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Extraaxial Neoplasms: Ct or Mri?

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Abstract: *Extraaxial Neoplasms represent a significant proportion of intracranial neoplasms. Early identification of the neoplasm and its location by imaging is essential for surgical planning. Meningiomas, being the most common have varied locations within the brain and have typical imaging features which aid in prompt diagnosis. Other neoplasms, although less typical, have certain characteristic features that when encountered make their diagnosis straightforward.*
A total of 38 patients diagnosed with supratentorial extraaxial neoplasms referred to department of department of radiodiagnosis over a period of 2 years were examined using Computerised Tomography and subsequently by Magnetic Resonance Imaging of the Brain. The most common age group of presentation was 61-70yrs. Meningiomas, the most common tumors, occurred in a wide range of age group of 22-79 years.
Although both CT and MRI play a crucial role in the diagnosis of these neoplasms, MRI provides more accurate localisation as well as characterisation and is hence, essential.
Keywords*: Meningioma, Macroadenoma. Craniopharyngioma, Pineal*

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I. Introduction

Intracranial neoplasms are on the rise in recent times.They are most deadly of all neoplasms. As the presenting symptoms are trivial such as headache, altered mentation, vomiting, altered vision and seizures; these tumors can be clinically occult for years before diagnosis. Extra-axial is a descriptive term to denote lesions that are external to the brain parenchyma, in contrast to the term intra-axial which describes lesions within the brain substance. Meninges, dura, calvarium, ventricles, choroid plexus, pineal gland, or pituitary gland are the potential sites for origin of extraaxial neoplasms (1). Of these, Meningioma is the most common accounting for about one third of extraaxial tumours. In this study we are going to characterise various kinds of extraaxial neoplasms by using contrast and non contrast CT scan and MRI and subsequently carry out biopsy to prove our diagnosis. The relationship between Diffusion Restriction and Malignancy of Meningiomas will be explored.

II. Materials And Methods:

A total of 38 patients diagnosed with supratentorial extraaxial neoplasms referred to department of department of radiodiagnosis over a period of 2years i.e from October 2015 to September 2017 were included in this study**.**

Pregnant women and patients with severe renal failure were excluded from this study.

Non-contrast and contrast enhanced CT brain examination of patients were carried out using 64 slice Siemens Somatom Emotion CT scan machine subsequently they were evaluated with 1.5T GE MRI machine. Diagnostic Accuracy of Computerised Tomography and Magnetic Resonance Imaging were further evaluated with Biopsy correlation whenever possible.

III. Results

38 diagnosed cases of extraaxial neoplsms were included in the study. Most common age group of presentation was 61-70yrs. Most common neoplasms were Meningiomas. They occurred in a wide age range 22-79 years (Table 1). Craniopharyngeoma showed bimodal distribution, one peak at 10-23 years and other at 53-62years (Table 1). Choroid plexus papillomas and pinealoblastoma were encountered in the paediatric age group.

Out of all cases them 23(60.5%) were females and 15(39.4%) were males(Table 1). Meningioma showed marked female predilection.

Most common clinical presentation was headache which was seen in 25 cases(65.7%) followed by vomiting in 20 cases (52.6%).

Table I. Demography of Extraaxial tumors.

Tumor	Age range	Male	Female	Total
Meningioma**	22-79	6	15	21
Craniopharyngioma	10-23, 53-62	4	3	7
Pituitary Macroadenoma	6-35	2	3	5
Epidermoid Cyst	46,60	2	-	2
Choroid Plexus Papilloma	7	1	1	2
Pinealoblastoma	4	-	1	1
Total		15	23	38

Most of the meningiomas were hyperdense in plain CT scan i.e 15 cases(71.4%).
Choroid plexus papillomas and pituitary macroadenomas were also showed hyperattenuation in CT. Majority of craniopharyngiomas were hypodense representing cystic components i.e in 5 out of 7 cases (71.4%).

Table II. PLAIN CT FINDINGS

Tumor	Isodense	Hyperdense	Mixed / Solid-Cystic	Hypodense/Cystic	Total
Meningioma**	5	15	-	1	21
Craniopharyngioma	2	-	-	5	7
Pituitary Macroadenoma	4	1	-	-	5
Epidermoid Cyst	-	-	-	2	2
Choroid Plexus Papilloma	-	2	-	-	2
Pinealoblastoma	-	1	-	-	1
Total	11	19	0	8	38

3 out of 21 cases(14.28%) showed heterogenous contrast enhancement which is considered as a malignant feature by Noriaki Tomura et al. Common pattern of enhancement in case of craniopharyngioma was ring like enhancement visualised in 5 out of 7 cases(71.4%).

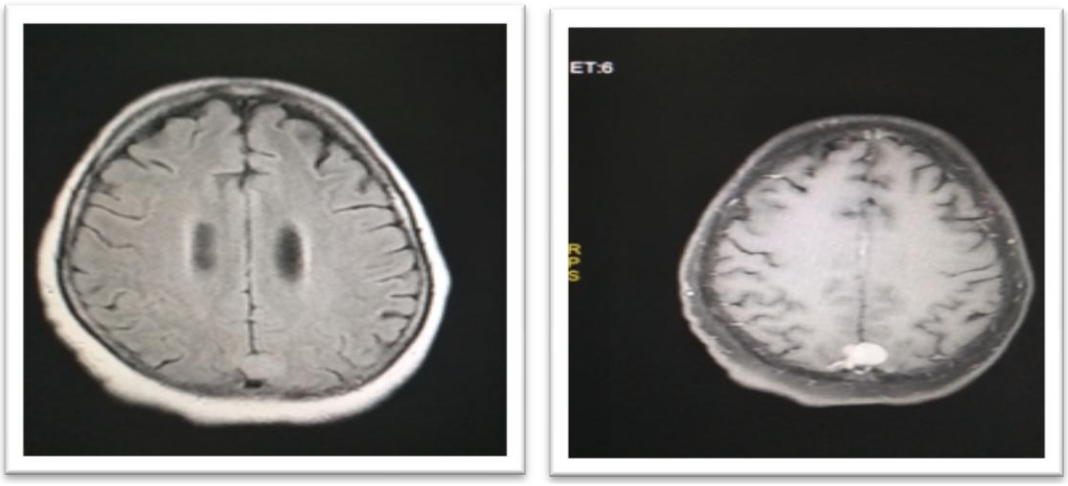
Table III. Contrast Enhancement Pattern on CT

Tumor	No enhancement	Homogenous	Inhomogenous	Ring – Like	Total
Meningioma**	-	18	3	-	21
Craniopharyngioma	2	-	-	5	7
Pituitary Macroadenoma	-	4	1	-	5
Epidermoid Cyst	2	-	-	-	2
Choroid Plexus Papilloma	-	2	-	-	2
Pinealoblastoma	-	1	-	-	1
Total	19	28	18	25	38

Table XII. MRI FINDINGS

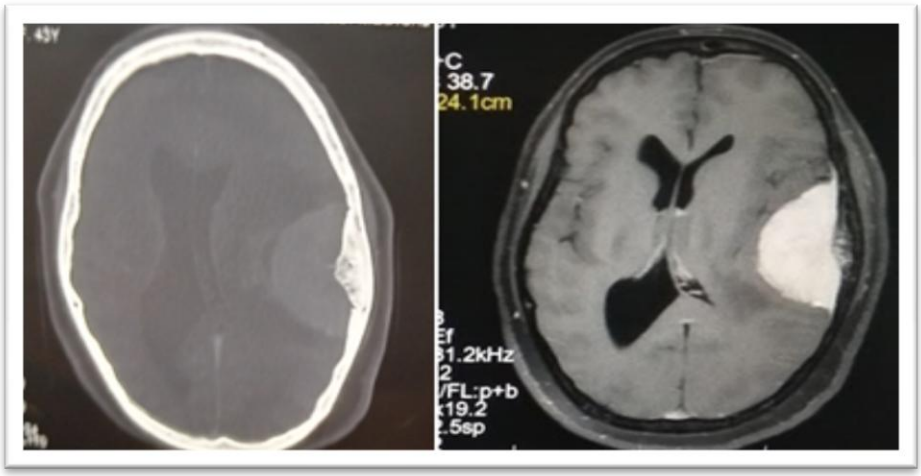
Tumor	T1				T2 FLAIR				DWI		Total
										Restriction	
Meningioma**	3	18	-	-	-	13	8	-	6	15	21
Craniopharyngioma	2	5	-	-	-	-	7	-	-	7	7
Pituitary Macroadenoma	2	3	-	-	-	4	1	-	-	5	5
Epidermoid Cyst	2	-	-	-	-	-	2	-	2	-	2
Choroid Plexus Papilloma	-	2	-	-	1	1	-	-	2	-	2
Pinealoblastoma	-	1	-	-	1	-	-	-	1	-	1
Total	9	29	-	-	2	18	18	-	11	27	38

Predominantly meningiomas showed T1 and T2 isointensity relative to grey matter . 4 out of 21(19.04%) cases of meningiomas showed diffusion restriction.
**The most common MR Imaging finding of Meningioma was iso-intensity relative to grey matter on T1 and T2 W imaging without diffusion restriction.



(a) (b)

Fig 1. T2 flair image depicts a subtle isointense lesion noted abutting the posterior falx(a) which showing marked homogenous enhancement. This was a case of falx meningioma.



(a) (b)

Fig 3(a) Axial CT bone window showing hyperosteosis in a case of convexity meningioma. (b) showing typical dural tail in T2 flair axial MRI

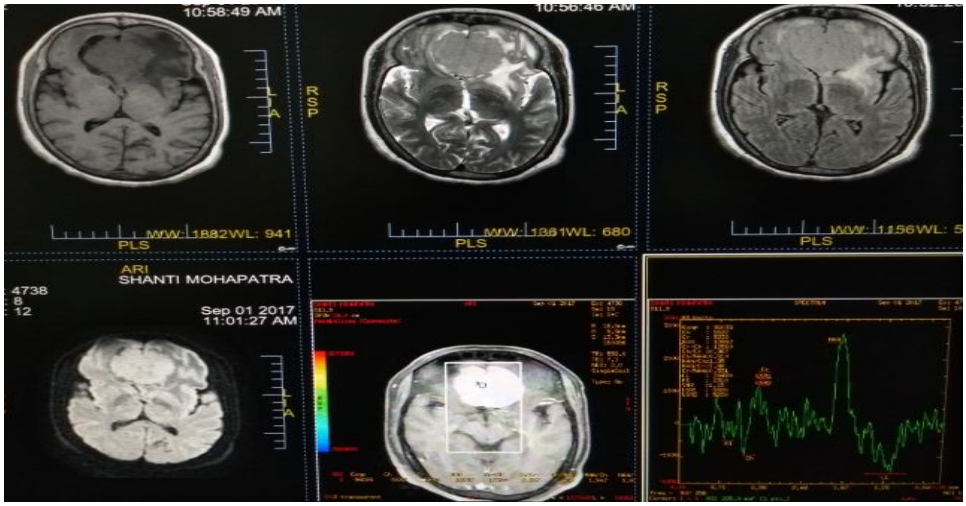
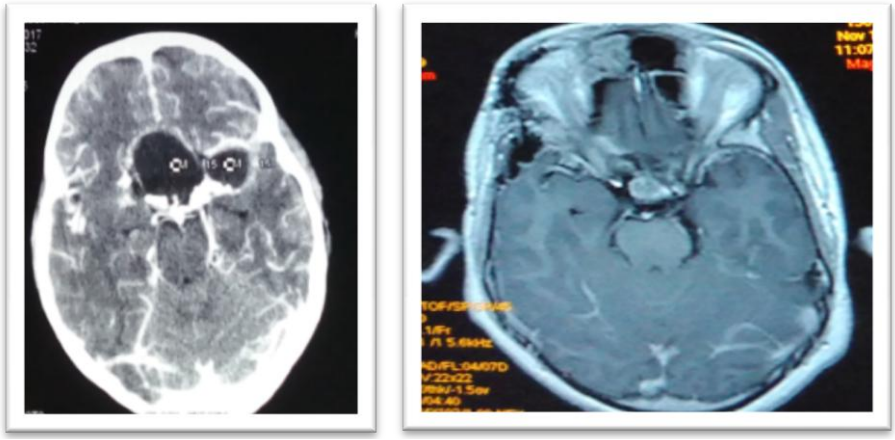


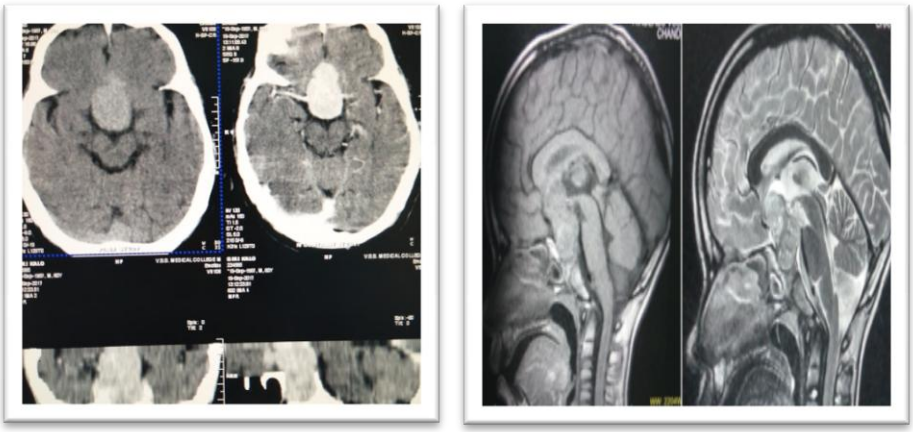
Fig 4 Upper row axial T1, T2 and T2 flair images showing isointensity of falx meningioma with CSF cleft sign well depicted. Lower right Diffusion weighted image showing marked diffusion restriction. Lower middle and lower left images depicts characteristic lipid peak suggestive of meningioma.

Fig 5 shows a homogenously enhancing well circumscribed lesion in trigone of right lateral ventricle enhancement favouring diagnosis of intraventricular meningioma.



(a) (b)

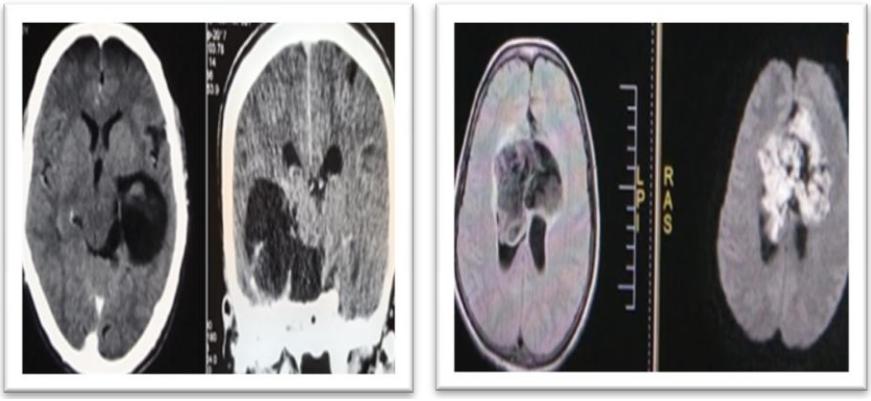
Fig 7 (a) CT Scan Brain: A cystic lesion in suprasellar cistern with peripheral calcification. Meningeal enhancement suggests meningitis. (b) shows T1 MRI image different patient showing hyointense lesion with peripheral enhancement in suprasellar citern. This is a case of craniopharyngioma



(a) (b)

Fig 8 (a) CT image shows a homogenously hyperdense lesion causing expansion of suprasellar cistern which takes intense enhancement on IV contrast administration. (b) Ti and T2 images .The picture on extreme right shows T2 hyperintense microcysts in the same cases. Diagnosis was pituitary macroadenoma.

Fig 10 CT Scan post contrast image shows a heterogeneously enhancing lesion in pineal region with multiple peripheral calcifications and microcysts causing resultant hydrocephalus suggesting the diagnosis of pinealoblastoma which was further biopsy proven.



(a) (b)

Fig 11 (a)CT axial and coronal depicts a hypodense insinuating mass located in CP angle in the image.(b) is MR picture of another patient with non enhancing hypointense mass in interhemispheric location which shows diffusion restriction characteristic of intracranial epidermioid.

IV. Discussion

The most common primary extraaxial neoplasms are slow growing extradural masses - **meningiomas** which are predominant in older females, a finding reiterated in our study (2,3).

There are various locations of meningiomas – parafalcine, falcotentorial, convexity, olfactory groove, sphenoid wing, intraventricular and suprasellar; of which only suprasellar wasn't encountered in this study. Convexity meningiomas were most common(4).

Majority of Meningiomas were hyperdense on Plain CT which showed correlation with Hagga et al (5).

Isointensity on T1 and T2 W was seen in 13 cases of Meningioma (62%). This correlated well with a study by Elster et al (6). A subtle meningioma missed on CT scan was localised on MRI.

Three out of 21 meningiomas showed heterogenous enhancement (14.3%). Of these, two (67%) were biopsy proven as Malignant Meningioma. Correlation: According to a study by Noriaki Tomura et al, half of Malignant Meningiomas demonstrate heterogenous contrast enhancement (7).

Even though extraaxial, associated Edema was seen in 66.6% of Meningiomas.

Calcification was evident in 29% of Meningiomas (8). This was readily evident on CT scan compared to MRI. MRI missed calcifications in two cases that were pointed out on CT.

Dural Tail was encountered in 8 patients with Meningioma (38.1 %) which has been described as a feature of malignant meningioma by Wen M et al (9).

4 out of 5 malignant meningiomas proved on biopsy, demonstrated diffusion (DWI) restriction with low ADC Values which has been mentioned in literature (10). Thus DWI provides an additional angle with regards to aggressiveness of the lesion making MRI a useful supplement to CT scan imaging.

Various other lesions like metastases, lymphoma and sarcoidosis can mimic Meningioma on imaging. Presence of a known primary and multiplicity go in favour of metastases where as Lymphomas demonstrate T2 hypointensity and markedly low ADC Values (11). Sarcoidosis of the Brain involves cranial nerves as well as meninges (diffusely) and frequently has a simultaneous pulmonary involvement(8).

Craniopharyngiomas can be adamantinomatous (5-14 years of age: cystic (90%); calcification (90%) or Papillary (older age; Calcification and cystic change are less common) (5). Bone erosion especially of the dorsum sella is a common finding seen in around 42% of Craniopharyngiomas in the present study (5).

Pituitary Macroadenomas were isointense to grey matter on T2 weighted images but most of them (three out of four) showed multiple characteristic hyperintense microcysts, a finding emphasised by Majos C et al (12).

Epidermoids have typical appearance of hypodensity on CT, hyperintensity on T2 W MRI and FLAIR as well as marked diffusion restriction. Their insinuating appearance as well makes their diagnosis simple and straightforward (5).

The imaging accuracy in the diagnosis of extraaxial neoplasms by CT and MRI were similar at 94.4% and 94.7% respectively. However MRI better delineated tumor extent than did CT Scan alone.

V. Conclusion:

Although CT alone can suffice in the diagnosis of extraaxial neoplasms, MRI provides more thorough and accurate localisation as well as characterisation and is hence, recommended before surgery.

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