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Impact of Neurosurgical Intervention on Neuropsychiatric Behavioral Changes in Patients with Intracranial Tumors: A Longitudinal Study

Sheema Atif[1], Muhammad Nawaz[2], Syed Aamir Shah[3], Faizullah Khan[4], Rayif Rashid Kanth[5], Hammad Mehtab[6]

1. Sheema Atif, Consultant Neurosurgeon, Life Care Hospital Islamabad, Pakistan. email: drsheema@icloud.com
2. Muhammad Nawaz, Consultant Neurosurgeon, Advance International Hospital Islamabad, Pakistan. email: nawazafridi415@gmail.com
3. Syed Aamir Shah, Assistant Professor Neurosurgery, Pakistan Institute of Medical Sciences Islamabad, Pakistan. email: dr_aamir_shah@hotmail.com
4. Faizullah Khan, Postgraduate Resident Neurosurgery, Pakistan Institute of Medical Sciences Islamabad, Pakistan. email: faizkhan_achakzai@yahoo.com
5. Rayif Rashid Kanth, Assistant Professor Neurosurgery, Maroof international hospital Islamabad, Pakistan. email: rayif.kanth@gmail.com
6. Hammad Mehtab, Consultant Neurosurgeon, Smart Medical Centre Islamabad, Pakistan. email: hammadmehtab@gmail.com

Corresponding Author: Sheema Atif, Consultant Neurosurgeon, Life Care Hospital Islamabad, Pakistan. email: drsheema@icloud.com

Abstract

Aim: To assess the impact of the neurosurgical intervention on neuropsychiatric behavioral changes in patients with intracranial tumors:

Study design: A longitudinal study

Place and duration: This study was conducted at Life Care Hospital Islamabad, Pakistan from April 2020 to April 2021.

Methodology: Purposeful sampling technique was used in this study to investigate neuropsychological symptoms in patients with intracranial tumors who were getting treatment in our hospital. The Neuropsychiatric Inventory Questionnaire (NPI-Q), which identifies 12 behavioral disorders, was rated as symptom severity as well as symptom scores at baseline, one month, and six months after therapeutic interventions.

Results: Out of 45 participants, at least one neuropsychological symptom was present in every patient. Anxiety (92 %), agitation (80%), irritability (80%), sadness (78 %), and sleep difficulties were the most common neuropsychological symptoms at baseline (62 %). The symptom and severity scores were 4.34 (SD +3.7) and 10.8 (+8.2), respectively, at one month, 3.3 (+2.1) and 6.2 (+4.1), and then 2.1 (+3.9) and 4.6 (+4.2) at six months. Anxiety (22%) was the most common neuropsychological symptom, followed by sadness (22%), sleep problems (22%),

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agitation (24%), irritability (33%), and disinhibition (33%). (22 %). Shortly after surgery, the severity score improved, while the symptom score improved with time.

Conclusion: Patients with intracranial tumors have a high cognitive impact. The severity score improved soon after surgery, while the symptom score improved over time. Six months following surgery, the wide range of improvement in cognitive problems needs further examination.

Keywords: Behavioural symptoms, Intracranial tumor, Neuropsychological, therapy

Introduction:-

Intracranial tumors are among the most conjoint causes of illness in individuals of all ages around the world. (1, 2) An intracranial tumor has a one-year incidence of roughly 12 in 100,000, with about 256,000 new cases detected each year around the world. (2) The annual mortality rate is 4.25 per 100,000 people, with males having a higher mortality rate. The development of uncontrolled cerebral edema, which leads to cerebral herniation, is one of the leading causes of morbidity and mortality in brain tumor patients. (3) Because of increased intracranial pressure, patients with brain tumors frequently appear with neuro emergency. This is due to the peritumoral or extensive effusion's space-pressing effect, as well as the massive mass size or ventriculomegaly generated by the mass's obstruction. (4)

The previous studies have repeatedly shown that these patients have a very high psychological burden. (1) The unique characteristics of intracranial neoplasms have been connected to these high levels of distress and psychological illness. A brain tumor can be life-threatening, but it can also pose a direct threat to a patient's nature and identity, and it is usually linked to neuropsychological alterations in cognition, language, affect, and/or personality. The treatment of an intracranial tumour has a direct impact on brain function. Neurological, cognitive, and psychiatric problems are the most prevalent symptoms that patients encounter. (5) As the survival rate of these patients rises, the need to recognise and address neuropsychological problems grows. Patients with behavioural symptoms are difficult to manage, according to evidence, which adds to the caregivers' load. (6) These symptoms may appear in patients before or after the commencement of the disease, or they may appear later in the disease and treatment process. This study aimed to look at the neuropsychological symptoms of patients with intracranial tumours at the start of treatment, one month later, and six months later.

Methodology

A total of 45 patients with brain malignancies were included in this study. The cognitive symptoms of patients with intracranial tumours were assessed in this longitudinal. The Institute Ethics Committee provided ethical clearance, and all study subjects and guardians provided written consent. Patients' neuropsychiatric behavioural changes were examined before surgery, one month after surgery, and six months after surgery.

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The Neuropsychiatric Inventory Questionnaire (NPI-Q) was used to measure these symptoms. The primary caregiver, who is familiar with the patient's behaviours, is consulted for information about their conduct. In order to provide an accurate report on patient behaviour, the interview was done without the presence of the patient. Both a symptom severity score and a symptom score were used to score the participants. The patients' average number of neuropsychological symptoms at baseline, one month, and six months following surgery were also calculated.
SPSS (Statistical Package for Social Sciences) version 20 was used to enter and analyse the data. Based on the study objectives, appropriate descriptive statistics such as % were employed for data analysis.

Results:

In the current study, 45 patients with intracranial tumors were followed upon at one month, three, and 6 months. The patient's mean age was 48.23±15.13 years, with a range of 32–72 years (As shown in **Table 1).** Males were 53.3 % of the total, while women were 46.6 %. Most of the patients were married (84 %). In addition, 44% of them were illiterate and 66% of them were employed.
In addition, Glioma (11 %), meningioma (13 %), pituitary tumour (24 %), and other types of tumours such as schwannoma, craniopharyngioma and others (51 %) were found in the patient's clinical profiles **(**As shown in **Table 2).** Furthermore, 62 % of the patients had supratentorial tumours, with 50 % of the tumours being located on the left side of the brain. At the time of the initial visit, 20% of the patients had been sick for less than a month. Surgery had been performed on all of the patients. In addition, 22 % and 6% of the patients had received radiotherapy and chemotherapy, respectively.
At least one cognitive symptom had been experienced by all of the patients. At the start, the neuropsychiatric symptom and severity scores were 4.34 (SD+3.7) and 10.8 (+8.2), respectively, and after one month, it was 3.3 (+2.1) and 6.2 (+4.1), then 2.1 (+3.9) and 4.6 (+4.2) after six months. As can be seen, the severity of the condition improved almost immediately after surgery, and the symptom score improved with time. At each consultation, the number of neuropsychological symptoms was dramatically reduced (p 0.001). Before surgery, the average number of symptoms was 8.2, but this dropped to 4.35 after one month and to 3.18 after six months. **Table 3** demonstrates the neuropsychological symptoms that patients had prior to surgery, as well as after 1 and 6 months after surgery. Anxiety (92%), agitation (80%), irritability (80%), depression (78%), and sleep problems were the most common neuropsychological symptoms at baseline (62 %). Although, the fact that the trend remained stable after a month, the number of patients suffering from anxiety and sleep problems increased as compared to the first visit. After six months, the proportion of patients who presented with each of these symptoms was lower than one month at the first visit. Depression, anxiety, and sleep problems were all present in 22% of persons, while agitation, irritability, and disinhibition were present in 24%, 33%, and 22% of people, respectively.

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Table 1. Demographic characteristics of the study participants

Variable	**n**	**%**
Age,(years) , mean ± SD	48.23±15.13-	
Gender		
Male	24	53.3
Female	21	46.66
Marital status		
Married	38	84.4
Divorced/widowed/single	7	15.5
Education		
Elementary school	20	44.4
Junior high school	18	40
High school certificate/university degree	7	15.5
Employment status		
Currently employed/in education	30	66.6
Retired/sick leave	12	26.6
Housekeeper/unemployed	3	6.6

Table 2: Patients clinical characteristics

Variables	**n**	**(%)**
Diagnosis of patient		
Meningioma	6	13
Glioma	5	11.1
Pituitary tumor	11	24
Others *	23	51
Location		
Supratentorial	28	62
Infratentorial	17	37
Surgery done		
Craniotomy and excision	32	71
Transphenoidal surgery	13	28.8
Types of tumor		
Benign	38	84.4
Malignant	7	15.5
Radiotherapy received		
Yes	10	22.2
No	35	77.7
Chemotherapy received		

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Yes	3	6.6
No	42	93
Duration of illness		
>1 month	36	80
< 1 month	9	20

Table 3: Patients neuropsychological symptoms at various intervals

Behavioural symptoms	**1st visit**	**At 1 month**	**At 6 months**
	n (%)		
Hallucination	6 (22)	4 (15)	1 (5)
Delusion	8 (22)	5 (12)	2 (20)
Agitation	20 (80)	15 (60)	5 (24)
Depression	23 (78)	18 (54)	12 (22)
Anxiety	28 (92)	18 (95)	10 (22)
Elation	6 (45)	3 (21)	0 (0)
Apathy	8 (55)	6 (35)	2 (15)
Disinhibition	10 (52)	8 (33)	4 (22)
Irritability	15 (80)	11 (70)	4 (33)
Motor symptoms	8 (45)	6 (34)	2 (26)
Night time behaviour/ sleep disturbances	18 (62)	10 (75)	5 (22)
Appetite disorder	15 (72)	8 (52)	3 (16)

Discussion:-

Neuropsychological symptoms have been noted in patients with intracranial tumors receiving therapy at different intervals. Anxiety, agitation, and irritability were found prevalent. In individuals with intracranial malignancies, neuropsychological symptoms are well documented in the literature. However, prospective investigation of cognitive impairment in these patients in relation to surgery is lacking. (7) The current research looked at the progression of cognitive symptoms from before surgery to six months afterward. Depression, disinhibitions, apathy, mood disorders, psychotic symptoms, personality changes, weariness, emotional eruptions, dread and uncertainty to hope, and loss are among the neuropsychiatric symptoms documented by different studies. (8, 9)

Age was estimated to have a mean of 52.23 ±15.13 years based on the demographic features of research subjects. The average age of the subjects in this study matches that of a recent study by Sina et al., who found that the average age of cerebral tumour patients was 53.29 8.5 years. (4)

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In this research, 24 patients were male (53.3%), while women were 21 subjects (46.6%). Most of the patients was married (84 %). Males were 1.5 times more likely than women to be diagnosed with intracranial tumours, according to McKinney's research. Intracranial cancers can affect both men and women. However, men are more likely than women to have both primary and metastatic intracranial tumours. (10, 11) In addition, in this study, 44% of them were illiterate, and 66% of them were employed.

Intracranial malignancies have a complicated etiology with multiple risk factors. Meningioma and gliomas are the most common types of brain tumors, and they differ greatly in histological type, age at diagnosis, gender, race, and country. (12, 13) In our study population, Glioma (11 %), meningioma (13 %), pituitary tumor (24 %), and other types of tumors such as schwannoma, craniopharyngioma, and others (51 %) were found prominently in the patients. Our study findings are in line with the results of an investigation conducted in Pakistan. (14)

At least one cognitive symptom was seen in every subject in our investigation. Anxiety, agitation, irritability, depression, and sleep difficulties were experienced by roughly in 70–80 % of the patients. These symptoms persisted in 25–33 % of patients at 6 months of follow-up. Each of the patients' behavioural disorders requires individual attention in order to enhance their functional level. The patient with neuropsychological symptoms can also contribute to poor quality of life, and disease stages can alter them. (15, 16)

Many activities may require caregiver support and repeated guidance and reminders for the actions performed by the patients. When patients with neuropsychiatric symptoms refuse to collaborate with caretakers, more time and energy must be committed. Furthermore, nervous patients are more likely to develop skewed thinking and reasoning, leading to depression and other disorders, reducing caregiver mastery. Compared to functional and cognitive states, neuropsychological symptoms are more obvious. Patients may lack insight or understanding of these changes, and they may even be unwilling to accept them. (17)

Because of the small sample size, this study has limitations. To determine the significance of the numerous parameters discussed in this study, multicentre studies with a bigger sample size are required. A long-term follow-up can help researchers learn more about the patients' cognitive issues.

Conclusion:

Patients with intracranial tumors face a significant neuropsychological burden. The severity score improved soon after surgery, while the symptom score improved over time. Six months following surgery, the wide range of improvement in cognitive problems needs further examination.

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Conflict of interest

None

Permission:

It was taken from the ethical review committee of the institute

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