

Macroscopic and Microscopic study of thymus of pig

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Abstract: As a preliminary work the macroscopic and microscopic study of thymus of pig was carried out. 2 male and 2 female pigs weighing 80±10 kgs were used. The thymus of these animals was procured in the slaughter house where it is sacrificed for edible purpose. It was a large bilobed structure situated in the superior mediastinum. Tissue from the thymus was processed and stained with H&E. Lobules were observed. Cortex and medulla could be differentiated. Two to three Hassall's corpuscles were observed and the distribution was uniform.

Key Word: Thymus, Hassall's corpuscles, cortex, medulla.

I. Introduction:

J N Blau, observed thymus is a bilobed structure in Guinea pigs. Its colour became faintly more yellow, changes in the histological structures were observed as age advances. Tatsuya irifune, et al observed that rat thymus tissues are important for understanding thymocyte proliferation and maturation in relation to the variability of T cell function. In case of mouse thymus, thymulin is histochemically detected in small cytoplasmic vacuoles of reticular endothelial cells. In case of guinea pigs thymus consists of both lobules of adenoid tissue which contains squamous epithelium, many of which were invaded by polymorphonuclear leucocytes. Krystyna Wyrzykowska & Zygmunt Wyrzykowski in Beaver the cervical part of thymus forms two separate lobes, left and right, oval in shape, flattened dorsoventrally. The lobes have distinct lobular structure visible under the thin, but well formed connective tissue capsule. The dark brown lobules are separated by light-coloured bands of connective tissue. The edges of the lobules are blunt and regular in outline. In thoracic part of thymus is usually unpaired, irregular shaped, weakly formed capsule of connective tissue, loose in structure

II. Aim:

Anatomical structure of pig is almost similar to human, like mitral valve which is genetically engineered and used for heart valve transplant in humans (xenograft). Henceforth we study the normal appearance (Macroscopic and Microscopic) of Thymus of pig.

III. Materials And Methods:

The present study included 4 pigs (2 males and 2 females) hybrid pigs (combination of Low Weight Axial and Desi) of age (SD 8±1 months) weighing about (S D 90±10 Kilograms) sacrificed at the Slaughter house. The slaughtered pigs were free from infectious disease since these meats were used for edible purpose. Pigs were slaughtered under the guidance of veterinary physician using captive bolt stunning method. After preliminary cleaning works an incision is put on the ventral aspect of the trunk which exposes thoracic, abdominal and pelvic cavities. Thymus gland was located near ventral aspect of base of the heart. Once the gland is identified it is removed and transferred to 10% formalin. Later the specimens were processed. Blocks were prepared and section thickness of 6µm thickness was cut using rotatory microtome. Each section was stained with Haematoxylin & Eosin stain (H&E), and studied under low power and high power. Parameters like gross appearance, histological findings like capsule, sub-capsular level, cortex, Cortico-medullary junction (CMJ), and medullary areas were studied in detail.

IV. Observation:

Macroscopic Appearance

The pig thymus was located in the pericardial mediastinum anterior to the major vessels and ventral to the base of the heart. Thymus gland was bilobed structure covered by thin capsule. Blood vessels were observed

along the course of the interlobular connective tissue septa which was entering inside the substance. Blood vessels were ramifying into branches that were observed till the CMJ.

V. Microscopic Appearance

Capsule:

A thin delicate layer of capsule made up of connective tissue was observed which was penetrating inside the gland which is known as interlobular septae or thymic septa (Fig 1 & 2). Thymic septae doesn't separate the lobes into lobules hence cortex continuous with medulla. Underneath the capsule we can observe the regularly arranged thymic epithelial cells (Fig 2).

Sub-Capsular Level

Occasionally lymphoblasts were observed along with adipocytes.

Cortex

Histologically darkly stained cortical area contains small immature lymphocytes. Large mitotically active lymphoblasts were observed in the sub-capsular cortex. In the deeper cortex rapidly dividing lymphocytes and phagocytised macrophages were seen (Fig.2)

Corticomedullary Junction

Consist of blood vessels with least amount of connective tissue with lymphoblasts (T-cells) and fat cells were also observed (fig 3).

Medulla

Medulla continuous with adjacent lobe of thymus gland. Appearance of lymphoblast cells which is arranged like scanty (pale) comparatively less than cortical level (Fig 4). Medulla also contains final stage that undergoes degeneration can be observed (Fig 7).

Hassall's Corpuscles

Reticular Epithelial Cells (REC) was well differentiating at this level. Hassall's corpuscles with trapped macrophages along with degenerating REC was also seen at this level. Peripheral cystic appearance with central hyalinization and trapped macrophages & phagocytised lymphocytes were seen (Fig. 5 & 6).

VI. Discussion

From the present study we can observe a thin layer of capsule which penetrates inside the gland known as interlobular septae or thymic septae. These septa were incomplete hence cortex continuous with that of medulla. Underneath the capsule thymic epithelial cells or Reticular Epithelial cells were seen. Blood vessels were ramifying.

Capsule covers the entire gland. Cortical substances of the thymic parenchyma and blood vessels were traversing to supply the gland. Cortex continues with the medulla which correlates with the previous research studies in rodents. Medulla contains degenerating thymic epithelium forming the concentric central hyalinization with trapped macrophages known as Hassall's Corpuscles (Cystic & Non-Cystic Type). Few adipocytes were observed within the parenchyma which has been clearly stained with H & E. Densely packed lymphocytes were distinguishable in cortex unlike that of medulla.

It was only in two individuals that sputum of loose connective tissue was observed thoracic thymus into two separate lobes. Marion D, et al observed that Intercellular cyst were a constant feature of the medulla in all mouse thymus glands examined. Interdigitating cells were present in all animals throughout the medulla, in the deep cortex and the perivascular spaces cells were not able to distinguishable with certainty from thymocytes at the EM level. All mice thymus occasionally contained neutrophils and some eosinophils with in the deep cortex and in the connective tissue of the septa. Study in the mouse also suggested that the thymus retains its activity during pregnancy. The epithelial cells of the mouse thymus can be directly equated out of 6 types although minor differences occurred. Most of the macrophages were observed in the cortex only few numbers in medulla. Patel DD, et al studied on thymus mouse showing anatomically divided into sub-capsular, cortical and medullary compartments. Thymic stroma contains a variety of professional antigen presenting cells including bone marrow derived dendrite cells, macrophages, B-cells, endoderm derived cortical epithelial cells, medullar epithelial cells. A striking morphological feature of medulla is presence of Hassall's corpuscles, which consist of concentric whorls of stratified keratinized epithelium and share antigenic properties with ectodermic epithelium. Haken oner, et al studied the ultra structural examination in adult wistar rats, showed altered medium to large sized lymphoid cells were observed in the thymic cortex after pinealectomy. There was numerous macrophages containing abundant phagocytic materials which included degenerated nuclei, electron

dense bodies, etc. the thymus gland of melatonin- treated rats appeared ultra structurally similar to the control groups and contained mitotic images. Gail Pearse, suggests that Hassall's corpuscles are rare in rodent species when compared with humans and primates. In the mouse they can be very small and can't be visualized without immune staining. In the present study we have observed well distinguishable Hassall's Corpuscles in H&E stain.

VII. Conclusion:

This was the preliminary study which was carried out in the hybrid variety of pig thymus gland using H&E stain that reveals

- I. The capsule was well appreciated along with the interlobular septa which was not traversing the entire gland
- II. The cortex contains densely packed lymphocytes and reticular epithelial cells were observed
- III. In medulla well distinguishable Hassall's corpuscles were identified
- IV. Blood vessels were seen along the course of interlobular septa that were extending upto Cortico-medullary junction

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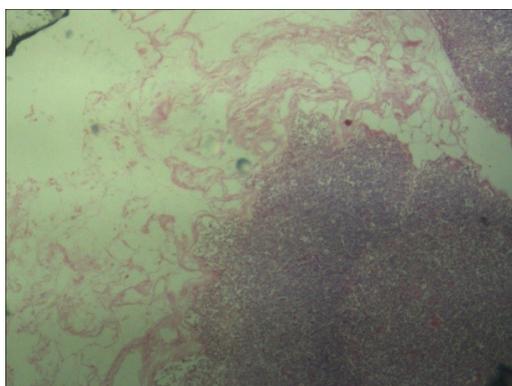


Fig 1: Section shows the well defined capsule

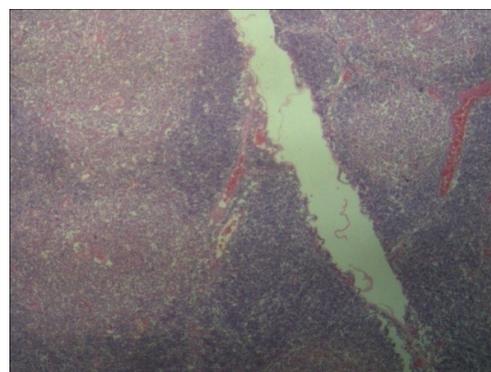


Fig-2: Section shows the traversed capsule along with the lymphatic nodules in the cortex

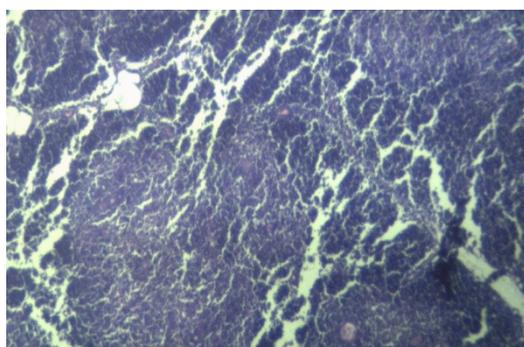


Fig. 3: Section shows adipocytes and interlobular containing ramifying arterioles

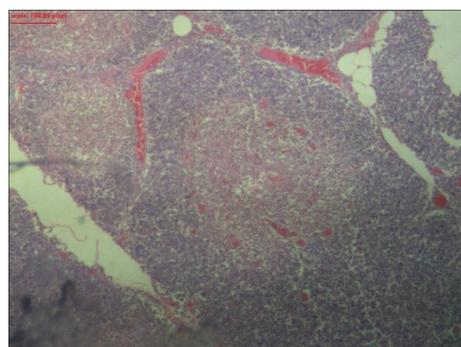


Fig. 4: Section shows cortex with Cortico-septa medullary junction

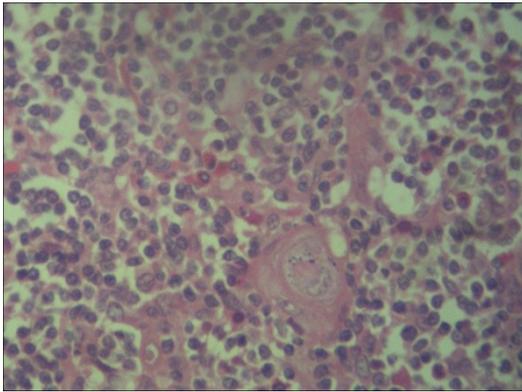


Fig-5: Hassall's Corpuscles with Reticular Epithelial Cells

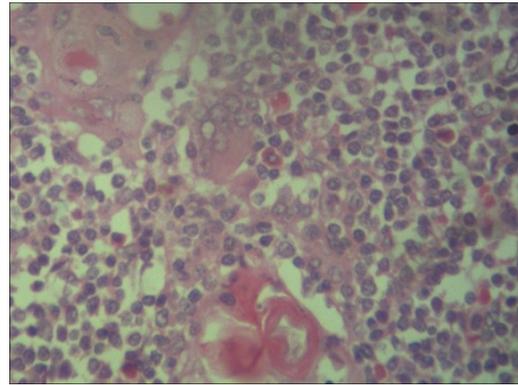


Fig-6: Section shows cystic type of Hassall's corpuscles

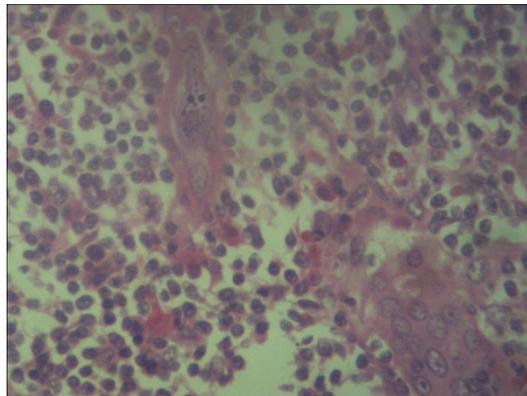


Fig.7: Shows sparing of lymphocytes in the medulla

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