



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(2): 1658-1661

© 2020 IJCS

Received: 20-01-2020

Accepted: 23-02-2020

Girish MH

Assistant Professor, Department of Anatomy, Veterinary College, Bengaluru, India

Jamuna KV

Department of Veterinary Anatomy, Veterinary College, Bengaluru-24, Karnataka, India

Prasad RV

Department of Veterinary Anatomy, Veterinary College, Bengaluru-24, Karnataka, India

Manjunatha K

Department of Veterinary Anatomy, Veterinary College, Bengaluru-24, Karnataka, India

Bharathkumar ML

Department of Veterinary Anatomy, Veterinary College, Bengaluru-24, Karnataka, India

Ganganaik S

Department of Veterinary Anatomy, Veterinary College, Bengaluru-24, Karnataka, India

Corresponding Author:

Girish MH

Assistant Professor, Department of Anatomy, Veterinary College, Bengaluru, India

Anatomical localisation of the tonsils in oropharynx and nasopharynx of sheep

Girish MH, Jamuna KV, Prasad RV, Manjunatha K, Bharathkumar ML and Ganganaik S

DOI: <https://doi.org/10.22271/chemi.2020.v8.i2y.8998>

Abstract

The topography and distribution of the various tonsils were studied anatomically in sheep. The palatine, paraepiglottic and lingual tonsils in Oropharynx and Pharyngeal, Tubal tonsil and Soft palate tonsils in Nasopharynx were studied macroscopically. Mid sagittal sections of freshly slaughtered sheep heads were fixed in 2% Acetic acid for 12-24 hours. After fixation the tonsils were macroscopically visible as white elevated patches in the mucosa which can be clearly appreciated. Pharyngeal tonsil was one of the biggest tonsils noticed in sheep which was seen as white nodule in the caudal part of pharyngeal septum. The surface of this tonsil showed several folds which were mostly oriented longitudinally. Tubal tonsil appeared as scattered nodules in the lateral pharyngeal wall, ventral, and mainly caudal, to the opening of the auditory tube. The number of these nodules on each side varied from 40-60. The tonsil of the soft palate is located at the dorsal surface (nasopharyngeal side) of the soft palate they were small pin head size nodules scattered in the mucosa of rostral aspect of soft palate no aggregations were seen in the caudal aspect. The lingual tonsil was not macroscopically visible in sheep and consisted of scattered small aggregations of lymphocytes.

Keywords: Tonsils, lymphatic nodules, nasopharynx, NALT, FAE

Introduction

The tonsils consist of an accumulation of lymphocytes which are usually concentrated in lymph nodules and are present in the mucosae of the oropharynx, nasopharynx and laryngopharynx. They are a part of the integrated pharyngeal mucosal immune system (Ogra, 2000) and form a ring of lymphoid tissue in the pharyngeal wall which was first described by von Waldeyer-Hartz (1884) [15], and is therefore called the “Waldeyer ring” (Perry and Whyte, 1998) [13]. This location involves an important role for tonsils as secondary lymphoid tissue in the immunological response against antigens which enter the body by the oral or nasal route. Six tonsils are described in sheep: the palatine tonsil, the lingual tonsil and the tonsil of the soft palate in the oropharynx, the pharyngeal tonsil and the tubal tonsil in the nasopharynx, and the paraepiglottic tonsil in the laryngopharynx (Barone, 1997; Thome, 1999) [1, 14]. The topography and structure of these tonsils in sheep are poorly documented. Larger amount of immunological investigations are limited to those tonsils that are most easily identified, such as the palatine tonsils. The study of other tonsils seems to be hampered by the small amount of basic anatomical and histological data present in the literature. Moreover, available data are scattered in conventional anatomical textbooks, and some inconsistencies between several sources can be noticed. Therefore, this study offers an overview of the anatomical localization of the tonsils that are present in the sheep. The present study described the topographic structure and distribution of the various tonsils in sheep.

Materials and Methods

The heads of 6 sheep were collected from the local slaughterhouse. Immediately after slaughter heads were thoroughly washed in tap water and using a band saw 3 heads were sagittally sectioned and remaining 3 heads were opened by cutting vertical ramus of mandible and oropharynx and nasopharynx were exposed.

For macroscopic study the sectioned heads were rinsed with tap water for 2 min and fixed in 2% acetic acid for 12-24 hours to visualise the lymph nodules (Cornes, 1965; Chauhan and

Singh, 1970)^[7, 5]. The location of the lymph nodules were noted, the length and width of the tonsils were measured and the number of lymph nodules were counted. Photographs were taken using a digital camera.

Results and Discussion

The number of studies investigating the immune functions of the tonsils have increased substantially since it was acknowledged during the past decade that tonsils form a first line of defense against foreign antigens or play a role in the propagation of infectious diseases. As a result, more and more researchers entering the field of mucosal immunology are interested in the anatomical localizations and the morphology of these MALT structures.

Gross Localization of NALT

After fixation of sagittal and horizontal sections of sheep heads with 2% acetic acid for 12-24 hours, lymphoid nodules appeared macroscopically as opaque white spots under the mucosal surface located in the nasopharynx and oropharynx. The number, location and size of nodules varied between animals, apparently regardless of age. Specific tonsils like tonsil of soft palate, Pharyngeal tonsil and Tubal tonsils were easily demonstrated as white patches. Apart from designated tonsils in other areas of nasopharynx also shown lymphatic nodules especially at pharyngeal septum at the apex of pharyngeal septum lymphatic nodules were clearly demonstrated (Fig. 1). In the present study no gross lymphatic nodules were seen at nasal turbinates and mucosa of nasal cavity.



Fig 1: Lymphatic nodules on the posterior Pharyngeal septum as whitish patches (arrow)

Tonsil of the Soft Palate

On the ventral (oral) surface of the soft palate, no macroscopic signs of this tonsil were observed. The tonsil of the soft palate was located at the dorsal surface (nasopharyngeal side) of the soft palate, but it was macroscopically visible after 12 h fixation in 2% acetic acid after which white, scattered nodules appeared (Fig.2). The structure of the lymphoid tissue varied from diffuse lymphoid tissue with some lymphoid nodules in the rostral part of the soft palate, towards a caudal zone near the arcus veli palatini, where scattered small aggregations were present. Lymphatic nodules were seen more at rostral aspect of soft palate where as in the middle and caudal part not much lymphatic nodules were observed grossly. The tonsil of the soft palate was especially well developed in the pig. It is present as a bilateral oval plaque of lymphoid tissue, approximately 5cm in length and 3 cm in width. Numerous tonsillar fossules are visible at the ventral side of the soft palate. The most prominent ambiguity concerning the localization of the tonsils can be

noticed when studying the literature about the tonsil of the soft palate. The present study, together with previous reports (Cocquyt *et al.* 2005, Brandtzaeg *et al.* 2008)^[6], unequivocally shows that this tonsil is located at the nasopharyngeal side of the soft palate in ruminants. In conventional anatomical textbooks; however, the tonsil of the soft palate is allocated to the oropharyngeal side of the soft palate in these species (Barone 1997, Habel 1975)^[1, 9]. In the pig and horse, the well-developed tonsil of the soft palate is located at the oropharyngeal side of the soft palate. This tonsil is sometimes erroneously called the palatine tonsil in the pig. However, the latter tonsil lacks in this species. Also in horses, the tonsil of the soft palate has been designated by other names such as tonsilla palatina impar or tonsilla veli palatini impar (Dyce *et al.* 1991)^[8]. In domestic carnivores, a tonsil of the soft palate that is located at the oropharyngeal side of this anatomical structure has been mentioned by Schummer and Nickel. (1973)^[12] and Habermehl, (1994)^[10]. This tonsil was, however, not found in the present study nor was it observed in the dog by Cesta, (2006)^[4].

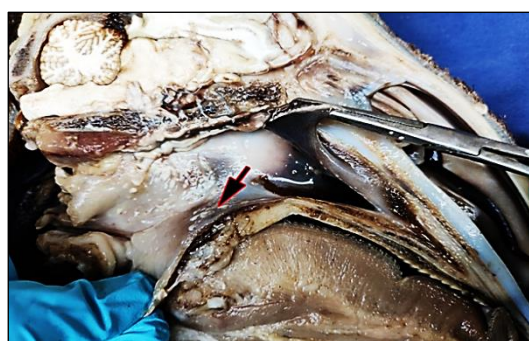


Fig 2: Tonsil of soft palate white lymphatic nodules seen as whitish patches on rostral aspect of soft palate (Arrow)

Pharyngeal Tonsil

The pharyngeal tonsil was located in the roof of the pharynx on the caudal part of the pharyngeal septum. The length of the tonsil varied from 18 to 40 mm and the total width from 12 to 21 mm (Fig. 3). The surface of this tonsil showed several folds which were mostly oriented longitudinally. After overnight fixation in 2% acetic acid, large white spots became visible on the surface of the tonsil. The prominent pharyngeal tonsil was located dorsally in the nasopharynx on the caudal part of the pharyngeal septum. It measures approximately 2-3 cm in length and 1 cm in width and height. Numerous folds, mainly longitudinally arranged were present on its surface. After acetic acid fixation entire tonsil was highlighted as large white patch and folds of tonsils were very clearly noticed. The pharyngeal tonsil was found well developed in many species like goat, pig, cat, and bovine however in horse pharyngeal tonsil is not well delineated and macroscopically hardly visible (Casteleyn *et al.* 2011)^[3].

Tubal tonsil

After fixation with acetic acid, scattered nodules were observed in the lateral pharyngeal wall, ventral, and mainly caudal, to the opening of the auditory tube (Fig 3). The number of these nodules on each side varied from 40 to 60. The borders of the tubal tonsil could not be clearly distinguished macroscopically. Lymphoid tissue was found mainly ventral to the pharyngeal opening of the auditory tube, and was distributed variably in rostral to caudal direction in different sheep. The tubal tonsil was bilaterally situated in the lateral nasopharyngeal wall around and caudoventral to the

opening of the auditory tube. It was, however, only macroscopically visible after 12 h fixation in 2% acetic acid, after which white, scattered nodules appeared. Location and distribution of tubal tonsil is same in goat, bovine, pig and cat as studied by (Casteleyn *et al.* 2011) [3]. However, in the horse tubal tonsil is located near the opening of the auditory tube, but is continuous with the pharyngeal tonsil since the border between both tonsils is not clear.

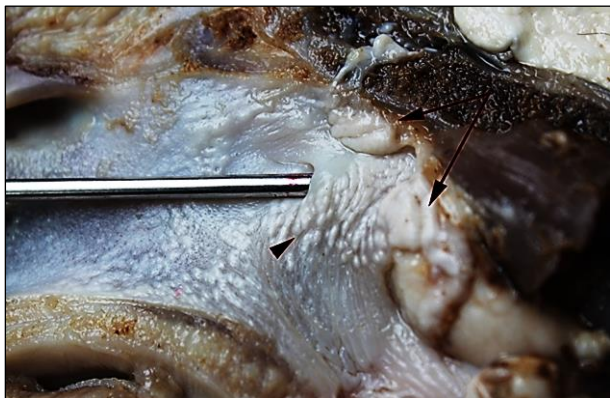


Fig 3: Pharyngeal tonsil seen as large white patch (arrow) and tubal tonsils seen as multiple small aggregates of patches (arrow head) opening of estuation tube is also seen (Needle)

Lingual Tonsil

The lingual tonsil was not macroscopically visible since it consists of small aggregations of lymphoid cells that are mainly present within the connective tissue cores of the vallate gustatory papillae. These were located at the lateral sides of the root of the tongue. The lingual tonsil was entirely covered by a keratinized stratified squamous epithelium. Since lingual tonsil in the small ruminants does not contain lymphoid follicles hence cannot be considered as proper tonsils. Even after acetic acid fixation no clear patches were appreciated in the sheep (Fig. 4) unlike in the pig and the cattle where clear lymphatic patches can be seen after fixation with acetic acid (Casteleyn *et al.* 2011) [3]. The lingual tonsil is well developed in Horse and Bovine it can be identified macroscopically by the presence of many tonsillar fossules (Manesse *et al.*, 1995) [11].

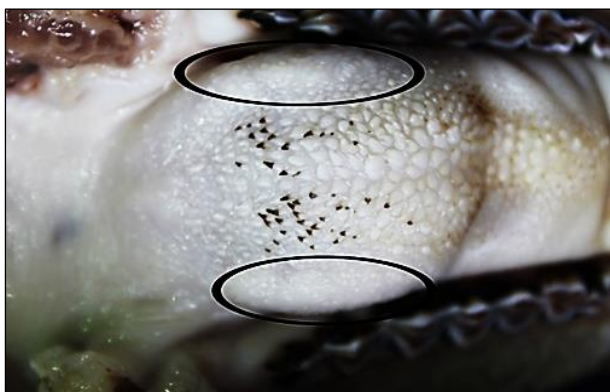


Fig 4: Location of Lingual tonsil no gross nodules were seen even after acetic acid fixation (oval markings)

Palatine tonsil

The palatine tonsil is bilaterally present in the oropharynx and is located between the palatoglossal and palatopharyngeal arches. It is an ovoid structure, the size of a hazelnut that contains one to three narrow elongated entrances (*fossulae tonsillares*) to the underlying crypts (*cryptae tonsillares*)

which had a few diverticula (Fig. 5). Palatine tonsil in comparatively larger in goats and absent in pigs. Casteleyn *et al.* (2011) [3].



Fig 5: Palatine tonsil seen as ovoid structure on the ventral aspect of soft palate (arrow)

Paraepiglottic Tonsil

The bilaterally present paraepiglottic tonsil was located in the laryngopharynx lateral to the base of the epiglottis. It was macroscopically visible as a few nodular mucosal elevations that are separated by deep invaginations (Fig. 6). Apart from bilateral paraepiglottic tonsils few lymphatic patches were noticed within the larynx on the lateral wall of epiglottis which can be regarded as epiglottic tonsils (Fig. 7) since these lymphatic nodules were consistently seen in all the animals examined. Similar findings were observed by Casteleyn *et al.* (2011) [3] in goats. The paraepiglottic tonsils were not seen in the cattle and Horse. In pigs it is macroscopically present as a round to oval plaque of approximately 1-2 cm in diameter which possesses a few tonsillar fossules. Where as in goats paraepiglottic tonsils were inconstant, which means that it may not be observed in each animal (Casteleyn *et al.* 2011) [3]. Paraepiglottic tonsils are also not seen in cats (Schummer and Nickel., 1973) [12].



Fig 6: Para epiglottic tonsils seen as oval bodies on either side of the epiglottis (arrow)

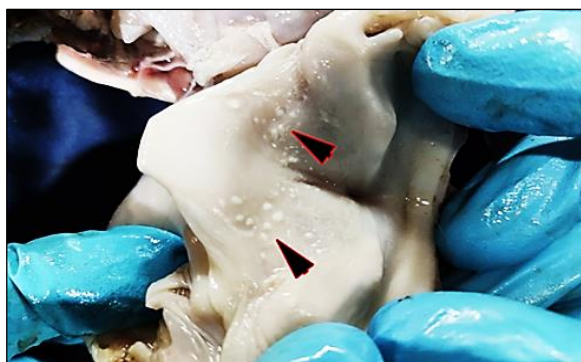


Fig 7: Few Lymphatic nodules are seen on the mucosa of Larynx on lateral wall of epiglottis (Arrow heads)

Conclusion

According to present study of tonsils in sheep the tonsillar ring of the pharynx can be composed of up to six tonsils. The presence and location of these tonsils vary according to the animal species. Since the anatomical literature of the tonsils is sometimes ambiguous and basic knowledge of these structures is needed in immunological studies, the present paper could be valuable for both anatomists and immunologists.

References

1. Barone R. Pharynx et oesophage. Anatomie comparée des mammifères domestiques, 1997, 249-90.
2. Brandtzaeg P. Immune function of human nasal mucosa and tonsils in health and disease. Immunology of the lung and upper respiratory tract, 1984, 28-95.
3. Casteleyn C, Breugelmans S, Simoens P, Van den Broeck W. The tonsils revisited: review of the anatomical localization and histological characteristics of the tonsils of domestic and laboratory animals. Clinical and developmental immunology, 2011.
4. Cesta MF. Normal structure, function, and histology of mucosa-associated lymphoid tissue. Toxicologic pathology. 2006; 34(5):599-608.
5. Chauhan HV, Singh CM. The clinical pathology of maedi of sheep in India. British Veterinary Journal. 1970; 126(7):364-7.
6. Cocquyt G, Baten T, Simoens P, Van Den Broeck W. Anatomical localisation and histology of the ovine tonsils. Veterinary immunology and immunopathology. 2005; 107(1-2):79-86.
7. Cornes JS. Number, size, and distribution of Peyer's patches in the human small intestine: Part I The development of Peyer's patches. Gut. 1965; 6(3):225.
8. Dyce K, Sack W, Wensing C. Anatomie der Haustiere Lehrbuch für Studium und Praxis übersetzt von: Budras KD, Goller H, Goller J, Hofmann RR, Hummel G, Weyrauch KD, Ferdinand Enke Verlag Stuttgart S, 1991, 844.
9. Habel RE. Ruminant digestive system. Sisson and Grossman's the Anatomy of the Domestic Animals. 1975; 1:861-915.
10. Habermehl KH. Kopfdarm und Gebiß. Anatomie von Hund und Katze, 1994, 130-46.
11. Manesse M, Sautet J, Delverdier M, Schelcher F, Espinasse J, Cabanie P. Anneau de Waldeyer des bovins: anatomie topographique et microscopique des tonsilles. Revue de Médecine Vétérinaire. 1995; 146:749-56.
12. Nickel R, Schummer A, Seiferle E, Sack WO. The Viscera of the Domestic Mammals: Verlag Paul Parey. Berlin and Hamburg, 1973, 104-5.
13. Perry M, Whyte A. Immunology of the tonsils. Immunology today. 1998; 19(9):414-21.
14. Thome H. Mundhöhle und schlundkopf. Lehrbuch der Anatomie der Haustiere. Bd. II, Aufl, 1999, 8.
15. Von Waldeyer-Hartz W. Ueber den lymphatischen apparat des pharynx. Deutsche Medizinische Wochenschrift. 1884; 10:313.