

## CORRELATION BETWEEN MENINGIOMA GRADING AND PATIENT'S AGE, GENDER AND LOCATION OF TUMOR

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### ABSTRACT

Meningiomas are usually slow growing brain tumors deriving from arachnoid cap cells. They are the most frequently diagnosed benign primary brain tumor accounting for 33.8% of all primary brain and central nervous system tumors. **The aim of this analysis** was to investigate the relationship of patient's age, gender, meningioma location with WHO grade and potential risk factors for tumor recurrence. **Methods:** Cross sectional retrospective study for 308 patients diagnosed as brain Meningiomas, computerize archived data collected from Ghazy Al-hariri hospital for surgical specialties, teaching laboratories, Private Nursing Home hospital and Neurosurgical teaching hospital, Baghdad, Iraq, covering the period from January 2018 to February 2022. The variables of study are; age of patients, gender, location of Meningiomas, and grading of it. **Results:** Cross section study of 308 patient, 146 (53.2%) of them are at age group 40-59 (middle age group). 229 (74.4%) of patients are females, 132 (42.9%) of patients are skull base tumor location and the rest are non-base. 268 (87%) of patients are at grade 1 tumor, 38 (12.3%) of them are at grade 2. 140 (45.45%) of patients with convexity brain Meningiomas, 86 (27.92%) patients with anterior fossa brain Meningiomas, 31 (10%) patients with posterior fossa brain Meningiomas. There is significant correlation between grade of tumor and gender of patients. There is no significant correlation between grade of tumor and age groups of patients, location of tumor. **Conclusion:** Brain Meningiomas occur more in females at age group 40-59 years old, most patients are at grade 1, convexity brain Meningiomas is more common site of tumor, there is correlation between tumor grade 1, 2 and females gender. While grade 3 more occur in male gender.

**KEYWORDS:** Correlation, Meningioma grading, patient's age, gender, location of tumor.

### INTRODUCTION

Meningiomas are usually slow growing brain tumors deriving from arachnoid cap cells. They are the most frequently diagnosed benign primary brain tumor accounting for 33.8% of all primary brain and central nervous system tumors.<sup>[1,2]</sup> Prevalence rates for meningiomas range from 50.4/100,000 to 70.7/100,000.<sup>[3,4]</sup> The incidence rate for meningioma in Iraq is 0.15 and 0.25 per 100,000 population for males and females, respectively.<sup>[5]</sup> Meningiomas can occur at many sites that reduce them agreeable to microsurgical elimination.<sup>[5,6]</sup> The most common meningiomas are WHO grade I and have a low risk of recurrence. However, atypical meningiomas classified as WHO grade II exhibit increased mitotic activity and have a higher recurrence rate (up to 40% at 5 years).<sup>[5,7,8]</sup> Anaplastic meningiomas are malignant tumors (WHO

grade III) with a very high rate of recurrence and the 5 year progression free survival (PFS) is only 10%.<sup>[9]</sup> WHO classification system has included brain invasion as a controversial feature for the diagnosis of atypical meningiomas, the reported incidence of atypical meningioma increased from 7% to 20–30%, due to reclassifying of grade I cases as grade II meningiomas.<sup>[10]</sup> Unfortunately, no imaging criteria are accepted to preoperatively differentiate between different WHO grades of intracranial meningiomas. Thus, uncertainty persists regarding which patient should be operated on early versus followed with MR imaging. Thus, beside patient related factors, meningioma size, location, extent of peritumoral edema, the assumed extent of resection and the potential surgical morbidity have implications for patients counselling, as well as patient's management and outcome.<sup>[5]</sup> Diagnosis of

meningioma is usually based on examination of Hematoxylin and Eosin (H & E) sections; however, some problematic cases need further confirmation by immunohistochemistry. Despite epithelial membrane antigen (EMA) and progesterone receptor (PR) were used routinely for these cases, they proved to lack sensitivity and specificity, so a new sensitive and specific marker was needed.<sup>[11,12]</sup> Therefore, the aim of this study was to investigate the relationship of patient's age, gender, meningioma location with WHO grade and potential risk factors for tumor recurrence.

**METHOD**

Cross sectional retrospective study for 308 patients diagnosed as brain Meningiomas, computerize archived data collected from Ghazy Al-hariri hospital for surgical specialities, teaching laboratories, Private Nursing Home hospital and Neurosurgical teaching hospital, covering the period from January 2018 to February 2022. The variables of study are; age of patients, gender, location of Meningiomas, and grading of it.

Statistical analysis done by SPSS 22, frequency and percentage used for categorical data, mean, median and SD for continuous data. Chi-square used for assessed association between variables, person correlation shows the correlation between continuous data. P-value less or equal to 0.05 is consider significant.

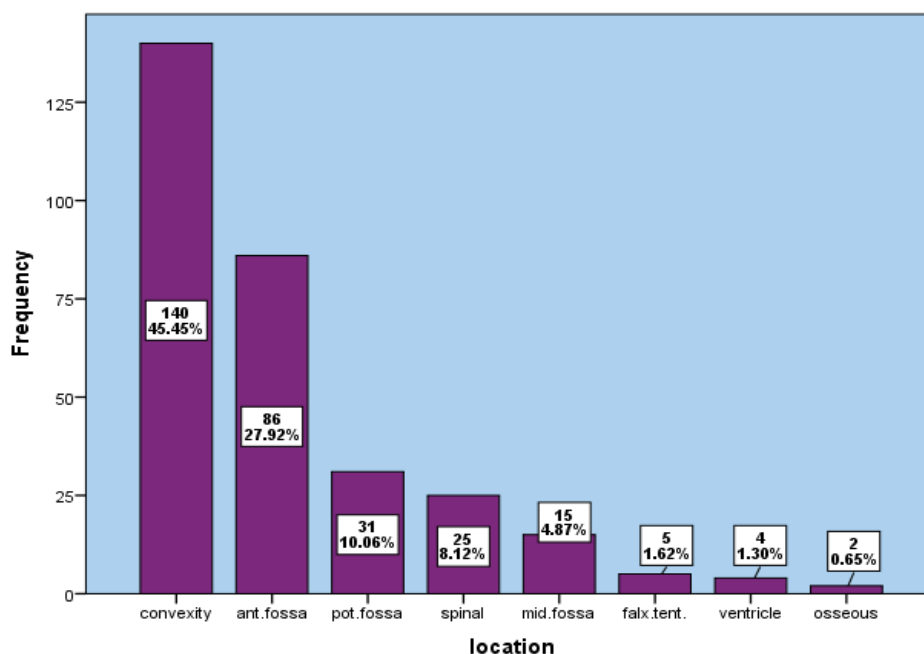
**RESULTS**

Cross section study of 308 patients mean age is (37.3 ± 13.8), 146 (53.2%) of patients at age group 40-59 (middle age group). 229 (74.4%) of patients are females, 132 (42.9%) of patients are skull base tumor location and the rest are non-base. 268 (87%) of patients are at grade 1 tumor, 38 (12.3%) of them are at grade 2. As show in table 1.

**Table 1: Distribution of age, gender, location and grade of patients studied.**

Variables	frequency	percentage	
Age	<39	74	24.0
	40-59	164	53.2
	>=60	70	22.7
Gender	female	229	74.4
	male	79	25.6
Location	nonskull base	176	57.1
	skull base	132	42.9
Grade	1	268	87.0
	2	38	12.3
	3	2	0.6

According to fig 1. The distribution of tumor location in details as the following; 140 (45.45%) of patients with convexity brain Meningiomas, 86 (27.92%) patients with anterior fossa brain Meningiomas, 31 (10%) patients with posterior fossa brain Meningiomas and so on.



**Fig. 1: Distribution of tumor location in details in studied group.**

There is significant correlation between grade of tumor and gender of patients. 2 (100%) of grade 3 tumor occur in males, 25 (65.8%) of grade 2 tumor occur in females while 204 (76.1%) of grade 1 tumor occur in females.

There is no significant correlation between grade of tumor and age groups of patients, location of tumor. As show in table 2.

**Table 2: Association between grade of tumor and age groups, gender of patients, location of tumor in studied group.**

Variables		Grade			P-value
		1	2	3	
Age groups (years)	<39	65	8	1	0.74
		24.3%	21.1%	50.0%	
	40-59	144	19	1	
		53.7%	50.0%	50.0%	
	≥60	59	11	0	
		22.0%	28.9%	0.0%	
Total	268	38	2		
	100.0%	100.0%	100.0%		
Gender	Female	204	25	0	0.02
		76.1%	65.8%	0.0%	
	Male	64	13	2	
		23.9%	34.2%	100.0%	
Total	268	38	2		
	100.0%	100.0%	100.0%		
location	Non basal	152	22	2	0.47
		56.7%	57.9%	100.0%	
	Basal	116	16	0	
		43.3%	42.1%	0.0%	
	Total	268	38	2	
100.0%		100.0%	100.0%		

**P-value ≤ 0.05 (significant).**

**DISCUSSION**

Meningiomas are the most common benign intracranial tumors. Despite the facts that patients with these tumors are frequently treated in neurosurgical units and that there is an extensive body of literature, recently, current guidelines for the diagnosis and treatment of meningiomas have been summarized by the European Association of Neuro-Oncology (EANO).<sup>[13]</sup> Meningiomas are frequently diagnosed incidentals and up to date no reliable clinical or imaging biomarker is available to identify atypical meningioma or anaplastic variants prior to surgery. Radiographic findings, including brain invasion, bone invasion, tumor necrosis and peritumoral edema in the surrounding brain, have been found to be associated with higher-grade meningiomas.<sup>[14,15]</sup>

In current study the location in details as the following; 140 (45.45%) of patients with convexity brain Meningiomas, 86 (27.92%) patients with anterior fossa brain Meningiomas, 31 (10%) patients with posterior fossa brain Meningiomas and so on this is similar to other study that state recently, Sade et al. reported that skull base meningioma have a fourfold decreased risk of being atypical or malignant as compared with non-skull base tumors<sup>[16]</sup>, although some of them may also have an aggressive growth pattern, which may require extensive resection.<sup>[17]</sup> Other studies, however, controversially indicated, that atypical and malignant meningiomas are more frequently found at the convexity.<sup>[18]</sup> By analyzing MRI features and locations of intracranial meningiomas Hale et al. found, that location along the falx and

convexity was predictive for atypical meningioma.<sup>[14]</sup> The skull convexity is known to represents one of the most frequent meningioma locations.<sup>[19,20]</sup>

In current study the mean age is (37.3 ± 13.8), 146 (53.2%) of patients are at age group 40-59 (middle age group). 229 (74.4%) of patients are females, 132 (42.9%) of patients are skull base tumor location and the rest are non-base. 268 (87%) of patients are at grade 1 tumor, 38 (12.3%) of them are at grade 2, this is similar to other studies that state 184 [76.7%] female and 56 [23.3%] male) were surgically treated. The mean age was 59.0±12.8 years (Table 1). Table 2 depicts the different locations of meningiomas with regard to their histological grading. Histology revealed grade I meningioma in 189 (78.8%) cases, grade II in 49 (20.4%) and grade III in 2 (0.8%), respectively.<sup>[5]</sup>

Also in another studies state that 17 patients (7.1% were in the age group 20–40 years, 112 patients (46.7%) in the age group 41–60 years and 111 (46.3%) in the group>60 years, respectively.<sup>[5,21,22]</sup>

In current study, there is significant correlation between grade of tumor and gender of patients. 2 (100%) of grade 3 tumor occur in males, 25 (65.8%) of grade 2 tumor occur in females while 204 (76.1%) of grade 1 tumor occur in females. There is no significant correlation between grade of tumor and age groups of patients, location of tumor. This is similar to other study that state age was not a significant predictor of grade II meningioma's<sup>[5,18]</sup>, also another study state that although female gender has an overall higher incidence of

meningiomas<sup>[23,24]</sup>, the results showed an increased risk for male gender for higher-grade meningiomas which was according to the previous studies.<sup>[25,26]</sup> The possible reasons for the male gender association with higher-grade meningiomas are still unclear. The chromosome abnormalities, hormone receptor status and hormone levels might affect the trend for higher grade tumors.<sup>[25]</sup> The observations that non-skull base meningiomas are more likely to be the higher-grade meningiomas is supported by many studies.<sup>[27]</sup> This was also confirmed by our present study. Based on the further detailed anatomical stratification of non-skull base location, we found that the most common site of atypical and anaplastic meningiomas was the cerebral convexity.<sup>[23]</sup>

## CONCLUSION

Brain Meningiomas occur more in females at age group 40-59 years old, most patients are at grade 1, convexity brain Meningiomas is more common site of tumor, there is correlation between tumor grade 1, 2 and females gender. While grade 3 more occur in male gender.

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