Original Research Article

Radiological evaluation of primary brain tumours using computed tomography

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Abstract

Background: A total of fifty clinically diagnosed primary brain tumours were studied over a period of one years. The study was aimed to evaluate the efficacy of computed tomography (CT) in pre-operative diagnosis of primary brain tumours. Site, density, mass effect and contrast enhancement of the lesion were studied as primary efficacy variables of CT scan. In the present study, the common brain tumours were astrocytoma, medulloblastoma, craniopharyngioma and ependymoma. In 11 (22%) cases the tumours were supratentorial and in 10 (20%), they were infratentorial in location. The findings of CT scan in different intracranial neoplasm strongly correlated with those of histopathology. The study concludes that CT is an invaluable imaging modality in preoperative diagnosis of paediatric brain tumour due to its excellent characterization of tumours.

Keywords: Computer Tomography, Brain Tumour, Age.

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Received Date: 23/10/2015 Revised Date: 05/11/2015 Accepted Date: 11/12/2015

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 28 December 2015

INTRODUCTION

The third National Cancer Survey of the United States, in 1975, placed the incidence of central nervous system (CNS) neoplasm for children younger than 15 years of age at approximately 2.4 per 100,000 which increased to a corresponding value of 3.45 in 1994.[1] Brain tumor could be developed in the body over several days. It is difficult to screen out brain tumor without radiography. This rise in brain tumor incidence among children is attributed to improved diagnostic methods and more awareness of brain tumors among physicians.[1,2] Diagnosis of brain tumours may be delayed as the initial symptoms and signs are vague and nonspecific. The symptoms include headache, focal seizures and focal neurological deficit, with clinical examination revealing, raised intracranial tension or focal neurological deficit. Developed in the mid 70's the computed tomography (CT) scan revolutionized the diagnosis of brain tumors. CT images show skull, blood clots, and the calcified mass, appears white, while the brain is gray, and the CSF, fat and air appear black.[3,4] CT has the capacity to differentiate a wide range of tissue types including air, fat, soft tissue and bone with superior spatial resolution. The use of iodinated contrast agents allows better delineation of vascular anatomy and pathological entities, and can differentiate enhancing lesion from surrounding reactive change. CT is highly sensitive to calcification and blood within the brain parenchyma. CT is preferred for the uncooperative and unstable patients, because each axial image is obtained separately. Thus, motion artifact is minimized, particularly in later generation scanners which can perform individual scans in less than 2 seconds. The incidences of brain tumours in the children are approximately 2-5 per 100,000 per year. Most paediatric brain tumours are primary neoplasm; CNS metastases are rare in children.[5,6] Primary tumours of the central nervous system (CNS) are the most common neoplasm in children and the leading cause of death in this patient population.[7] Hence the study was carried out to correlate paediatric brain tumours by CT scan and MRI in relation to age and sex further to find out most common paediatric brain tumour. Primary brain lymphoma is a rare central nervous system malignancy, and only accounts for

How to site this article: M Praveen Kumar. Radiological evaluation of primary brain tumours using computed tomography. *MedPulse – International Medical Journal.* December 2015; 2(12): 975-978. http://www.medpulse.in (accessed 30 December 2015).

1.5% of all intracranial tumours.[8] However, with the continuous development of medical technology in recent years, the widespread use of immunological agents and the maturity of organ transplantations have made patients prone to primary brain lymphoma due to immunodeficiency.[9,10] It is reported that the number of patients with primary brain lymphoma increased by 80,000 in 2000-2005 compared with that in 1990s. Also reported that the incidence of primary brain lymphoma showed an increasing trend, and it will become a type of malignant intracranial tumour with extremely high incidence in 2025.[11] Clinically, prevention of primary brain lymphoma has become an extremely important issue.[12] The universal treatment of intracranial tumours is 'early detection and early treatment', and the main clinical diagnosis methods are magnetic resonance imaging (MRI), and computed tomography (CT). Primary brain lymphoma shows no obvious signs during the early stages, and specific imaging features are also lacking. Thus, early diagnosis is difficult.[13,14] Therefore, this study aimed to analyze the radiological evaluation of CT for patients with primary brain lymphoma with an expectation of providing reference and guidance for the early diagnosis of patients with primary brain lymphoma.

MATERIALS AND METHODS

This cross-sectional study was carried out on consecutively selected 50 patients aged between 3 to 18 years, admitted into the Department of Neurosurgery of Katuri Medical College and Hospital, Guntur, with the clinical history of brain tumour during the period of one year and referred to the Dept. of Radiology and Imaging, for CT scan of the brain with a suspicion of intra cranial neoplasm.

The following patients were included in the study:

- Patients having clinical suspicion of brain tumor.
- Patients aged 1 to 18 years irrespective of their sex.

The following patients were excluded from the study:

- Patients who were not willing to undergo surgery.
- Non-cooperative patient.

At first all the selected patients were evaluated through detailed history taking and clinical examination with special emphasis on the nervous system. Subsequently, CT scan of the brain was performed after counselling the patients or their parents. Proper sedation was applied in restless children. CT scan was done from caudal to cephalad level with 15 to 20 degree angulations to the canthomeatal line before and after the I.V contrast agent administration with 5mm to 10 mm slice thickness. CT was performed at 120 Kv and 150 mA and was viewed in axial and if needed in coronal slices. Those patients who were operated upon were continuously followed up after the surgery up to histopathological diagnosis. The histopathological reports were collected and were examined for correlation with the CT scan findings. All this information was collected in pre-designed structured data collection sheet and then organized using a scientific calculator and standard and appropriate statistical formulae. Further statistical analyses of the results were obtained by using computer software Statistical Packages for Social Sciences (SPSS).

RESULTS

The age range of the patients was 3 to 18 years. The mean age $\pm$ SE was 10.6 $\pm$ 0.56 years and the peak incidence was found in the age group between 10 to 15 years. Male female ratio was 2:1.

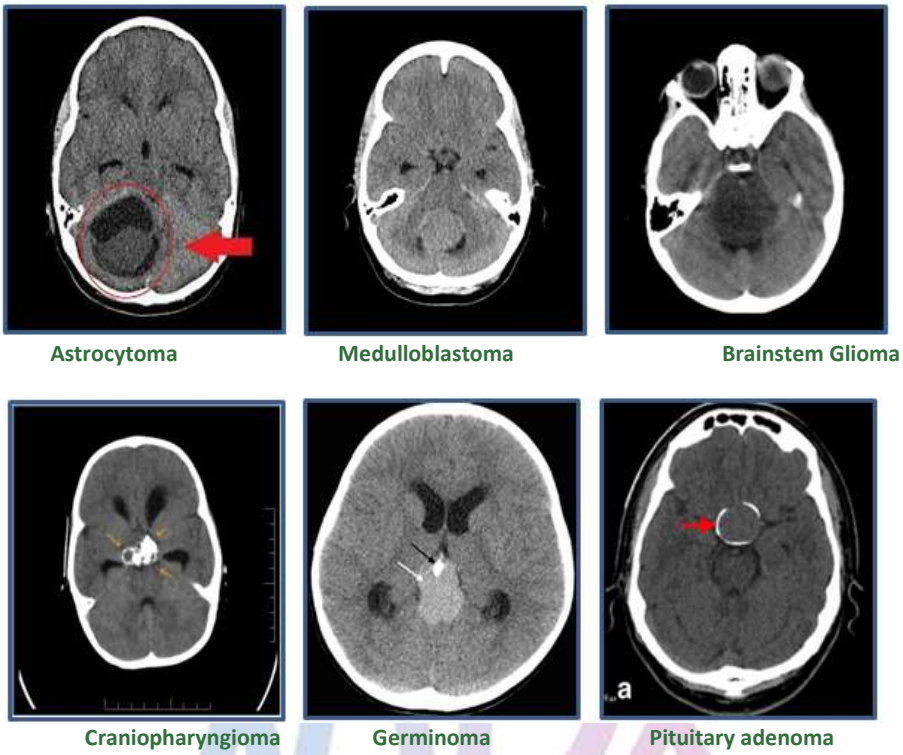
Table 1: Distribution of Patients suspected of brain tumours as per Age and Sex.

Variable		No. of Cases	Percentage
Age in Groups (Years)	0 – 2	3	6%
	2 – 5	7	14%
	5 – 10	11	22%
	10 – 15	20	40%
	15 – 18	9	18%
Sex	Male	30	60%
	Female	20	40%

Table 2: Comparison between CT and histopathological findings of Study cases.

CT Findings	No. of Cases	Percentage
Astrocytoma	21	42.00%
Medulloblastoma	13	26.00%
Craniopharyngioma	7	14.00%
Ependymoma	3	6.00%
Brainstem Glioma	2	4.00%
Germinoma	2	4.00%
Pituitary adenoma	1	2.00%
Arachnoid cyst	1	2.00%

Among the 50 patients in this study, in 11 (22%) cases the tumours were supratentorial and the rest were infratentorial in location. The most common tumours were astrocytoma (42%), medulloblastoma (26%), craniopharyngioma (14%), and ependymoma (7%).



Figures: Observed Cases

DISCUSSION

This cross-sectional study was done to evaluate the diagnostic accuracy to computed tomography of primary brain tumour. As regards to the location of the primary brain tumours, the incidence of supratentorial and infratentorial tumours in the present study closely agree with others. In our study of 50 cases of intracranial 11 (22%) were located in suprastentorial and 10 (20%) in the infratentorial region by CT scan. Osborn 2008 also found similar incidence of 52% of supratentorial tumours and 48% of infratentorial tumours.[15] The majority of infratentorial tumours were cerebellar astrocytic tumours (42%), Medulloblastoma (26%) Brain stem glioma (4%) Ependymomal tumours (6%), Craniopharyngioma (14%) diagnosed by CT. The majority of infratentorial tumours were cerebellar astrocytic tumours (30%), Medulloblastoma (8%) Brain stem glioma (8%) Ependymomal tumours (2%), Craniopharyngioma (1%) diagnosed by CT.[16] The most common brain tumour in this study was found astrocytoma, followed by medulloblastoma, craniopharyngioma and ependymoma. These findings were close to study of other investigators.[16] Among the cases in supratentorial location, most common paediatric brain tumours were astrocytoma and craniopharyngioma.[17] Ten cases were in infratentorial location, the common tumours were medulloblastoma, astrocytoma, ependymoma. These findings were close to the study done by others.[18]

CONCLUSION

From the result of the present study as well as the findings obtained by other investigators, it is conceivable that CT is one of the accurate diagnostic modalities in the evaluation of primary brain tumours. The function of CT is mostly relegated to emerging imaging in the detection of haemorrhage, herniation, and hydrocephalus but mass effect from brain tumours and calcification within brain tumours such as oligodendrogliomas or menigiomas can potentially be discovered.

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Source of Support: None Declared
Conflict of Interest: None Declared