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MRI EVALUATION OF MENINGIOMAS IN PATIENTS OF RIMS, RANCHI, JHARKHAND

Radiodiagnosis

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ABSTRACT

Meningiomas begin from arachnoid meningothelial cells of the arachnoid villi which are normally situated along dural venous sinuses. Most of meningiomas are unconstrained and of obscure etiology, albeit perceived chance elements incorporate past introduction to radiation, injury, hereditary issue. Meningiomas are characterized into three grades as indicated by World Health Organization (WHO) 2016 criteria. Considering the vagueness of the clear-cut demarcation and heterogeneity of the meningiomas its imperative that we gather more data and build on evidence. We employed a noninvasive, imaging classification technique , to associate the meningiomas with WHO grading and facilitate the diagnostic features evident on the MRI imaging for the Meningiomas.

Methodology: The present study was a cross sectional study from Feb 2018 to Jan 2019 (11 months). Research study was conducted at Department of Radiodiagnosis, RIMS Ranchi. A total 50 patients were part of the study. Department's MRI Machine of 1.5T(Seimens Magnetom Symphony) was used . Data was collected on the questionnaire and analysis was done using the SPSS software version 16. We evaluated peritumoral brain edema and T2 signal hyperintensity of the tumours and its correlation.

Results : A test for association using chi square was found to be significant statistically on comparing the Peritumoral brain edema (Radiologically evident) with Grading of the Meningioma visualized in the MRI . Occurrence of the meningioma was most in Parasagittal/falx region(30%) followed by convexities while other locations were also located on MRI .

Conclusion: Non invasive methodologies will be the need in future for accurately predicting how a tumor is going to behave . Whether it's a grade III or II it can be shown by noninvasive markers (in our case tumor edema and Hyperintensity in T2WI) will be boost in managing meningiomas . Hyperitensity of tumour in T2WI was significantly associated with peritumoral brain edema.

KEYWORDS

Meningioma, MRI, Peritumoral brain edema, WHO grading, T2WI hyperintensity

INTRODUCTION

Meningiomas are the most widely recognized non-glial extraaxial essential tumors of the central nervous system representing between 18 to 21% of every single intracranial tumor. Meningiomas begin from arachnoid meningothelial cells of the arachnoid villi which are normally situated along dural venous sinuses. (1) Most of meningiomas are unconstrained and of obscure etiology, albeit perceived chance elements incorporate past introduction to radiation, injury, hereditary issue. Meningiomas are characterized into three grades as indicated by World Health Organization (WHO) 2016 criteria. (2) Grade I tumors are treated with medical procedure alone though Grade II and III are treated with medical procedure, radiotherapy and chemotherapy. (3,4, 5) Almost 10% of meningiomas are atypical (WHO grade II) or anaplastic (WHO grade III) tumors with forceful natural conduct, a propensity to repeat , and, moderately more terrible anticipation, as clear from 5-year survival rate of 67.5% and 60% for patients with Grade II and III meningiomas, individually.(6) Various meningioma is regularly connected with Neurofibromatosis type 2 and Multiple Meningiomatosis disorder. Commonly benign and as a rule have particular appearance on histology and imaging however once in a while might be atypical or dangerous graded as WHO Grade II and III. For separating among Typical and atypical/anaplastic meningiomas, a few regular MRI discoveries have been proposed as markers of forceful tumors, including non-skull base area, T2 hyperintensity, peritumoural brain edema(PTBE), unclear tumor-brain interface, unpredictable tumor edges, heterogeneous tumor improvement, capsular upgrade, cystic changes, and skull intrusion. (7,8 ,9)

Of late recent evidences are being cited often probing the relationship of various radiological features noted on MRI and then relating them to the grading of the Meningiomas. Its needed as often histological diagnosis requires surgical interventions .Non invasive techniques have been looked for and many predictors like Tumor Volume , Tumor edema , presence of necrosis , 3D tumor measurement etc to name a few . (10, 11,12,13,14,15)

In these scenario authors quoted above have advocated for tumor edema which has been graded by them as mild, moderate and severe. (12) We found it relevant and a model which we can adopt in our setting .Considering the vagueness of the clear-cut demarcation and heterogeneity of the meningiomas its imperative that we gather more data and build on evidence so that the meningiomas can be understood better based on the MRI findings and other modalities as well. The state of Jharkhand has yet to come up with concrete evidence not only regarding the epidemiologic, but other critical data regarding the incidence, prevalence and imaging outlines about the meningiomas being diagnosed and being worked on in various hospitals across the state. RIMS being the premier institute of the state caters to a large proportion of patients with Meningioma not only from Jharkhand but also from other neighboring states as well. The present study was done with an aim to facilitate the diagnostic features evident on the MRI imaging modality being used to diagnose the Meningiomas . The objectives were (1) To see the incidence of Meningioma cases coming in a Superspeciality Hospital (tertiary care set up) (2) To understand the fine details about the various meningiomas being detected thus using MRI technique .

METHODOLOGY

The present study was a cross sectional study from Feb 2018 to Jan2019 (11 months). Research study was conducted at Department of Radiodiagnosis, RIMS Ranchi. A pretested semi structured questionnaire was used to collect data regarding the various aspects conforming to the aims and objectives was used. A total 50 patients were part of the study who were willing to participate and were fulfilling our inclusion criterion. Inclusion was done on the basis of complaints of persistent headache , visual field defects , hemiparesis etc. who underwent MRI imaging technique with an age group of >10 years to 70 years . Cases not coming under our inclusion criterion were excluded.

MRI machine used was based in the department with a 1.5 Tesla configuration (Seimens Magnetom Symphony). All standard protocols

were used for patients undergoing MRI. Peritumoral brain edema was graded using the following scale: (0) No edema: absence of increased T2 signal surrounding the meningioma. (1) Mild edema: rim or crescent of increased T2 signal surrounding the meningioma without mass effect. (2) Moderate edema: more extensive increased T2 signal surrounding the meningioma without mass effect. (3) Severe edema: mass effect from edema and/or tongues of advancing edema. We evaluated peritumoral brain edema and T2 signal hyperintensity of the tumours and its correlation. Data collected on the questionnaire was further entered in the MS Office Excel sheets and analysis was done using the SPSS software version 16. The measures of central tendency like mean etc. were used to express the results while tests of association like Chi square etc. were used with p value of <.05 considered as statistically significant . Quantifiable data was expressed as gender wise with mean and standard deviation values.

RESULTS

Table 1. Sociodemographic Profile of the participants. With Religion, Socioeconomic Status , and Employment.

N=50			Religion				p value	SES		p value	Employment		p value
			Hindu	Muslim	Sikh	Sarna	>.05	APL	BPL	>.05	Employed	Non Employed	<.05
	Male n=25		17	2	1	5		10	15		14	11	
		%	68.0%	8.0%	4.0%	20.0%		40.0%	60.0%		56.0%	44.0%	
	Female n=25		12	3	6	4		9	16		4	21	
		%	48.0%	12.0%	24.0%	16.0%		36.0%	64.0%		16.0%	84.0%	

29 Rural and 21 urban participants.

Table 2. Relationship of Peritumoral brain edema (PTBE) and WHO grading present gender wise.

Gender	Conventional MRI Imaging focusing on Tumor Volume			WHO Grade		Total
				WHO Grade I	WHO Grade II/III	
Male	PTBE	Yes		10	5	15
			%	66.7%	33.3%	100.00%
		No		8	2	10
			%	80%	20%	100.00%
Female	PTBE	Yes		9	7	16
			%	56.25%	43.75%	100.00%
		No		7	2	9
			%	77.8%	22.2%	100.00%
Total				34	16	50
			%	64%	32%	100.00%

P <.05

Table 3. Correlation of Occurrence with WHO grading for different genders

Gender				Occurrence					
				Parasagittal/Falx	Convexities	Suprasellar	Sphenoid Ridge	Posterior fossa	Olfactory Groove
Male	WHO Grade	WHO Grade I	Count	6	4	2	2	3	1
			%	75%	66.7%	100%	66.7%	60%	100%
p<.05		WHO Grade II/III	Count	2	2	0	1	2	0
			%	29.41%	0.00%		75.00%		
	Total		Count	8	6	2	3	5	1
			%	100.00%	100.00%	100.00%	100.00%	100.00%	100%
Female	WHO Grade	WHO Grade I	Count	5	5	2	2	1	1
			%	71.4%	62.5%	66.7%	50%	100%	50%
p<.05		WHO Grade II/III	Count	2	3	1	2	0	1
			%	35.71%	30.00%	28.57%	40.00%		50%
	Total		Count	7	8	3	4	1	2
			%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Total		Count	15	14	5	7	6	3
	p <.05		%	30%	28%	10%	14%	12%	6%

Table 4. Correlation of T2W signal hyperintensity of tumour & Peritumoral brain edema

T2W intensity	Peritumoral brain edema Present	Peritumoral brain edema Absent	Total
Low/Iso	10(45.5%)	12(54.5%)	22(100%)
High	21(75%)	7(25%)	28(100%)
Total	31(62%)	19(38%)	50(100%)

p<.05

In our results we saw majority of the participants were with the age group of 40-45 with a mean age of 43.58 ± 16.65 . We saw maximum participants were Hindus followed by other religion like Muslims , Sikh and Sarna (Table 1) with majority from rural area 29 (58%) out of 50 participants . A comparison of the socioeconomic factors showed a relationship of employment status and Gender (Table 1) . A test for association using chi square was found to be significant statistically on comparing the Peritumoral brain edema and hyperintensity in T2WI (Radiologically evident) with Grading of the Meningioma visualized in the MRI (Table 2 & 4). Out of 34 cases of WHO grade I 19(55.9%) showed PTBE whereas out of 16 cases of WHO grade II/III 12 (75%) showed PTBE. MRI images were used to identify the location of the meningioma and the results were tried to test for association depending on the location and WHO grading . Chi square tests established the relationship to be a statically significant one as p values were <.05 for both genders . (Table 3). Occurrence of the meningioma was most in Parasagittal/falx region (30%) followed by convexities while other locations were also located on MRI . Higher signal intensity accompanied peritumoral brain edema was seen significantly more often than lower signal intensity (p<.05)(Table 4). Out of 28 cases with hyperintensity in T2WI, 21 (75%) were showing PTBE.

DISCUSSION

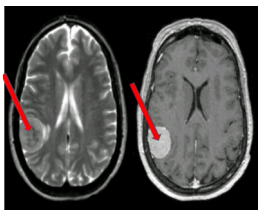

Fig1: T2W1 shows an isotence homogenous convexity meningioma being demonstrated on contrast enhancement sequence .

Regular MRI signal force qualities comprise of iso to slight hypointensity comparative with grey issue on the T1-weighted imaging and iso to reasonably hyperintensity comparative with grey matter on the T2 W imaging. Usually after administering contrast enhancement on T1 contrast sequence, meningiomas typically show avid, homogeneous enhancement which was in our study found in 78% cases. While in rest of cases we found peripheral , calcifications resulting in heterogenous enhancements , necrotizing areas and cysts of non enhancing nature . Also observed was adjacent bony changes like hyperostosis in some 24% of cases visualized better in CT . On spectroscopy increased choline peaks are usually noted in meningiomas. The usual signs like Dural tail sign, Cerebrospinal fluid cleft sign were identified for tumors located at extra axial locations .

A high signal intensity in TWI of the tumour indicates a high water cotent and a high level of vasculaity in the tumour .(13,16) Tumours with high water content can easily spread to the adjacent organs because of differences in osmotic pressure .(16) We found a significant association between a high SI in T2WI and PTBE.

CONCLUSION

MRIs are making the diagnosis of meningiomas very easy until the location of the meningiomas are at unusual locations or they present with very unusual images . Hyperitensity of tumour in T2WI was significantly associated with peritumoral brain edema. MRIs not only help in locating the exact position but can also help in predicting the recovery for the concerned patient. Non invasive methodologies will be the need in future for accurately predicting how a tumor is going to behave . Whether it's a grade III or II it can be shown by noninvasive markers (in our case peritumoral brain edema and Hyperintensity in T2WI) will be boost in managing meningiomas . Pooling of evidence from regional centers need to be done for understanding the enigmas related to the unusual appearances etc. Large data base with non invasive features highlighted will give strong evidence and will be a paradigm shift in managing the meningiomas radiologically . It will not only help the radiologist to predict authoritatively but will also spare the patient further suffering and will be less on the out of pocket expense being incurred by the patient.

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