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# Pre-operative and post-operative psychiatric manifestations in patients with supratentorial meningiomas

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ABSTRACT

*Objectives:* In the present study, we have tried to delineate the nature of psychiatric abnormalities caused by supratentorial meningiomas and the effect of surgery on them. We have tried to find the patient and tumor characters influencing the psychiatric abnormalities and their post-operative outcome.
*Materials and methods:* This is a prospective study conducted on patients with supratentorial meningiomas, admitted and operated in neurosurgery department, Nizam's Institute of Medical Sciences, India, from July 2006 to July 2009. We have included fifty-seven patients aged between 15 and 65 years with a clinico-radiological diagnosis of supratentorial meningioma in our study. We later confirmed the diagnosis by histopathological examination of the tumor. We have evaluated the patients for psychiatric manifestations before and after surgery and also analyzed the various clinical and radiological factors influencing the psychiatric status.
*Results:* We have enrolled 57 patients into the study. Frontal group had 22 patients (38.6%), parietal group had 10 patients (17.5%), temporal group had 10 patients (17.5%), occipital group had 6 patients (10.5%), and suprasellar group had 9 patients (15.8%). Twenty patients (35.1%) presented with psychiatric symptoms. The frequency of psychiatric symptoms was highest in the temporal group (60%) followed by the frontal group (45.5%). Frontal convexity meningiomas presented predominantly with depression, basifrontal and sphenoid wing meningiomas presented with mania or depressive symptoms, Suprasellar lesions and temporal convexity lesions presented with organic delusional disorder. Basifrontal meningiomas also caused organic personality disorders. The frequency of psychiatric symptoms was much higher in meningiomas with volume greater than 35cc compared to the smaller ones, in the frontal group. None of the patients developed new psychiatric symptoms after surgery. Among the twenty patients with psychiatric symptoms, 3 (15%) didnot improve, 8 (40%) improved partly and 9 (45%) improved completely.
*Conclusions:* Meningiomas, although extra-axial, cause significant psychiatric symptoms up to 35.1%. Frontal and temporal group of meningiomas have the highest frequency of psychiatric symptoms. The frequency of psychiatric symptoms was significantly higher in meningiomas with volume greater than 35 cc compared to the smaller ones, in the frontal group. Surgical excision of meningiomas ameliorates the psychiatric symptoms, either completely or partly, in the majority of the patients.


## 1. Introduction

Meningiomas are the most common benign intracranial tumors. Brain tumors are known to present with a great variety of psychiatric disorders, including depression, anxiety, personality changes, mania, psychosis, cognitive deterioration, and anorexia nervosa [1–6]. Kocher and colleagues [3] reported that 1/1000 of hospitalized psychiatric patients have brain tumors. This rate is ~20-times higher than in general population. The literature is abounding in

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**Table 1**
Influence of laterality of tumor on psychiatric symptoms. (Chi-Square Test).

| Psychiatry | Left | | Right | | Midline | | Exact sig |
|---|---|---|---|---|---|---|---|
| | N | N% | N | N% | N | N% | (p) |
| abnormal | 5 | 25.0% | 8 | 40.0% | 7 | 41.2% | 0.501 |
| normal | 15 | 75.0% | 12 | 60.0% | 10 | 58.8% | |

**Table 2**
Correlation between location of meningioma and psychiatric symptoms (Chi-Square test).

| Location | Psychiatry | | | | Exact sig |
|---|---|---|---|---|---|
| | abnormal | | normal | | |
| | N | N% | N | N% | (p) |
| Frontal | 10 | 45.45% | 12 | 54.55% | 0.039 |
| Parietal | 0 | 0.00% | 10 | 100.00% | |
| Temporal | 6 | 60.00% | 4 | 40.00% | |
| Occipital | 2 | 33.33% | 4 | 66.67% | |
| Suprasellar | 2 | 22.22% | 7 | 77.78% | |
| Total | 20 | 35.09% | 37 | 64.91% | |

articles characterizing the psychiatric manifestations of patients with invasive brain tumors like gliomas. Only a few of these studies discuss the differential prevalence of psychiatric symptoms for benign and malignant tumors. Benign tumors like meningiomas are also known to present with impaired cognition, psychiatric manifestations but only a few case reports and case series are available [1,7]. In this study we have tried to characterize the nature of psychiatric disorders caused by meningiomas and we have tried to analyze the features of meningiomas which are more probable to cause psychiatric disturbances.

## 2. Materials and methods

### 2.1. Aim

The aim of the study is to assess the pre-operative and post-operative psychiatric symptoms in patients with meningiomas in the supratentorial compartment. We have tried to find the patient and tumor characters influencing psychiatric abnormalities and their post-operative course.

### 2.2. Methods

This is a prospective study conducted on patients with supratentorial meningiomas, admitted and operated in the neurosurgery department, Nizam's Institute of Medical Sciences, India, from July 2006 to July 2009. We have included fifty-seven patients aged between 15 and 65 years with a clinico-radiological diagnosis of supratentorial meningioma in the study. We later confirmed the diagnosis by histopathological examination of the tumor. We have excluded patients with co-existing major systemic illness, history of head injury, transient ischemic attacks, stroke, multiple meningiomas, recurrent meningiomas, intraventricular meningiomas and meningiomas with infratentorial extension. Patients with CT or MRI evidence of co-existent other cerebral lesions were also excluded from the study. Patients with presenting GCS less than 15 and patients with a family history of psychiatric illness were also excluded from the study. The radiological diagnosis was made based on plain and contrast enhanced CT and MRI scans. The diagnosis was later confirmed by histopathological examination in all the patients. All patients underwent Simpson's grade I, II or III excision. We have assessed the patients for cognitive functions and psychiatric abnormalities before and after surgery. We will publish our findings for cognitive functions later. In this article, we have discussed the results for psychiatric abnormalities.

### 2.3. Psychiatric evaluation

Our psychiatrist has evaluated the patients for psychiatric manifestations. Initially, the patients were screened for psychiatric manifestations using brief psychiatric rating scale (BPRS). Patients with an abnormality in BPRS were further evaluated by the psychiatrist and an appropriate diagnosis was made as per ICD-10. The psychiatric assessment was done pre-operatively, one or two days before surgery and post-operatively at three months. None of the patients were started on antipsychotics before surgery. Post-operatively, patients with a significant improvement in BPRS score and not requiring antipsychotics were said to have completely improved. Patients with improvement in BPRS score but requiring antipsychotics were said to have partially improved.

### 2.4. Radiological evaluation and classification into anatomical groups

Clinical symptoms were correlated with tumor laterality, size, peritumoral edema and midline shift. The size of the tumor was calculated from the maximum diameter of the tumor in the sagittal, axial and coronal contrast enhanced MRI images. The tumor volume was calculated using the prolate ellipse formula [8]:

$$\text{Tumorvolume} = \text{length} \times \text{depth} \times \text{width} \times 0.523.$$

The effective volume of the tumor (i.e. the sum of the volume of tumor and peritumoral edema) was calculated from the maximum diameter of the tumor along with peritumoral edema on the sagittal, coronal and axial T2 weighted MR images. The volume of peritumoral edema was obtained by deducting the volume of the tumor from the effective volume of the tumor.

On the basis of location, we classified meningiomas as frontal meningiomas (olfactory groove meningiomas, frontal convexity meningiomas, anterior one-third parasagittal and falcine

**Table 3**
Psychiatric disorders according to ICD-10.

| | Depression | Organic manic disorder (06.30)Count | Organic delusional (schizophrenia-like) disorder (F06.2) | mixed anxiety and depressive disorder (F41.2) | Organic personality disorder (F07.0) |
|---|---|---|---|---|---|
| Frontal | 4 | 2 | 0 | 2 | 2 |
| Temporal | 2 | 3 | 1 | 0 | 0 |
| Occipital | 0 | 1 | 0 | 1 | 0 |
| Suprasellar | 0 | 0 | 2 | 0 | 0 |
| Total | 6 | 6 | 3 | 3 | 2 |