ADRENAL DYSFUNCTIONS AND TUMOURS

ESSAY

SUBMITTED IN PARTIAL

FULFLILMENT OF MASTER DEGREE

(UROLOGY)

BY

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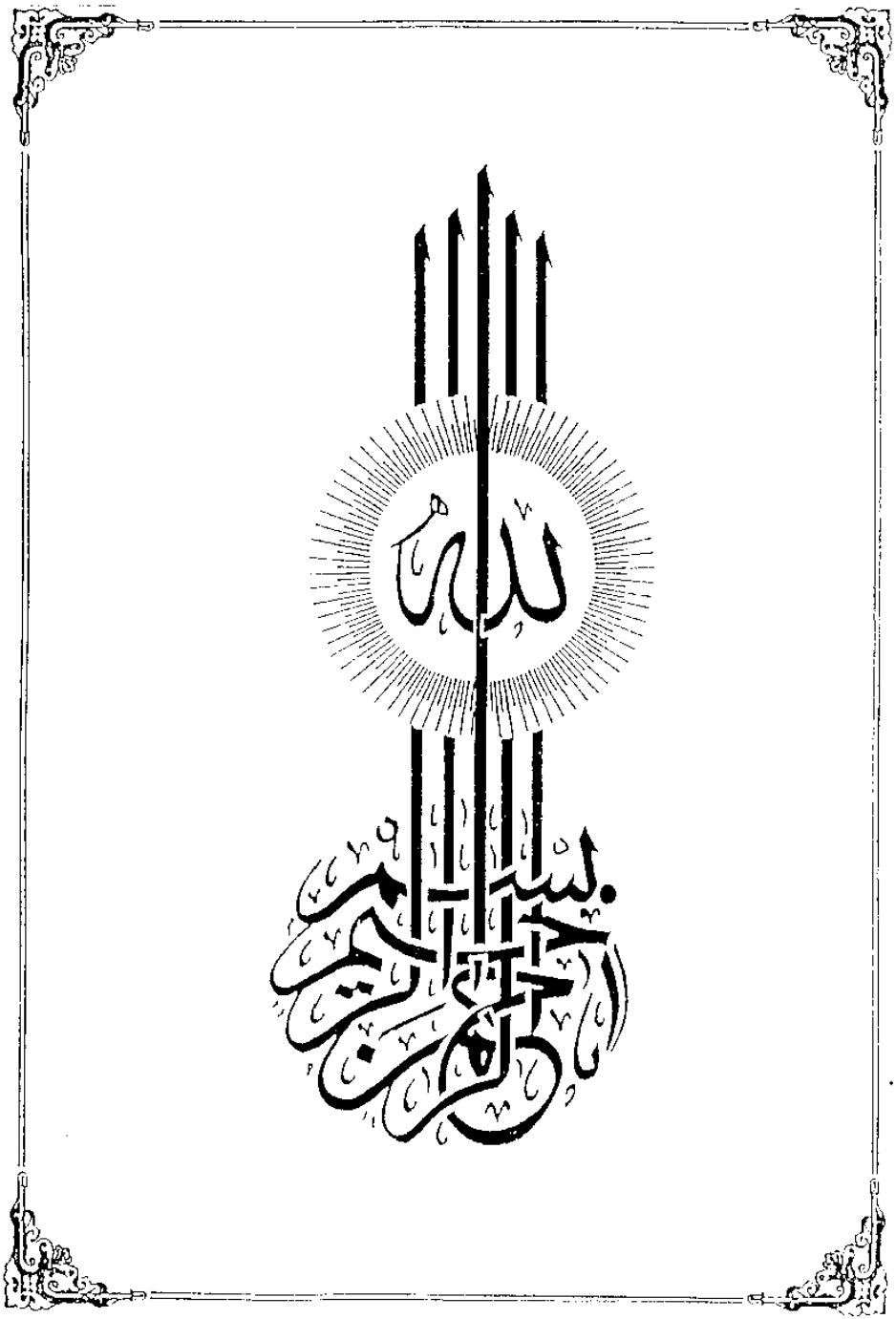

A c k n o w l o d g e m e n t .

I must acknowlodgement profoundly , Professor Dr. Abdel-Fattah Mohamed Aggour , for all , his great help , co-operatively , useful instructions , and guidance , which he has been given to me , during writing of this Essay .

Surely , his kind-heart , is the only way , that lead to evaluation of this work , by this manner .

M. Moawd .

C O N T E N T S .

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CHAPTER (I)

INTRODUCTION &

HISTORICAL REVIEW .

I N T R O D U C T I O N .

The adrenal glands constitute one of the major homeostatic organs of the human body . They composed of two organs , cortex and medulla , both parts were different , in embyologic origin , type of secretion , and function . Complete removal is lethal , unless replacement therapy is instituted .

Historical Review :

Eustachius , (I5I3 - I574) , who was a professor of anatomy in Rome , was the first one could discribe the adrenal glands in I563 . (Drill's , I97I) . Thoms Addison , (I793 - I863) , described the effects of the suprarenal capsules in I855 . (Bailly & Love's , I977) . Brown - Sequard , in I858 showed that bilateral adrenalectomy in animals was fatal . (Good & Gilman's , I980) . Arnold , in I866 studied macerated sections of the adrenal cortex and according to the arrangement of the reticular framework he divided the cortex into , the zona glomerulosa , the zona fasiculata , and the zona reticularis , from outside inwards . (Weiss & Greep , I977) . Gottshau , in I883 also divided the cortex into three zones , similar to those described by Arnold , but this differentiation was made according to the arrangement , size and micro - chemical features of the cells , the terms suggested by Arnold and Gottshau , are still used uptill now . (Singer , I962) . Faster & Smith , in I926 established , the fact that hypophysectomy results in atrophy of the adrenal cortex . (Drill's , I97I) .Hartman & his associates , in I930 , described a meth-

od for preparing , potent adrenocortical extracts . (Goodman & Gilman's , I980) . Harvey Williams Cushing , (I869 - I939) described in I932 , " Hypophyseal basophilism " , which was known after him as Cushing's disease . (Bailly & Love's , I977) . Butenandt , inI93I , by his herculean effort he obtained I5 mg of crystalline androsterone , from I5000 liters of male urine . (Goodman & Gilman's , I980) .

Reichstein & Shoppee , I943 , could isolate and elucidate the structures of 28-Steroids from the adrenal cortex five of these compounds ; Cortisol , Cortisone , Corticosterone , II-Dehydrocorticosterone , and II-Desoxycorticosterone were demonstrated to be biologically active . (Goodman & Gilman's , I980) . Simpson & Tait , in I952 , were identified " Aldoserone " , which the main mineralocorticoid secreted by the human adrenal cortex . (Samson Wright's ,I98I) .

Gerome W. Conn , in I954 , described the primary hyperaldosteronism , which known after him as " Conn's syndrome " . (Bailly & Love's , I977) . Bell & coworkers , in I956 , described the structure of ACTH , Hoffman et al , I96I , could succeeded in the synthesis of biolgically active peptide ACTH Schwyzer & Sieber , in I963 could succeeded in the synthesis of ACTH of 39 amino acid residues . (Goodman & Gilman's , I980)

In more recent years , there has been a certain stabilization of the field , and the effective clinical use of the corticosteroids and androgens , has become possible because of thier isolation , elucidation of structure , and economical synthesis . (Drill's , I97I) .

C H A P T E R (II)

E M B R Y O L O G Y .

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The adrenal cortex is mesodermal in origin , while the adrenal medulla is ectodermal in origin . The fetal gland is capable of steroidogenesis by I0 weeks of gestation , and in an 8 weeks' fetus , the kidney and the adrenals are about the same size . (Willims , I98I) . At birth , the adrenals are large and heavy , relative to body weight , and about I/3 size of the kidney , and each weights 2 to 4 gm , whereas in the the adult its only I/28 size of the kideny , but the adult gland is little larger than it is at birth . Due to rapid involution of the fetal zone , the gland weights , by the end of the second month , only i to 2 gm . (Campbell , I970) .

Development of adrenal cortex :

The primitive cortex or fetal zone ; During the 4 th to 5 th week a number of mesothelial cells on either side of the root of the mesentery and the genital ridge begin to prliferate and unite to form a mass of large eosinophilic cells which is termed the " fetal zone " , (See figure , I) , which constitutes approximately 80 % of the cortex at term , but it undergo rapid regression after birth , and it disappeared entirely by the end of the first year of life . (Growley ,I976 , Gray's , I973) .

The definitive cortex or permanent cortex ; During 9 th to II th weeks of fetal life , a second series of small basophillic cells , arise from the coelomic mesothelium and form a layer which surrounds the fetal zone forming the permanent cortex , (See figure , I) , (Willims , I98I) .

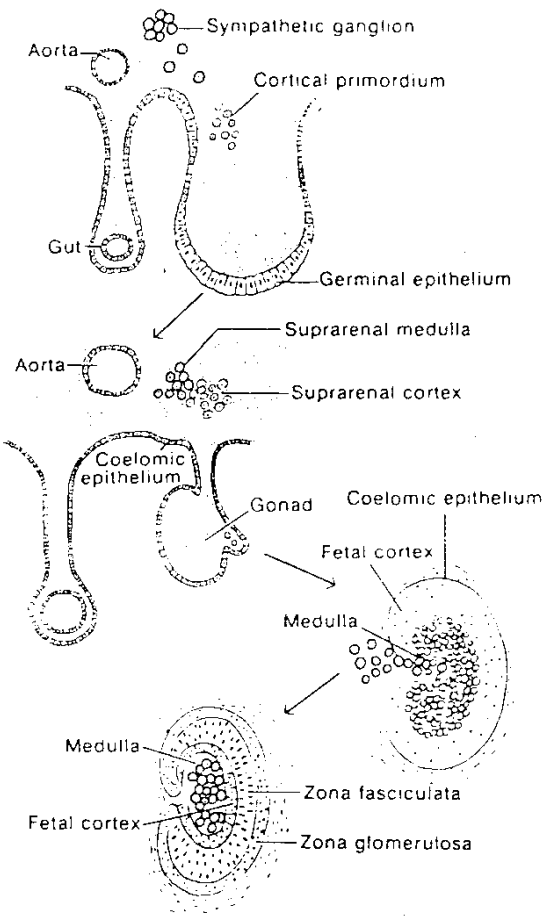

Fig.(I) Diagrams showung the successive stages in the differentiation of the adrenal gland . (Hamilton, I962)

A few weeks after birth , the permantent cortex gradully grows , and replace the fetal zone , but differentiation of the permanent cortex into three zones seen in adult is apparent at the 3 rd year after birth , and the full histologic differentiation of the permanent cortex , is attained only at puberty . (Gray's , I973) .

The fetal cortex produces mainly androgens , and a very little cortisol , because the enzymes that synthesize cortisol are incompletely developed , and this reduced output of cortisol stimulate ACTH release by the pituitary gland , which in turn stimulate the fetal cortex to undergo hyperplasia (i.e. the fetal cortex is ACTH dependent) , (Samson Wright's ,I98I)

The androgens and androgens precursors , synthesized by the fetal cortex is converted to estrone and estradiol by the placenta , these latter steroidd are transferred back to the fetus to be converted to estriol which will enter the maternal circulation , (i.e. the convertion to estriol is completed in the fetus liver and the fetal adrenal gland is a part of " The fetal - placental unit ") . (Willims , I98I , Weiss & Greep , I977 , Growley , I976) .

Soon after birth , the fetal cortex is switches from androgens production to cortisol production , and this increased cortisol level , leads to a decline in ACTH output , and the fetal cortex undergoes regression . (Goodman & Gilman's , I980) At puberty the adrenal cortex , whilst still secreting cortisol acquires the capacity to secrete androgens once more . (Samson-Wright's , I98I) .

Development of adrenal medulla :

During the 7 th week of embryonic development the cells from the neural crest migrate and invade the medial aspect of the fetal cortex and subsequently aggregate in the center of the gland to form the adrenal medulla , (See figure , I) , (Growley , I976) . The mother cells are the sympathogonia and from these are derived , The Ganglionic cells , through the sympathoblasts , and The Phaeochromoblasts . (Muir's , I975 , Campbell , I970) .

The chromaffin reaction is positive in the 5 th month of fetal life , but adrenalin is present as early as 3 th month . (Willims , I98I) .

Congenital anomalies of the adrenal glands :

Ectopic adrenals ; (heterotopia) , Accessory adrenal tissue may be found retroperitoneally any where from the diaphragm to the pelvis . Rests of adrenal cortex are also found in the subcapsular regions of the kidney , testis , and ovarian cortex .

There are two types of congenital adrenal hypoplasia ; Anencephalic type is seen in anencephalic infants ; the glands consists only of adult cortex , and no fetal zone . The cause is either cerebral , hypothalamic , or pituitary in origin . Cytomegalic type is a familial condition , the glands are small (combined weight less than I gm) , . The cortex consists of large compact eosinophilic cells , referred to as cytomegaly . They extend in irregular columns up to the capsule of the gland . (Robbins & Cotran , I98I) .

Congenital adrenal hyperplasia ; has equal frequency in males and females and is transmitted by an autosomal recessive gene . It is responsible for the large majority of cases of adrenogenital syndrome developing within the first year of life . (Ackerman's , I98I) . There are deficiency of adrenal cortical enzymes , this lead to reduced output of cortisol , which in turn stimulate the pituitary gland to secrete extra amount of ACTH , and ACTH is responsible for adrenal hyperplasia especially of the zona reticularis , and over production of androgens , (Ganong , I98I) . Josso et al proved that ; androgens don't inhibit the development of Mullerian ducts - as do the secretions of the fetal tests , (Goodman & Gilman's , I98I) . There for the internal genital tract is normally formed , even though the external genitalia have a masculine configuration . (Growley , I976) .

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C H A P T E R (III)

A N A T O M Y .