

Macro-Anatomic Investigation of Larynx, Trachea and Lungs in Martens (*Martes Foina*)

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With 3 figures

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Abstract

The purpose of this study is to determine the macroanatomic characteristics of larynx, trachea, and lungs in martens. In this study, six martens including three males and three females were used. It was found that the larynx of marten was consisted of totally five cartilages, one paired, and three unpaired. These cartilages were cartilago arytenoidea, cartilago thyroidea, cartilago cricoidea, and cartilago epiglottica. It was observed that trachea was consisted of averagely 56-58 cartilago trachealis and the length was measured as approximately 19 ± 2 cm. The pulmo dexter had four lobes: lobus cranialis, lobus medius, lobus caudalis, and lobus accessorius. On the other hand, the pulmo sinister had two lobes: lobus cranialis and lobus caudalis. As a result, it was expected that the macro-anatomic information regarding larynx, trachea, and pulmones would address the lack of literature in this area.

Keywords: Marten, Larynx, Pulmo (lung), Trachea.

Introduction

Marten (*Martes foina*) is a species of the family Mustelidae of the suborder Caniformia of the order Carnivora. This sub-species is represented by mink and badger (ITIS 2015).

Larynx is a tube-shaped organ that provides the connection between the pharynx and trachea. The function of the larynx is preventing the pass-age of foreign matters into the respiratory tract during respiration. Also, another essential function of the larynx is to create the sound (König and Liebich 2007). The skeleton of the larynx is combined with double-side symmetrical shaped cartilages (cart.). Larynx in a dog is consisted of seven cartilages. These cartilages are epiglottic, thyroid, arytenoid, cricoid, cuneiforme and corniculate. While cart. Arytenoidea is paired, the others are unpaired (Evans and

Christensen, 1993; Getty, 1975; Pasquini et al., 2003). In the cat, the larynx is shaped by the combination of totally five cartilages as one double (cart. arytenoidea) and three single (cart. cricoidea, cart. Epiglottica, cart. thyroidea), (Dyce et al., 2002; Getty, 1975; Pasquini et al., 2003).

Trachea is a flexible, cartilaginous, and membranous tube which forms the proximal part of the tracheobronchial tree (Getty, 1975). On the other hand, the dog trachea is formed by combination of 42-46 cart. trachealis, and the cat trachea is formed by 38-43 cart. trachealis (Getty, 1975 ; König and Liebich, 2007). It is stated that although trachea can be changed according to types of carnivores, its average length is 22.5 cm (Bahadır and Yıldız, 2005).

In cats and dogs; being larger than pulmo sinister, pulmo dexter is consisted of four lobes: lobus cranialis, lobus medius, lobus caudalis, and lobus accessorius. Pulmo sinister has two lobes: cranial and caudal (Evans, 2010; Getty, 1975).

In the available literature, while there are some related to the respiratory tracts of some carnivores, a study on the marten could not be found. Therefore, the aim of this study was to describe the

macroanatomic characteristics of the larynx, trachea, and lungs (pulmones) in the *Martes foina*.

Materials and Methods

In this study, six martens (three males and three females), which were killed in traffic accidents and brought to the Anatomy Department of Faculty of Veterinary Science of Mehmet Akif Ersoy University, were used. Permission was taken from Local Ethic Committee of Animal Experiments of Mehmet Akif Ersoy University in order to use the animals. Larynx and trachea were exposed by dissecting the neck skins and muscles of the martens. Then, the breast skins and muscles were dissected. The ribs were cut by using a costatome and the larynx, trachea, and pulmones were taken out as a whole. Findings were obtained by dissecting the laryngeal cartilages individually and a picture of each cartilage was taken. The number of the cartilagenous rings of the trachea were counted and transverse sections were photographed. Each lobe of the pulmo (lung) was separately weighed by using a precision scale. Findings regarding number, shape, and location of these lobes were obtained. Photos were taken by using a Canon 600D brand camera. Digimato brand digital caliper (150mm) was used to take

measurements. Weight dimensions were measured by a Precisa precision scale (S 125 SM). The terminology was based on the *Nomina Anatomica Veterinaria* (NAV 2012).

Results

In this study, the average length of the marten from the nose tip to tail root was 44 cm. The average body weight of marten was 2.20 kg. The larynx, trachea, and lungs of marten were viewed from cranial to caudal.

Larynx

The larynx of the marten consisted of four cartilages; one double and three single namely: cart. thyroidea (unpair), cart. arytenoidea (pair), cart. cricoidea (unpair), and cart. epiglottica (unpair). The cart. Thyroidea forms the base of the larynx. It has a cornu rostrale, cornu caudale, and lamina thyroidea. There was no evidence about significant linea obliqua and prominentia laryngea ventralis on this cartilage. The cart. Arytenoidea were simple pair of cartilages forming the cranio-dorsal aspect of the larynx. It was observed that there was a transition via membrana crico-tracheale between the first tracheal ring and the cart. cricoidea of the larynx and it has a significant processus muscularis. The apex of

the cart. epiglottica is wriggled in the ventral direction (Fig 1).

Trachea

The trachea was shaped by 56-58 cartilages and its length was approximately 19 ± 2 cm. It lies on the median line of the animal neck and was formed by two parts: cervical part and thoracic part. Examining transverse sections of the tracheal rings cleared that the rings were flattened dorso-ventrally, has a slightly oval shape and its ends were free. The free ends of the tracheal rings faced each other, and leaving a space of about 5.31 mm long between them. In the cervical part of the trachea the diameter was 8.32 mm for transversal and 5.94 mm for vertical lengths. In the mid part of the trachea these values were 7.00 mm for transversal and 5.23 for vertical lengths. At the trachea bifurcation level, the values were 8.49 mm and 5.24 mm for transversal and vertical respectively (Fig 1).

The thoracic part of the trachea entered the thorax at a level between the 4th and 5th ribs. The trachea was branched at the bifurcatio trachea into two main bronchi: bronchus principalis dexter and bronchus principalis sinister. The tracheal bifurcation angle was measured as 88.47° . It was determined that bronchus principalis

dexter splits into four bronchi ventilating the right lung lobes. These four bronchi were bronchus cranialis, bronchus medius, bronchus caudalis, and bronchus accessorius. It was also found that the bronchus principalis sinister splits into two bronchi: bronchus cranialis sinister and bronchus caudalis sinister.

Lung (Pulmo)

On opening the chest cavity in marten, the lungs were dark red-brown in colour and had the flat surfaces. The fissure interlobaris in martens was deep and the lobes were significantly distinct from each other.

a) The right lung (Pulmo dexter)

The right lung (pulmo dexter) was formed by four lobes: lobus cranialis, lobus medius, lobus caudalis, and lobus accessorius. The pulmo dexter was located at a level between the 2nd and 10th ribs. The lobus cranialis pulmonis dexter lies at the level between the 2nd and 7th ribs, the lobus medius pulmonis dexter at the level between 6th and 8th ribs, the lobus accessorius pulmonis dexter at the level between the 7th and 8th ribs, and lobus caudalis pulmonis dexter at the level between 5th and 10th ribs.

The shape of the lobus cranialis pulmonis dexter was long, dorso-

medially flattened and looked like a small tongue. The lobus medius pulmonis dexter was flat and pyramidal in shape. The lobus accessorius pulmonis dexter looked like a plump pyramid; whereas, the surface of the lobus caudalis pulmonis dexter was found to be similar to a stuffed and large triangle.

b) The left lung (Pulmo sinister)

The left lung (pulmo sinister) was formed by two lobes only: lobus cranialis and lobus caudalis (Fig 2). The pulmo sinister was observed between 2nd and 10th ribs. The lobus cranialis pulmonis sinister was determined at the level between 2nd and 6th ribs, while the lobus caudalis pulmonis sinister was observed to lie at the level between the 5th and 10th ribs.

Estimating the weight of the lung lobes revealed that; the lobus cranialis pulmonis dexter was 4.8 gr, the lobus medius pulmonis dexter was 1.9 gr, the lobus caudalis pulmonis dexter was 7.4 gr and the lobus accessorius pulmonis dexter was 2.3 gr. In the left lung, the lobus cranialis pulmonis sinister and lobus caudalis pulmonis sinister weighed 5.7 gr and 9.3 gr, respectively.

The upper surface of the lobus cranialis pulmonis sinister was large and narrowed ventrally; whereas,

the upper surface of the lobus caudalis pulmonis sinister was similar to a stuffed triangle (Fig 3).

Discussion

Larynx

Larynx of the dog was shaped by combination of seven cartilages: cart. epiglottica, cart. thyroidea, cart. arytenoidea (pair), cart. cricoidea, cart. cuneiformis and cart. Corniculate (Evans and Christensen, 1993; Getty, 1975; Pasquini et al., 2003). Larynx of the cat was shaped by combination of 5 (3 unpaired, 1 paired) cartilages: cart. cricoidea, cart. Epiglottica, cart. thyroidea, and cart arytenoidea (Dyce, 2002; Getty, 1975; Pasquini et al., 2003). In this study, the marten's larynx was shaped by combination of 5 cartilages as in the cat's larynx (3 unpaired, 1 paired). Cart. Cuneiformis and cart. corniculate cartilages, which were described in the larynx of the dog, were not observed in the larynx of the marten.

Getty (1975) reported that the appearance of cart. thyroidea was different in dogs and cats. While the laminae in dogs were similar to a rectangular, the laminae in cats were higher, narrower and extended obliquely towards the corpus to dorsocaudal. In martens, the laminae of cart. thyroidea were perpendicular and looked like rectangular as in dogs. Evans and

Christensen (1993) and Getty (1975) reported that in dogs there was a significant linea obliqua and prominentia laryngea ventralis on the cart. thyroidea. Getty (1975) noted that in cats the linea obliqua was not clear as in dogs and prominentia laryngea ventralis was not available. In agreement with what Getty (1975) stated in cats, the prominentia laryngea ventralis and linea obliqua were not also present in martens. König and Liebich (2007) and Getty (1975) stated that the apex of the epiglottis was sharp and triangular in carnivores. In the present study, the apex of the epiglottis was sharp and triangle, and also, curved in cranioventral direction.

Trachea

Evans and Christensen (1993) and Getty (1975) reported that while trachea in cats was consisted of 38-43 tracheal rings, the trachea in dogs was consisted of 42-46 tracheal rings (cartilago trachealis). The tracheal rings were 56-58 in martens. Getty (1975) stated that the ends of tracheal cartilages faced each other in uppe and there was an opening between them in transverse sections in the cervical part of the trachea. In martens, the ends of cartilages were faced each other and there was an opening as in the carnivores (mentioned in the

results). Getty (1975) stated that the trachea was separated into two bronchi towards the right of the median plane at the level between the 5th and 6th ribs and dorsal to the hearth base. These bronchi were bronchus principalis dexter and sinister. Similar bifurcation was found in martens at the level of the 4th and 5th ribs (mentioned before in the results). Bahadır and Yıldız (2005) reported that the average length of the trachea was 15-30 in carnivore species. In this study, this length was measured as 19 ± 2 cm for martens.

Lungs (Pulmones)

Getty (1975) and Dursun (2006) reported that the color of the blood drained the lungs could change from pink to orange according to the blood content. They also stated that when the lung is full with blood, its color was dark red, in addition, the carnivore lung had a flat surface. In marten of this study, the color of lungs was dark red-brown and its surface was flat. Getty (1975) stated that in cats and dogs, the pulmo dexter was consisted of four lobes which were lobus cranialis, lobus medius, lobus caudalis, and lobus accessorius and the pulmo sinister was consisted of two lobes: cranial and caudal. In the martens of the present study the lungs have the similar number of lobes as in cat

and dog. Getty (1975) and Dursun (2006) reported that lungs were divided into lobes by interlobar fissures (fissura interlobares) and these fissures were quietly deep in carnivores. In parallel with this information, the fissura interlobares in martens were deep and lobes were significantly distinct from each other (This piece of information was not mentioned in the results and was added there).

The study involves some limitations. Due to the fact that martens are wild animals, the lack of materials can be considered as a limitation. Since animal materials were arrived as dead, histological examination could not be performed. Also, owing to the fact that the lack of literature about some species in the same family (mink, badger, etc.), gives no chance to compare with animals in the same order could be regarded as a limitation of the study.

Conclusion

In conclusion, larynx, trachea and lungs of the martens were described macroscopically. The larynx was similar to the cat in felidae family; whereas, the trachea and lung were similar to canidae. It is expected that the information set forth regarding martens would address the lack of literature in this area.

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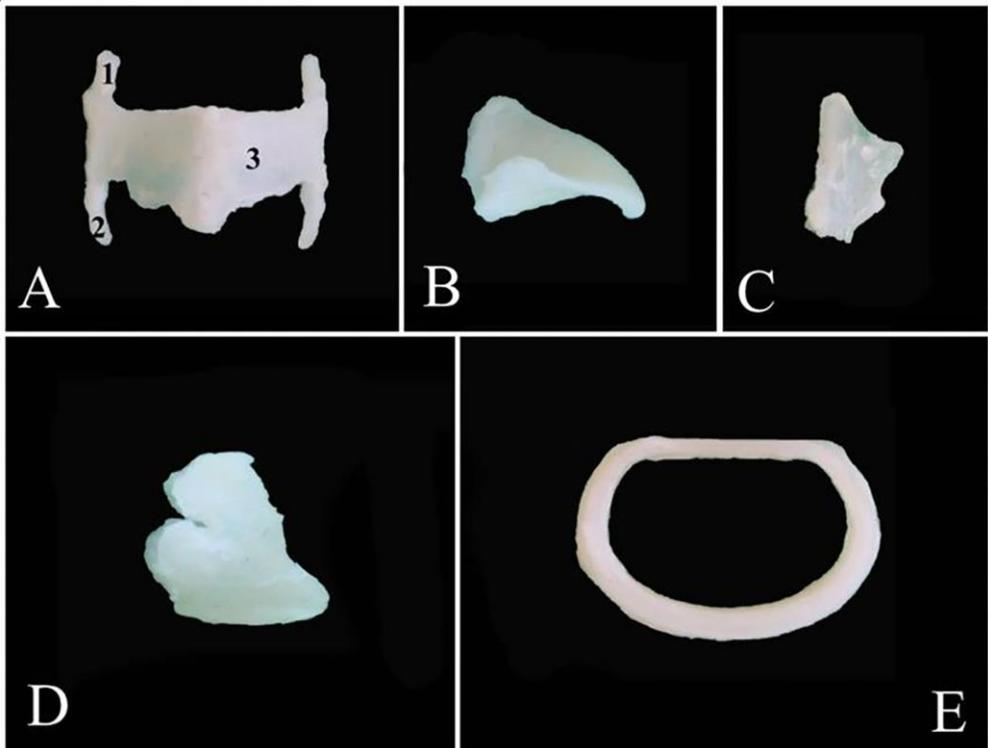


Fig (1): Larynx cartilages and transverse sections of cartilago trachealis. A: Cartilago thyroidea, 1. Cornu caudale, 2. Cornu rostrale, 3. Lamina thyroidea, B: Cartilago epiglottica, C: Cartilago arytenoidea, D: Cartilago cricoidea, E: Cartilago trachealis (the upper 1/3)

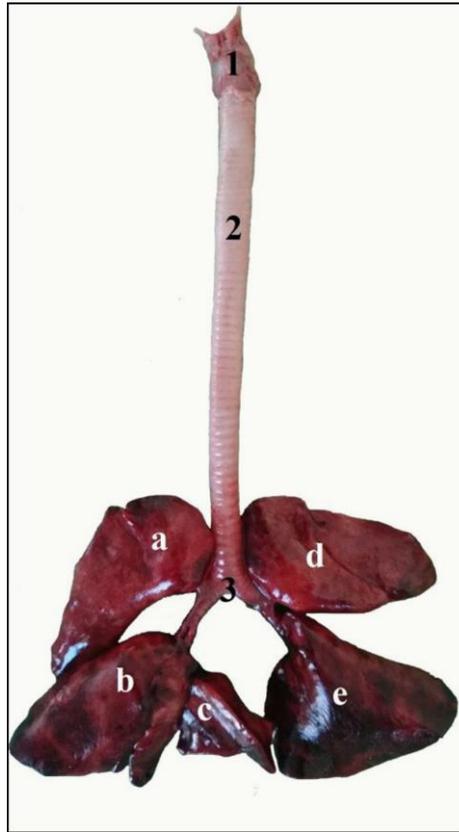


Fig (2):The dorsal image of the larynx, trachea and lung in marten. 1. Larynx, 2. Trachea, 3. Bifurcatio trachea, a. Lobus cranialis pulmonis dextri, b. Lobus caudalis pulmonis dextri, c. Lobus accessorius pulmonis dextri, d. Lobus cranialis pulmonis sinistri, e. Lobus caudalis pulmonis sinistri

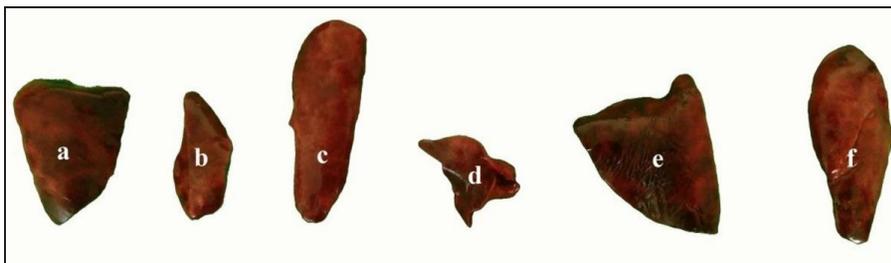


Fig (3): The image of the separated pulmonary lobes (lobus pulmonis). a. Lobus caudalis pulmonis dextri, b. Lobus medius pulmonis dextri, c. Lobus cranialis pulmonis dextri, d. Lobus accessorius pulmonis dextri, e. Lobus caudalis pulmonis sinistri, f. Lobus cranialis pulmonis sinistri.

Animal species in this Issue

Martens (*Martes foina*)



Kingdom: Animalia & Phylum: Chordata & Class: Mammalia & Order: Carnivora & Suborder: Caniformia & Family: Mustelidae & Subfamily: Mustelinae, Genus: ***Martes*** & Species: ***N. foina***

The **beech marten** (*Martes foina*), also known as the **stone marten**, **house marten** or **white breasted marten**, is a species of marten native to much of Europe and Central Asia, though it has established a feral population in North America. While the pine marten is a forest specialist, the beech marten is a more generalist and adaptable species, occurring in a number of open and forest habitats.

The beech marten has a somewhat longer tail, a more elongated and angular head and has shorter, more rounded and widely spaced ears. Its nose is also of a light peach or grey colour, whereas that of the pine marten is dark black or greyish-black.

the beech marten moves by creeping in a polecat-like manner, whereas the pine marten and sable move by bounds. The beech marten's fur is coarser than the pine marten's, with elastic guard hairs and less dense underfur. Its summer coat is short, sparse and coarse, and the tail is sparsely furred. The colour tone is lighter than the pine marten's. Unlike the pine marten, its underfur is whitish, rather than greyish. The tail is dark-brown, while the back is darker than that of the pine marten.

Source: Wikipedia, the free encyclopaedia