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Human Genetics

EVALUATION OF MENINGIOMAS BY COMPUTED TOMOGRAPHY.

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ABSTRACT

Introduction: Intracranial neoplasm are a heterogenous group of disorders all of which present as an intracranial space occupying lesion. Meningioma is one of the common intracranial neoplasm. The clinical manifestations of which are vague. Diagnosis of them is largely dependant on imaging modalities and in this, one of the pioneer technology was computerized tomography (CT) which for the first time actually demonstrated the intracranial mass lesion. With advent of Magnetic resonance imaging (MRI), CT scan has largely been replaced but even today there are many indications and findings for use of CT scan in a suspected meningioma. In this article we tried to evaluate the utility of CT scan in identification of meningiomas.

Aims: To study the role of Computed Tomography in evaluation of meningiomas with histopathological confirmation.

Study design: Prospective observational study. Images and reports of 40 patients of intracranial tumours who underwent CT scan and were diagnosed as meningioma on imaging in period of 2 years. Confirmation was obtained in form of histopathological reports.

Results: Out of the 40 patients 36 were diagnosed as meningioma on histopathology. Thirty cases were supratentorial and 10 infratentorial. Precontrast they were hypodense in 5, isodense in 10 and hyperdense in 25. Enhancement was homogenous in 35 and heterogenous in 5. Edema was seen in 27 cases while 6 cases had miscellaneous findings.

Conclusion: Contrast enhanced CT scan has high predictive value for diagnosis of meningioma.

KEYWORDS : CT scan, Meningioma, Intracranial, neoplasm

Introduction:

Meningioma is a relatively common tumour and accounts for nearly one third of all intracranial neoplasms.1 They are a slow growing neoplasm which are extra axial in location and arise from the meninges. Apart from the cranial vault they can also be found in the spinal canal, ventricles and sometimes skull bones. These are tumours of adulthood and when found in young high suspicion for neurofibromatosis type II should be kept where additionally CP angle tumours like schwannoma and ependymoma are identified. They are also found associated with multiple meningioma syndromes. Sex wise they are more common in women in both intra cranial and intraspinal locations. However malignant variant is more common in males. With increasing lifespan the incidence of meningiomas is increasing, however many small meningiomas are asymptomatic and often detected incidentally during autopsy or neuroimaging for some other cause.2

Histologically there are many types of meningiomas3 however imaging wise there is not much difference. On imaging they can be divided as typical, atypical and malignant meningiomas. Cross sectional imaging modalities like CT scan and MRI have vastly improved the depth of knowledge regarding the behaviour of intra cranial neoplasms. It is very easy to identify a space occupying lesion, characterize it, comment on spread and relations with adjacent structures and state a probable diagnosis. Earlier the decisions regarding respectability of tumours which were often taken on the operating table itself can now be safely made in the radiology reporting room. This holds even more true for lesions like meningiomas which are basically extra axial tumours arising from meninges which can be resected with ease without any permanent damage to the underlying neuroparenchyma.4

Meningiomas are the most common extra axial neoplasm as well as most common non glial intracranial neoplasm. On both CT scan and MRI they have typical imaging findings. On non contrast CT scan they appear broad extra axial hyperdense to isodense welldefined masses. In bone window nearly 30% demonstrate hyperostosis of adjacent calvarial bones. On post contrast scans majority of them show moderate to intense post contrast enhancement. Cystic variant may show non enhancing areas. Anterior fossa meningiomas sometimes show enlargement of adjacent paranasal sinuses which is known as pneumosinus dilatans. Calcification can be demonstrated in chronic or burnt out meningiomas. Nearly 30 to 50 % of meningiomas have an adjacent vasogenic type of edema. It appears as non enhancing hypodensity in the adjacent white matter. On MRI they appear as broad dural based masses which are isointense to gray matter on T1/T2 weighted images. On FLAIR it is slightly hyperintense. Diffusion restriction is seen in some cases indicating high cellularity however histological correlation is variable. The patterns of MR spectroscopic changes are not sensitive and often not needed. Additional signs like dural tail sign or CSF cleft sign can be demonstrated but they are not specific for meningioma and can be seen in variety of extra axial neoplasms. On GRE blooming may be seen in cases of calcifications. Intralesional hemorrhage is rare. Perilesional edema appears hyperintense on T2/FLAIR.5[6]

In present era MRI with contrast is the imaging modality of choice, however there are instances where CT scan is performed. Absolute contra indications for MRI like implanted pacemakers, aneurysmal clips, claustrophobia etc are indication for CT scan. In developing nations like India CT scan has reached in all district places and many subdivisions also, however MRI is still restricted to most metropolitan centres and tertiary care hospitals. Due to less cost CT scan is often the first screening modality used for vague CNS complaints by physicians. Before operating most of the neurosurgeons need to know regarding the vascularity and extensions of the lesion and in such cases MRI with contrast is the investigation of choice. However these days due to increase in neuroimaging referrals many small or burnt out meningiomas are getting detected incidentally. Most of such cases are managed conservatively with followup imaging to look for change in size. In such cases of medical management and few selected cases where MRI is contra indicated, CT scan can play a pivotal role for deciding further management.7[8]

Aim and Objectives:

1. To study the role of CT scan in diagnosis of Meningioma
2. Identify the different features seen on CT scan in meningiomas
3. Confirm with histopathological reports

Material and Methods:

Type of study: Prospective observational study.

Place of study: CT scan section of Department of Radiodiagnosis in a tertiary care hospital.

Duration of Study: The study period was 2 year from August. 2015 to July 2017. At the end of each study the histopathological report was confirmed.

Sample size: 40 patients were selected who had the diagnosis of Meningioma on CT scan.

Inclusion Criteria: Imaging findings consistent with meningioma on CT scan.

Exclusion criteria: All patients who were not willing for contrast scan or who did not undergo neurosurgical tumour removal/sampling for histopathological confirmation were excluded from the study.

Machine used: GE Brightspeed 8 slice Multidetector CT scan machine. 350 mg/ml iodinated non ionic monomer (Iohexol) was used as contrast media.

Observations and Results:

Table 1: Age-wise distribution of patients

Age Group (Years)	Number	Percentage
21 - 30	1	2.5
31 – 40	3	7.5
41 – 50	12	30
51 – 60	14	35
> 60	10	25
Total	40	100

Table 2: Distribution based on location

Location	Number		Percentage
Supratentorial	30	Parafalcine (12)	75
		Sphenoid ridge (6)	
		Parasellar (2)	
Infratentorial	10	Others (10)	25
		CP Angle (8)	
		Post Fossa (2)	

Table 3: Imaging characteristics

CT Imaging Characteristics		Number	Percentage
Non contrast	**Hypodense**	5	12.5
	Isodense	10	25
	Hyperdense	25	62.5
Post contrast enhancement	**Homogenous**	35	87.5
	Heterogenous	5	12.5
Edema	**Present**	27	67.5
	Absent	13	32.5
Miscellaneous	**Calcification**	3	7.5
	Hyperostosis	2	5
	Cystic necrosis	2	5

Table 4: Results based on 1 year followup

CT scan report	Histopathology Meninigioma	Histopathology Other
Meningioma	36 (90%)	4 (10%)

Discussion:

In our study a large number of patients (> 90%) belonged to 40 years and above. Meningiomas are generally neoplasms of the adulthood. Similar results were observed in different Western and Indian studies.1[9,10] When found in younger patients they are often associated with neurofibromatosis Type 2. Similarly in our study also the single patient in the age group of 21 to 30 years had an associated cerebellopontine angle schwannoma indicating a possibility of neurofibromatosis type 2.11

Location wise in our study majority (75%) of the meningiomas were supratentorial while 25% were infratentorial. Most of the studies have demonstrated that meningioma is mostly a supratentorial lesion. Most common site is cerebral convexity followed by CP angle. In a recently conducted study nearly 85% meningiomas were supratentorial in location.—12

Most of our meningiomas were hyperdense on non contrast scan and showed homogenous post contrast enhancement. Perilesional edema was seen in 67.5% of the patients. Most of the studies have demonstrated that large proportion of meningiomas appear hyperdense on non contrast scans and show homogenous post contrast enhancement. Heterogenous enhancement or hypodense appearance on plain scans is common feature of atypical meningiomas and they are often associated with significant edema.7[5,13]

Most of the studies agree that edema is present in more than 50% of meningiomas and is vasogenic in origin. The presence of edema is linked with tumour recurrence.4 Hyperostosis is reactionary bone reaction but recurrence is common in them.4

Thus combination of classical features for meningioma have got a positive predictive value of nearly 90% on contrast enhanced CT scan. In all patients who are considered for neurosurgery, based on current literature they should undergo MRI imaging. Hyperosteosis, out of proportion perilesional edema, hypodense appearance on plain scans and heterogenous post contrast enhancement all should point towards atypical nature of the meningioma and should be considered for MRI evaluation.

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