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Histological development of lymphatic tissue in oral cavity of prenatal black Bengal goat

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Abstract

A study was conducted to reveal the structural organisation of tonsil in prenatal stages of goat. Lingual tonsil was close to the developing skeletal muscle fibers underneath the mucosa on day 73 of gestation. With advancing age the size of tonsil increased and by day 112 the proprio-submucosa constituted a diffuse lymphatic tissue (DLT). At day 73 proprio-submucosa of pharyngeal wall was dominated with densely packed small, medium and large lymphocytes whereas, in day old neonates besides lymphocytes macrophages, plasma cells, reticular cells, megakaryocytes were also evident. Aggregated lymphatic nodules could not be observed in palate of all the goat foeti studied, whereas sporadic lymphocytes were seen from 106 days of gestation and onwards.

Keywords: histology, lymphatic tissue, prenatal goat

Introduction

Though the colostrum helps raise the maternal antibody level in the neonates, ever since the kid mortality has never come under control despite the routine vaccination schedule in the herd. This asks upon the structural integrity and functional intactness of the immune system of the goat. The tonsils consist of accumulation of lymphocytes which are usually concentrated in the primary and secondary lymph nodules that are surrounded by extranodular zones and covered by reticular epithelium. According to the Blecha and Charley (1990) [2] the structural and functional dimensions of the GALT in bovine fetuses do not work out until 164 days of gestation.

This indicates an existence of age dependent development, maturation and compartmentalization of cells and fibers in the lymphatic tissues. Thus age correlated study on the lymphoid tissue of oral cavity in goat foeti will not only unveil their mechanism of histomorphogenesis, but also provide a platform understand the age dependent recruitment of the cell types into the lingual, pharyngeal and palatine tonsil.

Materials and Methods

The study was conducted on the black Bengal goat fetuses of different age. The gravid uteri were cut open followed by amnion puncture to drain out the amniotic fluid. The CRL of the foeti was measured linearly from crown of head to the tail base with the help of a graduated tape. The foeti were harvested from the amniotic bag and their approximate age was calculated using the "CRL-Gestation Age" correlation of Norden and De Lahunta (1985) [10] in sheep and Gautam *et al.* (2015) [4] in goat. The fetuses were grouped into 62, 73, 80, 94, 99, 106, 112, 130, 142 and day old neonates for light microscopy on the basis of increasing gestational age. For histological study tissue pieces were collected in 10% buffered neutral formalin and were processed routinely to obtain 5-6 μ m thick serial paraffin sections. The sections were stained with Haematoxylin-Eosin-Phloxin for general tissue reactions and cytoarchitectural studies, Masson's trichrome stain for collagen fibers, Gomori's silver for reticular fibers and Verhoeff's stain for elastic fibers (Bancroft and Stevens, 1977) [1].

Result and Discussion

Tonsillar mass in the tongue of goat foeti was not evident until day 62 of gestation. On day 73 a small aggregation of lymphocytes being circumscribed by a thin fibrous wall was seen. The tonsil was close to the developing skeletal muscle fibers underneath the mucosa. It revealed moderate basophilia and mainly contained lymphocytes with dense round nuclei and scanty cytoplasm. No crypt was seen adjacent to the tonsil. The core of the lingual papillae contained

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isolated lymphocytes enmeshed in a fine fibrillar network. With advancing age the size of the tonsil increased and shape varied from spherical to ovoid in outline. The proprio-submucosa on 80 days of gestation revealed light basophila and occasional lymphocytes. By day 112 the proprio-submucosa became highly fibrous and cellular with few circular densely nucleated lymphocytes. The lymphocytes and isolated RBC mostly dominated the lingual tonsil. The cells of proprio-submucosa constituted a diffuse lymphatic tissue (DLT). The day old neonates revealed secondary nodules along with DLTs (Fig. 1).

On day 73 a group of lymphocytes in the proprio-submucosa of pharyngeal wall appeared adjacent to a developing crypt. It contained densely packed small, medium and large lymphocytes, and few blood vessels. With advancing age the size of this nodular mass increased and the crypts became apparent. The consistently increasing pharyngeal tonsils encroached a section of differentiating pharyngeal cryptal epithelium in its DLT (Fig. 2). By one day of neonatal age some of the nodules were in typical secondary form revealing a distinct germinal center and mantle. The marginal zone was not evident. Distinct crypt were not seen either in association with the nodules or with the DLT. The cells that impregnated the nodules/DLT included mostly lymphocytes (small, medium and large), macrophages, plasma cells, reticular cells, RBC, megakaryocytes etc (Fig. 3). Kumar and Nagpal (2007) [7] revealed that the lamina propria submucosa had a dense distribution of lymphoid tissue mainly in the form of lymphoid follicles having different sized lymphocytes, plasma

cells and macrophages. According to Nickel *et al.* (1967) [9] DLTs are seen at root of tongue of sheep and goat. Indu *et al.* (2018) [6] observed the lingual tonsil at the root of the tongue within the connective tissue cores of the mechanical conical papillae in pigs and in the vallate papillae in goats. May (1970) [8] identified abundant lymphoid tissues in the dorsolateral wall of pharynx. Chen *et al.* (1990) [3] opined that lymphoid cells first appear in the subepithelium at 92 days of gestation in sheep and the cell proliferation was triggered during the last trimester to form dense aggregations. Morphologically the pharyngeal tonsils can take up antigenic challenge at birth. The present findings on lingual tonsil and pharyngeal tonsils corroborate the observations of the aforesaid authors.

No tonsil or aggregated lymphatic nodules was evident in the proprio-submucosa of the palate in all the prenatal ages of goat studied under this investigation. Sporadic lymphocytes in the said location were seen from 106 days of gestation and onwards.

No collagen fiber was seen to vest the tonsillar nodules/DLT. A thin beaded discontinuous reticular mesh was seen to circumscribe the cells of the tonsil/DLT and the fibers became thick, continues and consolidated with advancing age in day old neonates and in prenatal goat of 142 days both thick and thin reticular fibers were seen (Fig. 4) No elastic fibers could be seen in any of the tonsils studied across all prenatal ages. However, Indu *et al.* (2015) [5] reported that the lamina propria-submucosa formed by the meshwork of reticular and, thin loose collagen fibers in tubal tonsil of goat.



Fig 1: Photograph of tongue showing lingual tonsil (LT), sub mucosal layer (SM) and lamina epithelia (LE) in day one kid. H & E x 100

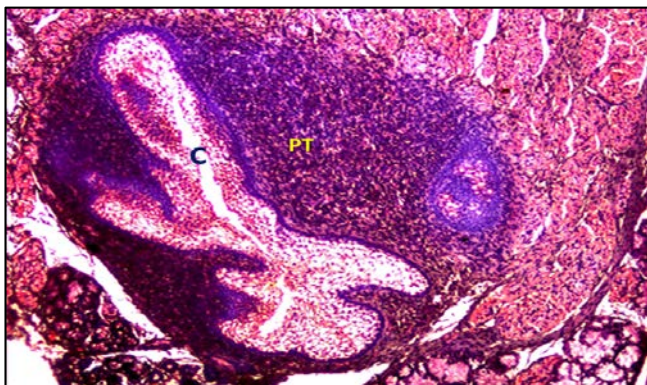


Fig 2: Photograph showing pharyngeal tonsil (PT) with crypt (C) in 73 days old goat foetus. H & E x 100

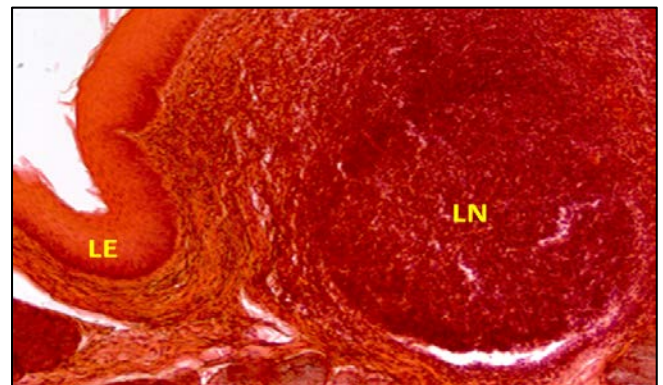


Fig 3: Photograph showing lymphoid nodule (LN) and lamina epithelia (LE) in pharynx of day old neonate kid. H & E x 100

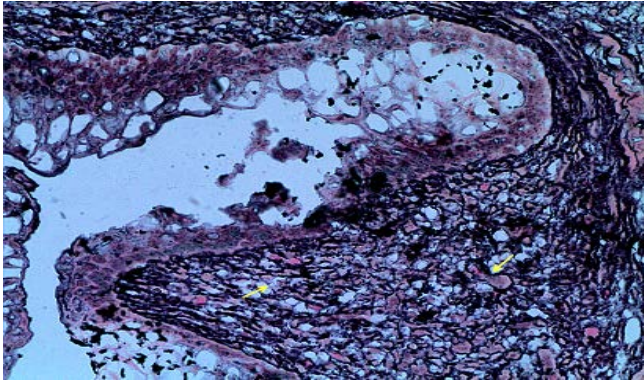


Fig 4: Photograph showing thick and thin reticular fibers (arrow) in the stroma of pharyngeal tonsil in goat foetus aged 120 days of gestation. Gomori's silver reticular Stain x 400

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