

## **Review Article**

# **The Hassal of Thymus: Hassals Corpuscle Histological and Histopathological Perspective**

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**Abstract:** Hassals corpuscles are special and specific bodies present in the thymic medulla. The medulla of thymus is pale staining and composed of scattered thymocytes, reticular cells and characteristic bodies called Hassals Corpuscles. The Hassal's Corpuscles are large, acidophilic, rounded bodies consisting of central degenerated Hyaline mass surrounded by concentrically arranged reticular cells. They are specific to thymus. The article deals with different clinical conditions associated with Hassals Corpuscle. Increase or decrease in number of Hassals Corpuscle with different diseases and their histopathological importance.

**Keywords:** Hassals, Corpuscle, Pouches, Cortex, Medulla, Gland

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## **INTRODUCTION**

The Thymus is a soft, pinkish, lobulated lymphoid organ located posterior to the sternum. It is different from other organs as it undergoes involution. It is well developed in childhood. It arises from Pharyngeal Pouches simultaneous to the development of Parathyroids. Around puberty it degenerates and is replaced by adipose connective tissue. Its main function is processing of lymphocytes. The thymus also has a connective tissue stroma and a parenchyma. The connective tissue stroma of the thymus is formed of a thin capsule and thin connective tissue. Trabeculae divide the thymus into two lobes and multiple lobules. Each Lobule has an outer cortex and inner medulla. The cortex is formed of densely packed small rounded cells similar to lymphocytes called thymocytes. They are round in shape about 7-9 microns in diameter with darkly stained rounded nuclei. The reticular cells are present in both cortex as well as medulla. They are branched non phagocytic cells and form about 10-20 percent of cells in comparison to thymocytes which form 80-90 percent cells. The medulla is pale staining. It is composed of scattered thymocytes, reticular cells and characteristic bodies called Hassals Corpuscles. Hassal's Corpuscles are large, acidophilic, rounded bodies consisting of central degenerated hyaline mass surrounded by concentrically arranged reticular cells. Their size ranges from 20-75 microns.

## **DISCUSSION**

The Hassal's Corpuscles are highly specific for thymus [1]. They are not seen in any other lymphoid

tissue and presence of Hassals bodies in any lymphoid tissue suggests a histological or histopathological diagnosis of thymic tissue. The Hassals corpuscles can present as histological bodies in a variety of ways. They can present in a variety of forms with cystic changes, calcification, necrosis, cysts in human thymus. Maturation forms of hassals corpuscles [2]. Hassals corpuscles have different roles. Hassals corpuscles have a secretory function [3]. Hassals corpuscles have their origin from thymic epithelial cells [4].

The Thymus is a primary lymphatic organ and has importance in processing of T Lymphocytes. The development of the lymphoid system begins with a pluripotential stem cell in the liver and bone marrow of the fetus [5, 6]. As the fetus matures, the bone marrow becomes the primary site for lymphopoiesis. The cells migrate to the thymus, which becomes the primary lymphoid organ wherein the CD3+ T lymphocyte matures and becomes educated. Then it is released to populate the peripheral lymphoid tissues, lymph nodes, spleen, and gut. It is in the thymus that T lymphocytes acquire their cell surface subset differentiation markers (e.g., CD4+, CD8+, T-cell receptor [TCR]), which in turn permit their specific functions in the immune system [7]. A second lymphocyte subpopulation that descends from the stem cell is the B-cell line.

Circulating leukocytes consist of neutrophils, monocytes, eosinophils, basophils, and lymphocytes (T cells, B cells, and natural killer cells are all lymphocytes). Any one or all of these cell types can

increase in peripheral blood to abnormal levels, depending on the stimulus. Each type of leukocyte is produced in the bone marrow (and in the case of lymphocytes, in lymph nodes, spleen, and thymus as well) in response to specific growth factors.

Thymic hypoplasia or DiGeorge's syndrome results from defects in pharyngeal apparatus particularly and specifically the dysmorphogenesis of the third and fourth pharyngeal pouches, leading to hypoplasia or aplasia of the thymus and parathyroid glands. Other structures forming at the same age are also frequently affected, resulting in anomalies of the great vessels, varieties of esophageal atresia, bifid uvula, congenital heart disease (atrial and ventricular septal defects), a short philtrum of the upper lip, hypertelorism, an antimongoloid slant to the eyes, mandibular hypoplasia, and low-set ears. Serum immunoglobulins are usually normal for age, but some fractions, particularly IgA, may be diminished and IgE may be elevated. T-cell numbers are decreased, and there is an increased number of B cells. Responses of peripheral blood lymphocytes following mitogen stimulation, like the intradermal delayed hypersensitivity response, have been absent, reduced, or normal. Careful postmortem studies have sometimes revealed tiny nests of thymic tissue containing Hassall's corpuscles and a normal density of thymocytes.

Nezelof's syndrome is an immune dysfunction and is characterized by lymphopenia, diminished lymphoid tissue, abnormal thymus architecture, and the presence of normal or increased immunoglobulins. Children with this condition may have serious infections and usually present with recurrent or chronic pulmonary infections, failure to thrive, oral or cutaneous candidiasis, chronic diarrhea, recurrent skin infections, gram-negative sepsis, urinary tract infections, severe varicella, or combinations of these. Other findings include neutropenia and eosinophilia. Studies of cellular immune function have shown delayed cutaneous anergy to ubiquitous antigens and low to absent *in vitro* lymphocyte responses to mitogens and allogeneic cells. Such patients have profound deficiencies of total T cells and T-cell subsets. Peripheral lymphoid tissues demonstrate paracortical lymphocyte depletion. The thymuses are very small and have a paucity of thymocytes and usually no Hassall's corpuscles.

IgA deficiency is one of the most frequent immunologic abnormality. Here Specific antibody levels may be decreased or normal. *In vivo*, there is impaired but not absent cell-mediated immunity. Enumeration of blood T cells and subsets reveals reduced percentages of total T cells and T cells of the helper (CD4) phenotype, with normal or increased percentages of cells of the suppressor (CD8) phenotype. In this condition, *in vitro* studies of lymphocyte function have shown moderately depressed proliferative responses to mitogens, decreased T-helper cell function,

and an intrinsic defect in B-cell IgA synthesis. The thymus is very hypoplastic and lacks Hassall's corpuscles. The lack of Hassall's corpuscle is important histological feature.

As the thymus develops in close relation to the Cardiac area in embryonic life, abnormalities of thymus are associated with Cardiac defects as well. It has been seen that Hassall's Corpuscles are present in large numbers in patients with congenital heart defects such as ASD, VSD, TOF.

## CONCLUSION

Although Hassall's Corpuscles are unique to thymus, can be associated with normal thymus. But the presence of absence of Hassall's Corpuscles can be associated with many diseases as well. A careful histological diagnosis would suggest a relation between Hassall's Corpuscles and these disease conditions.

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