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THE ASSOCIATION BETWEEN MRI AND INTRA OPERATIVE FINDINGS WITH ESTROGEN RECEPTOR/PROGESTERON RECEPTOR STATUS IN PATIENTS OPERATED FOR INTRA CRANIAL MENINGIOMA IN TERTIARY CARE HOSPITAL

Neurosurgery

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ABSTRACT

Background: Meningiomas constitute about 13-26% of primary intracranial tumours. Women are affected twice. Common in 5th to 6th decades. Meningiomas mostly are asymptomatic but presents with variety of symptoms related due to compression of adjacent structures. The World Health Organization (WHO) has divided the meningioma into three grades: typical, atypical, and anaplastic. Consideration of Pre operative MRI findings, macroscopic factors (intraoperative meningioma factors), such as tumor size and shape, and the rate of local invasion of this tumor, like bone invasion, can also be useful in determining the prognosis of patients because of differences in brain meningioma in different parts of the brain. **Objectives:** 1. To study the association between MRI findings with Estrogen receptor/progesteron receptors status in patients operated for meningioma in Tertiary Care Hospital 2. To study the association between intra operative findings with Estrogen receptor/progesteron receptors status in patients operated for meningioma in Tertiary Care Hospital **Materials and Methods:** A Descriptive study was conducted Department of Neurosurgery, Government medical college Thiruvananthapuram between September 2021 to march 2022. 74 cases of meningioma were included in the study. **Results:** In majority 43(58.11%)), hormonal receptor status was PR+ followed by ER and PR negative 17(22.97%)). Hormonal receptor status was ER+ in only 14 out of 74 patients (18.92%) with no significant association between them. (p value=0.499) according to age. ER+ most commonly seen in postmenopausal women as compared to PR+(34.15%). MRI Brain in majority of patient with ER +status presented with single tumour commonly at convexity(50%), hard in consistency(29.41%), moderate edema,(42.86%) commonly calcification not present, diffusion restriction, homogeneous contrast enhancement, sinus involvement with atypical grade (57.14%,) whereas with PR+ presented with single tumor, commonly arises from convexity but spenoid wing is specific site for this receptor, tumor was firm in consistency, had mild edema, moderate vascularity, no calcification, diffusion restriction, homogeneous contrast enhancement, no sinus involvement with typical grade(95.35%). Intraoperative findings with ER+ patient had single tumor, convexity, hard in consistency (29.41%), moderate edema, mild vascularity, suckable, cusable, maximum patient had calcification (71.43%), maximum had no hyperostosis with Resectable Simpsons grade2. Maximum had no hyperostosis with Resectable Simpsons grade2 Proportion of patients with histopathological grading: - meningo-epithelial meningioma grade 1, psammomatous meningioma grade 1 was significantly higher in PR+, atypical meningioma grade 2 was significantly higher in ER+ as compared to PR+ and ER and PR negative. **Conclusions:** Meningioma expresses predominantly progesterone receptor followed by estrogen receptor. Postmenopausal females have estrogen receptor positive meningioma, in older age group, with MRI features of atypical meningioma, intraoperative hard consistency and higher grades of histopathology, whereas progesterone receptor positive meningioma is common in premenopausal women with typical features of meningioma with soft to firm consistency intraoperative and with lesser grades of histopathology. MRI and intraoperative findings are associated with hormonal receptor status. Thus, aid in predicting nature and prognosis of meningioma.

KEYWORDS

Meningioma, Progesterone receptor, Estrogen receptor, immunohistochemical study.

INTRODUCTION

Meningioma accounts for the commonest dural based tumor, accounting for 15-30% of all primary tumors of brain originating from the arachnoid cap cells. So far, much progress has been made so far in the diagnosis and treatment of brain meningioma, however, due to the increasing prevalence of this tumor in recent decades in the general population and increasing incidence of Undesirable prognosis of this brain tumor, studies are needed to identify the factors associated with this tumor (especially those associated with increased prevalence and predictors of its poor prognosis) to improve the outcome of patients [(1)].

On Magnetic resonance imaging (MRI), meningiomas presents as hypo to hyperintense, dural based contrast enhancing masses. Peritumoral edema is seen prominently in atypical or anaplastic meningioma. 2-10% of meningiomas show cystic in nature and may cause difficulty in diagnosis. In benign meningiomas which receives blood supply from the dural branches lack blood brain barrier and Gadolinium can permeate into the tumour tissue and shows typical curve whereas in high grade meningiomas which receives blood supply from the pial branches have blood [(2,3)].

Magnetic resonance spectroscopy (MRS) is considered to be useful for the diagnosis of meningiomas whose radiological appearance is atypical and it may also play a role in the evaluation of malignant potential [(4)]. Meningiomas demonstrate increased choline (3.2 ppm) and decreased creatine (3.0 ppm). Despite their extra-axial location, meningiomas are not uncommonly associated with brain oedema, reported to be present in 60 % of all cases in one study. The distinction between benign and atypical or malignant meningiomas is not reliably accomplished when assessing the imaging features on routine MRI [(3)]. Diffusion tensor imaging (DTI) may aid in the distinction with several studies reporting a decreased apparent diffusion coefficient (ADC) in high-grade tumours [(5)].

Since the meningiomas show variable growth potential, and even the WHO microscopic morphological classification frequently fails to predict their clinical behaviour, quantifying the hormonal status of the tumor may help to predict its biological behaviour and provide options for further treatments. It is generally agreed that most meningiomas express PR but are devoid of ER [(6,7)]. Hence this study is taken to co relate MR ,intra operative findings with ER/PR status in post operative meningioma.

OBJECTIVES

1. To study the association between MRI findings with Estrogen receptor/progesteron receptors status in patients operated for meningioma
2. To study the association between intra operative findings with Estrogen receptor / progesteron receptors status

METHODOLOGY

The present descriptive study was conducted in department of Neurosurgery, Medical College Trivandrum – A Tertiary care Hospital on All patients undergoing surgery for intra cranial meningioma during study period Sept. 2021 to March 2022. Children (< 12 years old), other Malignancies on chemotherapy or harmonal therapy, and patients with Recurrent disease were excluded.

Study Procedure

Patients will be selected after considering inclusion and exclusion criterias . Pre operatively ,MRI Brain Plain, contrast, Magnetic Resonance Venogram and Magnetic Resonance Spectroscopy of each patient will be analysed based on following variables (a)Site and Number , (b) Consistency, (c) Peritumoral edema , (d)Bone /sinus involvement (e)MRS (f)others Intraoperatively following variables will be noted (a)Site and Number (b)Consistency (c) Vascularity (d) Cusability and suckability (e) Intra-op Frozen if any After Surgery, tumor sample will be sent to Histopathology section of Department of Pathology, Medical College, Trivandrum in 10% formalin solution .Histopathological grading and Estrogen and progesteron receptors analysis will be done. MRI Brain, intraoperative findings will be compared with different histological grades of meningioma (Grade I, Grade II and Grade III) with Estrogen receptor and progesteron receptor status and will be analysed.

Statistical Analysis

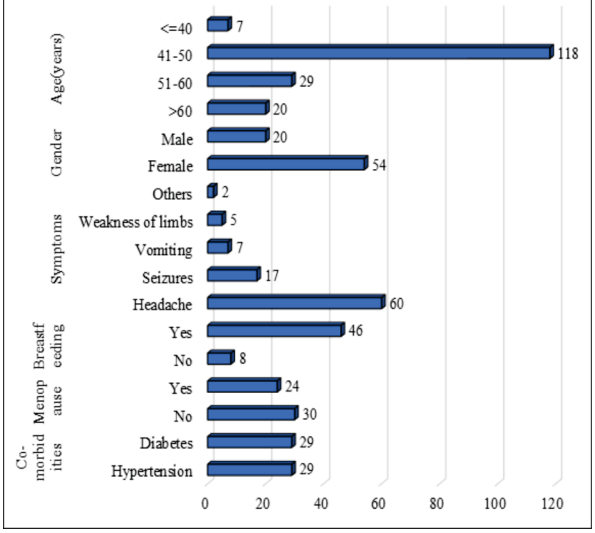
Data will be entered in Excel sheet and analysed by SPSS 26. Quantitative variables will be expressed in mean and standard deviation. Qualitative variables will be expressed in percentage. Associations with categorical variables will be assessed by chi-square test. Univariable and multi variable analysis will be done.

RESULTS

Distribution Of Demographic Characteristics Of Study Subjects:

29(39.19%) patients belonged to age group 51-60 years followed by >60 years (20(27.03%)) and 41-50 years (18(24.32%)). Mean value of age(years) of study subjects was 54.04 ± 10 with median (25th-75th percentile) of 54(48-62). 54(72.97%) patients were females and 20(27.03%) patients were males.

Graph 1. Demographic and Clinical Characteristics of study subjects



Majority (60(81.08%)) of patients presented with headache followed by seizures 17(22.97%)), vomiting (7(9.46%)) and weakness of limbs (5(6.76%)). Only 2 out of 74 patients (2.70%) had other symptoms. In majority (46(85.19%)) of patients, breastfeeding was given. Only 24 out of 54 patients (44.44%) were in menopausal stage. 29(39.19%) patients had hypertension, diabetes each.

Distribution Of MRI Brain Findings Of Study Subjects

In majority (69(93.24%)) of patients, one tumour was present. Number of tumours was 2 in only 5 out of 74 patients (6.76%). 31(41.89%) patients, site of tumour was convexity followed by parasagittal (24(32.43%)), spenoid wing (5(6.76%)) and olfactory groove (5(6.76%)). 42(56.76%) patients, consistency was firm followed by soft (19(25.68%)) and hard (9(12.16%)).

42(56.76%) patients, edema was mild followed by moderate (21(28.38%)). Edema was severe in only 11 patients (14.86%). 56(75.68%) patients, vascularity was moderate followed by mild (14(18.92%)). Vascularity was severe in only 4 patients (5.41%). Calcifications, diffusion restriction and sinus involvement was present in 29(39.19%), 61(82.43%) and 24(32.43%) patients respectively.

Table 1: Distribution Of MRI Brain Findings Of Study Subjects

MRI brain findings		Frequency	Percentage
Number of tumours	One	69	93.24%
	Two	5	6.76%
Site of tumour	Convexity	31	41.89%
	Parasagittal	24	32.43%
	Spenoid wing	5	6.76%
	Suprasellar	3	4.05%
	Olfactory groove	5	6.76%
	Posterior fossa	3	4.05%
	Orbital roof	3	4.05%
Consistency	Soft	19	25.68%
	Firm	42	56.76%
	Hard	9	12.16%
	Mix	4	5.41%
Edema	Mild	42	56.76%
	Moderate	21	28.38%
	Severe	11	14.86%
Vascularity	Mild	14	18.92%
	Moderate	56	75.68%
	Severe	4	5.41%
Calcifications	No	45	60.81%
	Yes	29	39.19%
Diffusion restriction	No	13	17.57%
	Yes	61	82.43%
Contrast enhancement	Homogeneous	45	60.81%
	Heterogeneous	29	39.19%
Sinus involvement	No	50	67.57%
	Yes	24	32.43%
Possible grades	Typical	57	77.03%
	Atypical	17	22.97%

45(60.81%) of patients, contrast enhancement was homogenous. Contrast enhancement was heterogeneous in only 29 patients (39.19%). 57(77.03%) patients, possible grades was typical. Possible grades was atypical in only 17 out of 74 patients (22.97%).

Table 2: Distribution Of Intraoperative Findings Of Study Subjects

Intraoperative findings		Frequency	Percentage
Number of tumours	1	69	93.24%
	2	5	6.76%
Site of tumour	Convexity	31	41.89%
	Parasagittal	24	32.43%
	Spenoid wing	5	6.76%
	Suprasellar	3	4.05%
	Olfactory groove	5	6.76%
	Posterior fossa	3	4.05%
	Orbital roof	3	4.05%
Consistency	Soft	15	20.27%
	Firm	46	62.16%
	Hard	9	12.16%
	Mix	4	5.41%
Edema	Mild	40	54.05%
	Moderate	29	39.19%
	Severe	5	6.76%
Vascularity	Mild	8	10.81%
	Moderate	53	71.62%
	Severe	13	17.57%
Suckable	No	6	8.11%
	Yes	68	91.89%
Cusable	Yes	74	100%
Calcifications	No	34	45.95%
	Yes	40	54.05%
Hyperostosis	No	46	62.16%
	Yes	28	37.84%
Resectable Simpsons grade	1	14	18.92%
	2	53	71.62%
	3	7	9.46%

69(93.24%) patients, one tumour was present. Number of tumours was 2 in only 5 out of 74 patients (6.76%). 31(41.89%) patients, site of tumour was convexity followed by parasagittal (24(32.43%)), spenoid wing (5(6.76%)) and olfactory groove (5(6.76%)). Site of tumour was

suprasellar, posterior fossa and orbital roof in only 3 out of 74 patients (4.05%) each.

46(62.16%)) of patients, consistency was firm followed by soft (15(20.27%)) and hard (9(12.16%)). Consistency was mix in only 4 out of 74 patients (5.41%). 40(54.05% patients, edema was mild followed by moderate (29(39.19%)). Edema was severe in only 5 out of 74 patients (6.76%). 53(71.62%) patients, vascularity was moderate followed by severe (13(17.57%)). Vascularity was mild in only 8 out of 74 patients (10.81%). In majority of patients, suckable was yes. Suckable was no in only 6 patients (8.11%). Suckable, cusable, calcifications and hyperostosis were present in 68(91.89%), 74(100%), 40(54.05%) and 28(37.84%) patients respectively. 53(71.62%) of patients, Resectable Simpsons grade was 2 followed by 1 (14(18.92%)). Resectable Simpsons grade was 3 in only 7 out of 74 patients (9.46%).Distribution of hormonal receptor status of study subjects.

In majority (43(58.11%)) of patients, hormonal receptor status was PR+ followed by ER and PR negative (17(22.97%)). Hormonal receptor status was ER+ in only 14 out of 74 patients (18.92%).

Table 3: Association Of Demographic Characteristics With Hormonal Receptor Status

Demographic characteristics		ER+ (n=14)	PR+ (n=43)	ER, PR - ve (n=1 7)	Total	P value
Age (years)	<=40	2 (14.29%)	3 (6.98%)	2 (11.76%)	7	0.723*
	41-50	3 (21.43%)	10 (23.26%)	5 (29.41%)	18	
	51-60	5 (35.71%)	16 (37.21%)	8 (47.06%)	29	
	>60	4 (28.57%)	14 (32.56%)	2 (11.76%)	20	
Gender	Female	11 (78.57%)	41 (95.35%)	2 (11.76%)	54	<.01*
	Male	3 (21.43%)	2 (4.65%)	15 (88.24%)	20	
Symp-toms	Headache	9 (64.29%)	43 (100%)	8 (47.06%)	60	<.01*
	Seizures	5 (35.71%)	3 (6.98%)	9 (52.94%)	17	0.002*
	Vomiting	2 (14.29%)	5 (11.63%)	0 (0%)	7	0.356*
	Weakness of limbs	2 (14.29%)	3 (6.98%)	0 (0%)	5	0.283*
	Others	0 (0%)	2 (4.65%)	0 (0%)	2	1*
Breast feeding	No	0 (0%)	8 (19.51%)	0 (0%)	8	0.311
	Yes	11 (100%)	33 (80.49%)	2 (100%)	46	
Meno-pause	No	3 (27.27%)	27 (65.85%)	0 (0%)	30	0.019
	Yes	8 (72.73%)	14 (34.15%)	2 (100%)	24	
Co-morbi-dities	Hyperten sion	10 (71.43%)	15 (34.88%)	4 (23.53%)	29	0.017†
	Diabetes	5 (35.71%)	16 (37.21%)	8 (47.06%)	29	0.747†

* Fisher's exact test, ‡ ANOVA

Age <=40 years in 14.29% vs 6.98% vs 11.76% respectively, 41-50 years in 21.43% vs 23.26% vs 29.41% respectively, 51-60 years in 35.71% vs 37.21% vs 47.06% respectively, >60 years in 28.57% vs 32.56% vs 11.76% respectively (p value=0.723). Mean ± SD of age(years) in ER+ was 54.36 ± 12.93, PR+ was 54.93 ± 9.63 and ER and PR negative was 51.53 ± 8.46 with no significant association between them. (p value=0.499) Proportion of female was significantly higher in PR+, ER+. (Female in 95.35%, 78.57% vs 11.76% respectively, p value<.0001). Proportion male was significantly higher in ER and PR negative. (Male in 88.24% vs 21.43%, 4.65% respectively, p value<.0001).

Headache was significantly higher in PR+. (Headache in 100% vs 64.29%, 47.06% respectively, p value<.0001). Seizures was significantly higher in ER and PR negative. (Seizures in 52.94% vs 35.71%, 6.98% respectively, p value=0.0002).

Vomiting in 14.29% vs 11.63% vs 0% respectively (p value=0.356), Weakness of limbs in 14.29% vs 6.98% vs 0% respectively (p value=0.283), Others in 0% vs 4.65% vs 0% respectively (p value=1). No breastfeeding in 0% vs 19.51% vs 0% respectively, breastfeeding in 100% vs 80.49% vs 100% respectively) (p value=0.311).

Proportion of patients with menopause was significantly higher in ER and PR negative and ER+. (100%, 72.73% vs 34.15% respectively) (p value=0.019). Hypertension was significantly higher in ER+. (Hypertension in 71.43% vs 34.88%, 23.53% respectively (p value =0.017)). Diabetes in 35.71% vs 37.21% vs 47.06% respectively (p value=0.747).

Association Of Mri Brain Findings With Hormonal Receptor Status

Convexity and parasagittal was significantly higher in ER+. (Convexity in 50% vs 41.18% and 39.53% respectively, Parasagittal:- 50% vs 34.88%, 11.76% respectively). Spenoid wing was significantly higher in PR+, Spenoid wing in 11.63% vs 0%, 0% respectively). Olfactory groove, orbital roof was significantly higher in ER and PR negative. (Olfactory groove in 29.41% vs 0%, 0% respectively, Orbital roof in 17.65% vs 0%, 0% respectively). (p value=0.0008)

Soft was significantly higher in ER+ and PR+. (Soft in 28.57%, 30.23% vs 11.76% respectively). Hard was significantly higher in ER+ and ER and PR negative. (Hard: in 28.57%, 29.41% vs 0% respectively). Mix was significantly higher in PR+ and ER and PR negative. (Mix in 4.65%, 11.76% vs 0% respectively). Firm was significantly higher in PR+. (Firm in 65.12% vs 42.86%, 47.06% respectively). (p value=0.002)

Moderate was significantly higher in ER+ and ER and PR negative. (Moderate in 42.86%, 35.29% vs 20.93% respectively). Mild edema was significantly higher in PR+. (Mild in 72.09% vs 57.14%, 17.65% respectively). Severe edema was significantly higher in ER and PR negative. (Severe in 47.06% vs 0%, 6.98% respectively). (p value=0.0001)

Table 4: Association Of Mri Brain Findings With Hormonal Receptor Status:

MRI brain findings		ER+ (n=14)	PR+ (n=43)	ER and PR -ve (n=17)	Total	P value
Number of tumours	1	14 (100%)	40 (93.02%)	15 (88.24%)	69	0.473 *
	2	0 (0%)	3 (6.98%)	2 (11.76%)	5	
Site of tumour	Convexity	7 (50%)	17 (39.53%)	7 (41.18%)	31	0.000 8*
	Parasagittal	7 (50%)	15 (34.88%)	2 (11.76%)	24	
	Spenoid wing	0 (0%)	5 (11.63%)	0 (0%)	5	
	Suprasellar	0 (0%)	3 (6.98%)	0 (0%)	3	
	Olfactory groove	0 (0%)	0 (0%)	5 (29.41%)	5	
	Posterior fossa	0 (0%)	3 (6.98%)	0 (0%)	3	
	Orbital roof	0 (0%)	0 (0%)	3 (17.65%)	3	
Consis-tency	Soft	4 (28.57%)	13 (30.23%)	2 (11.76%)	19	0.002 *
	Firm	6 (42.86%)	28 (65.12%)	8 (47.06%)	42	
	Hard	4 (28.57%)	0 (0%)	5 (29.41%)	9	
	Mix	0 (0%)	2 (4.65%)	2 (11.76%)	4	
Edema	Mild	8 (57.14%)	31 (72.09%)	3 (17.65%)	42	0.000 1*
	Moderate	6 (42.86%)	9 (20.93%)	6 (35.29%)	21	
	Severe	0 (0%)	3 (6.98%)	8 (47.06%)	11	

Vascularity	Mild	6 (42.86%)	6 (13.95%)	2 (11.76%)	14	0.115 *
	Moderate	8 (57.14%)	35 (81.40%)	13 (76.47%)	56	
	Severe	0 (0%)	2 (4.65%)	2 (11.76%)	4	
Calcification	No	9 (64.29%)	29 (67.44%)	7 (41.18%)	45	0.164 †
	Yes	5 (35.71%)	14 (32.56%)	10 (58.82%)	29	
	Yes	14 (100%)	30 (69.77%)	17 (100%)	61	
Contrast enhancement	Homogenous	8 (57.14%)	24 (55.81%)	13 (76.47%)	45	0.32†
	Heterogeneous s	6 (42.86%)	19 (44.19%)	4 (23.53%)	29	
Sinus involvement	No	5 (35.71%)	32 (74.42%)	13 (76.47%)	50	0.026 *
	Yes	9 (64.29%)	11 (25.58%)	4 (23.53%)	24	
	Atypical	8 (57.14%)	2 (4.65%)	7 (41.18%)	17	

* Fisher's exact test, † Chi square test

Proportion of patients with diffusion restriction was significantly higher in ER+ and ER and PR negative. (100%, 100% vs 69.77% respectively). (p value=0.002) Proportion of patients with sinus involvement was significantly higher in ER+. (64.29% vs 25.58%, 23.53% respectively). (p value=0.026) Atypical was significantly higher in ER+ and ER and PR negative. (Atypical in 57.14%, 41.18% vs 4.65% respectively). Proportion of patients with possible grades in typical was significantly higher in PR+. (Typical in 95.35% vs 42.86%, 58.82% respectively). (p value <0.0001)

One tumor in 100% vs 93.02% vs 88.24% respectively, two tumors in 0% vs 6.98% vs 11.76% respectively (p value=0.473)), Mild Vascularity in 42.86% vs 13.95% vs 11.76% respectively, Moderate in 57.14% vs 81.40% vs 76.47% respectively, Severe in 0% vs 4.65% vs 11.76% respectively (p value=0.115), No Calcifications in 64.29% vs 67.44% vs 41.18% respectively, Calcifications in 35.71% vs 32.56% vs 58.82% respectively (p value=0.164), Heterogenous Contrast enhancement in 57.14% vs 55.81% vs 76.47% respectively, Homogeneous in 42.86% vs 44.19% vs 23.53% respectively (p value=0.32).

Association Of Intraoperative Findings With Hormonal Receptor Status

Proportion of patients with site of tumour in convexity and parasagittal was significantly higher in ER+. (Convexity in 50% vs 41.18% and 39.53% respectively, Parasagittal in 50% vs 34.88%, 11.76% respectively). Proportion of patients with site of tumour in spenoid wing was significantly higher in PR+ as. (Spenoid wing in 11.63% vs 0%, 0% respectively). Proportion of patients with site of tumour in olfactory groove, orbital roof was significantly higher in ER and PR negative. (Olfactory groove in 29.41% vs 0%, 0% respectively, Orbital roof in 17.65% vs 0%, 0% respectively). (p value=0.0008) Proportion of patients with consistency in soft was significantly higher in ER+ and PR+. (Soft in 28.57%, 20.93% vs 11.76% respectively). Proportion of patients with consistency in hard was significantly higher in ER+ and ER and PR negative. (Hard in 28.57%, 29.41% vs 0% respectively). Proportion of patients with consistency in mix was significantly higher in PR+ and ER and PR negative. (Mix in 4.65%, 11.76% vs 0% respectively). Proportion of patients with consistency in firm was significantly higher in PR+. (Firm in 74.42% vs 42.86%, 47.06% respectively). (p value=0.001)

Proportion of patients with site of tumour in convexity and parasagittal was significantly higher in ER+. (Convexity in 50% vs 41.18% and 39.53% respectively, Parasagittal in 50% vs 34.88%, 11.76% respectively). Proportion of patients with site of tumour in spenoid wing was significantly higher in PR+ as. (Spenoid wing in 11.63% vs 0%, 0% respectively). Proportion of patients with site of tumour in olfactory groove, orbital roof was significantly higher in ER and PR negative. (Olfactory groove in 29.41% vs 0%, 0% respectively, Orbital roof in 17.65% vs 0%, 0% respectively). (p value=0.0008) Proportion of patients with consistency in soft was significantly higher in ER+ and PR+. (Soft in 28.57%, 20.93% vs 11.76% respectively).

Proportion of patients with consistency in hard was significantly higher in ER+ and ER and PR negative. (Hard in 28.57%, 29.41% vs 0% respectively). Proportion of patients with consistency in mix was significantly higher in PR+ and ER and PR negative. (Mix in 4.65%, 11.76% vs 0% respectively). Proportion of patients with consistency in firm was significantly higher in PR+. (Firm in 74.42% vs 42.86%, 47.06% respectively). (p value=0.001).

Table 5: Association Of Intraoperative Findings With Hormonal Receptor Status

Intraoperative findings		ER+ (n=14)	PR+ (n=43)	ER and PR -ve n=17)	Total	P value
Number of tumours	1	14 (100%)	40(93.02 %)	15 (88.24%)	69	0.473 *
	2	0 (0%)	3 (6.98%)	2 (11.76%)	5	
Site of tumour	Convexity	7 (50%)	17 (39.53%)	7 (41.18%)	31	0.000 8*
	Parasagittal	7 (50%)	15 (34.88%)	2 (11.76%)	24	
	Spenoid wing	0 (0%)	5 (11.63%)	0 (0%)	5	
	Suprasellar	0 (0%)	3 (6.98%)	0 (0%)	3	
	Olfactory groove	0 (0%)	0 (0%)	5 (29.41%)	5	
	Posterior fossa	0 (0%)	3 (6.98%)	0 (0%)	3	
	Orbital roof	0 (0%)	0 (0%)	3 (17.65%)	3	
Consistency	Soft	4 (28.57%)	9 (20.93%)	2 (11.76%)	15	0.001 *
	Firm	6 (42.86%)	32 (74.42%)	8 (47.06%)	46	
	Hard	4 (28.57%)	0 (0%)	5 (29.41%)	9	
	Mix	0 (0%)	2 (4.65%)	2 (11.76%)	4	
Edema	Mild	5 (35.71%)	32 (74.42%)	3 (17.65%)	40	<.000 1*
	Moderate	9 (64.29%)	11 (25.58%)	9 (52.94%)	29	
	Severe	0 (0%)	0 (0%)	5 (29.41%)	5	
Vascularity	Mild	6 (42.86%)	0 (0%)	2 (11.76%)	8	<.000 1*
	Moderate	2 (14.29%)	41 (95.35%)	10 (58.82%)	53	
	Severe	6 (42.86%)	2 (4.65%)	5 (29.41%)	13	
Suckable	No	0 (0%)	4 (9.30%)	2 (11.76%)	6	0.612 *
	Yes	14 (100%)	39 (90.70%)	15 (88.24%)	68	
Cusable	Yes	14 (100%)	43 (100%)	17 (100%)	74	NA
Calcifications	No	4 (28.57%)	28 (65.12%)	2 (11.76%)	34	0.000 3†
	Yes	10 (71.43%)	15 (34.88%)	15 (88.24%)	40	
Hyperostosis	No	8 (57.14%)	31 (72.09%)	7 (41.18%)	46	0.077 †
	Yes	6 (42.86%)	12 (27.91%)	10 (58.82%)	28	
Resectable Simpsons grade	1	2 (14.29%)	5 (11.63%)	7 (41.18%)	14	0.000 1*
	2	8 (57.14%)	38 (88.37%)	7 (41.18%)	53	
	3	4 (28.57%)	0 (0%)	3 (17.65%)	7	

* Fisher's exact test, † Chi square test

Proportion of patients with edema in moderate was significantly higher in ER+ and ER and PR negative. (Moderate in 64.29% and 52.94% vs 25.58% respectively). Proportion of patients with edema in mild was

significantly higher in PR+. (Mild in 74.42% vs 35.71%, 17.65% respectively). Proportion of patients with edema in severe was significantly higher in ER and PR negative. (Severe in 29.41% vs 0%, 0% respectively). (p value <0.0001)

Proportion of patients with vascularity in mild, severe was significantly higher in ER+. (Mild in 42.86% vs 0%, 11.76% respectively, Severe in 42.86% vs 4.65%, 29.41% respectively). Proportion of patients with vascularity in moderate was significantly higher in PR+. (Moderate in 95.35% vs 14.29%, 58.82% respectively). (p value <0.0001) Proportion of patients with calcifications was significantly higher in ER and PR negative and ER+. (88.24% and 71.43% vs 34.88% respectively). (p value=0.0003)

Proportion of patients with Resectable Simpsons grade in 3 was significantly higher in ER+ and ER and PR negative. (3 in 28.57% and 17.65% vs 0% respectively). Proportion of patients with Resectable Simpsons grade in 2 was significantly higher in PR+. (2 in 88.37% vs 57.14%, 41.18% respectively). Proportion of patients with Resectable Simpsons grade in 1 was significantly higher in ER and PR negative. (1 in 41.18% vs 14.29%, 11.63% respectively). (p value=0.0001) Distribution of suckable hyperostosis Cusable and was comparable with hormonal receptor status {ER+, PR+ and ER and PR negative}. (Suckable in (100% vs 90.70% vs 88.24% respectively (p value=0.612)), Hyperostosis in (42.86% vs 27.91% vs 58.82% respectively (p value=0.077)).

DISCUSSION

Different studies have addressed the correlation of the grades of meningiomas and the preoperative magnetic resonance imaging (MRI) findings and histopathology results. Various literature have shown that detection of estrogen and progesterone receptor might predict the clinical behaviour of meningioma and patient survival. In the present study three factors that is association of MRI and intraoperative findings with Estrogen and progesterone receptor status have been studied.

Seventy-four cases with meningioma were included in the study. The age of patients ranges from 24 – 72 years. Mean age was 54.04 +/- 10 years. This is in accordance with the results by El-Badawy et al (2013) in which mean age was 46.7 years [8]. Similar studies conducted by Ashraf Fakhrjou et al (2012) [9], and in Chennai by Shalinee Rao et al(2009) [10]showed mean age was 52.9 years.

Out of 74 cases studied, females were 54 in number outnumbering males who were 20 in number(.i.e)Females constituted around 72.97% and males were 27.03%. This is similar to the study by Ashraf Fakhrjou et al (2012) [9] in which out of 50 cases, Females were 76.5%(n=26), males were 23.5 %(n=8). Al- Nuaimy et a (2012) [11] studied 50 meningioma cases in which females (n=34) outnumbered males (n=16).

Majority (60(81.08%)) of patients had presented with headache followed by seizures (17(22.97%)), vomiting (7(9.46%)) and weakness of limbs (5(6.76%)). Only 2 out of 74 patients (2.70%) had other symptoms). This study is in congruence with Wu, Ashley; Garcia, Michael (2017) study [12] showed presenting complaint as headaches (48.2%),, seizures (23.6%) and cranial nerve deficits (38.9%).

The most common presenting symptoms were headache associated with vomiting or nausea. 52% of all the cases had these symptoms. New onset seizures were the second most common symptoms accounting for 20% of all the cases in study

In majority 46(85.19%)) of patients, history of breastfeeding present .24 out of 54 patients (44.44%) were in menopausal stage. This study is in congruence with Elizabeth B. Claus,& Lisa Calvocoressi [13], in 2011 done study which had 51.06% in menopausal and 49.94% in premopausal women. JILL S. et al [14] 29(39.19%) patients had hypertension, diabetes each. Various studies have no relation with these co morbid conditions.

In majority (31(41.89%)) of patients, site of tumour was convexity followed by parasagittal (24(32.43%)), spenoid wing (5(6.76%)) and olfactory groove (5(6.76%)). Site of tumour was suprasellar, posterior fossa and orbital roof in only 3 out of 74 patients (4.05%) each. These results are in congruence with study of Chongran Sun, Zhangqi Dou et al [14] showed convexity (20.8%), parasagittal (16.1%), and falx (11.4%) were the most predominant loci of meningiomas. This is similar to the study by Ashraf Fakhrjou et al (2012) [9] in which out of 50 cases, convexity (35%), parasagittal (24.1%).

In majority (42(56.76%)) of patients, consistency was firm followed by soft (19(25.68%)) and hard (9(12.16%)). Consistency was mix in only 4 out of 74 patients (5.41%). This is congruence with study of Alireza Mohammadi1, Peyman Mokarian) [15] Comparison of Intraoperative Findings and Pathological Grading of Cerebral Meningioma which had 24 tumors (22.5%) had firm consistency and 7 tumors (17.5%) had soft (suctionable) consistency.

In majority (42(56.76%)) of patients, edema was mild followed by moderate (21(28.38%)). Edema was severe in only 11 out of 74 patients (14.86%). This is similar to the study by Ashraf Fakhrjou et al (2012) [9] in which out of 50 ,(53.05%) having moderate and severe edema and (50 %)have mild edema. Bydder, G. M. et al [15] conducted study on MRI imaging of meningiomas revealed (66%) of tumors with mild edema.

In majority (56(75.68%)) of patients, vascularity was moderate followed by mild (14(18.92%)). Vascularity was severe in only 4 out of 74 patients (5.41%). Calcifications, diffusion restriction and sinus involvement was present in 29(39.19%), 61(82.43%) and 24(32.43%) patients respectively). Bydder, G. M. et al [16] conducted study on MRI imaging of meningiomas revealed (16.66%) calcifications, (45%) diffusion restriction and (20%) sinus involvement.

In majority (45(60.81%)) of patients, contrast enhancement was homogeneous. Contrast enhancement was heterogenous. in only 29 out of 74 patients (39.19%). This in congruence with study Watts, J.; Box, Magnetic resonance imaging of meningiomas: a pictorial review. Insights into Imaging, 5 (45(60.81%)) of patients, contrast enhancement was homogeneous. Contrast enhancement was heterogenous. in only 29 out of 74 patients (39.19%) [15].

In majority (57(77.03%)) of patients, possible grades was typical. Possible grades was atypical in only 17 out of 74 patients (22.97%). This was found in similar study done by Watts, J.; Box, MRI of meningioma. 67.% of patients, possible grades was typical And Possible grades was atypical in patients (33%) [15].

In majority (31(41.89%)) of Site of tumour was suprasellar, posterior fossa and orbital roof in only 3 out of 74 patients (4.05%) each. These results are in congruence with study of Chongran Sun, Zhangqi Dou [14], convexity (20.8%), parasagittal (16.1%), and falx (11.4%) were the most predominant loci of meningiomas. This is similar to the study by Ashraf Fakhrjou et al (2012) [9] in which out of 50 cases, convexity (35%), parasagittal (24.1%). Suckable, cusable, calcifications and hyperostosis was present in 68(91.89%), 74(100.00%), 40(54.05%) and 28(37.84%) patients respectively .In majority of patients, were suckable, only 6 out of 74 patients (8.11%).

In study Watts, J.; Box, MRI of meningioma , 5 (45(60.81%)) of patients showed, contrast enhancement was homogeneous. Contrast enhancement was heterogenous. in only 29 out of 74 patients (39.19%) [15]. In same study Osteogenesis (bone formation) and bone erosion were seen in 13 (32.5%) and 8 (20%) patients, respectively. 19 tumors (47.5%) did not cause bone changes.

In majority (53(71.62%)) of patients, Resectable Simpsons grade was 2 followed by 1 (14(18.92%)). Resectable Simpsons grade was 3 in only 7 out of 74 patients (9.46%).This study is in congruence with study conducted for 205 patients of meningioma by Oya et al (2012) [17]. Where (51.75%)) of patients, Resectable Simpsons grade was 2 followed by 1 (30.73%). Resectable Simpsons grade was 3 in (17.56%) patients.

In majority 43(58.11%)) of patients, hormonal receptor status was PR+ followed by ER and PR negative 17(22.97%)). Hormonal receptor status was ER+ in only 14 out of 74 patients (18.92%). Similarly, the expression of PR in various other studies are as follows. According to Al-Nuaimy et al., 2012 PR positivity was present in 72% of cases with 28% negative. [16] In a study by Shayanfar et al., 2009 the PR positivity was 96.8% [18], in another study by Taghipur et al., 2009 the PR positivity was noted in 68.6% of cases[19] and a study by Milenkovie et al., 2004 out of 30 cases PR positivity was present in 57% of cases.[20] In

all above studies ER was not expressed in any of the case. Thus, comparing all the above studies there is a consistent expression of PR positivity of more than 50%, and ER was 110% Thus our study correlates well with all the above studies.

Distribution of age(years) was comparable with hormonal receptor status. However a study by Al-Nuaimy et al, in 2012, PR was positive in age group of 41- 50 years which is slightly higher in age compared to the present study [16]. Also Roser et al (2004) showed mean age of PR positivity to be 55.4 years for females and 51.5 years for males [23].

PR positivity was analysed with sex of the patient. Proportion of female was significantly higher in PR+, ER+. (Female: - 95.35%, 78.57% vs 11.76% respectively, p value<.0001). Proportion male was significantly higher in ER and PR negative. (Male: - 88.24% vs 21.43%, 4.65% respectively, p value<.0001). In a similar study by Taghipour et al., 2007 [19], 80% of female cases showed PR positivity similarly 67.5% of females cases showed PR positivity (Veherjein et al.,2001) [21]. and also in Al-Nuaimy et al.,2012 PR was expressed in 72% of females and 20% of males [22].

Various other studies show a differing results.A study by Al-Nuaimy et al 2012 [11], showed a contrasting result in which PR positivity was 100% in fibrous subtype followed by the below mentioned subtypes in decreasing order – meningothelial 83%, Transitional 75%, Angiomatous type 66.6%. And also study by El- Badawy et al., 2013 in which meningothelial showed 100 % PR expression followed by Transitional 50%, fibrous 33.3% [8]. Another. Roser et al in 2004 showed angiomatous subtype with maximum PR expression constituting about 66.6% followed by meningothelial 64.6%, psammomatous 60 %, transitional 50% and fibrous 31.1% [23]. A study by Omulecka et al 2004, showed a 100 % PR positivity in Meningothelial subtype followed by transitional 95%, fibrous 46 % [24]. These differing results could be explained by the various stem cell factors involved in the Progesterone receptor expression in meningiomas.

CONCLUSION

Mri Brain in majority of patient with ER +status presented with single tumour commonly at convexity, firm in consistency, moderate edema, commonly calcification not present, diffusion restriction, homogeneous contrast enhancement, sinus involvement with atypical grade whereas with PR+ presented with single tumor, commonly arises from convexity but spenoid wing is specific site for this receptor, tumor was firm in consistency , had mild edema, moderate vascularity, no calcification, diffusion restriction, homogeneous contrast enhancement, no sinus involvement with typical grade. ER and PR negative with mri show single tumor, commonly arises from convexity, firm in consistency, severe edema, moderate vascularity, calcification, no diffusion restriction, homogeneous contrast enhancement, maximum had no sinus involvement with typical grade. Intraoperative findings with ER+ patient had single tumor, convexity firm in consistency, moderate edema, mild vascularity, suckable, cusable, maximum patient had calcification, maximum had no hyperostosis with Resectable Simpsons grade2 whereas with PR+ had had single tumor, convexity but show specific site of tumor from spenoid wing, firm in consistency, mild edema, moderate vascularity, maximum suckable, cusable, maximum patient had no calcification, maximum had no hyperostosis with Resectable Simpsons grade2 . ER and PR negative had single tumor, convexity but show specific site from orbital roof and olfactory grooves, firm in consistency, moderate edema, moderate vascularity, maximum suckable, cusable, maximum patient had calcification, maximum had hyperostosis with Resectable Simpsons grade 1 and 2.

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