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Research Article

Histogenesis of Human Fetal Thymus in 1st and 2nd Trimester

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Abstract
The thymus is the lymphoid organ that consists of lymphoid and epithelial cells The thymus is composed of two identical lobes and is located anatomically in the anterior superior mediastinum. In spite of remarkable progresses made in the field of the immuno histochemical characterisation of the thymus parenchyma, the diagnosis of thymoma largely depends on the interpretation of conventional morphologic aspects. In the present study thirty eight foetuses ranging from 9th to 24th gestational weeks were studied to find out the histological changes that occurred at different stages of the foetal growth period. After proper fixation, alternate sections of the thymus tissues stained with Haematoxylin and Eosin, Masson's Trichrome were examined histologically under light microscope. Lobulation and differentiation of cortex and medulla of the thymus were observed at 9th week. Lobulation was completed by 12th week. The differentiation of cortex and medulla was completed between 12thand 14thweeks. The normal structure and its variants are extremely helpful to differentiate normal from pathologic aspects.
Keywords: *Thymus,cortex,medulla, gestational age, lobulation, thymoma.*

Introduction

Thymus bilobed structure divided into lobules by the connective tissue septae. Each lobule is consisting of a cortex and a medulla responsible for cellular immunity of the body. During neonatal and early postnatal life thymus is essential for the normal development of lymphoid tissue. As an endocrine gland it is most active during puberty. A reduction in thymus function results in greater susceptibility to tumours, rheumatic disease, growth disorders and general geriatric conditions. According to Hamilton and Mossman (1976), the epithelial cells of the developing thymus became more loosely arranged to form a reticulum in which small lymphocytes soon appeared at about 9th week. The lobulation of thymus gland were reported to occur at 10th week by Ghali et al *(1980)* and 12th week by *Harr (1974).* The vascular mesodermal tissue invaded the gland in such a way as to produce its lobulation. The immunohistochemical diagnosis is important nowadays specially in classification of thymoma, characterization of other specific tumours of the thymus, and in research.

Development and Histogenesis

The thymus derives from the third brachial pouch and possible there is a minor contribution of the fourth. In the 6th week of pregnancy, the endoderm of the third pharyngeal pouch form a

pronounced invagination that finally is detached from the wall of the primitive pharynx and forms the thymic primordia. There are proofs to support the involvement of an ectodermic component in the development of the thymus. The thymic primordia migrate caudal and medial together with inferior parathyroid glands. In the 8th week the primordium growths, forming two epithelial structures that fuse on the median line and occupies the final position in the anterior and superior mediastinum.

The cranial extremity becomes thin during migration, it is then fragmented and, in normal conditions, these fragments are resorbed. In some cases islands of thymic tissue may persist in soft tissues of the neck, around parathyroids, or even in the thyroid parenchyma. As the migration came to an end, epithelial cells become stellate and arranged as a network. The surrounding mesenchymal tissue is condensed to form the capsule, and trabeculae that impart the parenchyma into lobules. In the 10th week, fatal liver-born and bone marrow-born small lymphocytes populate the thymic parenchyma that differentiates into cortex and medulla (Hale, 2004). Approximately at the same time occur small tubular structures lined by cuboidal epithelial cells that form Hassall's corpuscles.

Materials & Methods

A total of 38 dead foetuses of 9th week to 24th weeks gestational age and both sexes obtained from the Santhiram General Hospital, Nandyal and Government Hospital& Medical College, Kurnool with relevant obstetric records and preserved in Department of Anatomy, Santhiram Medical College, Nandyal were utilized for this study. This study has got the approval of institutional ethical committee. This work was conducted at the Department of Anatomy, Santhiram Medical College, Nandyal with the co-operation of Department of Pathology, Santhiram Medical College, Nandyal.

Then the foetuses were subjected to dissection. The sternoclavicular joints were disarticulated and costal cartilages were cut. Thus the entire thoracic cavity was opened and lower part of the neck was also dissected for complete exposure of the thymus gland in its natural location for proper recording.

The specimens of the human foetuses utilized in the present study were categorized into the following four groups: -

Group	Age(weeks)	No. of foetuses
Group-1	9th to11th week	9
Group-2	12th to14th week	11
Group-3	15th to17th week	10
Group-4	18th to 24th week	8

Evaluated specimens were preserved in freshly prepared solution of 10% Formal Saline fixatives for 7 days. After proper fixation, the tissue was subjected to the standard paraffin block making procedure. Thereafter 10 micrometers thick serial sections were prepared and alternate sections were stained with Haematoxylin and Eosin, Masson's Trichrome stains.

Results

On light microscopy, the observations at different gestational weeks were as follows: -

Group-I (9-11 weeks):

The lobulation and development of cortex and medulla had started at this stage. However, the medulla was of very small size (Fig. 1).

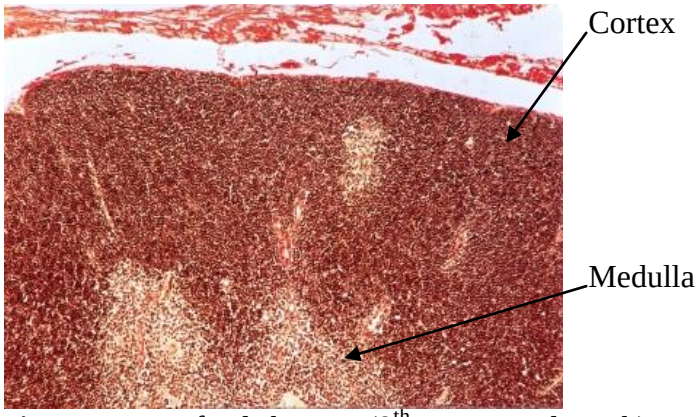

Fig.1: Human fetal thymus (9th gestational week) stained with haematoxylin & Eosin and examined under light microscope-Cortex, Medulla.

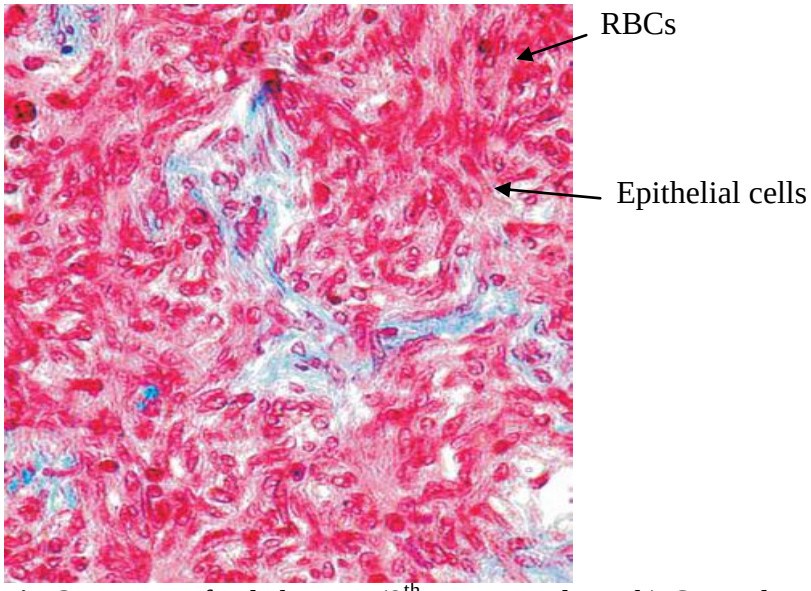

Fig 2: Human fatal thymus (9th gestational week) Stained with Masson's trichrome and examined Under light microscope-RBCs, Epithelial cells.

Red Blood Corpuscles and spindle shaped epithelial cells started appearing at 9th week. Some of these Red Blood Corpuscles were nucleated (Fig. 2). No Hassall's Corpuscles was observed.

Group-II (12-14 weeks):

The lobulation of the thymus gland was still continuing at this stage with the developing connective tissue trabeculae between the lobules. The lobules were found to possess blood vessels. They had a recognizable cortex and medulla.

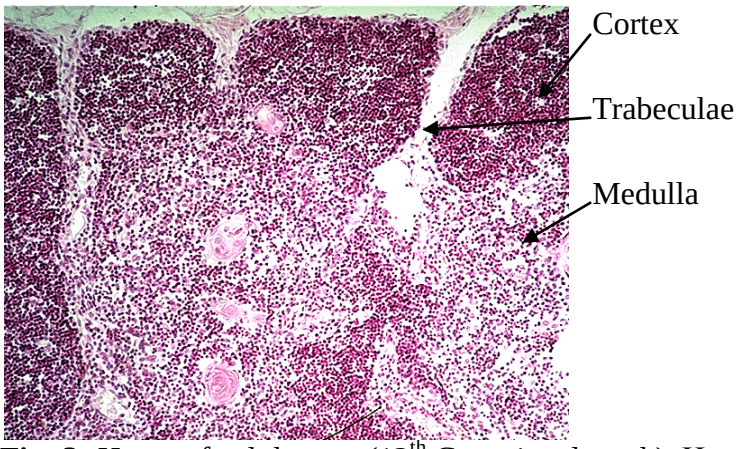

Fig: 3: Human fetal thymus (12th Gestational week). Hassall's Corpuscles could be seen.

Group-III (15-17 weeks):

The number of lobules had increased further. By 15th week, in some of the sections, the Hassall's Corpuscles were clearly visible in the medulla.

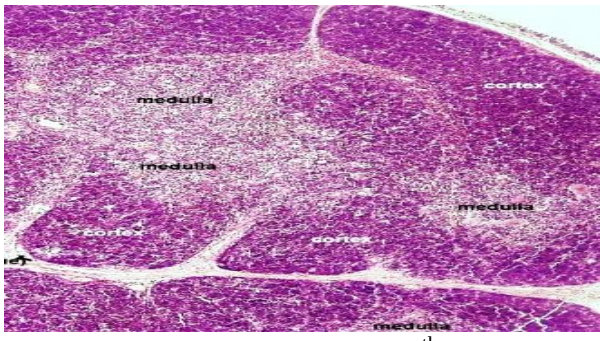

Fig: 4: Human fetal thymus (12th Gestational week) stained with haemotoxilin&eosin and examined under light microscope showing well differentiated connective septa.

Group-IV (18-24 weeks):

Blood vessels and adipose tissue of its capsule and trabeculae became more extensive at this stage. Number and size of Hassall's Corpuscles as well as number of lobules also increased.

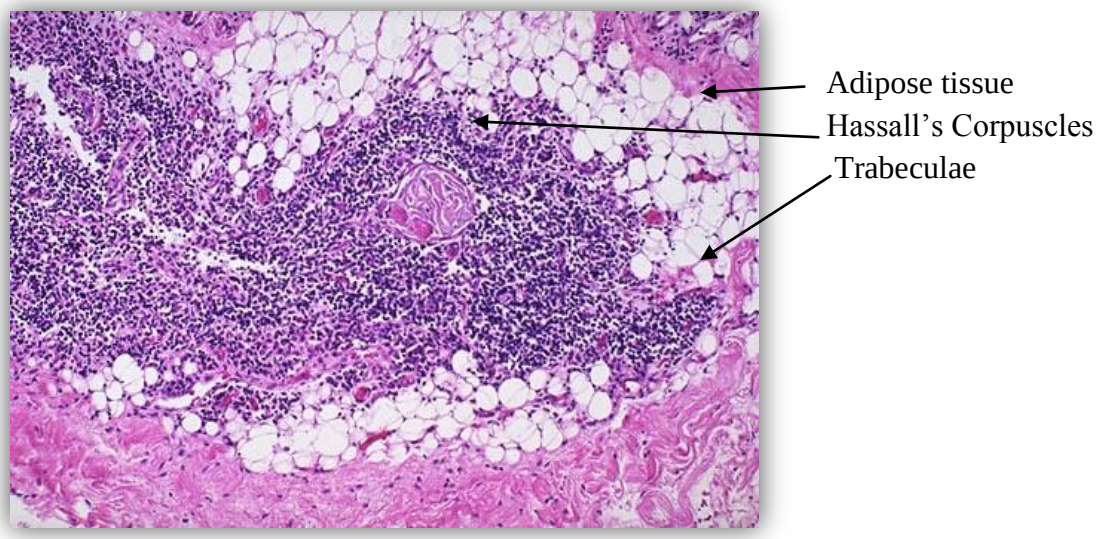

Fig: 5: Human Foetal thymus (24th Gestational week) stained with Haematoxylin & Eosin and examined under light microscope showing Trabecule and well developed Hassall's Corpuscles and adipose tissue.

Discussion

Different findings have since been reported by various workers as regards the structures of the thymus in human foetuses. Lymphocytes were different observations regarding the time at which the lymphocytes were present in the thymus such as from 8th week *(*Williams et al.1995*)*, at 9th week *(*Harr, 1974; Hamilton and Mossman, 1976; Von Gaudecker, 1991 and, Ritter and Lampert, 1992*)*. The present study observed the presence of thelymphocytes from 9th week onwards covered.

Ghali et al (1980) and Harr (1974) reported lobulation of thymus gland at 10th and 12th week respectively. Whereas, in the present study formation of lobules had started at 9th week and distinct formation of lobules were observed at 12th week Ghali(11^{th} week) et al (1980), in embryos of about 40 mm crown-rump length Hamilton and Mossman, (1976), by about 12th week Hayward, (1972) and Muller- Hermelink et al (1996), 14th week Harr, (1974) and; Lobach and Haynes, (1987), between 12th and 14th week Von Gaudecker and Muller-Hermelink, (1980). The present study indicated that the differentiation of the cortex and the medulla had started from 9th week and became well distinguished from 12th to 14^{th} week stage. The time of appearance of Hassall's Corpuscles in 8th week Fawcett, (1994), 9th week Gilhus et al. (1985), at 10th week Williams et al, (1995), at 11^{th} week Ghali et al. (1980), between 15th and 16th week Lobach and Haynes, (1987). In the present study, the presence of Hassall's Corpuscles was observed only from 15th week of gestation. (Fig: 5)

CONCLUSION:

The study revealed that structural changes of human thymus such as lobulation, differentiation of cortex and medulla, appearance of Hassall's Corpuscles occurred mostly within 15^{th} gestational week, the present study revealed that lobulation was completed by 12th week and, differentiation of cortex and medulla and adipose tissue was observed between 12th and 24th week. The presence of Hassall's Corpuscles was observed in 15th week, which increased in number and size during 17th-24th week.

References

1. Chevalier P, Sevilla R, Zalles L, Sejas E, Belmonte G,Parent G. Study of thymus and thymocytes in Bolivina preschool children during recovery fromsever protein energy malnutrition. J Nutr Immunol1994; 3:27-39.
2. Cormack DH: Ham's Histology In: Lymphatic tissue and the immune system. 9th Edn, JB Lippincott Company, Philladelphia. Pp.234-61(1987).
3. Fawcett DW: A Text Book of Histology in: Thymus. 12th Edn, Chapman and Hall: New York. Pp.432-444 (1994).
4. Ghali WM, Abdel-Rahman S, Nagib M and Mahran ZY (1980): Intrinsic innervation and vasculature of pre- and post-natal human thymus. Acta Anat; 108:115-123.
5. Haar JL (1974): Light and electron microscopy of the human foetal thymus. Anat. Rec; 179:463-467.
6. Hamilton WJ and Mossman HW: Hamilton, Boyd and Mossman's Human Embryology In: Alimentary and respiratory system, pleural and peritoneal cavity. 4th Edn; The Macmillan Press Ltd, London. pp.291-376 (1976).
7. Hollinshead WH: Anatomy for Surgeons: The Thorax, Abdomen and Pelvis In: The Thorax in General. 2^{nd} Edn, Vol. 2, Medical Department, Harper & Row Publishers, New York, Evanston, San Francisco, London. pp.1-43 (1971).
8. Lobach DF and Haynes BF (1987): Ontogeny of the human thymus during foetal development. J Clin Immunol; 7:81-97.
9. Ritter MA and Lampert IA: Oxford Text book of Pathology In: Thymus. Vol-2b. Oxford University Press, Oxford. pp.1807-1821 (1992).

10. Robert Anderson Gray's anatomy, 40th ed., 2008,p.945-948, Elsevier Limited.
11. Yekeler E, Tambag A, Tunaci A, Genchellac H, Dursun M, Gokcay G, Acunas G (2004). Analysis of the thymus in 151 healthy infants from 0 to 2 years of age. J Ultrasound Med 2004;23(10):1321–1326.