رقم البحث (9)

COMPARATIVE MORPHOLOGICAL STUDIES ON LYSSA IN CAMEL AND CARNIVORES

BY

M.B. Shoaib

Department of Anatomy, Faculty of Veterinary Medicine,

Mansoura University, Mansoura, Egypt.

ABSTRACT

Conformist macroscopic and microscopic methods were used to reveal the morphological differences of the lyssa in carnivores (dogs and cats) and camel .Six heads of adult healthy dogs, cats and camels, of both sexes were used as materials. In the dog the lyssa, pinkish white colored, was more or less straight in its course. In the cat the lyssa, yellow colored, had a helical appearance and its edge facing the oral cavity became sharp. The whole body of the cat's lyssa was buried among the intrinsic lingual muscles. In the dog, although aboral, two thirds of the lyssa were squeezed among the intrinsic lingual muscles, its cranial third was placed just under the mucosa to protrude slightly into the oral cavity. In carnivores, the whole body of the lyssa was determined to have been formed by the nearly adipose tissue in which occasional striated muscles existed. Moreover, in the middle third of the dog's lyssa, dense striated muscle fibers were seen dorsally to the adipose tissue, and we also noticed with interest that the lyssa sheath embracing this part contained few muscle spindle-like structures. It was of interest that in the cat a pyramidal rod encircled by a fine capsule of connective tissue was attached to the ventral edge of the cranial third of the lyssa.

INTRODUCTION

The lyssa is a morphological structure situated ventro-medially at the apex of the tongue in carnivores, which can easily be demonstrated on a cross section. In the pig, a topographically corresponding streak of fat tissue with a hyaluronan-rich matrix is found but a connective tissue sheath is missing. (Budras et al., 1994; Capellari et al., 2001). In olden times, the lyssa was thought to be a worm causing rabies in dogs, and it was sometimes removed to cure the disease (Easley, 1999). Lyssa is also a synonym for rabies. The illness

was known to the ancient Greeks as lyssa, meaning “frenzy”. But the Romans, adopting the Latin word that means “to rage”, gave us the name by which the disease is known today: rabies. This fusiform fibrous spicule shaped lyssa extends from the apex to the level of the attachment of the frenulum linguae (Evans and La Hunta, 1996). Budras et al. (1994) considered the adipose tissue of the lyssa as a structure because no change appeared during life in its adipose tissue. The authors (Capellari et al., 2001) claimed that the contraction of skeletal muscles located dorsally to the adipose tissue in the aboral half of the carnivore's lyssa causing volume reduction and consequently stiffening, straightening and dorsal flexion of the lyssa according to the shape of its connective tissue sheath, and that its relaxation causes the lyssa to become soft and to take an undulating course. Since previous anatomical descriptions concerning the lyssa in carnivores are rather superficial and/or conflicting, in the present study we aimed to describe a detailed morphology of the lyssa in the cat and dog.

MATERIAL AND METHODS

Six heads of adult healthy cats, dogs and camel of both sexes were used as materials. The cats, mixed breeding, 1 to 2 years of age, were weighing between 2.0 and 3.0 kg each; the dogs, mixed breeding, 1 to 3 years of age, were weighing between 15 and 20 kg each. The camels, one-humped camels, 2-3 years of age, were weighing between 300 and 350 kg each. The dog and cat heads were obtained from the recorded cadavers used by students in an anatomy laboratory of Mansoura University, Faculty of veterinary medicine, Egypt. The camel heads were obtained from kafr el sheikh abattoir The animals were intramuscularly anaesthetized with 2 mg/kg xylazine HCl (Rompun®, Bayer, Istanbul, Turkey) and 20 mg/kg ketamine HCl (Ketanez®, Alke, Istanbul, Turkey), and subsequently killed by exsanguinations from the right common carotid artery without regaining consciousness. After the tongues of the animals were removed, the specimens were transferred into containers with 10% buffered formaldehyde solution. The tongues of the collected specimens with lyssa were investigated macroscopically. For routine histological examinations, the tissue samples of the remaining tongues were fixed in 10% buffered-formaldehyde (pH 7.4), dehydrated, cleared and embedded in paraffin blocks and cut in 6-µm thick transverse sections which were stained with Crossman’s trichrome stain (Bradbury and Gordon, 1990). All measurements were performed using a digital calliper (Mitutoyo 500 171-1 Diagrammatic Calliper 150mm/6in, Japan).

RESULTS

Macroscopically:

In carnivores, the lyssa was rod-shaped supporting structure in the free segment of the tongue, situated in the median plane next to the ventral surface of the tongue. The lyssa was defined by a coarse sheath of connective tissue. However, in camel the lyssa was observed as a ridge- like structure, convex in its middle and tapered in both extremities, situated in the anterior third of the ventral surface of the tongue. The cranial extremity of the lyssa was about 2 mm and 7 mm away from the apex of the tongue in the cat and camel respectively. However, in the dog it reaches the apex of the tongue. The ***cat's lyssa*** was yellow colored and had an average length of 1.5-2.0 cm. Moreover, in the isolated tongue, the lyssa was tortuous in its course and its edge that faced the oral cavity became sharp (Figure 2). ***In the dog,*** the lyssa had almost straight course and pinkish white color, was approximately 3.5 cm long. The whole body of the cat's lyssa was buried among the intrinsic lingual muscles. In the dog, although the aboral two thirds of the lyssa were instituted among the intrinsic lingual muscles, the cranial third was located just under the mucosa to protrude slightly into the oral cavity. Consequently, the cranial portion of the dog's lyssa was readily visible and was palpable on the median plane in the free tip of the tongue. In carnivores, the sheath of the connective tissue of the lyssa was mixed with the lingual septum. ***In the cat***, the sheath leaving the aboral extremity of the lyssa about 10 mm away from the lingual frenulum was mixed aborally with the rostral part of the vertical fibers of the genioglossus muscle. ***In the dog***, however, the sheath completely surrounding the lyssa ran deeply into the intrinsic muscles where it terminated with a membranous form of approximately 10 mm distance from the lingual frenulum. **In the camel**, the lysaa was a thickening in the mid-ventral surface of the tongue, was approximately 4-4.5 cm in length.

Microscopically:

In carnivores, the body of the lyssa was encircled by a thick connective tissue made from collagen fibers. The latter ones were mixed with those of *lamina propria* along the whole length of the lyssa (Figure 3). However, in camel, the body of the lyssa was encircled by a thin connective tissue capsule. This structure was covered ventrally by the epithelium of the ventral surface of the tongue. In carnivores, the entire body of the lyssa was found to have been formed by the nearly adipose tissue in which not only occasional striated muscle fibers but also blood vessels and nerve fibers were found. Moreover, in the middle third of the

dog's lyssa, dense striated muscle fibers were seen dorsally to the adipose tissue (Figure 4), and we also noticed with interest that the lyssa sheath embracing this part contained few muscle spindle-like structures (Figure 5). In the cat it was interesting that a pyramidal rod encircled by a fine capsule of connective tissue was attached to the ventral edge of the cranial third of the lyssa (Figure 6). This rod was formed by the adipose tissue and seemed to support the lyssa ventrally. In the camel, the body of the lyssa consisted mainly of irregular dense connective tissue. In addition, group of striated muscle fibers and fat cells were pronounced. In the light of the macroscopic and microscopic findings, we suggested that the lyssa of both species serves as an elastic limb and/or skeleton of the free portion of the tongue and its helical or J-shaped structures can possibly be straightened by the contraction of intrinsic lingual muscles.

DISCUSSION

The present work showed that Although some authors (Evans and Christensen, 1979; Nickel et al., 1979; Schaller, 1992; Budras et al., 1994; Frewein and Vollmerhaus, 1994) stated that the cartilaginous tissue existed in the structure of the lyssa in carnivores, in our study we found no cartilaginous tissue in both species this result was in agreement with Capellari et al. (2001) and Besoluk et al. (2006). Although Capellari et al. (2001) reported that the lyssa had a rod-shaped appearance in both cat and dog. Moreover, Besoluk et al. (2006) stated that in the dog the lyssa was more or less J-shaped. this study revealed that it was spiral-shaped in the cat and straight in the dog. We proposed that the spiral structure of cat's lyssa makes its very quick and/or short-time lengthening possible, and therefore the cat can effectively use its tongue for speedy lingual movements. In camel, the present study revealed that the lyssa was ridge like structure. This results was in agreements with . The authors mentioned above stated that although the oral half of the lyssa contained mainly the adipose tissue, its aboral half also had skeletal muscles placed dorsally on the adipose tissue. However, we found that the whole body of the lyssa in both species comprised the adipose tissue in which rare striated muscles dispersed sparsely, and that in the dog its middle third also had dense striated muscle fibers located just dorsally to the adipose tissue.

Gartner and Hiatt, (2001) it was stated that the muscle spindles, an important proprioceptor, lie among myofibres and are monitoring devices of the nervous system for body position, tactile input, joint movement. We also saw that muscle spindle-like structures

existed in the middle third of the dog's lyssa sheath. We proposed that they possibly detected and/or adjusted the threshold level of changes suitable for any lingual tension thus acting as a sort of potentiometer apparatus. However, since vertical fibers of the genioglossus muscle in the cat were connected with the aboral extremity of the lyssa, they possibly substitute for muscle spindles in order to regulate the lingual extending position. Based on the findings of our study, it was concluded that the lyssa must be taken into consideration not only in operations on pathologic structures such as intermandibular and dermoid cysts found in the mouth and tongue (Liptak et al., 2000), but also in *frenulum linguae* operations such as partial or complete ankyloglossia and sublingual frenectomy (Eisenmenger and Zetner, 1985). The authors claim that further embryological and physiological studies are required to understand thoroughly the functional importance of the lyssa in carnivores. They also suggest that the results from this study shed light on the future experimental studies on the lyssa, and that they contribute considerably to the present anatomical knowledge regarding the lyssa in the cat and dog.

Legend of figures:

Figure 1. Location of the lyssa in dog's tongue, arrows show the J-shaped curving of lyssa
Abbreviations: L = lyssa; Lf = lingual frenulum

Figure 2. Location of the lyssa in cat's tongue, arrows show the helical structure of lyssa

Abbreviations: L = lyssa

Figure 3. Transverse section of the cranial third of the lyssa in dog Abbreviations: Ct = connective tissue; Dlf = deep longitudinal

fibres; L = lyssa; Ls = lingual septum; Tf = transverse fibres

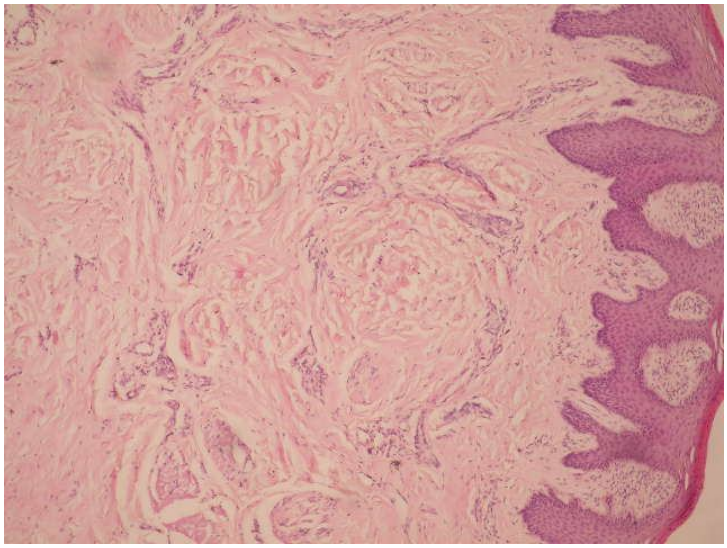

Figure 4. Transverse section of the middle third of the lyssa in dog

Abbreviations: At = adipose tissue; Ct = connective tissue; Dlf = deep longitudinal fibres; Sm = striated muscle; Pf = perpendicular fibres; Tf = transverse fibres

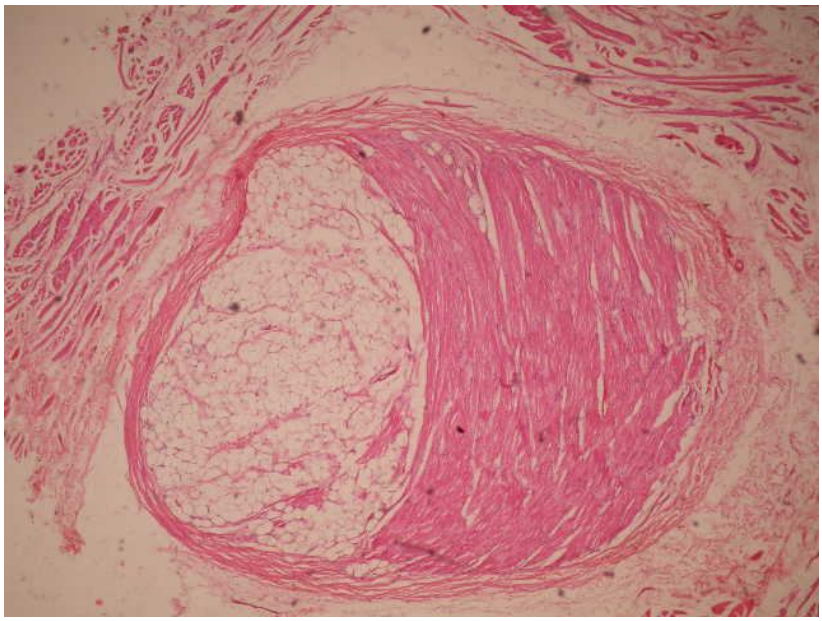

Figure 5. Muscle spindles in the connective tissue sheath of the middle third of the lyssa in dog.

Abbreviations: At = adipose tissue; Ct = connective tissue;

Ms = muscle spindle

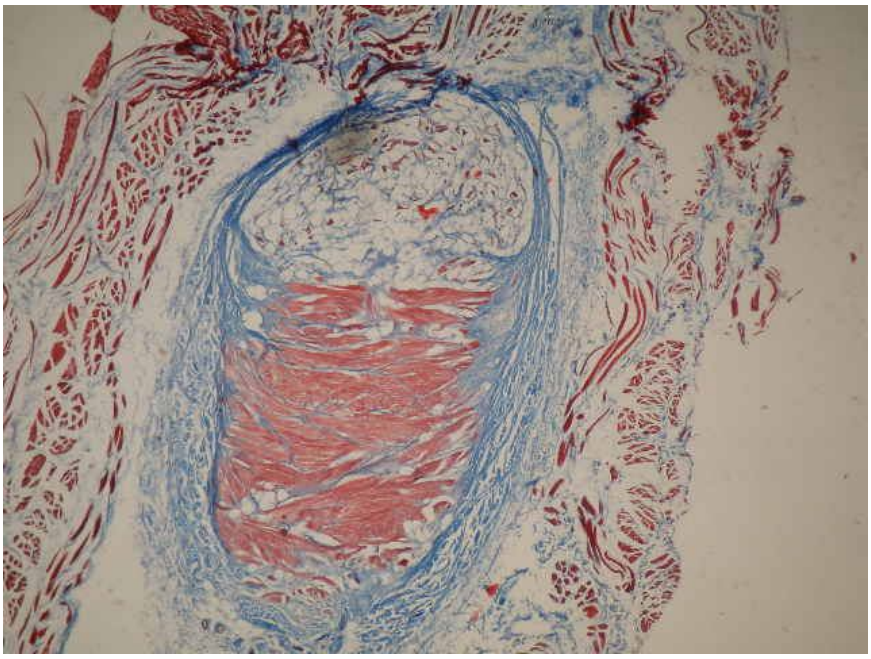

Figure 6. Transverse section of the cranial third of the lyssa in cat

Abbreviations: * shows a pyramidal rod of adipose tissue encapsuled by connective tissue; A = artery; Dlf = deep longitudinal fibres; L = lyssa; Ls = lingual septum; Pf = perpendicular fibres; Slf = superficial longitudinal fibres; Tf = transverse fibres

REFERENCES

Bradbury P., Gordon K.C. (1990): Connective tissues and stains. In: Bancroft J.D., Stewens A. (eds.): The Theory and Practice of Histological Techniques. 3rd ed. The Bath Press, Avon. 119–142.

Budras K.D., Fricke W., McCarthy P.H. (1994): Anatomy of the Dog. An Illustrated Text. 3rd ed. Mosby-Wolfe, London. 43, 109.

Capellari H., Egerbacher M., Helmreich M., Bock P. (2002): Bau und Gewebekomponenten der Lyssa: Fettzellen, myxoide Zellen und Knorpelzellen binden Antikorper gegen S-100 Proteine. Wiener Tierarztliche Monatsschriften, 89, 197–202.

Easley K. (1999): Veterinary Dentistry: Its origin and recent history. Journal of Dentistry, 47, 83–85.

Eisenmenger E., Zetner K. (1985): Veterinary Dentistry. Lea & Febiger, Philadelphia. 140.

Evans H.E., Christensen G.C. (1979): The digestive system. In: Miller's Anatomy of the Dog. 2nd ed. W.B. Saunders Company, Philadelphia. 441–442.

Evans H.E., La Hunta A. (1996): Miller's Guide to the Dissection of the Dog. 4th ed. W.B. Saunders Company, Philadelphia. 273–274.

Frewein H.J., Vollmerhaus B. (1994): Anatomie von Hund und Katze. Blackwell Wissenschafts-Verlag, Berlin.132–133.

Gartner L.P., Hiatt J.L. (2001): Color Textbook of Histology.2nd ed. W.B. Saunders Company, Philadelphia. 170–172.

Liptak J.M., Canfield P.J., Hunt G.B. (2000): Dermoidcyst in the tongue of a dog. Australian

Nickel R., Schummer A., Seiferle E. (1979): The Viscera of the Domestic Mammals. 2nd revised ed. Verlag Paul Parey, Berlin. 31, 58.

Schaller O. (1992): Illustrated Veterinary Anatomical Nomenclature (with the cooperation of Constantinescu M.G., Habel R.E., Sack W.O., Schaller O., Simoens P. and de Vos N.R.). Ferdinand Enke Verlag, Stuttgart. 149. Received: 2006–07–13.

Besoluk K., Eken E., Sur E. (2006): Morphological studies on lyssa in cats and dogs Veterinarni Medicina, 51, 2006 (10): 485–489

دراسات مورفولوجيه مقارنة علي الليسا في الجمل واكلات اللحوم

د محمود محمد بدران شعيب

قسم التشريح- كلية الطب البيطري- جامعه المنصوره

الملخص العربي

في هذا العمل تم استخدام دراسات مورفولوجية وميكروسكوبيه لتوضيح التركيب التشريحي والهستولوجي المقارن لليسا في الجمال واكلات اللحوم (القطط و الكلاب) . تم استخدام عدد ٦ رؤس من الجمال و القطط والكلاب من الجنسيين. و قد اظهرت النتائج ان هناك تماثل في التر