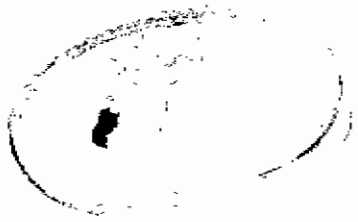
ANATOMY AND HISTOLOGY OF THE PITUITARY GLAND IN THE ADULT ALBINO RAT



By

ABBAS FATHY TAHA AHMED

(M.B., B. Ch)

Anatomy Department

Ein-Shams University

Supervised By

Professor Dr. Fakhry Amin

Professor Dr. Yehia Y. Ahmed

Thesis

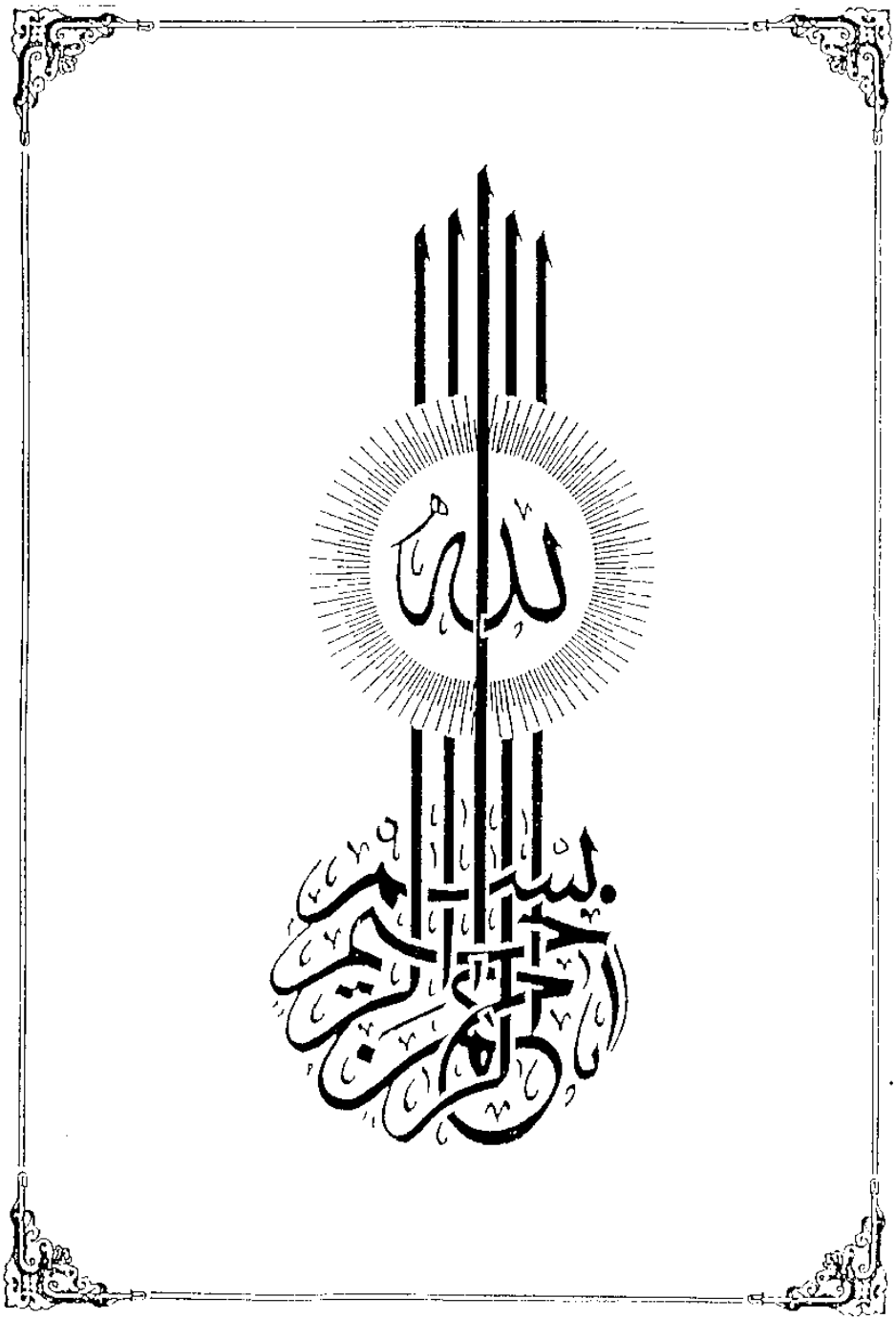
Submitted For The

Fulfilment Of The

M.Sc.

(Anatomy)

1982



ACKNOWLEDGEMENT

This work was suggested and planned by Professor Dr. Fakhry Amin, Head of Anatomy Department, and Professor Dr. Yehia Y. Ahmed, Professor of Anatomy.

I am deeply grateful for their constant supervision, continuous encouragement and criticism throughout the whole work.

C O N T E N T S

-0-0-0-0-0-

INTRODUCTION

Reviewing the literature, it was found that the structure of the pituitary gland and its comparative study was investigated by Willey (1894); De Beer (1926); Dawson (1937); Hair (1938); Wolfe (1943); Rasmussen (1947); Green (1951); Glydon (1955); Arey (1965); Mc Grath (1971) ; Andrew (1974); Bloom (1975) and Ham (1979).

The aim of the present work was to study the macroscopic and microscopic features of the hypophysis cerebri of the adult albino rat. Moreover, an attempt was made to study its innervation.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Pituitary Gland in Different Animals:

The anatomy and histology of the pituitary gland was reviewed in certain animal species:

I- Cephalochorda:

Willey (1894) reported that the hypophysis cerebri was absent in the amphioxus and was replaced by a pre-oral pit and an infundibular organ.

II- Cyclostomata:

De Beer (1926) mentioned that the neurohypophysis of the Cyclostomata was a hollow elongated sac. It was made up chiefly of ependymal-type cells which were situated close to the third ventricle and their processes extended out to unite with the peripheral glial membrane. In addition there were groups of nerve fibres which served to convey neurosecretions from the hypothalamus to the neurohypophysis. He also found that the adenohypophysis in the hagfish was situated on the floor of the cranial cavity near the infundibulum. It consisted of islets of cells embedded

in dense connective tissue. The cells were of two types, the chromophobes which were non-secreting cells, and the basophils which showed evidence of secretion. He mentioned that the adenohypophysis of the lamprey closely resembled the vertebrate form, being a glandular mass extending forwards as a flattened process beneath the forebrain. The adenohypophysis was connected with the olfactory apparatus and this connection was characteristic of the larval stage of the lamprey. Later on, in adult life the connection was lost.

III- Fishes:

Norris (1936) studied the hypophysis cerebri of the elasmobranch (cartilagenous fish). He noticed the presence of a hypophyseal cleft which extended backwards and downwards into the main mass of the adenohypophysis. A ventral lobe extended downwards as a stalk-like structure from the adenohypophysis. The caudal part of the main mass of the adenohypophysis was invaginated by finger-like projections from the neurohypophysis. Microscopically, the caudal part consisted chiefly of chromophobe cells. The rest of

the adenohypophysis showed acidophil and basophil cells which were disposed radially around the blood vessels. He noticed the presence of nerve fibres between the cells of pars nervosa and the caudal part of the adenohypophysis.

Green (1951) mentioned that the hypophysis of teleosts (bony fishes) showed two distinct parts, a neurohypophysis and an adenohypophysis. He noticed that the pars intermedia and the pars nervosa were connected by means of strands of glandular tissue and blood vessels.

IV- Amphibia:

Andrew and Hickman (1974) described the hypophysis of the Amphibia. The anterior lobe was a rounded mass and its cells were arranged in cords. The basophils, the acidophils and the chromophobes were apparent. The pars tuberalis was formed of granular basophilic cells and the neurohypophysis showed non-myelinated nerve fibres and neuroglia cells. A small dorsal portion of the neurohypophysis received an independent blood supply and was called the neural lobe.

V- Reptiles:

Poris (1938) observed that the pars intermedia of the Reptiles was the largest part and was almost surrounded by the pars nervosa. It was separated from the pars distalis by a cleft. Atland (1939) added that, the anterior lobe of the pituitary gland of the reptiles was formed of three types of cells namely, the acidophils, the basophils and the chromophobes which were arranged in flattened cords.

VI- Aves:

Rhan (1941) reported that the pars distalis of the hypophysis of Aves was divided into two distinct parts, rostral and caudal. It was separated from the neurohypophysis by a connective tissue sheath. He mentioned that the pars intermedia was absent, but occasionally a chromophobic region near the neurohypophysis was noticed. He added that the pars tuberalis extended from the most caudal region of the pars distalis and surrounded the infundibular stalk. Histologically, the neurohypophysis consisted of blood sinuses and branched granular pituicytes.

VII- Mammals:

1- Rabbit and Cat:

Dawson (1937) described the zona tuberalis in the adenohypophysis of the anterior lobe of the pituitary gland in rabbit and cat. It was situated at the anterior pole of the gland and was partially separated from the main mass of the pars distalis by connective tissue. It was richly supplied by many large vascular sinusoids. It merged dorsally with the pars tuberalis and ventrally with the bulk of the anterior lobe. Histologically, it was characterized by lack of eosinophil cells.

2- Dog:

Sisson (1975) reported that the hypophysis cerebri in the dog was found in the sella turcica of the body of the basisphenoid bone. The gland consisted of the pars distalis, the pars intermedia, the pars tuberalis and the neurohypophysis. The neurohypophysis was surrounded laterally and rostrally by the pars distalis and it was the least vascular part of the gland.

3- Albino rat:

Schwind (1928) studied the prenatal development of the hypophysis cerebri of the albino rat. He mentioned that the pars intermedia started to develop from the posterior wall of Rathke's pouch after twelve days from the date of conception and it was not supplied with blood vessels. At the thirteen th day, the pars distalis was heart-shaped but later on when the pars intermedia had rotated 90° dorsally and anteriorly, it became an oblong structure. At first, the pars nervosa was in contact with the pars intermedia dorsally but by the fifteen th day, a layer of mesenchymal cells appeared between them. In the meantime, the pars distalis pushed the pars nervosa from below, thus rotating it anteriorly and contacted the lamina post infundibularis. The pars tuberalis appeared at the thirteen th day as two buds just above where Rathke's pouch was constricted and separated from the roof of the mouth. One day later, the two buds were fused together and flattened out forming a tongue-like process extending below the diencephalon, within a sleeve of the dura mater.

Wislocki (1937) reported that the dura mater

fused with the capsule of the gland, while the pia mater enclosed only the infundibular stalk. The capsule consisted mainly of reticular and collagen fibres of varying density.

Wolfe (1943) stated that there was a progressive decrease in the relative number of the acidophils and increase in the chromophobes with advancing age. He added that the vacuolated basophils appeared first in the anterior lobe of the 3 months old rats and slowly increased in number as age progressed.

Green and Harris (1947) described the pars tuberalis as thin but very extensive sheet which extended out behind the optic chiasma and between the optic tracts. They mentioned that it would be almost impossible to remove the pars tuberalis or perform a total hypophysectomy in the rat without extensive damage to the ventral part of the hypothalamus. The pars tuberalis was separated from the neurohypophysis by a thin connective tissue septum. They observed a well defined pars intermedia which was thickened

in its caudal half. The pars distalis which appeared small in the midsagittal section was enlarged laterally and separated from the pars intermedia by a horizontal cleft which persisted throughout life.

Landsmeer (1951) reported that the entire gland had a well developed vascular supply consisting of wide sinusoids in the pars distalis and numerous narrow capillaries in the pars nervosa.

Glydon (1955) stated that, in the earlier stages of the development of the pituitary gland, the whole pituitary complex was surrounded by a plexus of meningeal vessels which was connected to vessels lying in the roof of the primitive pharyngeal cavity. Later on, with the subsequent development of the bony sphenoid, this connexion of vessels was lost. He claimed that due to the growth of the tuberal process of the adenohypophysis, a part of the peri-hypophyseal capillary plexus was trapped beneath the median eminence and was called, the supra-tuberal plexus. Subsequently, when the major part of