# THE ROLE OF COMPUTERISED TOMOGRAPHY IN HEAD INJURIES

Thesis

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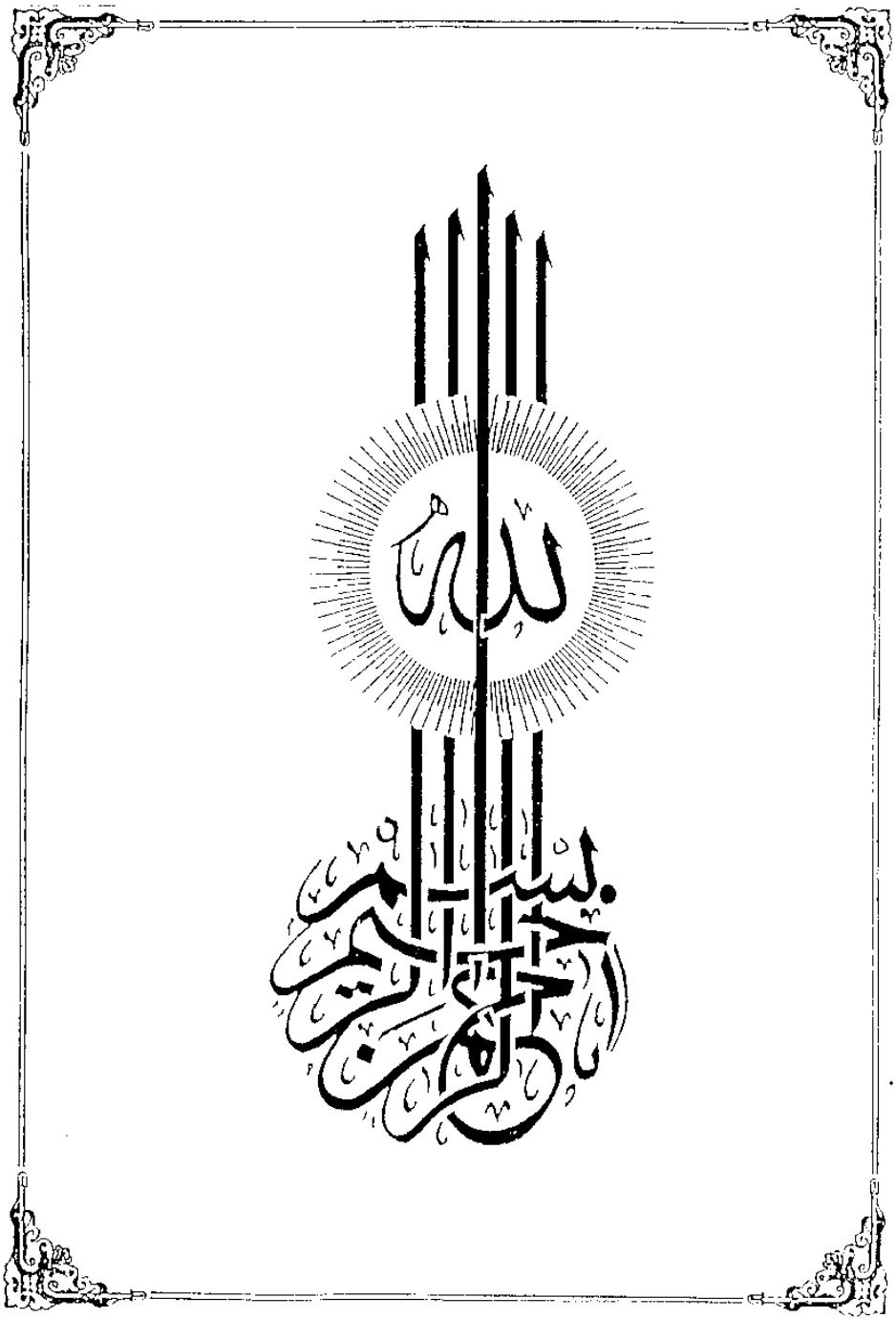
# Introduction And Aim Of Work



# Anatomy Of The Brain

## ANATOMY OF THE BRAIN

## THE COMPONENTS OF A COMPLETE SET OF CRANIAL C.T. IMAGES

The complete set of C.T. slices of the cranium from foramen magnum to vertex can be conveniently divided into four subsets. These subsets may be referred to as:

- Infraventricular.
- Low ventricular.
- High ventricular.
- Supra ventricular.

### THE INFRAVENTRICULAR SERIES

Is the lowest subset (Fig. 1). In these slices the petrous bones and the occipital bone delineate the walls of the posterior fossa, while the temporal and frontal bones delineate the remainder of the slice. In the posterior fossa, the fourth ventricle stands out as a landmark that separates the cerebellum posteriorly from the brainstem anteriorly. In front of the brainstem and

situated in the midline is the suprasellar cistern. On both sides of the brainstem and suprasellar cistern are the inferior parts of the temporal lobes. The tips of the temporal horns of the lateral ventricles may be shown anteromedial to the center points of each temporal lobe. The uncus of the temporal lobe forms the lateral border of the suprasellar cistern. This cistern has two distinct lateral extensions forming the sylvian cistern on each side. In front of the temporal lobes, and separated from them by the sylvian cisterns, are the frontal lobes. They lie on both sides of the midline separated by the interhemispheric fissure, (Gado, 1983).

## LOW VENTRICULAR SERIES

These slices lie above the level of the petrous bones and therefore are bounded peripherally by the occipital, temporal, parietal and frontal bones; they include parts of the frontal horns, trigones, and inferior horns as well as posterior horns of the lateral ventricles but not the bodies of the lateral ventricles (Fig. 2). In addition, these slices include the superior parts of the cerebellum and brainstem, together with the thalamus and basal ganglia. The

lowest and uppermost of these slices have distinctive features. The features of the lowest slice in this subset are shown in Fig. 2. The CSF spaces lying in the central part of this slice have a consistent pattern and include the following structures sequentially from front to back: the interhemispheric fissure, the inferior parts of the frontal horns, the third ventricle, and the quadrigeminal cistern. The inferior parts of the frontal horns appear as oblique curved slits that converge on the midline. The interhemispheric fissure and the third ventricle lie in line with each other. The quadrigeminal cistern lies in a more or less transverse position. It is curved, with the concavity anterior, and it caps the posterior aspect of the tectal plate of the midbrain. For purposes of description, this slice can be divided into an anterior, a middle, and a posterior third. In the middle third of the slice, the surface of the insula appears buried underneath the surface of the cerebral hemisphere. The CSF space on the surface of the insula is the circular sulcus. The brain parenchyma separating the circular sulcus and insula from the surface of the hemisphere is formed by the opercula, while deep to the insula the lentiform and caudate nuclei are visualised by

their higher density compared with the surrounding white matter (Fig. 2). The thalamus does not appear in this slice. The anterior third of the slice in front of the insula is occupied by the frontal lobes, separated in the midline by the interhemispheric fissure.

The posterior third of the slice is occupied by the temporal lobes on both sides and the cerebellum in the midline. The demarcation between the cerebellum and the temporal lobes is made by the dura and may be visualised on the CT scans after intravenous contrast injection.

The higher slice of the low ventricular subset has distinctive features shown in (Fig. 3). The CSF structures in the central part of the slice differ in appearance from those of the lower slice just described. The frontal horns each appears as a triangular CSF space with concave lateral border. The medial limb of the triangle is straight and lies against the opposite frontal horn, separated by the thin septum pellucidum. The third ventricle

lies in the midline, starting at the posterior end of the frontal horns. The foramen of Monro connecting the frontal horns to the third ventricle may be visualised in this slice. The quadrigeminal cistern in this slice has a rhomboid configuration with four extensions, the anterior extension is in the vellum interpositum of the roof of the third ventricle, the posterior extension forms the supracerebellar cistern, and the two lateral extensions form the retrothalamic cisterns. The trigones of the lateral ventricles are situated away from the midline, one each in the depth of a cerebral hemisphere.

For purposes of description, the slice may be divided into an anterior, middle, and posterior third. The middle third of the slice contains, in addition to the caudate and lentiform nuclei, the two thalami one on each side of the third ventricle. On each side, the internal capsule appears as an (L) shaped band of lower density separating the caudate nucleus, lentiform nucleus, and thalamus (Fig. 3).

The insula is visualised lateral to the lentiform nucleus. The circular sulcus appears on the surface of the insula. The sylvian fissure is shown as a deep fissure that extends from the surface of the hemisphere to the posterior end of the insula (Fig. 3). The posterior third of the slice is occupied by the temporal and occipital lobes, with a component of the cerebellum toward the center. The anterior third of the slice is occupied by the frontal lobes, separated in the midline by the interhemispheric fissure, (Gado, 1983).

## THE HIGH VENTRICULAR SERIES

The main distinctive feature of these slices is the presence of the bodies of the lateral ventricles. The lower and the higher slices in this subset are distinguishable by certain anatomic features (Fig. 4). In the lower slice of this subset the bodies of the lateral ventricles lie close to the midline, separated only by the septum pellucidum. In the posterior part, the lateral ventricles diverge away from the midline into the depth of each cerebral hemisphere, where the body of the ventricle joins the trigone. The cerebellum

does not appear in this slice or in any of the slices above this level. The basal ganglia also are not visualised, except perhaps the superior border of the caudate nucleus, which may appear as a narrow band of density at the lateral border of the body of the lateral ventricle. The rest of the brain parenchyma in this slice consists of the white matter of centrum semiovale and the overlying cerebral cortex. At the convexity, the sylvian fissure appears in the middle of this slice in the same plane as the trigone of the lateral ventricle (Fig. 4). In the anterior half of the convexity, the central sulcus lies in the same plane as the anterior end of the body of the lateral ventricle. In the midline, the parieto-occipital sulcus is seen in the posterior third of the slice separating the parietal lobe from the occipital lobe. The higher slice in this subset is distinct from the lower slice just described by the obvious separation between the bodies of the lateral ventricles. The gap between the two lateral ventricles is occupied by the corpus callosum and cingulate gyrus.

The most remarkable sulcus in the midline is

the parietooccipital sulcus in the posterior third of the slice.

At the convexity the sylvian fissure and central sulcus may be visualised. The sylvian fissure lies approximately in the same plane as the posterior end of the body of the lateral ventricle, while the central sulcus lies at or in front of the plane of the anterior end of the lateral ventricle, (Gado, 1983).

## THE SUPRAVENTRICULAR SERIES

The slices of this series (Fig. 5) decrease in size toward the vertex. Also, the higher the slice the more conspicuous the sulci appear and they extend farther toward the central part of each hemisphere. The feature common to all slices in this subset is the absence of any central CSF spaces other than the straight midline interhemispheric fissure. On each side, the cerebral hemisphere consists of the centrum semiovale and the overlying cerebral cortex. The only recognizable

feature in the midline is the interhemispheric fissure. The parietooccipital sulcus is seen near the posterior end of the interhemispheric fissure. Over the convexity, the central sulcus is not distinguishable from other sulci. Its location is approximately at the junction between the anterior one-fourth and posterior three - fourths of the convexity, (Gado, 1983).

# Review Of Literature

## REVIEW OF LITERATURE

Computed tomography is ideally suited for detection of intracranial pathology, whereas plain radiography is limited to the bony structures. Distinguishing surgical and nonsurgical lesions is quite feasible with C.T. Follow up examinations are nontraumatic and carry minimal risk to critically ill patients. In the great majority of head trauma cases, the recognition of pathology is unequivocal, thus facilitating proper management, (Hryshko and Deeb, 1983).

The incidence of traumatic cerebral lesions demonstrated on CT varies considerably, depending on patient selection, the severity of trauma, the interval between injury and CT, and the accessibility of a CT scanner, (Kishore and Lipper, 1983).

An accurate assessment and understanding of traumatic CT lesions can be achieved only by studying patients with well-defined neurological deficit immediately following injury and sequentially thereafter, if necessary, (Roberson et al., 1979).