International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

MRI Evaluation of Supratentorial Masses

Dr. M. Narasimha Chary[1], Dr. N. Aishwarya[2]

[1]Associate Professor, Department of Radiodiagnosis, Guntur Medical College, Guntur, Andhra Pradesh, India, 522001

[2]Junior Resident, Department of Radiodiagnosis, Guntur Medical College, Guntur, Andhra Pradesh, India, 522001

Abstract: ***Magnetic Resonance Imaging has supplimented CT as the modality of choice for imaging supratentorial fossa tumours. The Multiplanar capability of MRI provides superior localization of brain lesion. In addition, superior contrast resolution is provided via multiple sequences which exploit the various tissue characteristics of normal and pathological structures. Magnetic resonance is exquisitely sensitive for the detection of both solid and cystic lesions within the brain, and it is excellent for characterizing secondary effects of tumours such as edema, necrosis, hemorrhage and infarction. Multiplanar images provide superior evaluation of mass effect and associated anatomic distortion. The above study is conducted from Jun 2018 to Jun 2020 in department of radio diagnosis, government general hospital, Guntur for evaluation of supra tentorial masses using MRI***

Keywords: MRI, supratentorial masses, glioma, lymphoma**.**

1. Introduction

Supra tentorial tumours include those tumours that occurs in the sellar or supra sellar region and other areas of cerebrum. Among intra-axial tumours, gliomas and metastases are the most frequent tumours above the tentorium. Among extra axial tumours meningomas are the commonest in this region.[2]

The annual incidence of primary intracranial neoplasms is estimated to be 12.3 persons per one lac population and it is increasing in frequency. Since majority of these tumours present with nonspecific complaints such as headache, stroke like syndrome, or seizures, often a diagnosis is made or suggested initially by the findings on imaging studies.[5] Magnetic Resonance Imaging is a new and an important modality, which has high sensitivity for detecting intracranial pathology. Multiplanar imaging is possible only with MRI, which helps in detection, localization and characterization of the lesion. The MRI examination has helped in early diagnosis, accurate localization of the tumour with prompt initiation of appropriate medical or surgical therapy. It is an excellent tool for study of intracranial lesions in which the tumour appears as altered tissue signal intensities. It helps in recognizing the type of tumour by its characteristic appearance and location. Recent advances like magnetic resonance (MR) spectroscopy, MR fluoroscopy with stereotactic guided biopsy have revolutionized the role of MRI in study of intracranial tumours.

In view of the above the present study is undertaken to assess diagnostic ability of MRI in characterizing various supra tentorial tumours using T1 and T2 weighted , FLAIR, SWI, DWI and contrast enhanced axial, coronal, sagital images.

2. Review of literature

The first contrast examination was described by Walter Dandy who in 1918 introduced ventriculography by injecting air directly into the ventricles. In 1921, Sicard described a radiopaqe oily contrast substance that could be injected into the spinal canal and used to diagnose intra spinal lesions.

Egar Moniz, in 1927 described cerebral angiography. These developments represented considerable progress in the diagnosis of lesions of central nervous system (CNS).

In 1948, George More described the use of radioactive isotopes to diagnose the location of the tumour. This was an important non-invasive approach in diagnosing brain neoplasms and other conditions.

In 1960's the diagnostic procedures, particularly angiography, continued to improve through the use of selective and super selective approaches.

Computed tomography can detect over 90% brain tumours, small tumours (< 0.5 cm), tumours adjacent to bone such as pituitary adenomas, clival tumours and vestibular schwannomas, brainstem tumours, and low grade astrocytomas maybe missed and are better detected by the more sensitive MRI.[7]

MRI (Magnetic Resonance Imaging) is an important diagnostic modality in Clinical Radiology, Neurology and Neurosurgery.[8] Invention of MRI is considered as one of the greatest steps in radiology.

3. Method/approach

3.1 Aim

Role of MRI in evaluation of supratentorial masses.

3.2 Objectives

The objective of the present study is to assess diagnostic ability of MRI in characterizing various supra tentorial tumours using T1 and T2 weighted and contrast enhanced image.

3.3 Study

The present study was conducted in the Department of

Radio-diagnosis, Government General Hospital, Guntur, during the period of June 2018 to Jun 2020.

Study design
The present study on magnetic resonance imaging of supratentorial fossa tumours was a hospital based cross sectional study.

Study period
The present study was conducted during the period of June 2018 to Jun 2020.

Place
The present study was conducted at Department of Radio Diagnosis, Government General Hospital, Guntur

Source of data
All clinically suspected supratentorial brain tumour cases undergoing MRI at Government General Hospital, Guntur, over a period of two years.

Sample size
Fifty (50) cases of supra tentorial brain tumour cases undergoing MRI

Selection criteria

Inclusion criteria
Cases referred for MRI with clinically suspected supra tentorial brain tumours.

Exclusion criteria
- All patients having cardiac pace makers, prosthetic heart valves or any metallic orthopaedic implants.
- All patients having any adverse reaction to contrast agents used.
- Supratentorial pathology and sympatomatology due to infections
- Congenital malformations
- Trauma or cerebrovascular accidents will be excluded.

Technique
All the scans were performed with 0.4 Tesla MRI, manufactured by HITACHI with software version APERTO V5-0S.

The tests will be performed using following parameters.
- FOV – 14 to 24 cm
- Slice thickness – 10, 6 mm
- Matrix size – 256 X 256
- Sequences: T1, T2 and diffusion weighted;
- Coronal T2, Saggital T1, Post contrast axial, coronal and saggital T1.

Initially plain images were acquired in above mentioned sequences followed by injection of contrast Gadolinium DTPA at a dose of 0.1 mmol/kg body weight. Subsequent to injection of contrast images were acquired and assessed.

Patients were examined with MRI scanner in the supine position and proper positioning and immobilization of the head was obtained. Standard head coil was used for acquisition of images.

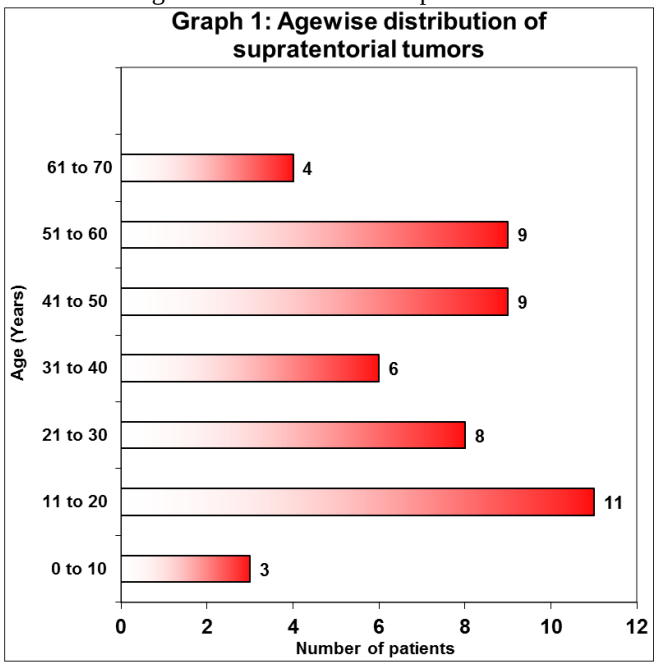
Pre-contrast scanning was done using axial T1, T2 and FLAIR; coronal T2 and sagittal T1 and slice thickness of 5 mm.

Omniscan (Gadodiamide) is used as contrast agents in dose of 0.1mmol/kg (I.V) body weight. Post-contrast coronal, sagittal and axial T1WI were obtained. If required, thinner sections were obtained in the region of interest wherever necessary. Special MRI sequences like FLAIR (Fluid attenuated inversion recovery sequence), DWI (Diffusion weighted imaging) were obtained. The images were analyzed for tumour size, location, number, margins, and signal intensity changes, areas of hemorrhage, cystic changes, calcification, surrounding edema, mass effect, effect on ventricles, contrast enhancement and encroachment into the adjacent structures.

Follow up
All patients were followed up to reach a surgical/ biopsy/therapeutic diagnosis. Findings during the surgery and on histopathologial examination were noted and were compared with the MRI features. On further management the final outcome of the disease was recorded.

4. Results

Table 3: Age wise distribution of supratentorial tumors



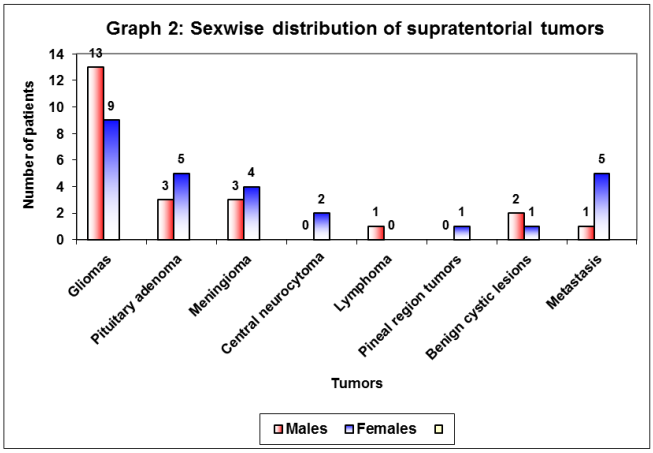
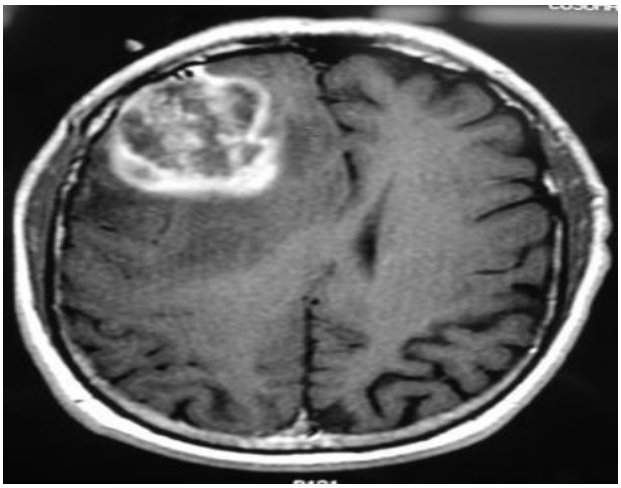
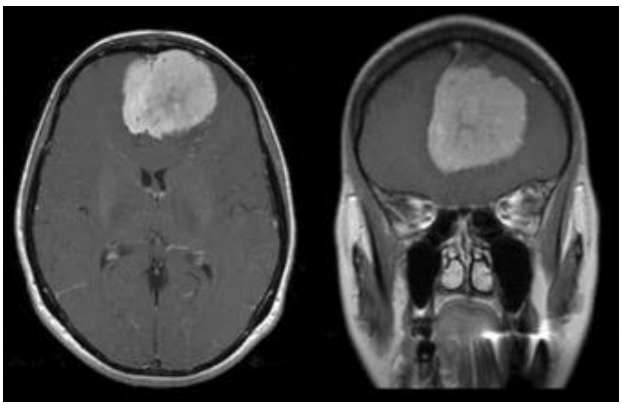


Table 3: Agewise distribution of supratentorial tumors

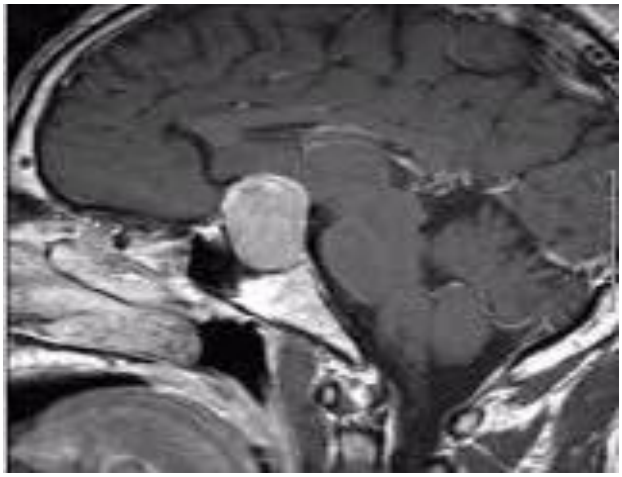
Supra tentorial mass	0-10	11-20	21-30	31-40	41-50	51-60	61-70
Glioma	1	5	2	3	4	4	3
Pituitary adenoma	-	3	3	1	1	-	-
Meningioma	-	-	2	1	2	1	1
Central neurocytoma	1	1	-	-	-	-	-
Lymphoma	-	-	-	-	-	1	-
Pineal region tumors	-	1	-	-	-	-	-
Benign cystic lesions	1	1	1	-	-	-	-
Metastasis	-	-	-	1	2	3	-
Total	3	11	8	6	9	9	4



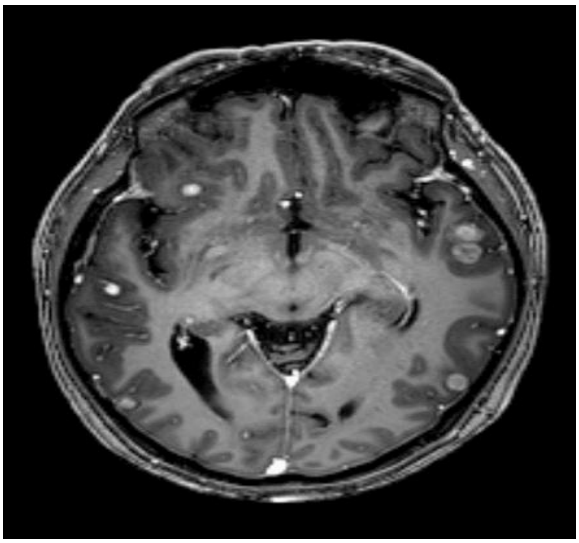
Glioma; T1 weighted well defined heterogenously enhancing lesion in rt frontal lobe with mid line shift



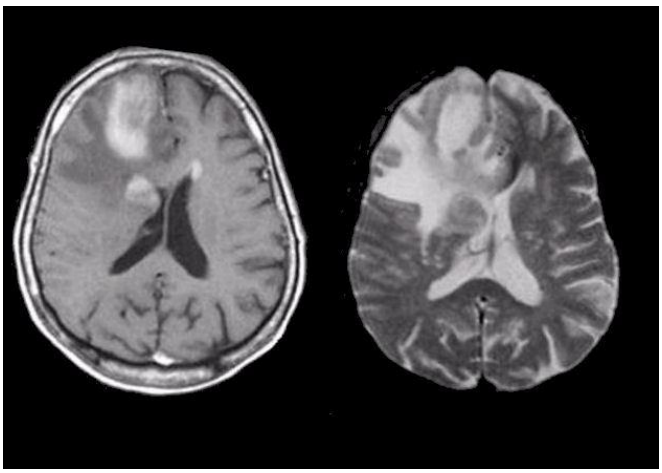
Meningioma; homogeneously enhancing extra axial mass in left frontal parasagittal region



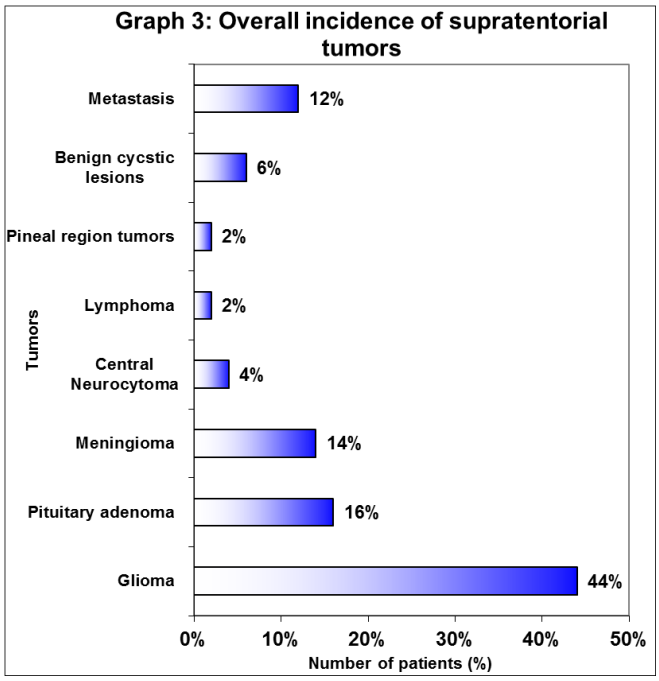
Pituitary adenoma: solid enhancing mass enlarging the pituitary fossa and extending into the suprasellar cistern, elevating and compressing the optic chiasm



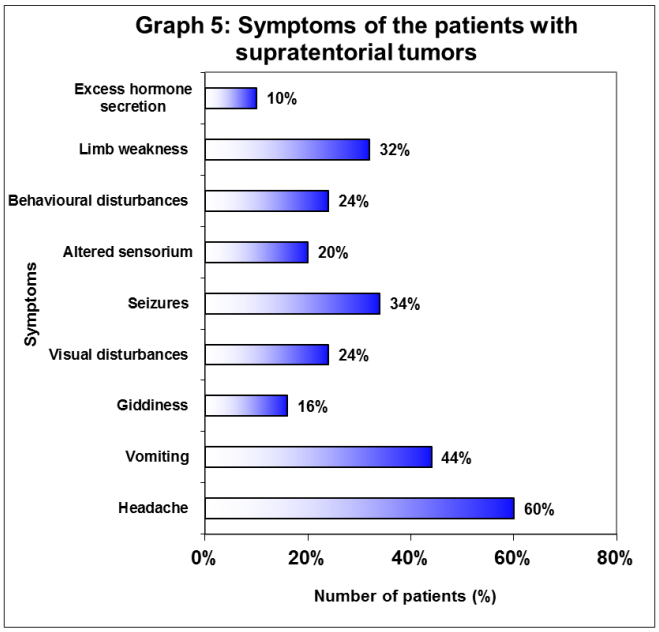
Metastasis: multiple ring enhancing lesions in known case of ca breast

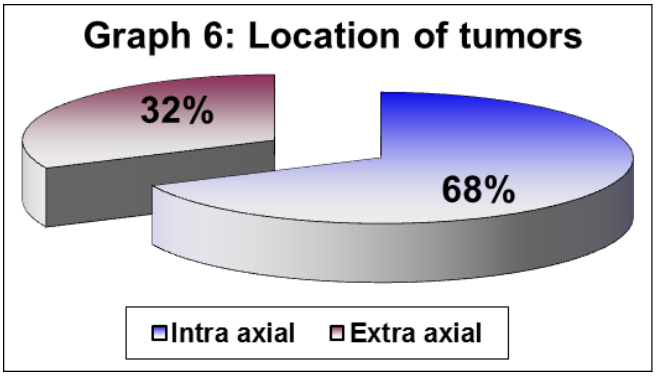


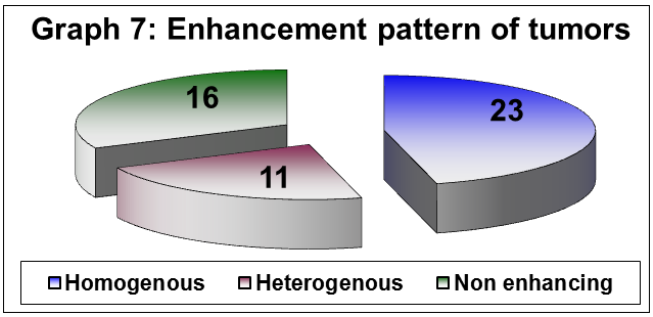
Primary CNS lymphoma: T1-weighted with gadolinium axial MRIs; DWI axial MRI. Note the large enhancing mass involving the right frontal lobe and the basal ganglia (especially the caudate) with surrounding edema.

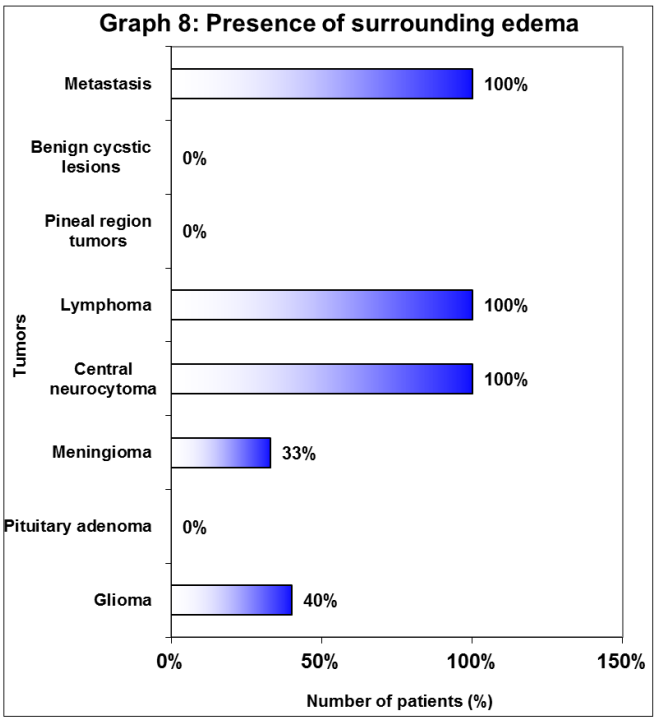


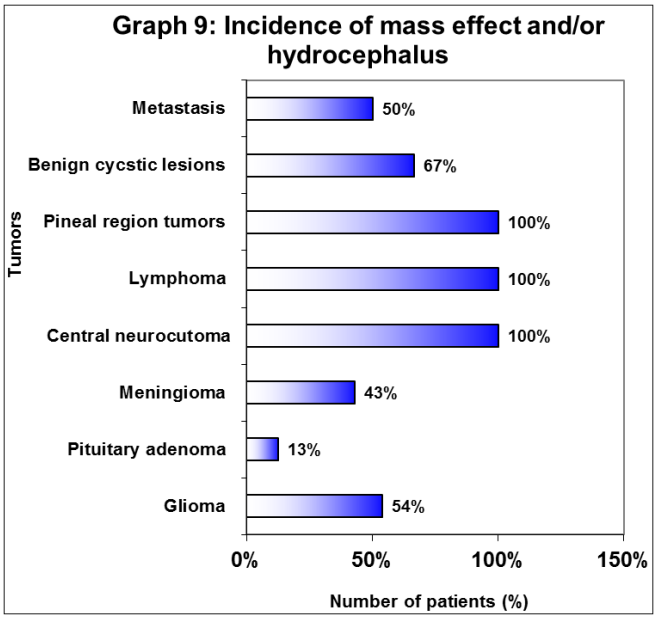
Tumors	*Number of cases*	*Percentage*
Glioma	22	44%
Pituitary adenoma	8	16%
Meningioma	07	14%
Central neurocytoma	02	4%
Lymphoma	02	4%
Pineal region tumors	02	4%
Benign cystic lesions	03	6%
Metastasis	06	12%
Total	50	100%











5. Discussion

Magnetic resonance imaging is a noninvasive, reproducible and highly accurate method, which demonstrates size, location configuration, extent and relationship of the lesion to the adjacent structures.

By analyzing the MR features of neoplasms one can have high specificity of MRI in identifying the nature of the lesion and if possible it's histological type.

In this study of 50 cases with supratentorial tumors, glioma was the most common diagnosis (44%). Others include Pituitary Adenoma, Meningioma, Lymphoma, Central neurocytoma, Pineal region tumors such as germinoma and pineocytoma, colloid cyst, Rathke's cleft cyst, Arachnoid cyst and Metastasis.

Age Distribution
Both children and adults were included in this study group. The age group from 5 to 63years, peak incidence of neoplasms was seen in third decade and the least incidence was seen in the seventh decade. Thus the age range was variable. This will be discussed under each tumor.

This study had only three patients in the pediatric age group (below the age of 12 years). The different tumors encountered in this age group were low grade glioma, central neurocytoma and colloid cyst

Sex Distribution
In this study a slight female predominance was noted as 27 patients were females and 23 patients were males.

Clinical Features
Headache was the commonest presenting complaint. In our study, 60% of patients came with headache especially, which is persistent and not relieved by routine analgesics. Vomiting, giddiness, seizures, visual disturbances were the other common symptoms. In a study by Baker et al[67] report headache, altered consciousness, personality change, cognitive disabilities, seizures, visual and gait disturbances as the common presenting complaints of the patients with brain tumor.

Features of hormonal imbalance were the main complaints in patients with pituitary adenoma.

Location
Intra-axial tumors were clearly more common than extra-axial tumors, 68% of the tumors were intra-axial, whereas 32% of them were extra-axial. This correlated with the study by National cancer institute[67] which report 80% as intra-axial and 20% as extra-axial tumors.

Histopathological Correlation
In our study out of 50 patients 46 patients were operated accounting for 92 % of cases.4 cases were managed conservatively accounting for 8% of cases.

Out of 46 operated cases 42 cases are histopathologicaly correlated and 4 case are not correlated out of which 2 cases are given as low grade astrocytoma are turned up into high grade , one case which was given as high grade turned up into low grade and one case which was given as metastasis turned up into primary brain tumour.

6. Conclusion

The present cross sectional study was conducted in the Department of Radio diagnosis, government general hospital, Guntur, during the period of june 2018 to jun 2020. Aimed to study the role of MRI in diagnosing supratentorial tumours.

- Magnetic resonance imaging scan of brain was performed in 50 patients with supratentorial tumours. Twenty eight (27 that is 54%) patients were females and 23 (46%) were males, showing female predominance.
- Patient in Pediatrics age group (below the age of 18 years) accounted for only eight cases (16%) and the adult population was 42 (84%) cases.
- The commonest supratentorial fossa tumour was glioma.
- The commonest intra axial tumours were gliomas (46%) while the commonest extra axial tumours were menigiomas (14%).
- Multiplanar capability of MRI was helpful in identifying the precise anatomic location and the exact extent of the tumours.
- On post contrast images there was a clear definition of the size, margins, and nature of the tumour and it also improved the differentiation between the tumour and surrounding edema.
- The major limitation of MRI in our study was its inability to accurately identify the foci and calcification within the tumour.

7. Summary

Magnetic Resonance Imaging has supplimented CT as the modality of choice for imaging supratentorial fossa tumours. The Multiplanar capability of MRI provides superior localization of brain lesion. In addition, superior contrast

resolution is provided via multiple sequences which exploit the various tissue characteristics of normal and pathological structures. Magnetic resonance is exquisitely sensitive for the detection of both solid and cystic lesions within the brain, and it is excellent for characterizing secondary effects of tumours such as edema, necrosis, hemorrhage and infarction. Multiplanar images provide superior evaluation of mass effect and associated anatomic distortion.

Unlike the X-rays computed tomography, a bone artifact is not a problem with MR imaging of the supratentorial fossa and a high level of contrast is seen between gray and white matter.

Objectives of this study were to assess diagnostic ability of MRI in characterizing various supra tentorial tumours using T1 and T2 weighted and contrast enhanced image.

The present cross sectional study was conducted on 50 cases with supratentorial tumours in the Department of Radio diagnosis, Alluri Sitaramaraju Academy of Medical Sciences, Eluru during the period of Oct 2012 to Oct 2014.

In this study female predominance was seen. Patient in Pediatrics age group (below the age of 18 years) accounted for 16% of the study population and the adult population was 84%. The commonest supratentorial fossa tumour was glioma. The commonest intra axial tumours were gliomas while the commonest extra axial tumours were menigiomas.
Magnetic resonance imaging is the optimal screening technique for the detection of most brain abnormalities. Magnetic resonance imaging using T1, T2 and FLAIR images with contrast enhanced studies provides greater contrast resolution between structural abnormalities and the adjacent brain parenchyma and has proved to be more sensitive than CT in detection of focal lesions of brain.

- Gadolinium DTPA at a dose of 0.1mmol/kg (I.V) body weight is usually administered as the contrast agent.
- The major limitation of MRI in our study was its inability to accurately identify the foci and calcification within the tumour.

References

[1] Kornienko VN, Pronin IN. Diagnostic Neuroradiology. Springer Verlag. (2009) ISBN:3540756523.
[2] Ricci P. Imaging of adult brain tumours. Neuro Imaging Clin North Am 1999; 9: 651-69.
[3] Tadmor R, Harwood DC, Scotti G, Savoiardo M, Musgrave MA, Fitz CR et al. Intracranial neoplasms in children: The effect of CT on age distribution. Radiology 1982; 145: 371-3.
[4] Bundy ML, Wrensch. Update on brain concern epidemiology. Cancer Bull 1993; 45: 365-9.
[5] Rees J, Lee SH, Smirnioptopoulos J. Primary brain tumors in adults. Chapter -7, In: Howard LS, Krishna CVG Rao, Zimmerman RA, Eds. Cranial HRI and CT. 4th ed, New York: Mc Graw Hill 1999: 261-340 pp.
[6] Seeram E. Computed Tomography: Physical principles, clinical applications and quality control, 2nd ed Philadelphia, USA: W.B. Saunders; 2001.
[7] Black P, Wen P. Clinical, imaging and Laboratory diagnosis of brain tumors. In: Kaye A, Laws E, eds. Brain Tumors. New York: Churchill Livingstone; 1995; 219-20.
[8] Felix R, Chroner W, Laniado M, Niendorf, Claussen C, Fiegler W, et al. MR imaging with gadolinium-DTPA. Radilogy 1985; 156: 681-8.
[9] Kramer ED, Rafto S, Packer RJ, Zimmermann RA. Comparison of melography with CT follow up versus gadolinium MRI for subarachnoid metastatic disease in children. Neurology 1991; 41: 46-50.
[10] Zawadzki MB, Badami JP, Mills CM, Norman D, Newton HT. Primary intracranial tumor imaging: A comparison of magnetic resonance and CT. Radiology 1984; 150: 435-40.
[11] Kjos BO, Zawadzki MB, Kucharczyk W, Kelly WM, Norman D, Newton TH. Cystic intracranial lesions: Magnetic resonance imaging. Radiology 1985; 155: 363-9.

Author Profile

Dr. M. Narasimha Chary, Aassociate Professor, Department of Radiodiagnosis, Guntur Medical College, Guntur, Andhra Pradesh, India, 522001

Dr. N.Aishwarya, Junior Resident, Department of Radiodiagnosis, Guntur Medical College, Guntur, Andhra Pradesh, India, 522001