

Cognitive and Mental Changes in Patients with Brain Tumor after Surgery

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Abstract Introduction and objective: the patients with brain tumor are affected with cognitive and mental changes when undergo surgery and need treatment and rehabilitation. The objective of this study is evaluation of the surgery's effect on these impairments. **Method and material:** the presented cross-sectional study is done on 94 patients with brain tumor and MMSE, Beck depression, and Hamilton anxiety tests were used for their cognitive and mental evaluation, before and after the surgery. **Results:** a significant difference were noticed in MMSE, Beck depression, and Hamilton anxiety tests' scores, before and after the surgery ($p < 0.000$). **Conclusions:** the surgery can lead into changes on patients' mental and cognitive status and there is a need on evaluation of these impairments before and after surgery, and in case of noticing the treatment and rehabilitation is needed in order to promote the life quality and survival.

Keywords: cognitive, mental, surgery, brain tumor

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1. Introduction

The patients with brain tumor are challenged with many problems which causes mental changes [1,2]. These impairments are affected by various factors. Surgery is one the factors which has role on occurrence of such impairments; depression is most noticed in surgeries on left hemisphere of the brain and anxiety is most noticed on the right hemisphere surgery [3,4]. The studies have shown that the patients whom were treated by surgery had more mental and cognitive problems in comparison to those who did not undergone surgery [5,6]. Assessment, diagnosis, treatment, and rehabilitation of such impairments in patients with brain tumor is difficult and have a role in promotion of life quality and survival [7,8,9]. Anxiety and depression are mental impairments that affect the life quality of the patients and prior studies have exhibited the decrease of survival in patients with brain tumor whom also have these impairments [10,11,12] and the life quality would also decrease under the effect of depression and anxiety. Such mental and cognitive difficulties might be caused by before, after, or during the surgery problems. The cognitive changes are complex processes that have various domains that involve the neural networks [23] and the necessity of diagnosis of these problems could be critical for promotion and improvement in living style, life expectancy, life quality,

and survival in these patients. The necessity of prompt recognition of such impairments before and after the surgery and their timely rehabilitation can have an important role in success of treatment management in these patients and the aim of the present study is the effect of surgery on the cognitive and mental impairment in patients with brain tumor.

2. Method and Material

The presented study is a cross-sectional study which was done on 94 patients with glioma brain tumor about 6 months in neuroscience department of functional neurosurgery studies center in Tajrish Shohada Hospital, Tehran, Iran. Before research participants enter the study, it was essential to complete the informed consent. Then the patients examined by neurosurgeon, neurologist and psychiatrist then after were done MRI, they have been introduced for surgery and before surgery the permission was taken from them and finally entered the study. Also, the ongoing study was approved in ethic committee and research faculty of Shahid Beheshti University of Medical Sciences.

The patients had referred for surgery and the sampling were done with simple random. It was necessary for the participants to sign a testimonial prior entering the study.

The study entrance criteria: The patients have glioma brain tumor, between the 15-65 age ranges, diagnosed by

WHO criteria, none had the history of prior psychological and neurological illness or surgery, not being or were treated with chemotherapy or radiotherapy before the surgery.

The excluding from the study criteria were: The patients had brain tumor other than glioma, were not in the mentioned age ranged, had a history of psychological and neurological illness or surgery, were treated with chemotherapy and radiotherapy before the surgery.

2.1. The Methods and Material for Data Gathering

The methods and tests for data gathering were:

1. Demographic questionnaire
2. MMSE questionnaire
3. Beck depression questionnaire
4. Hamilton anxiety questionnaire

1. The demographic profile: involved age, gender, marital status, number of children, education, smoking, weight, height, illness history, medication history.

2. Cognitive evaluation: were done through MMSE questionnaire. This questionnaire is a test which systematically evaluates the mental condition. This test contains 11 questions in 5 fields of condition evaluation, writing, attention and calculation, memory and language. The maximum score in this test is 30 that a score lower than 23 are indicating a cognitive disorder [20].

3. Depression: were assessed by using Beck depression questionnaire. This test consists of 21 questions that evaluate sadness, pessimism, and discontentment, difficulty in decision making, self-hatred and seclusion. The minimum score is zero and the maximum score is 63 [21].

4. Anxiety: is assessed by Hamilton anxiety questionnaire. It is one the most well-known anxiety tests which is used for evaluation of the severity of the anxiety and contains 14 anxious characteristics or behaviors that each is associated with specific anxiety symptoms. The scale is graded by an interviewer. This scale includes a wide range

of symptoms that are usually diagnosed as the symptoms of a specific state of anxiety. The symptoms are: anxious mood, tension, fear, insomnia, difficulty in concentrating, muscular tension, general physical condition, cardiovascular symptoms, respiratory symptoms, and the behavior during the interview. In addition, the validity and reliability of this questionnaire, it's correlation with Beck questionnaire is reported 0.6, with SCL-90 as 0.73, and with clinical evaluation as 0.77.

2.2. The Method of Data Analysis

After completing the demographic, MMSE, Beck depression, and Hamilton anxiety questionnaires, the data will be entered into the SPSS₁₈ software and will be analyzed through descriptive statistical test and Pearson correlation coefficient, stepwise regression, the t- test and one-way ANOVA.

3. Results

In this section a comparative survey of cognitive change, depression, anxiety, and life quality were conducted in patients with brain tumor before and 10 days after the surgery by using MMSE, Beck depression, and Hamilton anxiety questionnaires. We are faced with two groups of people that consist of people before the surgery and people after the surgery.

First by using the independent t-test we will survey the three groups and the significance of MMSE, Beck depression, and Hamilton anxiety tests are shown in binary comparisons. In each case, first the average and then the standard error were shown for these variables.

In this study 94 patients with brain tumor (50% male and 50% female, the average age = 46 ± 3) with different gender and educational level participated. Most of the participants in this study were married (69.04%). 10.71% of them were unemployed.

Table 1. a survey of demographic variables in patients with brain tumor

Age Vs. Sex		Age groups					TOTAL	Value	df	sig
		15-24	25-34	35-44	45-54	55-65				
Sex	Female	8	11	5	14	9	47	1.256	2	0.003
	Male	8	11	5	14	9	47			
TOTAL		16	22	10	28	18	94			
Age Vs. Education		15-24	25-34	35-44	45-54	55-65	Total	6.656	2	0.036
Education	Illiterate	6	4	1	2	4	16			
	Diploma	6	4	6	8	17	36			
	Associate of sciences	3	6	3	7	4	20			
	Bachelor of science	1	0	3	3	2	8			
	Master of science	1	0	2	0	1	4			
TOTAL		17	14	15	20	28	94			

In Table 1 the age groups of the participants in both genders has shown a significant relation ($p=0.004$) with $df=2$ and by paying attention to the equal number of

participants genders. Also in comparison with education and age groups of the participants were significant ($p=0.036$).

Table 2. comparative evaluation of cognitive, depression, and anxiety status in patients with brain tumor before and after the surgery

Evaluating questionnaires	Patients	Statistical group			T-test for the mean				
		Mean	Standard error	Mean standard error	Significance	Mean difference	Mean standard error	Confidence range 90%	
								Lower	Higher
MMSE questionnaire	Before surgery	22.24	6.713	1.036	0.000	12.238	1.036	10.177	14.299
	After surgery	10.00	0.000	0.000	0.000	12.238	1.036	10.177	14.299
Beck questionnaire	Before surgery	1.69	0.811	0.125	0.000	-1.310	0.125	-1.559	-1.061
	After surgery	3.00	0.000	0.000	0.000	-1.310	0.125	-1.559	-1.061
Hamilton questionnaire	Before surgery	2.24	0.656	0.101	0.000	-0.762	0.101	-9.63	-0.561
	After surgery	3.00	0.000	0.000	0.000	-0.762	0.101	-9.63	-0.561

According to [Table 2](#), and given the comparative evaluation of cognitive status by MMSE a significant difference ($P=0.05$) were noticed in patients with brain tumor and the cognitive disorder had increased after the surgery. Also in evaluation of Beck questionnaire in patients before and after the surgery (mean: -1.130, mean standard error: 0.125) an increase in depression is noticed after the surgery. According to the [Table 2](#) a significant difference in the anxiety level is seen before and after the surgery (mean: -0.762 and mean standard error: 0.101) which exhibits the increase in anxiety after the surgery.

4. Discussion

A comparative evaluation of depression, anxiety, and mental and cognitive status were made on patients with brain tumor before and after the surgery in the present research. The depression, anxiety, and mental and cognitive status are significantly related to each other and 62% variance describes it functionally [13,14].

This study has proved that these patients suffer from cognitive disorder and it will increase after the surgery. The cognitive function is related with the increase in depression and anxiety in patients. According to this study, depression is common in patients with brain tumor. The evaluation of depression is conducted before, during, and after the surgery. The findings show that the depression has a negative effect on the life quality [13]. According to the achieved data in this study, the depression is increased after the surgery and the depression mean is significantly higher in patients after the surgery than before the surgery ([Table 2](#)). Some previous studies also concluded that the depression is a common complication and increases during 6 months after the surgery [15]. The studies have shown that surgery on brain tumor is associated with mood and depression status worsening after the surgery [16]. This study has shown that anxiety has increased after the surgery. In recent studies on the anxiety in patients with brain tumor domain have reported different results [17,18,19]. A study has shown that patients with brain tumor on their right brain hemisphere are statistically has a higher anxiety median which has improved after the surgery [14]. Last studies showed cognitive changes [8].

In addition evaluating of quality of life should assess in longer period after surgery.

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