EVALUATION OF BRAIN TUMOURS USING COMPUTED TOMOGRAPHY

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ABSTRACT

BACKGROUND
The brain is basically formed by the neurons and the supporting cells. Tumours arising of neurons are almost impossible because the neurons never divide. Tumours arising from the supporting cells are almost frequently seen. The tumour characteristics depend upon the cell of origin. The brain is covered by meninges and the vascular tissue supplies the essential nutrients to all these components of the brain. Unfortunately, the brain is placed in a rigid box called as neurocranium. According to Monro–Kellie principle, if any of the one component increases in a rigid box, the other components will be compensated. So in a limited space if any of the catastrophes occur i.e. space occupying lesions, then the other components will be compensated and as a result the effects will be seen in a very small amount of time. A sincere effort has been put in this study to understand and evaluate the Brain Tumours using a CT scan. This study is intended to be useful to the diagnosing radiologists, internal medicine practitioners and general practitioners and surgeons.

METHODS
The aim of the study is to evaluate the brain tumours using CT and to confirm the diagnosis by sending to the Histopathology Department. The study is a cross-sectional study and is done in the Department of Radiology, Fathima Medical College, Kadapa, Andhra Pradesh. The study was done from December 2014 to May 2016. The study was done using thirty cases who were believed to have brain tumour and were studied in the Department of Radiology after initial clinical evaluation. First, the plain CT was done and was checked for the location, size, characteristics of the lesion and the surrounding characteristics were observed.

RESULT
In the present study, the most common of all tumours were those of the neuroepithelial groups. Next in frequency were the tumours of meninges of all intracranial tumours. This was followed by tumours of cranial nerves, metastatic tumour, one lymphoma case and tumour of sellar region was also seen. This was confirmed by histopathology report. The most common site was cerebrum followed by meninges, CP angle, sellar and cerebellum.

CONCLUSION
The most common site was cerebrum followed by meninges, CP angle, sellar and cerebellum. Based upon the tumour characteristics, the type of tumour can fairly be judged. The local bony changes can be appreciated in intra–axial only in later part of the disease whereas the extra–axial type shows these characteristics in the early part of the disease. The dural tail can always be appreciated in extra–axial type of lesions. The CSF clefts can be appreciated in extra–axial type of lesions. The effects on adjacent subarachnoid spaces is well appreciated in extra as well as in intra–axial lesions. The feeding vessels will give us a fair clue if angiogram is taken.

KEYWORDS
Evaluation, Brain Tumours, Computed Tomography.

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INTRODUCTION: The brain is the most evolved organ in the human body if we take natural evolutionary history into consideration. The human brain even today in the midst of incomparable technological advances has not been totally revealed. Every year millions of dollars have been spent by the developed and many developing universities. It's an enigma even today how the brain functions and performs so much complicated tasks with ease.

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No need to say that it is one of the most discussed topics around the world. Brain is one of the largest organs in the human body and of course the human brain is by far the largest known in the animal kingdom if we take brain mass and total body ratio. Tumours of the brain can occur from the supporting cells of the neurons, the covering meninges, the vascular tissue or the cells covering the ventricles.

Radiologically, the tumours of the brain can be broadly classified into intra–axial and extra–axial tumours. Intra–axial tumours arise from the brain cells or it's supporting cells and extra–axial arises from the cells other than the intra–axial i.e. by the covering meninges or the vascular tissue.

The central nervous system [CNS] is made up of the following six parts. The cerebrum is composed of right and left paired halves or hemispheres which are separated above in front and behind to a depth of approximately 1½ inches by the great longitudinal fissure. Deep to this is the corpus callosum, composed of nerve fibres which connects the two hemispheres. Each hemisphere is composed of a mass of white matter covered with a superficial layer of grey matter.

The cerebellum is composed of two hemispheres, the surfaces of which are divided by a series of deep fissures known as sulci, which are close together. As with the cerebrum there is a core of white matter with a superficial layer of grey matter. The midbrain and pons connect with the medulla and spinal cord; it is from here that the optic nerves emanate. The medulla connects the spinal cord to the midbrain and cerebellum. The meninges surround and protect the central nervous system. They are composed of connective tissue proper and comprise three membranes [a] the dura mater, [b] the arachnoid and [c] the pia mater. These membranes are composed of collagen fibres, a small number of elastic fires and endothelial cells.

Pathologists and radiologist share many commonalities, and our subspecialties have in many ways evolved in parallel. Serial computed tomography reconstruction techniques permit the rendition of 3-dimensional images that can be rotated to provide the radiologist, surgeon, and pathologist with a detailed view of the relationship of the detailed bony features of the skull and spine with the vasculature and the anatomic alterations in them arising secondary to tumour or other pathologic processes.[1] The general consensus is that the annual incidence rate of primary intracranial neoplasm is between 10 and 12 per 100,000 and these constitute approximately 9% of all primary cancers.[2] Primary CNS lymphomas in recent years, primarily are as a result of the AIDS pandemic. Glioblastomas have been seen to increase in chromosome 10 abnormalities.[3,4]

Astrocytomas have been linked in chromosome 17 translocations.[5] none of the other viruses, environmental agents have been linked to the disease directly. There may be considerable difficulty in correlating specific histopathologic features with CT images. Nonetheless in selected circumstances, an experienced paediatric neuroradiologist scan, using CT, predict certain pathologic lesions with a high degree of accuracy. In the series reported by Cushing, Olivecrona and Zulch, the relative occurrences were gliomas 43 to 53%, meningiomas 13 to 19%, neurinomas 7 to 9%, pituitary adenomas 7 to 18% and metastases 3 to 4%. Data from Israel, derived from a review of the tumour registry for 1964 through 1965, yielded a somewhat different distribution: gliomas 27%, meningiomas 17%, neurofibromas 12% and pituitary adenomas 5%. No statistics were reported for metastases. The Carlisle study revealed 25% gliomas; metastases comprised 45% of all intracranial neoplasms. In one of the studies, the distribution of primary neoplasms was gliomas 28%, meningiomas 35%, schwannomas 5%, and pituitary adenomas 7%, metastatic tumours represented 41% of the neoplasms.[6]

Intracranial tumours are amongst the commonest neoplasms in childhood. The leukaemias and renal and suprarenal neoplasms are excluded, they constitute the most frequently encountered neoplasm in childhood. Approximately, 15-20% of all brain tumours occur below the age of 15 years. Intracranial tumours accounted for 25% of all neoplasms in children seen at the hospital for sick children, Toronto.

No patient is too young to have a brain tumour included in the differential diagnosis of an ill-defined neurologic disorder.[7] In children, the neoplasms are more when compared to the adults because they have more growing neurons when compared to the adult population. As more and more numbers of intracranial neoplasms are diagnosed now a days, it is a right platform for us to study the evaluation of intracranial neoplasms using CT. As CT is the most common mode of scanning used in the periphery and since the MRI is not frequently available in the periphery, this study forms a perfect platform for us to study and evaluate the brain tumours using CT.

AIMS AND OBJECTIVES:

1. To evaluate the brain tumours using CT.
2. To confirm the diagnosis by sending to Histo-pathology Department.

MATERIALS AND METHODS: The study is a cross-sectional study and is done in the Department of Radiology, Fathima Medical College, Kadapa, Andhra Pradesh. The study was done from December 2014 To May 2016. The study was done using thirty cases who were believed to have brain tumour and were studied in the Department of Radiology after initial clinical evaluation. First, the plain CT was done and was checked for the location, size, characteristics of the lesion and the surrounding characteristics were observed. Then, the contrast medium was injected taking all aseptic precautions and then again the tumour was evaluated. This time the other characteristic features such as dural tail, CSF cleft, feeding vessels, buckling of grey and white matter junction and effects of adjacent structures were seen.

Inclusion Criteria: The patients belonged to the age group of 40 to 60 years. This was done to minimise the age related bias.

Exclusion Criteria:

1. <40 years and >60 years were excluded.
2. Paediatric age group were not included in the study.

RESULTS:

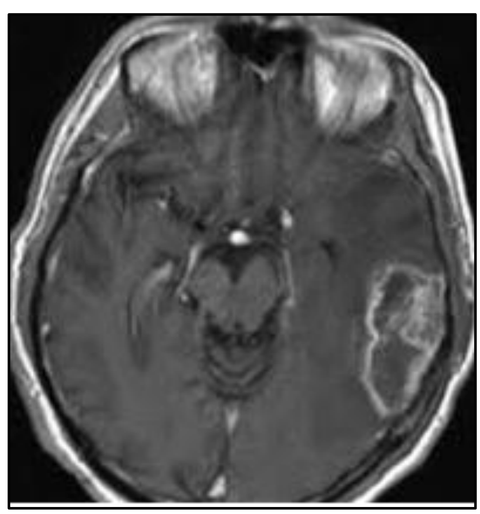

Fig. 1: Astrocytoma involving the Neurocranium

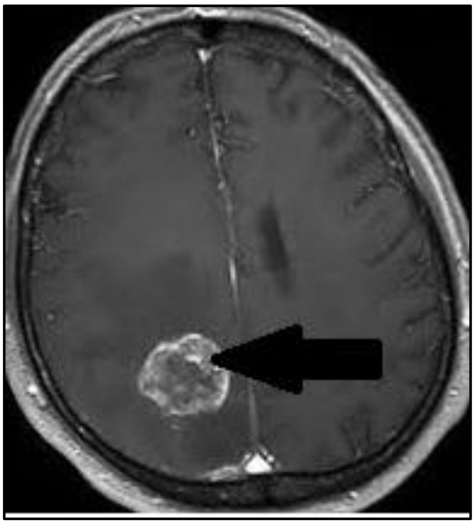

Fig. 2: Astrocytoma involving the right cerebral hemisphere a small mid line shift is seen.

Note: The erosion of the bone.

Types of Tumour	No. of Cases	Percentage
Neuroepithelial tumours	12	40%
Tumours of cranial nerves	4	13.33%
Tumours of meninges	11	36.66%
Lymphomas	1	3.33%
Tumours of sellar region	1	3.33%
Metastatic tumours	1	3.33%
Total	**30**	**100%**

Table 1: Showing Incidence of Intracranial Tumours

The most common of all tumours were those of the Neuroepithelial groups. Next in frequency were the tumours of meninges of all intracranial tumours. This was followed by tumours of cranial nerves, metastatic tumour, one lymphoma case and tumour of sellar region was also seen. This was confirmed by histopathology report.

Site	No. of Cases	Type of Tumour
Cerebrum	13	Neuroepithelial: 12 Lymphoma: 1
Meninges	11	Meningeal: 11
Sellar	1	Tumour of sellar region: 1
Cerebellum	1	Metastatic: 1
CP angle	4	Cranial nerve tumour: 4
Total	**30**	**Total: 30**

Table 2: Evaluation based upon Distribution of Intracranial Tumours

The most common site was cerebrum followed by meninges, CP angle, sellar and cerebellum.

Types of Tumour	No. of Cases	Mean size (widest dia)	Characteristics
Neuroepithelial tumours	12	3.28 cm	1. Bony erosions + (7 out of 12 cases) 2. Buckling of gray and white matter junction+ 3. Calcification+ 4. Necrosis + 5. Margins irregular and thickening +
Tumours of cranial nerves	4	1.44 cm	1. Bony erosions + 2. Calcification+
Tumours of meninges	11	5.23 cm	1. Bony erosions + 2. Calcification+
Lymphomas	1	4.81 cm	1. Bony erosions + 2. Buckling of gray and white matter junction+ 3. Calcification+ 4. Necrosis + 5. Margins irregular and thickening + 6. Satellite lesions were present.
Tumours of sellar region	1	1.86 cm	1. Bony erosions + 2. Calcification+ 3. Necrosis +
Metastatic tumours	1	4.34 cm	1. Bony erosions + 2. Buckling of gray and white matter junction+ 3. Calcification+ 4. Necrosis + 5. Margins irregular and thickening + 6. Satellite lesions were present.

Table 3: Evaluation based upon Characteristics of the Tumour

Types of Tumour	No. of Cases	Characteristics
Neuroepithelial tumours	12	• Dural tail: Absent. • Adjacent subarachnoid spaces: effaced. • Local vessels feed the tumour (pial). • The tumour is better appreciated because of disruption of BBB.
Tumours of cranial nerves	4	• Dural tail seen in 2 cases (50% of the cases). • Dural vessels is the source of nutrition. • Subarachnoid spaces are enlarged.
Tumours of meninges	11	• Dural tail seen in 2 cases (6 out of 11 of the cases). • Dural vessels is the source of nutrition. • Subarachnoid spaces are enlarged. • CSF clefts are present (3 out of 11).
Lymphomas	1	• Dural tail: Absent. • Adjacent subarachnoid spaces: effaced. • Local vessels feed the tumour (Pial). • The ventricles are seeded with gross metastatic lesions. • The tumour is better appreciated because of disruption of BBB.
Tumours of sellar region	1	• Dural tail seen in 2 cases. • Dural vessels is the source of nutrition. • Subarachnoid spaces are enlarged.
Metastatic tumours	1	• Dural tail: Absent. • Adjacent subarachnoid spaces: effaced. • Local vessels feed the tumour (Pial). • The ventricles are seeded with gross metastatic lesions. • The tumour is better appreciated because of disruption of BBB.

Table 4: Evaluation based upon Characteristics of the Tumour after Contrast Medium Injection

DISCUSSION: In the present study, the most common of all tumours were those of the neuroepithelial groups. Next in frequency were the tumours of meninges of all intracranial tumours. This was followed by tumours of cranial nerves, metastatic tumour, one lymphoma case and tumour of sellar region was also seen. This was confirmed by histopathology report. The most common site was cerebrum followed by meninges, CP angle, sellar and cerebellum. Based upon the tumour characteristics, the type of tumour can fairly be judged. The local bony changes can be appreciated in intra–axial only in later part of the disease whereas the extra–axial type shows these characteristics in the early part of the disease. The dural tail can always be appreciated in extra–axial type of lesions.

The CSF clefts can be appreciated in extra–axial type of lesions. The effects on adjacent subarachnoid spaces is well appreciated in extra as well as in intra–axial lesions. The feeding vessels will give us a fair clue if angiogram is taken. Apart from these, the primary lesions if present in the body like in cases of lung and breast cancers, the malignant cells are known to get implanted in brain through Batson's venous plexus.

Apart from these, the margins if thick then definitely it will be malignant in majority of the cases. The calcification and necrosis along with seeding in the ventricles also gives a fair idea of the type of the lesion. The presence of satellite lesions along with same contrast indicates the malignant variety of the lesion.

CONCLUSION: The most common site was cerebrum followed by meninges, CP angle, sellar and cerebellum. Based upon the tumour characteristics, the type of tumour can fairly be judged. The local bony changes can be appreciated in intra–axial only in later part of the disease whereas the extra–axial type shows these characteristics in the early part of the disease. The dural tail can always be appreciated in extra–axial type of lesions. The CSF clefts can be appreciated in extra–axial type of lesions. The effects on adjacent subarachnoid spaces is well appreciated in extra as well as in intra–axial lesions. The feeding vessels will give us a fair clue if angiogram is taken.

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