C.T. VERSUS MRI IN THE DIAGNOSIS OF BRAIN TUMOURS

Essay Presented

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M.B., B.Ch.

For

Partial Fullfilment of M.Sc. Degree

of

Radio Diagnosis.

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1990

ACKNOWLEDGMENT

I am greatly honoured to express my deep thanks and gratitude to Prof. Dr: YOUSSEF HAMED ZAKI, Assist. Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University., for suggesting the subject, offering helpfull ideas and sacrificing a good deal of his valuable time in helping me with beneficial suggestions throughout the whole work.

My deep appreciation and gratitude also for Dr. MAHMOUD MOHAMED OSMAN, Lecturer of Radiodiagnosis, Faculty of medicine, Ain Shams University., for his warm encouragement during the course of this work, and for his continuous and valuable help through all the work.

I am indebted to all my colleagues of Radio-diagnosis Department in Mataria Teaching Hospital especially Dr: Ahmad Fathy for all the facilities and help they offered.

Finally, I would like to thank all members of my family and all my friends for their kind help, assistance and love.

بسم الله الرحمن الرحيم

INTRODUCTION
&
AIM OF THE WORK

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The brain was one of the first areas where MRI was applied in the investigation of its tumours, and it soon became clear that there were several reasons why MRI would rival C.T in the investigation of the brain tumours and in some respects could be superior. * That may due to its advantages in which it has no ionzing radiation, high contrast and soft tissue discrimination, the ability to image directly in the sagital, coronal and transverse planes, the abscence of bony artefacts... all these advantages made it's image results different than those now in use..* As awareness of this technique grows, a need for a more fundamental understanding of it's multidiscriplinary nature emerges in order to overcome most of it's disadvantages such as long imaging time, many protocol options, difficult manage and monitor critically ill patient, claustrophobia and first of all the high coast ...., And so make the patient become more comfortable and the image is more informed user. * Nevertheless, the need still exists for C.T imaging. but C.T evidence alone became not sufficient, as some lesions not obvious on the simple scan could be revealed better by M.R. esp. in the posterior fossa tumors, and many others enhanced by the use of contrast media with C.T individual case as a routine technique to give avital informations and furtherly extended the value of C.T resolutions.

The Aim of the work is to discuss and illustrate some points of great value in evaluation of the principle, accuracy and extent of both C.T and MRI in the diagnosis of brain tumours.

ANATOMY

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I. CT SECTIONAL ANATOMY OF THE BRAIN:

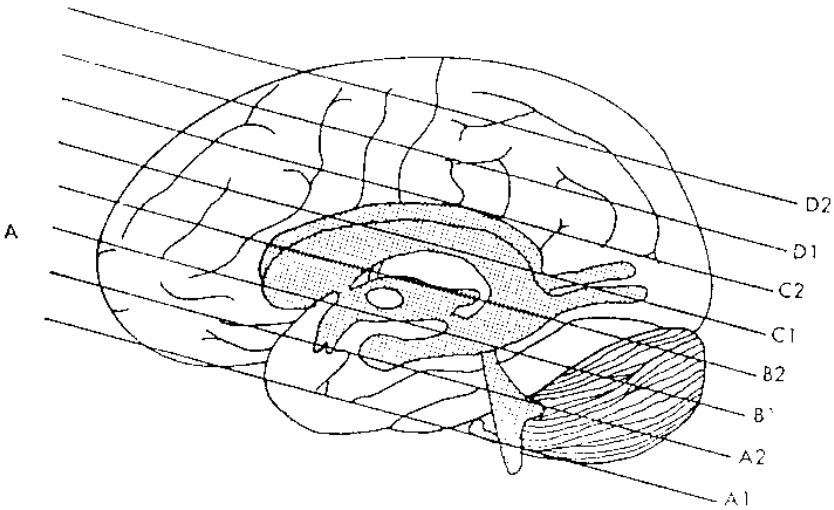
A complete CT examination of the brain consists of 12 to 17 slices, depending on the thickness of the slice (each slice displays characteristic structures of the brain which are explained schematically in plates), naturally different parts of the brain appear at different levels of the series. The ventricular system serves as an excellent guide. Familiarity with the configuration of the ventricular system at different levels enables one to determine which part of the cranium is being examined in a given slice. This is essential for localizing lesions in different parts of the brain and correlating the abnormalities on the CT image with the clinical appearance in a given case in (table 1), a lateral view of the ventricular system is presented in a schematic fashion together with the planes of a C.T scan obtained at the conventional angle of 20 degrees to the orbitomeatal line. The number of slices within each subset depends on the thickness of the slice (Gado; et al. 1983).

For the rest of the chapter these subsets are referred to by letters A to D, and slices which are referred to as 1 and 2. So, the first is lower than the second. Thus slice A_1 is lower than A_2, and the

Table 1

Subset	Slice No.	Level of Slice & Structures obtained
Supraventricular Subset .... (D)	2 1	- Constitues the slices above the level of the ventricular system.
High ventricular (C)	2 1	- Is a group of slices through the body and roof of the lateral ventricles.
Low ventricular (B)	2 1	- Slices above the previous subset and below the level of the lateral ventricle. Include the basalganglia, thalamus, pineal gland, frontal horn, Monro's foramen, trigones of the lat. ventricles, the third ventricle, and the quadrigeminal cistern.
Infraventricular (A)	2 1	- Slices obtained at levels below the frontal horn, body, and trigone of the lateral ventricle. Include the structures of the posterior fossa and part of the incisura.

Adapted from (**Gado; et al. 1983**).

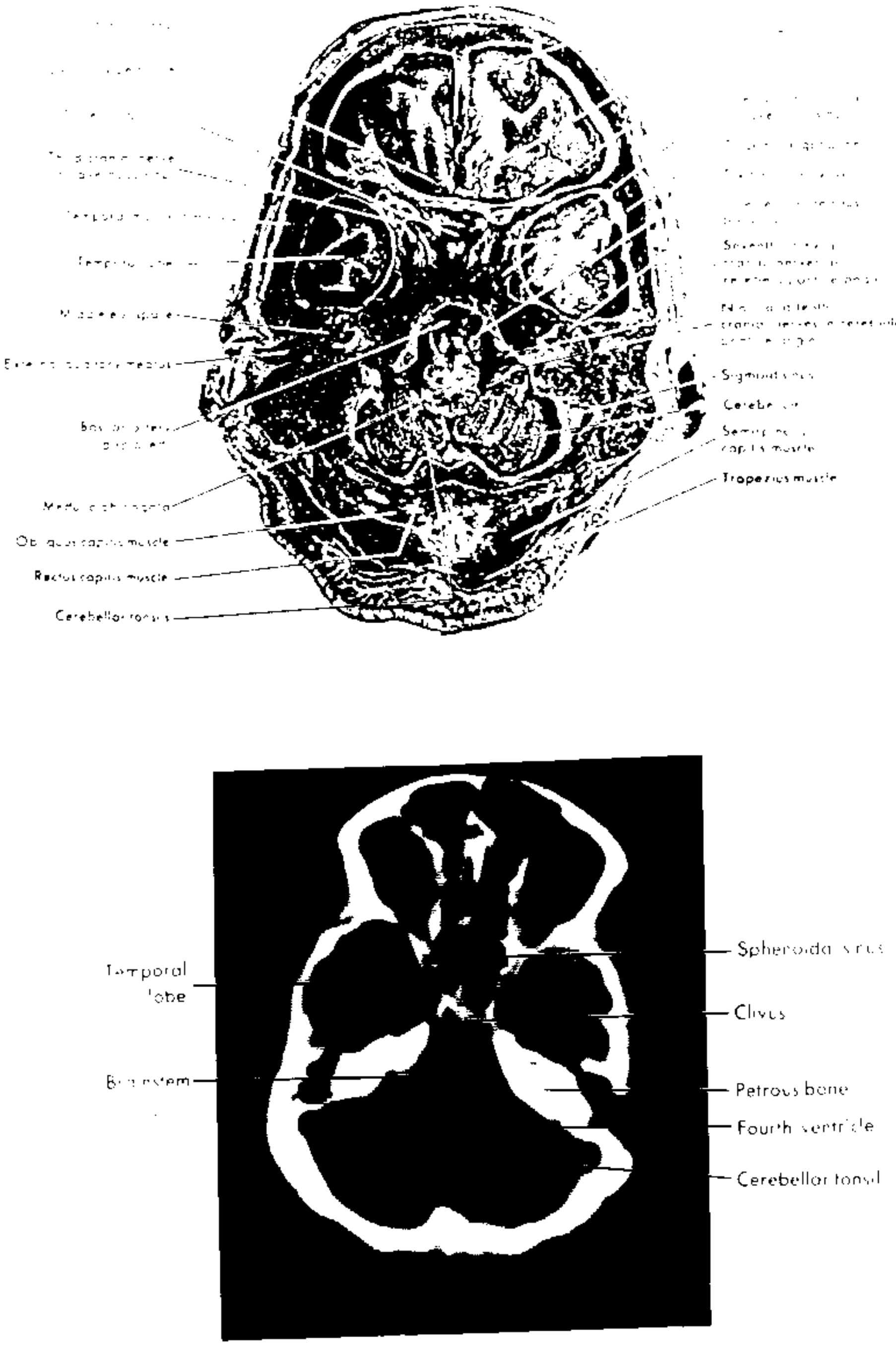


(Fig. 1) Sagittal view of the brain showing different levels of CT section (A_1-D_2).
(Quoted from **Alfidi; et al. 1977**).

slice A_2 is lower than B_1 and so on. There is a consistent configuration of the cranial structures at each of these eight levels (Fig. 1) (Gado; et al. 1983).

(A) The Infraventricular Series...

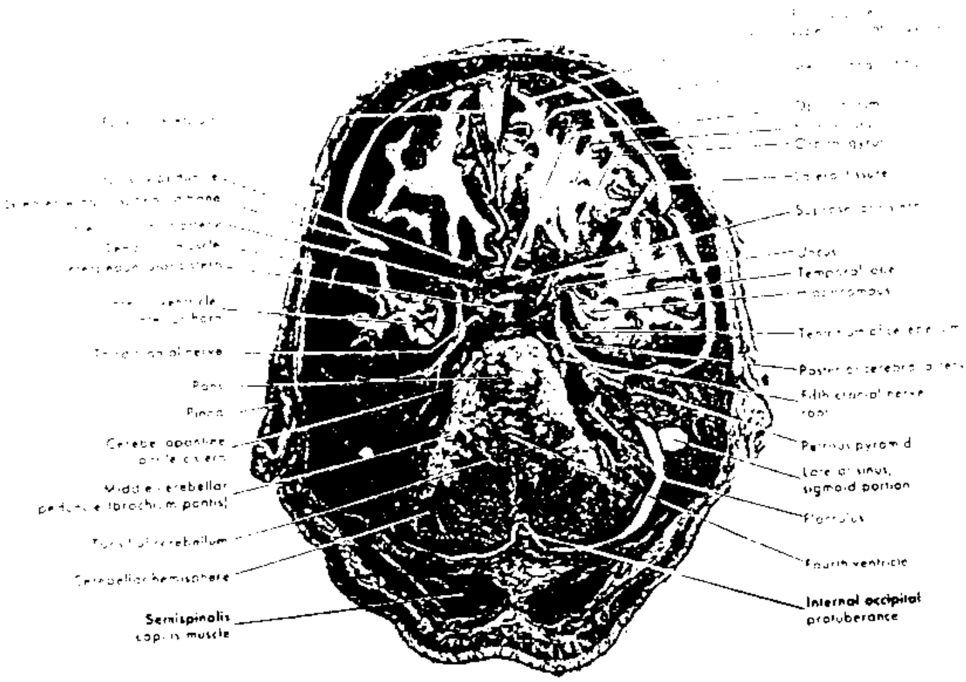
In the posterior part of the slices A_1 and A_2 of the infraventricular series the structures of the posterior fossa are visualized. The fourth ventricle is a useful landmark. The configuration of the fourth ventricle in level A_1 is rather similar to a transverse slit (Fig 2). Each lateral end of the slit is a lateral recess. At level A_2 the fourth ventricle is triangular (Fig 3). The lateral walls diverge posteriorly, and each lateral wall ends posteriorly in a posterosuperior recess. The part of the roof of the fourth ventricle between these two posterosuperior recesses is the fastigium. In both levels the fourth ventricle separates the brain stem anteriorly from the cerebellum posteriorly. In level A_2 the brain stem is represented by the pons. Behind the fourth ventricle is the cerebellum. At level A_1 the cerebellar tonsils form the midline structures behind the fourth ventricle. At the level A_2 the vermis lies in the midline behind the roof of the fourth ventricle. On both sides of the vermis are the cerebellar hemisphere (Gado; et al. 1979).

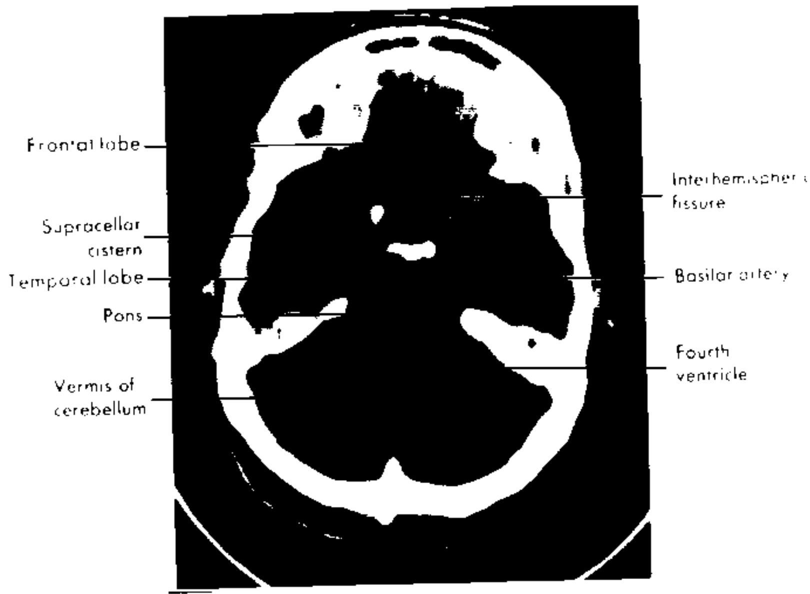


(Fig. 2) Infraventricular subset A1.
(Quoted from Alfidi; et al. 1977).

The bony walls of the posterior fossa are formed by the clivus anteriorly, the posterior surface of the petrous bone laterally, and the occipital bone posteriorly. The band of C.S.F. separating the anterior surface of the pons from the posterior surface of the clivus in the pontine cistern. On each side this cistern is continuous with the cerebellopontine angle cistern, which is directed posterolaterally, separating the posterior surface of the petrous bone from the lateral surface of the brainstem and anterior part of the cerebellum. The cross-section of the basilar artery is seen as a small soft tissue density within the pontine cistern. Its density is enhanced after I.V contrast injection. The basilar artery is recognized in level A_2. At the lower level A_2 the vertebral arteries may be seen further laterally (Gado; et al. 1979).

The middle and anterior parts of the slices in both levels A_1 and A_2 are occupied by the inferior parts of the temporal lobe and frontal lobe, respectively (Fig 2, 3). At level A_1 the temporal lobes are separated from each other by the pituitary fossa or the sphenoidal sinus. At level A_2 the suprasellar cistern separates the medial borders of the temporal lobes. The inferior parts of the frontal lobes meet in the midline and are separated by the interhemispheric fissure. It is not unusual to find the roof of the orbit occupying the anterior part of the slice in level A_1. A suprasellar





(Fig. 3) Infraventricular subset A2.
(Quoted from Alfidi; et al. 1977).

cistern separating the medial parts of the temporal lobes is a pool of CSF. It is continuous anteriorly with the midline interhemispheric fissure. Laterally is continuous with the sylvian cisterns, which separate the frontal lobe from the temporal lobe. Posteriorly the suprasellar cistern is limited by the anterior aspect of the pons or its junction with the midbrain. When it is bounded by the latter, it is not unusual to see a posterior extension of the CSF in the midline forming the triangular interpeduncular cistern (Tokunage; et al. 1977).

In slices of levels A_1 and A_2 the ventricular system is represented by the fourth ventricle only. It is possible to visualize also the tips of the temporal horns, appearing as a short semilunar structures in the depth of the temporal lobe on each side of the midline. Visualization of the temporal horns is consistently possible by high-resolution CT (HRCT). Standard CT examinations may fail to demonstrate the temporal horns when they are not enlarged. This is therefore a normal variant (Habib; et al. 1984).

(B) The low ventricular series...

The CSF spaces within the slices of B_1 and B_2 levels have a consistent pattern that enables one to