

# Overall survival for the patients with central nervous system (CNS) tumors during 9 years follows up in Markazi province of Iran

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SUMMARY

**Background:** Brain tumors are one of the important causes of morbidity and mortality, where surgery is usually used to treat tumor. Therefore, the aim of this study was to determine the postoperative survival of patients with brain tumors in Markazi province of Iran.

**Methods:** In a retrospective study, the medical records of patients with brain tumors after surgery were assessed from 2006 to 2015 in Vali-e-Asr Hospital, Arak, Iran. The survival time of patients was considered from diagnosis to death. The effects of age, sex, tumor location, size and tumor grade on survival were also evaluated. Data analysis was performed using the Cox regression method using SPSS21 software.

**Results:** 51 patients with an average age of 56.67 years were included in the study, of which 72.54% were women. The overall survival rate was 4.58 years, and 2, 5, 10-year survival rates were determined as 90.1, 43.13 and 5.88%, respectively.

**Conclusion:** The results of this study suggested that gender, age, grade and size of tumor had no significant effect on survival, but there was a significant relationship between tumor location and survival rate.

**Key words:** surgery, central nervous system tumor, survival

## INTRODUCTION

Central nervous system tumors are heterogeneous neoplasms that are often extracted from the cranio-vertebral cavity [1]. These tumors may be originated from cells of the neural tissue (meningiomas), brain cells (gliomas, neoplastic tumors, choroidal tumors), or other cell populations in the CNS (primary CNS lymphoma, germ cells), or from other parts such as metastases [2]. Brain tumors cause dementia and related syndromes due to a combination of diffuse and topical effects including edema, pressure on adjacent brain structures, increased intracranial pressure, and cerebral circulation problems.

Dementia is associated with brain tumor, subjective maladaptation, apathy, brain slowing down, and partial changes in personality. Depending on the area affected, memory impairment, aphasia or agnosia may be seen early. Brain tumors cause headaches, seizures or local sensory impairment [3]. One-third of patients with intracranial tumor suffered from headaches as the first symptom [4]. Glioblastomas, astrocytes and meningioma are the most prevalent tumors associated with seizures, which reflect their prevalence among tumors of the cerebral hemispheres [5]. About 3-4% of the CNS tumors are primary and the rest are considered as metastatic. CNS tumors account for a greater percentage of childhood cancers, responsible for 20% of all these tumors. The annual incidence of CNS tumors is indicated to be between 17 and 10 per 100,000 in brain tumors, and between 1 and 2 in every 100,000 cases for medullary tumors [5]. The overall incidence in primary malignant tumors has been estimated to be 2.74 per 100,000 individuals. The ratio of benign to malignant tumors has been estimated as 1.07. The most common tumors are histopathologic meningioma astrocytoma, glioblastoma and ependymoma.

These tumors are more common in men (M/F=1.48). Malignant tumors of the spinal cord account for 7.1% of the primary malignant tumors of the CNS, and their incidence has been suggested to be 21% per 100,000 individuals [6]. Studies have shown that the incidence of the intracranial tumor has increased in both sexes and in all age groups over the past years. Every year 13,000 people die from brain tumors. Recent advances in surgery and radiotherapy have significantly increased the average survival time and reduced the size and progression of malignant gliomas.

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The survival of people with a brain tumor is dependent on many variables, such as the type of tumor, the location and size of the tumor, tumor grade, the patient's age, and the patient's ability for activity. Survival decreases with age and 5-year survival for children aged 0-19 has been estimated as 66% and 5% for adults at age 75 or more. Patients with some types of tumors have better survival. The 5-year survival for patients with ependymoma and oligodendrogliomas aged 20-44 years has been indicated to be 85% and 81%, respectively, and is estimated to be 69% and 45% for patients aged 55-64 years. Patients with Glioblastoma Multiforme (GBM) have a poor prognosis, and their 5-year survival rate is 13% in those aged 20-44 years and also is 1% for those aged 55-64 years.

Primary brain tumors are one of the major causes of morbidity and mortality in adults and children. It often causes severe disability and imposes a large financial burden on the family and the health system. The epidemiology of these tumors is not well-known and published data on the incidence and prevalence of these tumors in the world is scarce. Reliable information on the incidence and prevalence of primary brain tumors contributes to better planning in the health sector and gives us a better understanding of geographical differences [7]. There seem to be differences in the epidemiological patterns of brain tumors in Iran with Western countries [8]. Therefore, the current study was aimed to investigate the survival of central nervous system tumors in patients who have been referred to Vali-e-Asr Hospital in Arak for 9 years.

## MATERIAL AND METHODS

Patients with central nervous system tumors referring to the neurosurgical Clinic of Vali-e-Asr Hospital of Arak, Iran, comprise the population of this study. Information including age, sex, location of tumor and type of surgery were extracted from medical records.

Then, in an interview with the patient (in case of being alive) or the family of the patient (in the case of the patient's death), the number of death and the cause of death were determined. Additional information was then obtained based on a questionnaire and examinations performed on live patients. Inclusion criteria included all patients with central nervous system tumors in Vali-e-Asr Hospital during 2006-2015. Exclusion criteria included patients who do not have access to them.

## STATISTICAL ANALYSIS

Determination of the mean and frequency (its repetition rate) is done by Statistical Package SPSS Statistics V21.0.

## RESULTS

In the current study, 51 brain tumors referred to Vali-e-Asr Hospital were evaluated after surgery. The mean age of patients (SD) was 56.67 (± 15.19) years and the lowest and highest age were 14 and 86 years, respectively. In addition, subjects consisted of 14 (27.45%) male and 37 (72.54%) female. Based on the results presented herein, the frequency of parietal lobe tumors was 19.6% (10 patients), followed by CP Angle tumors (3 patients; 5.88%), Frontal lobe tumors (2 patients; 3.92%), parasagittal tumor (8 patients; 15.68%), temporoparietal tumors (3 patients; 5.88%), Ventricle tumors (7 cases; 14.06%), spinal cord tumors (3 cases; 5.88%), temporal tumors (8 cases; 15.68%), frontoparietal tumor (1 subjects; 1.96%), suprasellar tumor (1 person; 1.96%), Sellar tumor (1 person; 1.96%), and tumor in the sphenoid region (4 patients; 7.84%), (Table 1).

Out of 51 patients, 12 patients (23.52%) died at the end of the study. The mean (SD) and the mean survival of patients were 4.58 (± 2.69) and 4 years respectively, which was totally determined to be 76.47%. Furthermore, the lowest and highest survival rates were calculated to be 1 and 10 years, respectively. The 2, 5 and 10-year survival rates of patients were 90.1, 43.13 and 5.88%, respectively (Tables 2 and 3, Figure 1).

Location of tumor	Number	Percentage
Parietal	10	19.6
CP Angle	3	5.88
Frontal	2	3.92
Parasagittal	8	15.68
Temporoparietal	3	5.88
Ventricle	7	14.06
Spinal Cord	3	5.88
Temporal	8	15.68
Frontoparietal	1	1.96
Suprasellar	1	1.96
Sellar	1	1.96
Sphenoid	4	7.54
Total	51	100

	Number (%)	Median survival (Y)	p-Value
Location of Tumor	Parietal: 10 (19.6%) Parasagittal: 8 (15.6%) Others: 78 (64.8%)	8	0.01
Gender	Male: 14 (27.45%) Female: 37 (72.55%)	10	0.94
Age	<30: 3 (5.88%) 30-50: 12 (23.52%) >50 :36 (70.58%)	6	0.14
Grade	Grade 1: 42 (82.35%) Grade 2: 7 (13.72%) Grade 3: 2 (3.95%)	10	0.81
Tumor size	Size <4: 23 (45.9%) Size 4-8: 25 (49.1%) Size >4: 3 (5%)	6	0.18

Location of tumor	Overall survival (Year)	SD
Parietal	5.1	3.21
CP Angle	5	2.64
Frontal	5.5	3.53
Parasagittal	4.75	3.57
Temporoparietal	6	3.46
Ventricle	4.28	2.43
Spinal Cord	3	1
Temporal	5	2
Frontoparietal	7	0
Suprasellar	3	0
Sellar	5	0
Sphenoid	1.75	0.95
Total	51	100

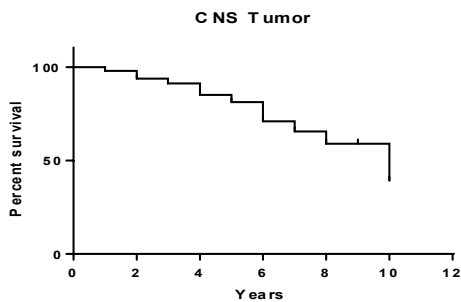


Fig. 1. Survival of patients with brain tumors

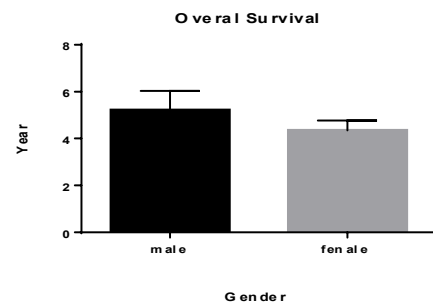


Fig. 3. Overall Survival based on the gender

Log Rank test showed that survival rate was no significantly correlated with sex ( $p=0.94$ ), age ( $p=0.14$ ), grade ( $p=0.84$ ) and tumor size ( $p=0.18$ ), but there was no a significant relationship between survival rate and tumor site and ( $p=0.01$ ).

Our findings revealed that the mean (SD) of overall survival in the age group less than 30 years was  $6.66 \pm 2.08$ , followed by  $5.23 \pm 2.04$  for the age group of 30 to 50 years and  $4.17 \pm 2.86$  for the age group older than 50 years (Figure 2). For the age group older than 50 years, it is  $4.17 (\pm 2.86)$  years (Figure 2). In other words, the overall survival rate decreased with age, but survival analysis using One Way ANOVA revealed that there was no significant difference in survival between age groups ( $F(2,48)=1.733, p=0.54$ ).

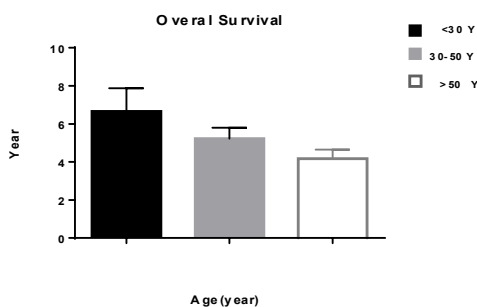


Fig. 2. The rate of Overall survival in the different age range

The results demonstrated that the mean (SD) of the overall survival of patients was  $5.21 (\pm 3.06)$  in males and  $4.35 (\pm 2.54)$  years in females (Figure 3). In other words, the overall survival rate was higher in males than in females. However, the survival analysis in two sexes by independent T-test depicted that there was no significant difference between the two sexes in terms of survival ( $p=0.31$ ).

The mean (SD) of the overall survival of patients is shown in Table 3, based on the tumor location. The highest survival was observed in the tumors of the frontoparietal region (overall survival: 7 years) and the lowest survival in the sphenoid region (overall survival: 1.75 years).

Based on the results presented herein, the mean (SD) overall survival based on the tumor grade was determined to be  $4.87 \pm 2.79$  for grade 1, followed by grade 2 ( $3.28 \pm 2.21$ ) and grade 3 ( $5 \pm 0$  years), (Figure 4). The highest frequency in our study was linked to Grade 1, and the highest and lowest survival rates were observed in grade 3 (survival of 5 years) and one with the survival of 3.28 years.

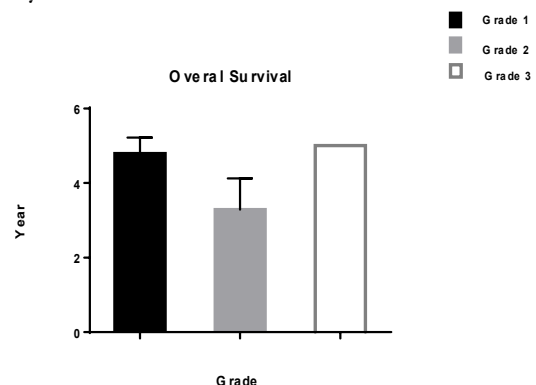


Fig. 4. Overall survival in terms of tumor grade

However, the analysis of survival rate in the three above-mentioned grades by one-way ANOVA analysis exhibited that there was no significant correlation between the survival and the various grades of the tumor ( $F(2,48)=0.954, p=0.39$ ).

The overall survival (mean  $\pm$  SD, years) was determined to be  $4.04 (\pm 1.87)$  for the size  $>4$ , followed by the size of 4-8 ( $4.80 \pm$

3.24) and a size > 8 (7 ± 2.0) years (Figure 5). One-way ANOVA analysis demonstrated that there was no significant relationship between survival and tumor size (F (2,48)=1.809, p=0.17).

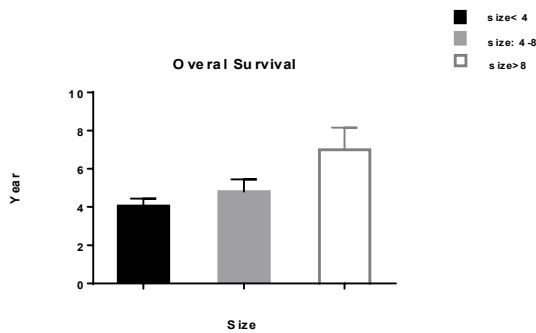


Fig. 5. Overall survival based on the tumor size

## DISCUSSION

There are several types of brain tumors, some of which are considered to be benign, and others are malignant. Primary brain tumors originate in the brain tissue and secondary brain tumors or metastatic brain tumor refers to cancer that originates in the body and spreads to the brain. The rate of growth of the brain tumor can be different, and the rate of growth and location of the brain tumor determines the symptoms of the brain tumor. Primary malignant tumors are the leading cause of death due to solid tumors in children and the third cause of cancer deaths ranging from 15 to 34 years [9]. Using the basic knowledge of the survival of patients with central nervous system tumors can be appropriate to reduce the costs imposed on the health system, the family of patients and most importantly the individual. Therefore, the aim of this study was to determine the survival of patients with a surgical brain tumor.

In this study, 51 patients with an average age of 56.67 years were studied and 72.54% of the patients (37 subjects) were female. The results of the current study depicted that the most common position of brain tumors in patients was the parietal area (19.6%). In the present study, the mean (SD) and the median survival rate of patients were determined to be 4.58 and 4 years, respectively, and The 2, 5 and 10-year survival rates were calculated to be 90.1, 43.13 and 5.88%, respectively. Gender, age, size and tumor grade did not have a significant effect on survival, but there was a significant relationship between survival rate and tumor location. The results of previous studies indicate that some of them are consistent with our study and some are inconsistent with the results of our study.

Damari et al. [10] indicated a significant relationship between survival and age. Patients in the age range of 18 to 30 years had a greater relative risk of death, while the results obtained in our study showed that age had no significant effect on the survival rate of patients with brain tumor after surgery, and the mean overall survival of patients over 30 years was more than patients aged 30-50 years old and >50 years old. This difference could be due to the larger sample size of patients in the aforementioned study. In addition, male sex had a higher relative risk of death in Damari et al. [10] study, but our study showed a higher overall survival rate for males than females, but gender did not have a significant

effect on survival. Furthermore, Damari et al. [10] revealed that the relative risk of death in Grade 3 tumors was significantly lower, but our findings demonstrated that the tumor grade did not have a significant effect on survival, and even the mean survival rate was greater in the grade three as compared to grades of 1 and 2.

In addition, in our study, the survival rate was not significantly correlated with tumor size, but the location of the tumor significantly affected survival and the highest survival was observed in brain tumors of the parietal lobe tumors and parasagittal areas with a median survival of 8 years. Davis et al. [11] examined the prevalence of primary brain tumors in the United States based on the behavior and major histology groups.

They found that the 2, 5, and 10-year survival rates for brain tumors were 58%, 49% and 38% respectively, while in our study, the 2, 5, and 10-year survival rates were determined as 90.1%, 43.13% and 5.88%, respectively. Porter et al. [12] determined the prevalence of primary brain tumors in the United States based on the behavior, and histology as well as age, and gender. They suggested that primary brain tumors exhibited 2, 5, 10, and 20-year survival rates of 62%, 54%, 45%, and 30%, respectively. In concordance with the aforementioned study, the results of our study showed that the 2, 5, 10, and 20-year survival rates have been gradually reduced.

Another study evaluated failure patterns and survival rates of patients suffering from atypical and anaplastic meningiomas, where 5-year overall survival for grade II and III tumors has been estimated to be 83 and 23%, respectively [13]. While our findings emphasized that the median survival rate for grade II and III tumors was 3 and 5 years. Furthermore, a study evaluated clinic-pathological features in patients suffering from glioblastoma multiforme. They indicated the prevalence tumor based on the location, where temporal was found to be the most frequent in 41.2%, followed by a frontal tumor in 25.5%, parietal tumor in 19.6%, and occipital tumor in 13.7% [14].

The frequency of parietal lobe tumors was 19.6% (10 patients), followed by CP Angle tumors (5.88%), Frontal lobe tumors (3.92%), parasagittal tumor (15.68%), temporoparietal tumors (5.88%), Ventricle tumors (14.06%), spinal cord tumors (5.88%), temporal tumors (15.68%), frontoparietal tumor (1.96%), suprasellar tumor (1.96%), Sellar tumor (1.96%), and tumor in the sphenoid region (7.84%). The median progression-free survival and overall survival for the subjects suffering from GSM has been reported to be 8.0 and 13.0 months, respectively as previously indicated by Zhang et al. [14], while overall survival was 4.58 years in the present study.

## CONCLUSION

The findings revealed that the overall survival of patients with brain tumors was 4.58 years and 2, 5, 10-year survival rates were calculated to be 90.1%, 43.13%, and 5.88%, respectively. Gender, age, grade and size of the tumor had no significant effect on survival, while there was a significant relationship between tumor location and survival rate.

## AUTHORS' CONTRIBUTIONS

ANR, MD, HJ, and AK prepared and edited the draft. All authors read and approved the final manuscript.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted in accordance with the Declaration of Helsinki. All patients provided written informed consent before

the screening. The study was approved by the ethics committee of the Arak University of Medical Sciences.

## CONSENT FOR PUBLICATION

The written informed consent was obtained from the patients included in this study.

## COMPETING INTEREST

The authors declare that they have no competing interests.

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