

11 Nov 14

75

ROLE OF THYMUS IN PEDIATRICS

ESSAY

*Submitted in Partial Fulfilment of
Master Degree in Pediatrics*

By

Farida Fahmy Abou El Ezz
M.B., B.Ch.

Supervised by

Prof. Dr. HAMED SHATLA
*Prof. of Pediatrics
Ain Shams University*

*Faculty of Medicine
Ain Shams University*

1987

✓

618.9243
F.F

25331

ACKNOWLEDGEMENT

Thanks first to God

Then I wish to express my deepest gratitude to **Dr. HAMED M. SHATLA** Prof. of Pediatrics, Ain Shams University. He provided me with the opportunity to work on this essay under his guidance of which I'm much proud. He revised every word in this essay and to his advice constructive discussion and criticism, I am much obliged.

I am much indebted to the great help offered by **Dr. Nancy Abd El-Aziz** Lecturer of Pediatrics, Ain Shams University who provided much of her time and offered me valuable assistance and sincere help.

Thanks to the kind care, help and sympathy of both of them.



C O N T E N T S

	<u>Page</u>
Introduction	1
Literature review	3
Embriology	3
Development changes in weight and length of the thymus with age	5
Anatomy of the thymus	7
Histology of the thymus	10
Physiology of the thymus	14
Immunity	14
The specific immune system	14
T-cell	18
T lymphocyte life span	21
The role of the thymus in immunoreactivity	22
Cell turn over in the thymus	23
T cell function in the feutus and newborn	25
Role of the thymus in B cells maturation	26
Thymic hormones	27
Effect of other endocrine gland on the thymus	33
Assesment of the function of the thymus	38
Monoclonal antibody	42
HLA	46
Disorders of the thymus	49
DiGeorge syndrome	49
Other immunodeficiency disease	58
Primary immunodeficiency disease	58

	Page
Aquired immunodeficiency	63
Syndrome	
The thymus in some neurological disorders	
Ataxia telangiectasia	66
Beckwith weidmann syndrome.....	67
The thymus in genetics disorders	69
The thymus in Down's syndrome	69
The thymus in blood diseases	70
The thymus in aplastic anamia	70
The thymus in autoimmune heamolytic anaemia.....	71
Thymus in thalassaemia intermedia	72
The thymus in Diabetes mellitus	74
The thymus in histocytosis X	75
The thymus in Mythenia gravis	77
Effect of malnutrition on the thymus	79
Thymic tumours	84
Summary	85
Abbreviation used	89
References	90
Arabic Summary	112

LIST OF FIGURES AND TABLES

	<u>Page</u>
Fig. (1): Embryology of the thymus.....	4
Fig. (2): Insolution patterns of human thymus.....	6
Fig. (3): Relations of the thymus gland in newborn infant.....	8
Fig. (4): Histology of the thymus	11
Fig. (5): Hassall's corpuscle.....	13
Fig. (6): Cell involved in immune system.....	16
Fig. (7): T-cell marker.....	19
Fig. (8): Correlation between circulating thymulin activity and serum T_3 or T_4	35
Fig. (9) Changes in thymulin activity as assessed mented after antithyroid therapy patients.	36
Fig. (10) A nude mouse.....	39
Fig. (11): Infant with DiGeorge syndrome.....	52
Fig. (12): Serum thymic hormon activity in PEM.....	30
Table (1): Main action of thymulin on T-cells.....	31
Table (2): Effect of Vit. A. deficiency on the thymus.....	32

INTRODUCTION

INTRODUCTION & AIM OF THE WORK

The thymus is a large organ which comprises about 0.8% of the body weight at birth in man. It has epithelial, endocrine and lymphoid (immunological) components (Toylor, 1965).

The function of the thymus in relation to immunity is the production of "T" cells which are involved in cellular immune responses and also help "B" cells to start humoral antibody responses. The thymus secretes a hormone like substance called immune complement factor (Cosba & Miller, 1963).

The thymus populates peripheral lymphatic organs, such as the lymph nodes and spleen, with immunocompetent T lymphocytes that are responsible for cellular immunity. It is thus one of the most important organs concerned with defense against infections.

It plays a key role in the development of immunological competence as manifested by the capacity to reject allografts and to develop delayed type of hypersensitivity. Removal of the thymus from newborn mice was found to cause lymphopenia and deficiency in all manifestations of the immune response (Altemier 1965). Therefore in the rare Swiss type of hypogammaglobulinemia

in which rudimentary development of the thymus is associated with failure of development of all types of immunologic responses including antibody production, graft rejection and delayed type of hypersensitivity (Shatla 1974). Thus the thymus plays an important role in the original genesis of the entire lymphoid system of the body. So the aim of this study is to delineate the main points in the embriology, anatomy, physiology, pathology and disorders of the thymus gland.

LITERATURE REVIEW

LITERATURE REVIEW

EMBRYOLOGY OF THE THYMUS:

Toward the end of the sixth week the right and left ventral recesses of the third pharyngeal pouches are converted into two solid flask-shaped masses by proliferation of endodermal cells. The masses grow medially and come in contact, and form the bases of the bilobed thymus gland, (Fig. 1) (Nerd 1974). The thymus lies immediately ventral to the aortic sac and as the heart descends, it follows it into the thorax. The endodermal masses are invaded by strands of mesenchyme which differentiate into the thymic blood vessels. Colony forming units reach the thymus via the blood stream and become T lymphocyte progenitors. These in their turn supply immunologically competent T lymphocytes to the general lymphatic tissues of the body via the bloodstream. The reticular cells and concentric corpuscles of the thymus are derived from endodermal cells (Wendell, 1984).

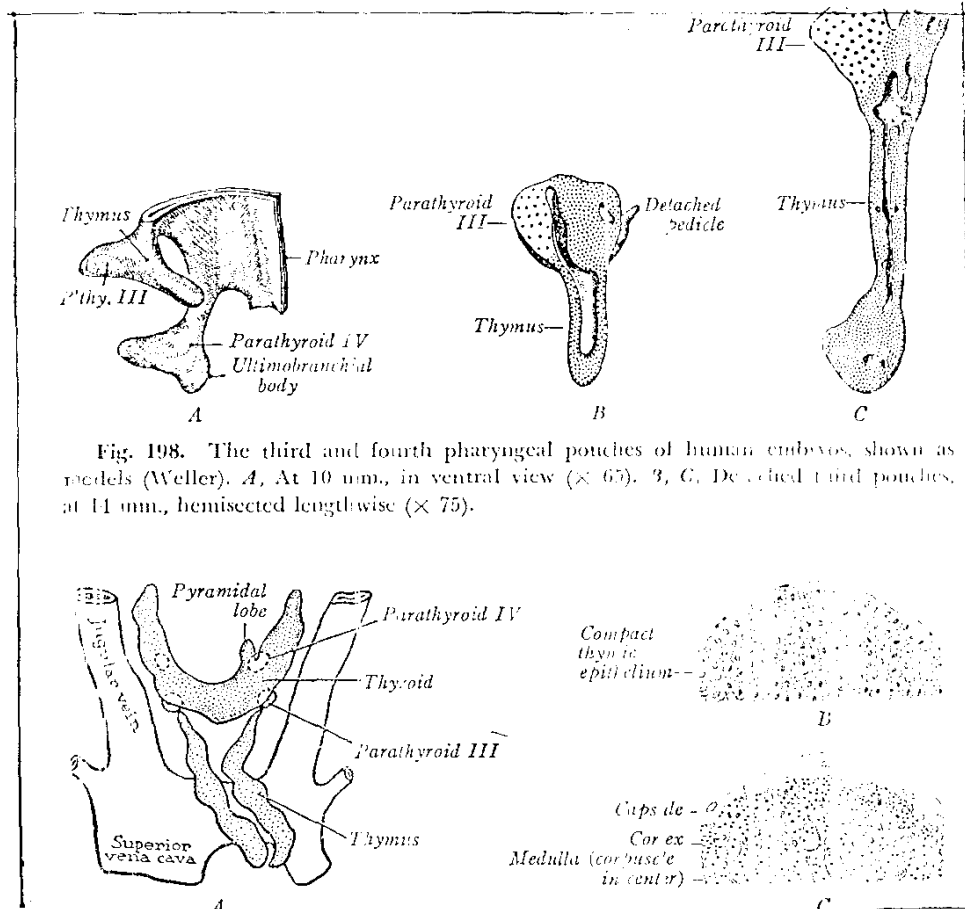


Fig. (1):

Embriology of the thymus gland from Nerd
L.R. 1974.

Edis Anatomy a text book and laboratory manual
of emberiology Ch. 13, P. 23.

Pub. Holl G.B. London.

DEVELOPMENTAL CHANGES IN WEIGHT & LENGTH OF THE THYMUS
WITH AGE:

The average weight of the thymus gland at birth is 10 gm (0.8% of wt.). The weight of the gland increases steadily from birth to puberty and then it slowly decreases in weight until old age (Fig. 2). At puberty it weighs 30 gm. in the young adult 18.6 gm. and in the old adult 12.5 gm. The thymus constitutes 0.8 percent of the body weight at birth and 0.03 to 0.05 percent in adulthood (Edmunds, 1973). However, it has to be put into consideration that acute atrophy in the thymus can take place within a short period of time due a variety of diseases or insults e.g. severe stress (Henry, 1968).

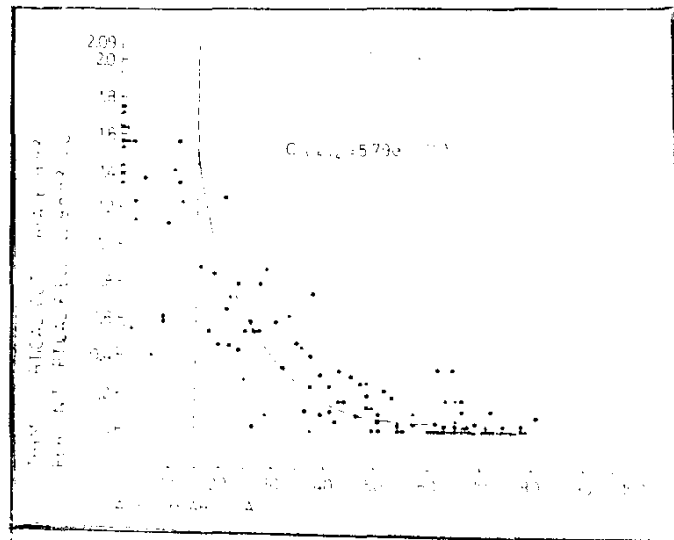


Fig. (2):

Insolution patterns of human thymus from P.Tosi.
Kraft, P. Luzi, Marcella G. (1982).
Clin. Exp. Immunol. 47, 497-504.

ANATOMY OF THE THYMUS