracic inlet. However, the authors explained that in domestic animals the esophagus was begin dorsally to the cricoid cartilage of the larynx and followed the trachea down the neck at the second vertebra inclining to the left but regaining a median line above the trachea before and after entering the thorax. While

Budras [13] in horse that recorded the esophagus slips at the opposite the fourth cervical vertebra to the left lateral surface of the trachea.

Our finding, revealed that the cervical esophageal walls were contained the longitudinal folds in its cranial and middle parts and transverse folds in its caudal part, this result disagree with [5,6,7] who described the presence of the transverse esophageal folds only. While [7] added that the transverse esophageal folds were found in the distal esophagus. However; revealed that most transverse folds were observed in the middle and distal thirds of the thoracic esophagus in cat, that disagrees with our results which appear the transverse folds in the caudal part in the cervical esophageal part.as well as there were resemblance to the transverse folds in cats, this appearance in humans has been termed a feline esophagus [14,15].

The length of the esophagus was different among the breed. In the current study, the length of the esophagus in adult cats, varies between 15 and 18 cm which how some agree with [16] reported that the length of the fresh esophagus, as measured in 8 of the 13 adult cats, varied between 17.5 and 21 cm.

The applied importance is to identify the topographic anatomy to avoid the surgery in the neck. Patti [10] indicated that the topographic relationships of the esophagus and the gastroesophageal junction with neighbouring structures were illustrated from the right and left horoscope and the laparoscopic viewpoints.

This study showed that the relationships between the cervical esophageal part of esophagus and other nearly structures. The esophagus ran within the neck. It related to the longus colli (subvertebral) muscles dorsally, and to the trachea ventrally on its course. On its length it accompanied through vagosympathetic trunk and the common carotid artery. These results agree with [17].Review a complete understanding of the anatomy and anatomic relationships of the esophagus in each area is essential for surgeons who addressed esophageal disorders.

Our finding, in many obstruction cases in cats such as mass of foreign bodies of hair and chicken bones in different positions in the esophagus especially in the proximal part of the cervical esophagus part embedded in bilateral esophagus walls but our study disagrees with [18] revealed that the esophageal obstruction is less common than other gastrointestinal obstructions.

In dog [19] recorded that the oral endoscopic removal of the foreign bodies was uncommon because it many push them into the stomach. Our results disagree with the searcher because many foreign bodies cases were removed by endoscope from the mouth. Many of the foreign bodies had V shape of subclavian or humerus and ulna parts bone causing the obstruction, the foreign bodies were removed by using some long-grasped forceps under endoscopic guidance. Rendano [9] assured that ingestion of cat V-shaped bones clavícula has been described as a reason of obstruction of the pharynx and proximal esophagus.

[14,15] recorded that in cat the identical pattern to that of feline esophagus was seen in surgical specimens, when the esophagus was contracted outside the body spontaneously. However; Leib [19] added that in dogs the diagnosis of esophageal foreign body obstruction was usually made via survey thoracic radiography that agreed with our results. Furth [15] recorded that in cat the identical pattern to that of feline esophagus was seen in surgical specimens, when the esophagus was contracted outside the body spontaneously. However; Leib [19] added that in dogs the diagnosis of esophageal foreign body obstruction was usually made via survey thoracic radiography that agreed with our results. Kook [4] mentioned that myasthenia gravis, polymyositis, polymyopathy, dysautonomia, distemper, tetanus, endocrine causes Esophageal obstruction. On the other hand, the abnormal healing of previous esophageal surgery is also a common condition of stricture formation in dogs and cats. reported by [20].

Finally, this study assured on the using of Laryngoscope to remove the foreign bodies to avoid the surgical complications because many esophageal infections are most common due to esophageal obstruction.

## Conclusion

The obtained data provided a sufficient basis to the endoscopic technique in the cat with esophageal obstruction cases. The gross and topographical anatomy of the cat esophagus had different approach than in other domestic animals. The Laryngoscope was the best technique used to remove the foreign bodies from the esophagus in the cat to avoid surgical complications.

## Competing interest

- The authors declare that it has no financial or personal relationships which may have inappropriately influenced them in writing this article.
- Author's contributions GA (Syria) planned and conceived the search the data. GA (Syria), interpreted the results and designed the figures wrote the manuscript. The author read and approved the final manuscript.

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