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ORIGINAL ARTICLE

Surgical Outcome of Low-Grade Glioma in Non-Eloquent Cortex

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ABSTRACT

Aim and objective: To identify the surgical outcomes of low-grade gliomas in the non-eloquent cortex.

Materials and method: The prospective study was conducted at the neurosurgery department of Lady Reading Hospital Peshawar from July 2019 to June 2022 after approval from the institutional review board. A total of 58 participants were included in the study through a convenient sampling technique. The age of the participants was from 15-60 years, including both males and females. Pre- and post-Karnofsky performance score (KPS) was calculated, Moreover, overall survival (OS) and progression-free survival (PFS) were calculated. All the data was collected from patients' assessments and histopathological lab reports and were analyzed by using the latest version of SPSS 24.

Results: A total of 58 patients were selected in the current study ranging from 15 to 60 years. 25.86 % were from 31-40 years of age and 32.75 % of them were from 41-50 years of age. 56.89 % of them were males and 43.10 % were female participants. Pre-operative KPS scores were 100-90 % (46.55 %), 80-70 % (32.75 %), and 60-50 % (20.68 %). 64.79 % had a headache and 1.03 % of them had seizures. 29.31 % had total removal, 37.93 % had GTR, 20.68 % had STR, and 12.06 % of the individual's biopsies were taken. The post-op KPS scores were 100-90 % (70.68 %), 80-70 % (18.98 %), and 60-50 % (10.34 %). Overall PFS was 75.86 %, while the OS was 81.03 %.

Conclusion: The current concluded that the careful surgical selection for non-low-grade gliomas in the non-eloquent cortex was the safe intervention and can result in favorable outcomes like enhanced KPS, PFS, and OS scores after the surgery.

Keywords: Karnofsky performance score, Progression-free survival, overall survival, GTR, STR

INTRODUCTION

Grade-2 gliomas, also known as gliomas with a low grade (LGGs), comprise a heterogeneous category that includes primary CNS tumors that originate within glial cells in the brain. These gliomas are classified by the World Health Organization (WHO)[1]. It has been demonstrated that LGGs multiply at a rate of approximately 4 mm annually on average as well as will ultimately develop into malignant tumors[2,3].The most current system for classifying LGGs developed by the WHO categorizes these into the categories of astrocytomas or oligodendrogliomas, placing a focus on the application of genetic analysis in order to differentiate between different types of tumors. In earlier times, there was an extra category for oligoastrocytoma; nevertheless, this category has since been eliminated from the most current amended system for categorization[4]. In addition, research has shown that the strategy of "watchful waiting" for LGG has been linked with a reduced general survival rate as well as an increased chance of cancerous transformation[5]. Approximately fifteen percent of all basic brain tumors have been LGGs, which are thought to be accountable for two thousand to three thousand annual diagnoses in the US. Most of these instances are astrocytoma. People between the ages of 35 and 44 experience the highest incidence rates[6]. Individuals having LGG have a 5 to 10-year average survival time. Although such individuals have a long survival span, 50–75% of them pass away from either tumor resurgence or cancer progression[7]. The total rate of LGGs is between 0.63 and 1.8 for every 100,000 individuals annually having the majority of individuals presenting their 30 to 40 years of age[8,9].They constitute strongly epileptogenic tumors, causing seizures in 60% to 88% of the affected individuals[10-11]. Multiple variables are believed to be playing a role in the epileptogenesis of the tumor, however, the precise pathways remain unclear. Peritumor alterations in metabolic rate, blood flow, electrolyte balance, and enzyme function are the most common causes of this phenomenon. Up to 80% of LGGs have IDH alterations, and it is thought that these genetic variants trigger epileptogenesis by stimulating NMDA receptors in the brain via the synthesis of a molecule chemically identical to glutamate[12]. Therefore, due to limited research studies regarding the surgical outcomes of non-eloquent low-grade gliomas. The current non-eloquent was conducted to identify the surgical outcomes of low-grade gliomas in the non-eloquent cortex.

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Aim and objective: To identify the surgical outcomes of low-grade gliomas in the non-eloquent cortex.

MATERIALS AND METHOD

The prospective study was conducted at the neurosurgery department of Lady Reading Hospital Peshawar from July 2019 to June 2022 after approval from the institutional review board. A total of 58 participants were included in the study through a convenient sampling technique. The age of the participants was from 15-60 years, including both males and females. Individuals' informed consent was obtained. All the patients have low-grade gliomas in the non-eloquent cortex as confirmed by MRI done pre-operatively. Those who were willing to the surgery and participate in the study were included in the study, while those who were not treated surgically and did not agree to participate in the study were excluded from the study. All the patients were prospectively followed for three years. Pre-operatively the size of the glioma was measured, and pre-and post-Karnofsky performance score (KPS) was calculated, Moreover, overall survival (OS) and progression-free survival (PFS) were calculated. All the data was collected from patients' assessments and histopathological lab reports and were analyzed by using the latest version of SPSS 24.

RESULTS

A total of 58 patients were selected in the current study ranging from 15 to 60 years. 25.86% were from 31-40 years of age and 32.75 % of them were from 41-50 years of age. 56.89 % of them were males and 43.10 % were female participants. Pre-operative KPS scores were 100-90% (46.55 %), 80-70% (32.75 %), and 60-50 % (20.68 %). Furthermore, pre-operative the size of the glioma was <4 cm (53.44 %), 4-6 cm (29.31 %), and > 6 cm (17.24 %). Table 2 indicates the symptoms and clinical signs of the patients. 64.79 % had a headache and 1.03 % of them had seizures. Neurological examinations show 32.75 % had normal, 44.82 % had motor impairments, and 22.41 % had language impairments, additionally, 46.55 % had right side and 53.44 % had left side gliomas.

Table 3 highlights the extent of glioma removed in the participants 29.31% had total removal, 37.93 % had GTR, 20.68 % had STR, and 12.06 % of the individual's biopsies were taken. Moreover, Table 4 Shows the histopathological results of the patients, 56.89% had astrocytoma, 25.86 % had oligoastrocytomas, and 17.24% had oligodendroglioma respectively. Table 5 highlights the post-op KPS score and

complications of the patients. The post-op KPS scores were 100-90% (70.68 %), 80-70% (18.98 %) and 60-50% (10.34 %). Table 6 represents the three-year follow-up results of progression-free survival (PFS) and overall survival (OS) of the patients. Overall PFS was 75.86 %, while the OS was 81.03 % among the patients who underwent surgery for low-grade glioma in non-eloquent cortex.

Table 1: Demographic and Treatment Characteristics

Age (years)	Number	Percentage
15-30	11	18.98 %
31-40	15	25.86 %
41-50	19	32.75 %
51-60	13	22.41 %
Gender		
Male	33	56.89 %
Female	25	43.10 %
KPS score `		
100-90 %	27	46.55 %
80-70 %	19	32.75 %
60-50 %	12	20.68 %
Size of Glioma		
<4 cm	31	53.44 %
4-6 cm	17	29.31 %
> 6 cm	10	17.24 %

Table 2: Symptoms and Clinical Signs

Early Symptoms of Patients		
Headache	37	63.79 %
Seizure	47	81.03 %
Neurological Examination		
Normal	19	32.75 %
Motor Impairment	26	44.82 %
Language Impairment	13	22.41 %
Side of Glioma		
Right side	27	46.55 %
Left side	31	53.44 %

Table 3: The Extant Glioma removed in the Research Group

	Number	Percentage
Total	17	29.31 %
Gross total	22	37.93 %
Subtotal	12	20.68 %
Only biopsy	7	12.06 %

Table 4: Histopathological Findings

Histopathology results	Number	Percentage
Astrocytoma	33	56.89 %
Oligoastrocytoma	15	25.86 %
Oligodendroglioma	10	17.24%

Table 5: Post-op KPS score and complications of patients

Time	Number	Percentage
100-90 %	41	70.68 %
80-70 %	11	18.98 %
60-50 %	6	10.34 %
Complications		
Infection	8	13.79 %
Seizures	3	5.17 %
VTE	2	3.44 %
Reoperation	5	8.62 %
Mortality	3	5.17 %

Table 6: Three Years PFS and OS

	Number	Percentage
PFS	43	75.86 %
OS	47	81.03 %

PFS: progression-free survival
OS: overall survival

DISCUSSION

Non-neuronal cells called glial cells within the CNS and PNS can generate gliomas. These cells normally surround and safeguard neurons. Seizures are typically the first and most obvious sign of an LGG. Small, hardly perceptible seizures might trigger brief, inexplicable episodes, such as a strange scent, a discomfort in the gastrointestinal tract, or other similar symptoms. Larger seizures brought on by an LGG may make it difficult to speak or cause tremors in the limbs. Headaches, trouble communicating, shifts in character, loss of memory, weakness, tingling, and visual impairment are some of the additional signs we may observe. Tumors are sometimes discovered in asymptomatic patients through routine diagnostic procedures such as MRI or CT scans. In the present study, pre-operative KPS scores were 100-90 % (46.55 %), 80-70 % (32.75 %), and 60-50 % (20.68 %). Furthermore, pre-operative the size of the glioma was <4 cm (53.44 %), 4-6 cm (29.31 %), and > 6 cm (17.24 %). Table 2 indicates the symptoms and clinical signs of the patients. 64.79 % had a headache and 1.03 % of them had seizures neurological examinations show 32.75 % had normal, 44.82 % had motor impairments, and 22.41 % had language impairments, additionally, 46.55 % had right side and 53.44 % had left side gliomas. In a similar study conducted by Turkoglu E et al patients varied, with 35% having seizures, 41% having headaches, 22% having various neural signs such as hemiparesis or aphasia, and 2% having coincidental indications. The KPS was used to analyze how well the individuals could perform daily tasks. 30 patients (47.6%) achieved a perfect score of 100, while 25 (39.6%) earned 90, as well as 8 (12.8%) received 80. Oligodendrogliomas accounted for 41.8% of tumors, astrocytes for 46.6%, whereas oligoastrocytomas for 11.6%. Both the 3-year as well as 5-year OS rates were high, at 80% as well as 76% respectively. A non-eloquent area's PFS prevalence remained at 83.6% over three years as well as 25% over five years[13]. According to Roberts M et al of the 63 participants, 71% experienced seizures. Five-seven percent had astrocytoma, whereas 57 percent had oligodendroglioma. Eighty-four percent had the IDH-1 mutations.29% of the tumors were found in non-eloquent sites. At an average of 43 months after surgery, 73% of patients had improved to Engel class I[14]. Bianco AD et al concluded that GTR, STR) and biopsy were used to describe the extent to which a tumor was removed. The resection rates for tumors located in eloquent regions were 22.5, 35, and 42.5%, while the rates for tumors located in non-eloquent regions were 31, 48, and 21%, respectively. Individuals having non-eloquent brain tumors had a 5-year and 2-year survival rate, respectively. Extensive operation across both eloquent and non-eloquent regions of the brain is associated with a better prognosis for adult individuals having LGA[15]. In 10% of patients before surgery, the KPS scored 100, in 65% it was at 90, and in 60% it was at 70 after 72 hours. Sixty percent of the trial cohort had a KPS of 100 during the first six months of follow-up, and just one individual (5%) expired within this time. Following 6 months KPS equaled 100, which was 95% of the total sample size. The LOS was exceptionally long, ranging from four to sixteen days. the quickest in non-eloquence (five days or less). Uncontrolled seizures occurred in 30% of patients before surgery, but 50% of patients were cured. The median length of time to return to job duties for the eloquent was 2.5 days, for the nearly eloquent 2.8 days, and for the non-eloquent 3.5 days. Time Period: Around 2.6 Months[16].

CONCLUSION

The current concluded that the careful surgical selection for non-low-grade gliomas in the non-eloquent cortex was the safe intervention and can result in favorable outcomes like enhanced KPS, PFS, and OS scores after the surgery.

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