

HISTOMORPHOLOGICAL STUDY ON THYMUS OF GOAT DURING PRENATAL DEVELOPMENT

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ABSTRACT

In thymus of prenatal goat the capsule and interlobular septa were thin and thickness is increased up to 142 days of gestation. The lobules had dark stained large cortex and contained blood vessels, isolated RBCs, lymphocytes and reticular cells. Medulla revealed moderate eosinophilia and cortex was strongly basophilic by 50th day of gestation. By 99 days more number of reticular epithelial cells and its concentration was increased in 112 days of gestation. At this stage some location of medulla has 2-3 epithelial cells which depicted the initial appearance of thymic corpuscles and by 120 days three types of vacuoles were seen which initiate the thymic corpuscles formation by coliation. By 130 and 142 days thymic corpuscles were enlarged and reticular epithelial cells were numerous in medulla. Similar structural feature in day old neonates were also noted. The concentration of Collagen fibres is increased with age in capsule and septa. Reticular fibres formed a thin layer in capsule and thick layer in septa but it was not observed either in cortex or in medulla till 112 days of gestation. A fine reticular net appeared to circumscribe the cortical and medullar cell types by 142 days of gestation and onwards. Elastic fibres could not be demonstrated in the thymus of goat foeti of any age.

KEY WORDS: Developing thymus, goat foeti, Histomorphology.

INTRODUCTION

The thymus is the first lymphoid organ to appear during embryonic development and it is prerequisite for the development of other lymphoid organ. It is responsible for proliferation and maturation of the T-lymphocyte (Hoshino *et al.*, 1968). These T-lymphocyte migrate to the secondary lymphoid organ such as spleen, tonsils and lymph nodes through various routs. The thymus becomes fully developed at birth in calves (Heilmann and Steinbach, 1978). However; the developmental changes have not been well documented in goat. Therefore, a comprehensive study on the histomorphology of thymus in goat fetuses was undertaken in the present study.

MATERIALS AND METHODS

The investigation was conducted on forty eight goat fetuses with a crown rump length (CRL) ranging from 7 cm (50 days of gestation) to 47 cm (142 days of gestation) and day old neonates (Table 1). Age of fetuses was calculated by using the "CRL-Gestation Age" correlation of Norden and De Lahunta (1985) in sheep. The fetuses were grouped on the basis of increasing gestational age. The tissue pieces were collected in 10 per cent neutral buffered formalin and were processed routinely to obtain 5 to 6 μ m thick 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).

RESULTS AND DISCUSSION

By 50th day of gestation thin capsule and interlobular septa were seen (Fig.1). With age their thickness increased up to 142 days of gestation. The capsule and septa contained blood vessels

with free RBCs. The interlobular septa divided the gland into lobes and lobules with triangular or polygonal in shape (Fig.1) in accordance with the findings of Mainde (2008) in goat foetus. The average thymic lobule increase with gestational age (Table 1).

Table : 1 Number of goat foeti with their crown-rump length

Sl. No.	Number of foeti	Crown-rump length (cm)	Calculated gestational age (days)	Diameter of Thymus lobule μm ,
1	4	7	50 ± 3	99.76 ± 2.65
2	5	14	62.5 ± 3	110 ± 2.80
3	4	18.5	73 ± 3	140 ± 3.99
4	3	20	80 ± 3	170.8 ± 4.55
5	3	23.5	87 ± 3	199.9 ± 9.90
6	4	26.5	94 ± 3	210.10 ± 3.81
7	5	29	99 ± 3	250.97 ± 9.8
8	3	33	106 ± 3	290.70 ± 8.11
9	4	35	112 ± 3	345.91 ± 4.79
10	4	38	120 ± 3	360.61 ± 6.20
11	3	43	130 ± 3	380.12 ± 7.21
12	4	47	142 ± 3	409.22 ± 4.19
13	2	-	Day old neonate	551.79 ± 5.01

Some of the blood capillaries penetrated into the peripheral part of the lobules in a radial fashion. According to Norden and DeLahunta (1985) the thymic T-cells originate from lymphopoietic stem cells derived from mesoderm of the yolk sac, liver and postnatally from bone marrow. The present observation on thymic vascularization probably indicates the cell proliferation and migration into thymus through the hematogenous route which is in conformity with the findings of Ramayya (2008). The lobules had darkly stained large cortex and contained blood vessels, isolated RBCs, small, medium and large sized lymphocytes and reticular cells. Medulla revealed moderate eosinophilia and cortex was strongly basophilic by 50th day of gestation (Fig.1).

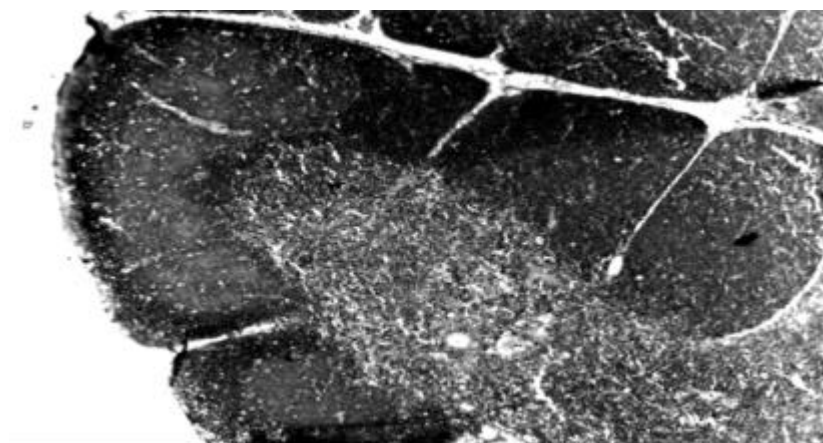


Photo 1. Photomicrograph of thymus of 50 day old goat foetus showing capsule (C), Septa (S), Lobules (LB), Cortex (CT) and Medulla (MD).
(H&E X100)

In goat foeti the medulla was apparent by 50th days of gestation and this observation corroborates the findings of Mackay *et al.* (1986) in sheep. Collagen fibers were few in the capsule and septa of the thymus of 50 days old goat foeti and their concentration gradually increased with age. In 73 and 80 days of gestation collagen fibres were evident whereas reticular fibres was apparent by 87 days of gestation. Density of collagen fibres and reticular fibre was increased by 94 days of gestation. Similar observation was noted in goat foetuses by Mainde (2008).

By 99 days of gestation reticular epithelial cells were more in number and its concentration was increased in 112 days of gestation with ovoid in outline and contained central/eccentric vesicular circular nucleus with a weakly eosinophilic cytoplasm. At some locations 2-3 epithelial cells merged together being circumscribed by a hollow (Fig.2).

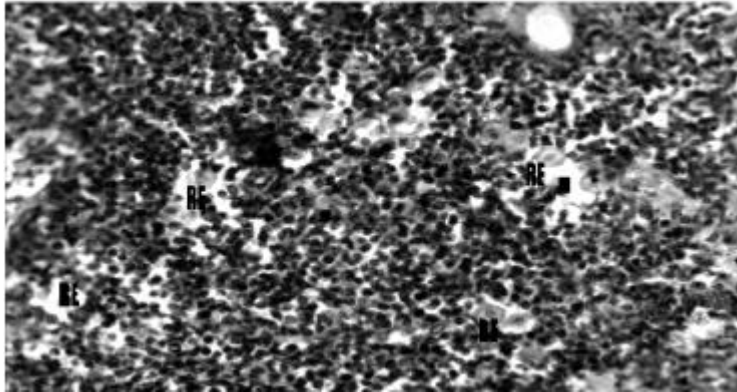


Photo 2 : Photomicrograph of thymus of 112 day old goat foetus showing reticular epithelial cell (RE) scattered in single or in groups of 1-3 cells. (H&E X400)

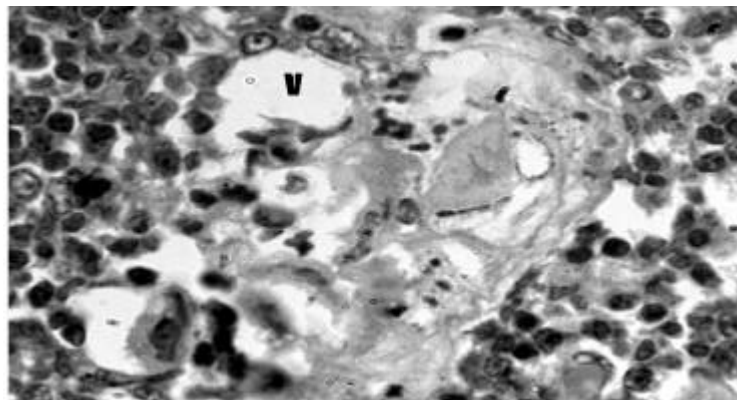


Photo 3 : Photomicrograph of thymus of 120 day old goat foetus showing formation of thymic corpuscles. Note the type-III Vacuoles (V) lined by simple cuboidal epithelium. (H&E X1000)

This structure depicted the initial appearance of thymic corpuscles where the epithelial cells remain unstained except that the chromatin material stained blue. With advancing age the blood vessels both in cortex and medulla increased in frequency. Moderate collagen bundles reinforced the

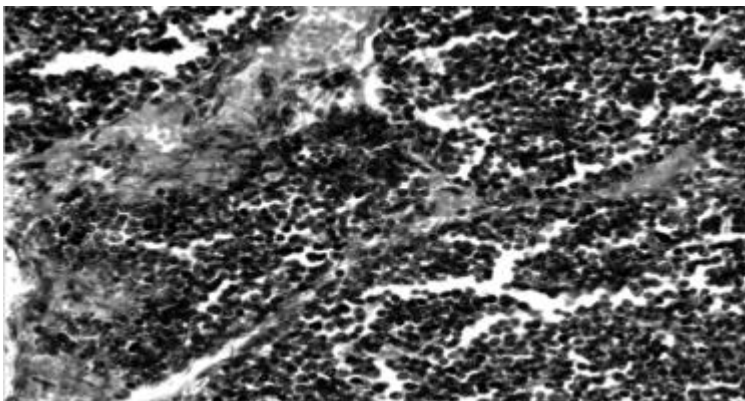


Photo 4 : Photomicrograph of thymus of 130 day old goat foetus showing infiltration of lymphocyte (L) into septal wall. Note the circumscribing capillary bed around the septal lymphatic tissue. (H&E X400)

capsule and septa. The septal arteriolar/venular walls discerned heavy collagen bundles and capillaries were devoid of collagen fibers (Fig. 5). Age dependent significant increase in collagen component in thymus was not apparent. Reticular fibers formed a thin layer in the capsule and a thick layer in the septa in the form of a meshwork (Fig. 6). By 120 day, numerous vacuoles

and capillaries were seen in the medulla. Three types of vacuoles were seen viz, Type I: Small circular vacuoles with a scanty wall, Type II: Medium sized ovoid vacuoles with a thick eosinophilic wall containing light eosinophilic body and Type III: Medium to large sized vacuoles with a wall lined by a simple cuboidal epithelium (Fig.3) which initiate the thymic corpuscle formation by coliation. These observations are in agreement with the reports of Banks (1993).

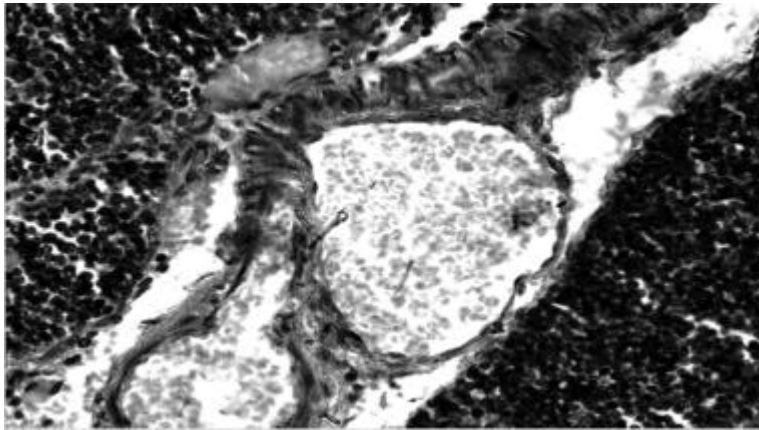


Photo - 5 Photomicrograph of thymus of 112 day old goat foetus is showing distribution of collagen fibres (CF) in the wall of arterioles, venoules and interlobular septa.

Masson's Trichrome X 400



Photo:- 6 Photomicrograph of thymus of 112 day old goat foetus is showing distribution of reticular fibers in capsule (C), septa (S), cortex (CT) and Medulla (MD).

Gomori 's silver reticular stain X 400

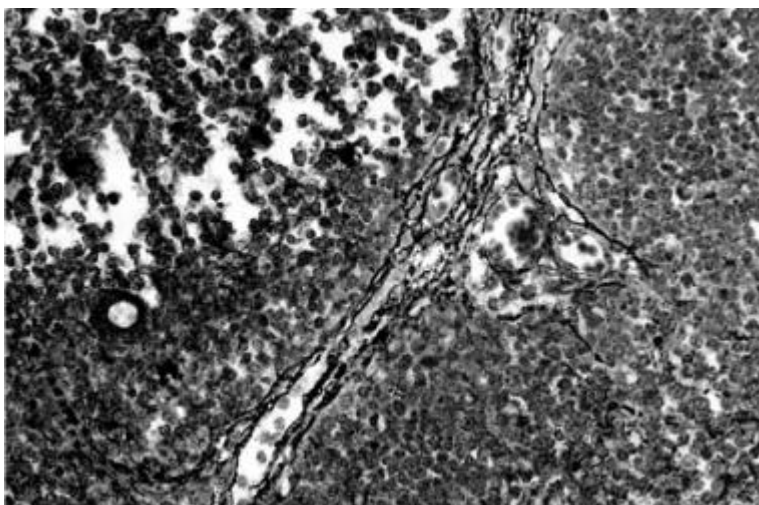


Photo:-7 Photomicrograph of thymus of day old kid shows distribution of reticular fibres (RF) in the septa and capillary wall.

Gomori 's silver reticular stain X 400

By 130th day interlobular septa also revealed diffuse scatters of lymphocytes being isolated by septal wall and capillaries on all sides from the surrounding lobules (Fig.4). The thymic corpuscles were

enlarged, hyalinized and involved as many as 3-4 epitheloid cells including the concentrically arranged degenerating lymphoid cells. By 142 days some of the epitheloid cells appeared to be oval, polyhedral or spherical in shape and were numerous in the medulla. Similar structural features were also noted in the thymus of the day old neonates. By 130 days of gestation the reticular fibers got more of consolidated, became thick and continuous in all the strategic locations described. A fine reticular net appeared to circumscribe the cortical and medullary cell types by 142 days of gestation and onwards (Fig.7). Elastic fibers could not be demonstrated in the thymus of goat foeti under investigation. These findings were agreed with Prakash (1999) and Mainde (2008) in buffalo and goat fetuses respectively.

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