THE RADIOLOGICAL CHANGES OCCUR AT SELLA TURCICA IN CASES OF INCREASED INTRACRANIAL TENSION

THESIS

Submitted for Partial Fulfilment of Master Degree in Diagnostic Radiology

By

Mansour Aziz Mansour

M.B.B.CH

Supervised by

Dr. MOHAMED SAMI EL BEBLAWI

Professor, Head of Radiology Department,

Faculty of Medicine, Ain Shams University

and

Dr. Youssef Hamed Zaki

Lecturer of Radiology, Faculty of Medicine

Ain Shams University

1985

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ACKNOWLEDGEMENT

I would like to express my deepest gratitude, and appreciation to Prof. Dr. MOHAMED SAMI EL BEBLAWI Head of Radiology Department, Faculty of Medicine, Ain Shams University for his great help, precious advices, guidance, and supervision, as well as the very kind feeling all through this work.

I am grateful to Dr. YOUSSEF HAMED ZAKI, Lecturer of Radiology, Faculty of Medicine, Ain Shams University for his continuous help and useful remarks which have helped me.

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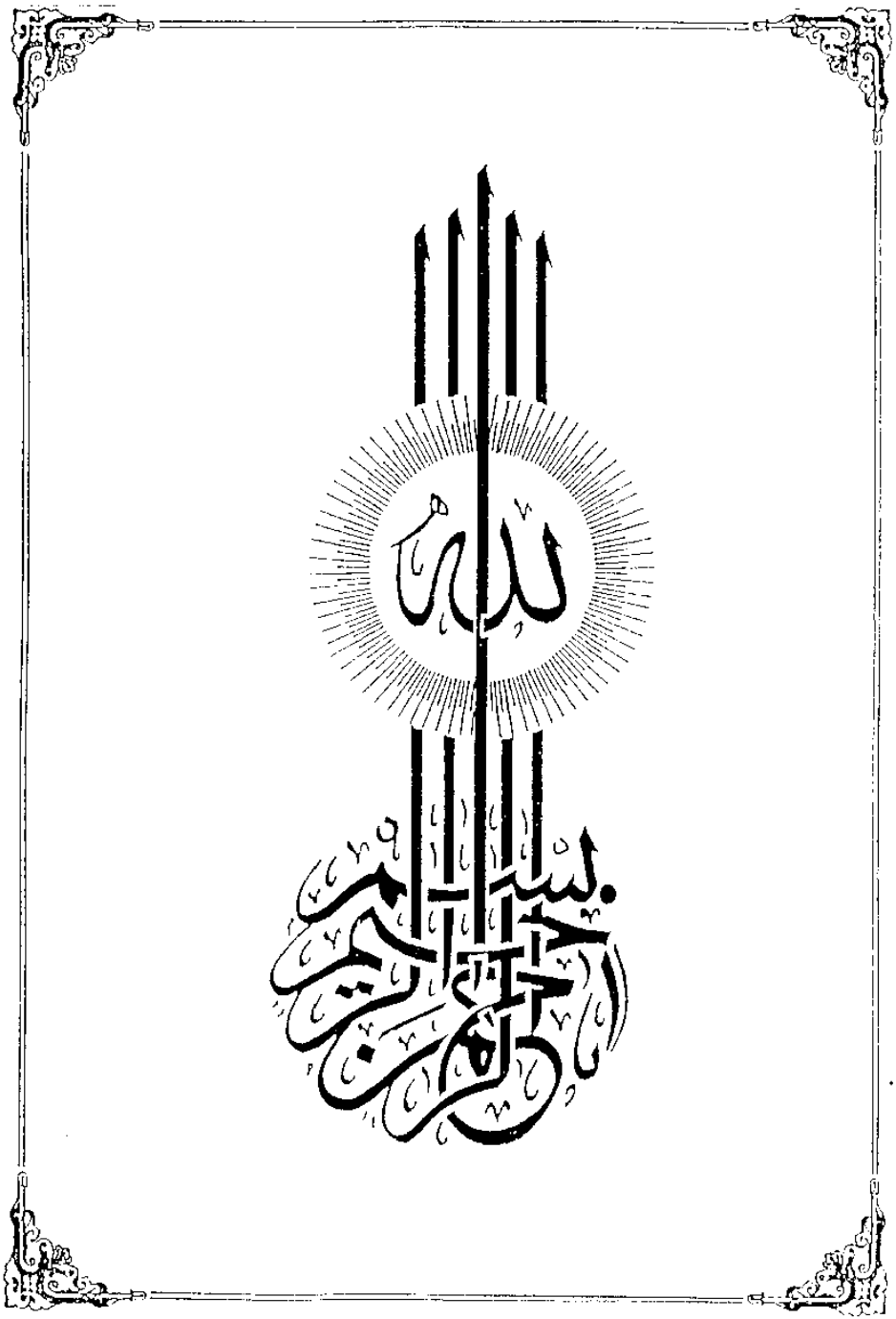

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CHAPTER (1)

INTRODUCTION AND AIM OF THE WORK

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INTRODUCTION AND AIM OF WORK

The earliest detectable radiologic signs in increased intracranial pressure in adults is erosion of the anterior aspect of the dorsum sellae, the cortical bone on the inside of the fossa becomes thin and indistinct, this followed by atrophy of the superior margins of the posterior clinoid processes and floor of the sella turcica. (Sutton, 1980).

The aim in our work is to study the different radiological manifestation occuring at the sella turcica in cases presented clinicaly by increased intracranial tension .

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CHAPTER (2)

ANATOMY OF SELLA TURCICA

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The sella turcica is a deep depression in the cerebral (superior) surface of the body of the sphenoid bone, the deepest part of which, the hypophyseal fossa, lodges the hypophysis cerebri.

The Anterior boundary :-

The tuberculum sellae, which is an oval elevation in the superior surface of the sphenoid bone separating the sella turcica from the sulcus Chiasmaticus anteriorly.

The anterior boundary is completed laterally by two small eminences called the middle clinoid processes.

Posterior boundary :-

The dorsum sellae, a square plate of bone, the superior angles of this plate end in two tubercles of varying size termed the posterior clinoid processes, which give attachment to the fixed margin of the tentorium cerebelli.

The sloping area behind the dersum sellae is termed the clivus, and is continuous with the clivus of the occipital bone in the adult skull.

(D.V. Davies, 1967.) (16)

The Roof :-

The sella is completed above by a horizontal sheet of dura mater, the diaphragma sellae perforated centrally to accommodate the stalk of the pituitary gland.

The diaphragma sellae flows out laterally to form the roof of the cavernous sinus.

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The sphenoid bone, Superior surface

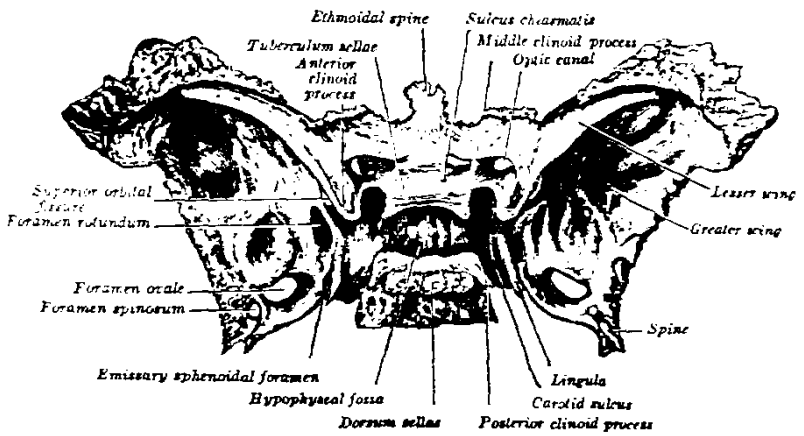

FIG. 1: From: (Gray's Anatomy' 34th edition 1967
Ediated by D.V. Davies)

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Relations of the sella turcica :

1. The content :
   1. The pituitary gland:

   A. The anterior lobe : The larger, mostly cells and is very vascular. It is adherent to the posterior lobe by a narrow zone of gland substance that is often divided by a cleft from the main mass of the anterior lobe, this narrow zone is often named the PARS INTERMEDIA but it is developmentally, structurally and functionally part of the anterior lobe.

Microscopic Anatomy : a. Anterior lobe : skeletal framework of minimum amount of fibrous tissue contains three kinds of cells.

1. Chromophobe cells (50%)
2. Eosinophils (40%)
3. Basophils (10%)

b. Pars intermedia :
commonly contains large colloid vesicles.

B. The Posterior lobe :

is smaller mostly fibres and is less vascular, it is connected with the stalk, a prolongation downwards and forwards from the tuber cinereum.

Microscopic anatomy :

Unmyelinated nerve fibres where cell bodies lie in the hypothalamic nuclei. scattered among these fibres and the neuroglia are a few cells named pituicytes.

The Pituitary gland is in theory surrounded by a subarachnoid space, but in practice it is usually found that Pia and arachnoid have fused together on its surface and around the stalk lying snugly against but not fused with, the dura mater of the sella turcica.

Blood supply : Branches from the internal carotid artery supply the stalk and the posterior lobe. From the capillaries in the posterior lobe a portal system of vessels runs on to supply the anterior lobe. (36)

(R.J. Last, 1975)

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Development:

A. The anterior lobe : formed from Rathke's Pouch which appears as a diverticulum from the roof of the primitive mouth just in front of the upper end of the buccopharyngeal membrane and notochord and in contact with the lower surface of forebrain.

The upper end of Rathke's pouch expands and is surrounded by mesenchyme to form a closed vesicle. From the anterior part of this vesicle the anterior lobe is develops, the posterior part fuses with the posterior lobe to form the pars intermedia.

The original cavity within Rathke's Pouch gets smaller and forms the residual cleft in the gland.

B. The Posterior lobe :

Develops from a diverticulum arises from the floor of the diencephalon, postro-superior to Rathke's Pouch.

The cells of the lower part of this diverticulum proliferete to form the posterior lobe.

The upper end of the diverticulum remains to give the infundibular recess of the third ventricle.

ANOMALIES :

Presence of ectopic anterior lobe along course of Rathke's Pouch, but rarely in the sphenoid bone

(Zaghloul M. and Youssef M. 1966.) (41)

2) Superior relation :

A) The optic nerve, optic chiasma and optic tract :

The optic chiasma , usually lies towards the back of the diaphragma selle and one cm. above, so that a tumour of the pituitary gland rising upwards usually passes in front of the Chiasma, pressing on the medial sides of the optic nerves, which is formed by the fibres from the nasal half of retina.

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The decussating fibres in the optic chiasma are arranged in well defined laminae . nasal retinal fibres, which constitute approximately 50 to 60% of the total retinal fibres from one eye, cross over to join the temporal Fibers of the opposite eye to form the optic tract. These fibres subserve vision in the temporal field. The ventro-medial fibres of the optic nerve which subserve the upper temporal fields are located in the anterior, inferior part of the chiasma, they form a short loop that extends into the optic nerve of the opposite side before passing backward in the optic tract. The dorso-medial fibres, which subserve the lower temporal field, loop into the ipsilateral optic tract before crossing in the postrosuperior chiasma to the centro-lateral optic tract.

Fibres from the macular region of the retina occupy the central part of the optic nerve crossing in the posterior part of the chiasma.

The visual disturbance produced by a lesion in the parasellar region and the changes in field of vision depends on the part of the optic nerve, chiasma or tract affected or compressed. (23)

(Joseph B. Martin, Seymour Reichlin and Gregory M. Brown, 1976)

B) The suprasellar subarachnoid cisterns :

As the arachnoid extends across the two temporal lobes, it is separated from the cerebral peduncles and the structures in the interpeduncular fossa by the 'Interpeduncular cistern, which contains the circulus arteriosus, anteriorly the inter-peduncular cistern is continued in front of the optic chiasma and is prolonged on the surface of the corpus callosum; here the arachnoid stretches between the celebral hemispheres immediately below the free border of the falx cerebri, and this leaves a space in which the anterior cerebral arteries are contained.

(D.V. Davies , 1967)(16)

C) The Third Ventricle :

The supraoptic recess and the infundibular recess of the third ventricle are in close relation to the sella turcica. (Sutton, 1980)(37)

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3) The inferior relation :

The body of the sphenoid bone, containing the sphenoid air sinus, when small the sinus lies antro-inferior to sella but when large the sinus extends back beneath the sella, from which it is then separated by only a thin plate of bone.

4) Lateral relation :

On each side of the sella a flange of dura mater separating the pituitary gland from the cavernous sinus. (see the diagram)

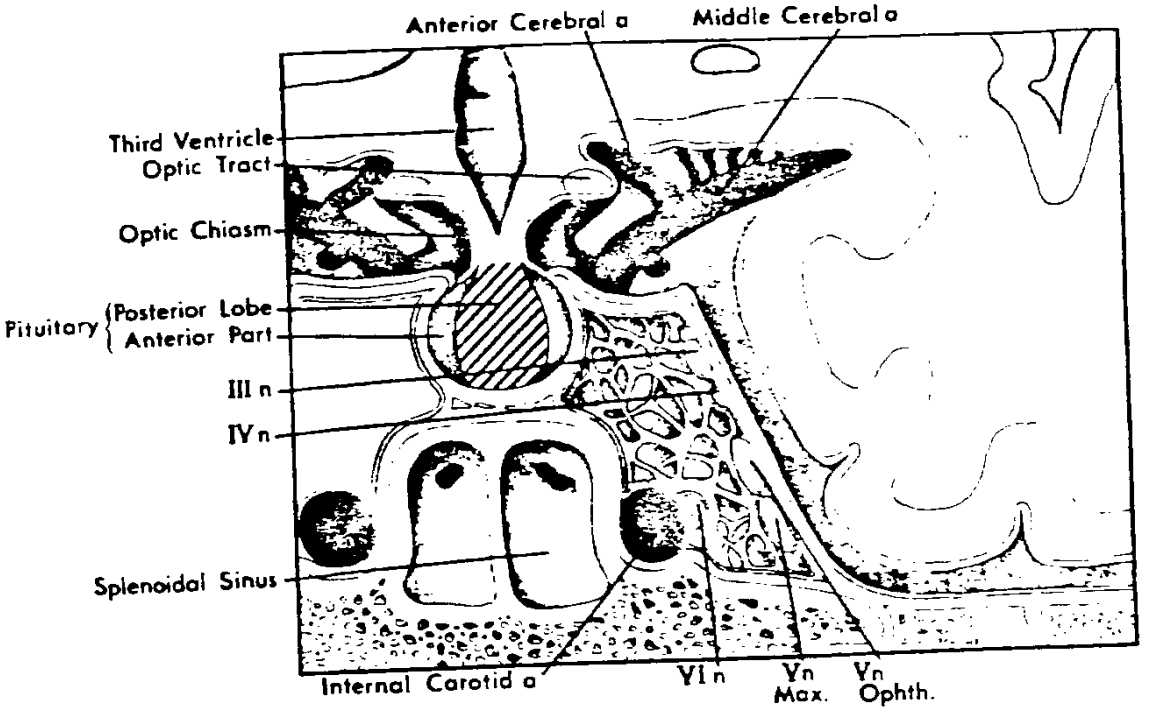

FIG. 2. Diagramatic representation of the anatomic relations of the pituitary fossa and cavernous sinus. The lateral wall of the sella turcica is formed by the cavernous sinus. The sinus contains the carotid artery, two branches of the fifth cranial nerve (ophthalmic and maxillary), the III nerve (oculomotor), IV nerve (trochlear), and VI nerve (abducens). The optic chiasm and optic tract are located superior and lateral, respectively, to the pituitary. (Drawing by B. Newberg, modified from A. K. Maxwell in *Gray's Anatomy*, ed. 35. W. B. Saunders, Philadelphia, 1973.)

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CHAPTER (3)

PATHOLOGY OF INCREASED INTRACRANIAL TENSION

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RAISED INTRACRANIAL PRESSURE

The intracranial pressure may be raised as result of a number of different conditions:

(1) A large intracranial mass such as new growth, abscess or haematoma raises pressure by displacement and; if it appears quickly, will have a greater effect upon the brain (though not upon the skull) than if the brain and blood vessels have time for accommodation.

(2) Obstructive hydrocephalus may follow a partial or complete block of the cerebrospinal fluid pathways by an intracranial mass or congenital anatomical abnormality, or may be post-infective or post-haemorrhagic.

(3) Cerebral oedema may occur around a neoplasm or abscess. It may also be present as a result of encephalitis, cerebral infarction or vascular hypertension.

(4) Cranio-stenosis (in those severe cases where skull growth falls short of the requirements of the growing brain).

(British authors, 1969) [6]

Gliomas: (are the commonest intracranial tumours and comprise between 40 and 50 per cent of the cases in most series. They vary greatly in malignancy. The well-differentiated tumours, e.g. oligodendroglioma or the well-differentiated astrocytoma, are relatively slow growing. On the other hand, the undifferentiated tumours such as glioblastoma multiforme are highly malignant.

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The classification of gliomas has been a matter of some controversy in the past. Most authors favour grading according to the degree of malignancy, e.g. Kernohan and his colleagues from the Mayo Clinic, whilst other workers have favoured the retention of specific names for the different types of glioma.

On the whole, gliomas tend to occur more frequently in males than in females and in large series there seems to be a greater incidence in the left hemisphere than in the right. It has also been shown that the temporal lobe is more commonly affected than other lobes. A small but significant proportion of the less malignant gliomas may show calcification on simple X-ray examination.

(Sutton, 1980.)[37]

- Glioma of the optic nerve and chiasma :

They are hamartomatous lesions (congenital malformation with a potentiality for growth which do not exceed that of the normal tissue in which they are situated.)

(Blackwood, W. ET AL. 1973)[5]

- Meningiomas :

Meningiomas are alleged to be derived from rests of arachnoid cells in the dura, they are usually benign, a few appear to be more invasive and malignant.

(Sutton, 1980)[37]

These tumours may arise from the planum sphenoidale, tuberculum, or diaphragma sella and expand into the supra-sellar region, causing visual and endocrine symptoms that simulate pituitary adenoma

(Fitz Jo, Mount LA, 1974)[13]

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