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Influence of partial resection on survival in glioblastoma: a case report

Glioblastoma, known for its aggressive behavior and poor prognosis, presents a formidable challenge in the realm of neuro-oncology. The conventional treatment paradigm for glioblastoma typically involves maximal safe surgical resection followed by adjuvant chemotherapy and radiation therapy, with the overarching goal of prolonging survival and mitigating symptom burden. Despite the concerted efforts directed towards these therapeutic modalities, the overall prognosis for glioblastoma patients remains dismal, particularly in cases where only partial tumor resection can be achieved. This case study seeks to explore the impact of partial resection on survival outcomes in individuals diagnosed with glioblastoma. A 44-year-old male presented with a constellation of symptoms including impaired speech, recurrent headaches, weekly seizures, and left-sided weakness. Due to the tumor's location near the motor strip, which posed a significant risk for neurological deficits, a decision was made to pursue partial resection, resulting in the removal of approximately 74 % of the tumor mass. Subsequent to the surgical intervention, the patient underwent a six-week course of chemotherapy utilizing temozolomide (75 mg/m^2), albeit without adjunctive radiation therapy. Notably, the patient experienced improvement in symptomatology following the completion of therapy and demonstrated a survival duration of five months post-diagnosis.This case serves to underscore the potential therapeutic utility of partial resection as a viable treatment approach for glioblastoma, particularly in scenarios where achieving total tumor excision is deemed unattainable due to critical anatomical considerations. Furthermore, it underscores the imperative of individualized treatment strategies tailored to each patient's unique clinical circumstances. Moreover, it emphasizes the critical need for ongoing research endeavors aimed at refining treatment approaches and improving outcomes for glioblastoma patients, particularly those with unfavorable prognostic profiles.

Keywords: glioblastoma, partial resection, extent of resection, survival outcome.

Glioblastoma multiforme (GBM) represents a predominant and exceedingly aggressive kind of glial tumor that mostly affects the central nervous system in adults. Although intensive treatment techniques such as surgical intervention, radiation, and chemotherapy have been implemented, the prognosis remains greatly limited [2, 9].

Approximately 15 % of all brain tumours are comprised of glioblastoma. Primarily impacting individuals over the age of 50, glioblastoma exhibits a higher incidence in males compared to females [4]. Surgical resection of tumor is crucial to Glioblastoma (GBM) treatment. Comprehensive observational studies and literature reviews using objective evaluations of resection (EOR) consistently show a strong link between maximum tumor removal and improved GBM outcomes [10, 11].

The median survival of GBM patients increases to 6 months with surgical resection alone. When surgical resection is combined with radiation treatment, there is a substantial enhancement in 12-month survival rates. Given the highly infiltrative nature of GBM, radiation treatment alongside chemotherapy has been shown to further improve survival outcomes. Notably, the addition of concurrent chemotherapy with temozolomide (TMZ) following surgical resection and radiation treatment has resulted in a significant improvement in survival, with rates extending to 14.6 months [5].

In this case study, we present the clinical scenario of a patient who underwent partial resection of glioblastoma followed by a 6-week course of temozolomide therapy, without adjunctive radiotherapy. Despite the

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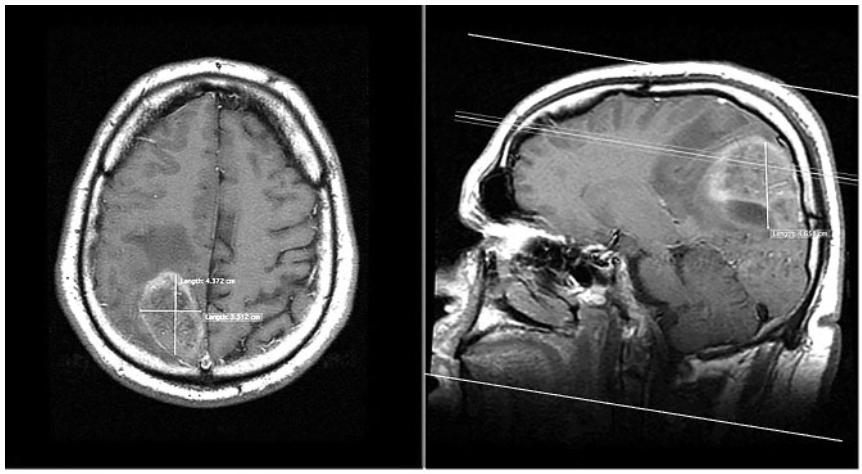

Fig. 1. *The volumetric analysis of tumor volume pre-operatively*

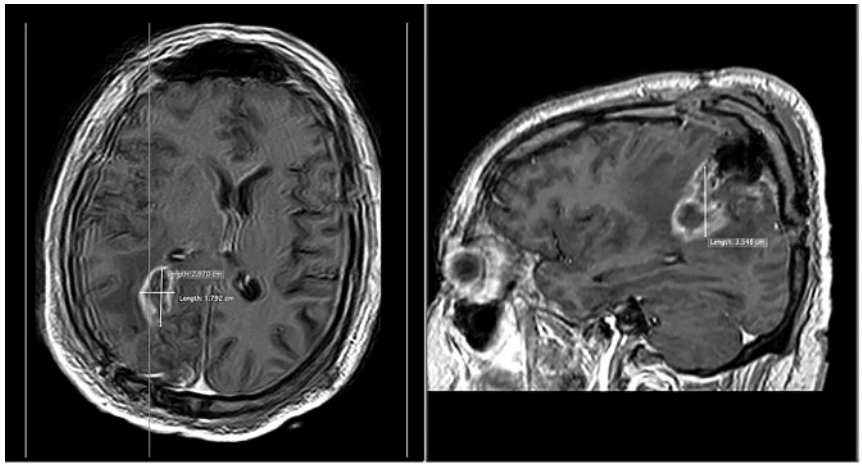

Fig. 2. *Volumetric analysis of residue volume of tumor post-operatively*

omission of radiotherapy from the treatment regimen, the patient achieved a survival outcome of 5 months.

Case Report

A 44-year-old male cab driver from Uzhhorod, Ukraine, went to the Neurosurgery Department of the Regional Clinical Centre of Neurology and Neurosurgery after a month of slurred speech, severe headaches, and weakness in his left arm and limbs. On top of that, he said that once a week, usually in the evening, he would have generalised tonic-clonic seizures for around 30—40 second. Neither a personal nor a family medical history of trauma was found. A heterogeneous lesion with uneven boundaries and necrotic patches was detected by Magnetic Resonance Imaging (MRI). Typical characteristics indicating of the aggressive and infiltrative nature of glioblastoma were peritumoral edema and mass effect following contrast injection, along with considerable enhancement. A tumour volume of 32.6 cm^3 was determined by volumetric analysis (Fig. 1).

The patient was administered steroid and anti-epileptic medication on the second day of hospitalisation to control inflammation, edema as well as seizure. Following this, a surgical procedure was conducted, which entailed a partial removal of the tumor because of location of tumor close to motor strip. The volumetric analysis performed on a subsequent magnetic resonance imaging (MRI) scan conducted on the second day after surgery revealed a significant decrease in tumour volume by 73.7 %. The predicted amount of residual tissue was determined to be 8.6 cm^3 (Fig. 2).

Following the surgical procedure, the patient did not encounter any difficulties except there was still weakness of lower limbs. Following the initial diagnosis, it was advised that the patient get further chemotherapy and radiation. The individual made the decision to engage in a chemotherapy treatment plan consisting of temozolomide for a duration of six weeks, with a daily dosage of 75 mg/m^2. During the two-month follow-up period, the patient had a decrease in symptoms. Nevertheless, he opted against pursuing radiation. Unfortunately, the individual succumbed to the ailment after a period of five months.

Discussion

The glioblastoma, which is considered to be the most common kind of malignant primary brain tumor,

is categorised as a high-grade glioma on the medical spectrum [5]. Gross total resection, which refers to the complete removal of tumors, presents considerable difficulties in the treatment of GBM due to the disease's extremely invasive nature, which is characterised by the persistence of microscopic tumours. This significantly adds to the unfavourable prognosis associated with GBM.

The primary focus of efforts is to get the most optimal and secure resection, with a special emphasis on tumour areas that are anatomically accessible. After surgery, it is routine to offer adjuvant radiation treatment and chemotherapy, usually with temozolomide. Furthermore, there is ongoing investigation into the possible use of novel therapeutic modalities, including as immunotherapy and antiangiogenic drugs, as supplementary approaches to established therapies. Nevertheless, despite the progress made in therapy methodologies, the median survival duration for individuals with GBM continues to fall below 15 months [5, 9].

The ideal surgical strategy for addressing glioblastoma has been widely recognised as maximal safe resection. Recent research findings suggest that enhancing the degree of tumour removal in individuals recently diagnosed with glioblastoma is linked to enhanced survival rates. This highlights the significance of pursuing optimal tumour excision while prioritising safety during surgical procedures [8].

The surgical treatment of glioblastoma is becoming increasingly personalised and multimodal. Imaging, surgical equipment, and intraoperative monitoring have all contributed to the improvement of tumor removal while simultaneously reducing the amount of damage to brain tissue [3].

G. Hallaert et al. [7] included were 159 patients. 37 individuals had biopsy-only and 73 partial resections. Median OS for all patients was 13.4 months. PR had a median OS of 12.2 months in unmethylated tumour patients. PR was an independent positive predictive factor in multivariate Cox regression, along with age, Karnofsky Performance Score, and MGMT-methylation [9]. In contrast, our case study revealed that the patient's overall survival (OS) was just 5 months.

Resection degree correlates with survival rate improvement, even when tumours are difficult to remove. A multicenter study of high-grade gliomas found that excision of the dominant tumour increased overall survival compared to biopsy alone. Resection patients had a median overall survival of 12 months, whereas biopsy patients had a median survival of 4 months [6].

Bjorland et al. found that a total of 158 individuals who were diagnosed with glioblastoma and had undergone biopsy or partial resection were found under our study. A total of 106 patients (67.1 %) had partial resection. The median age (range) in the partial resection group was 62.2 ($p = 0.90$). The median overall survival in the biopsy group was 8.1 months, but in the partial resection group it was 11.1 months ($p = 0.19$) [1]. In contrast, the results of our case study showed that the patient's OS was only five months after undergoing chemotherapy and a partial resection during which about 74 % of the tumour was removed. Radiotherapy was not chosen as the treatment treatment.

In summary, the implementation of adjuvant chemotherapy in conjunction with radiation is a viable treatment approach that has the potential to improve survival rates in individuals with newly diagnosed GBM who have had PR. Therefore, in order to enhance overall survival results, it may be advisable to provide chemotherapy and radiation concurrently to all patients with GBM who have received surgical surgery.

Conclusions

This case study emphasises the complexity of glioblastoma care and the need for early detection, surgery, and multimodal therapy. After surgical removal of partial tumor volume, however the patient's decision to avoid radiotherapy may have affected the long-term prognosis. In glioblastoma treatment, surgery, chemotherapy, and radiation are important. Partial resection can relieve symptoms, but chemotherapy and radiation are needed to slow disease progression and enhance survival. Finally, this instance shows the importance of individualised and detailed treatment plans tailored to each patient's needs to optimise GBM outcomes.

Ethics approval and consent to participate. This study was approved by the Research Ethics Committee, Faculty of Medicine, Neurosurgery Department, Uzhhorod National University.

Consent for publication. Not applicable.

Availability of data and material. The datasets used during the current study are available from the corresponding author on reasonable request.

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Вплив часткової резекції на виживання при гліобластомі: звіт про випадок

Гліобластома, яка асоціюється з агресивним перебігом та поганим прогнозом, становить величезний виклик у сфері нейроонкології. Традиційна парадигма лікування гліобластоми зазвичай передбачає максимально безпечну хірургічну резекцію з наступною ад'ювантною хіміотерапією та променевою терапією, метою яких є подовження тривалості виживаності та пом'якшення тягаря симптомів. Незважаючи на узгоджені зусилля, спрямовані на ці терапевтичні модальності, загальний прогноз для пацієнтів із гліобластомою залишається несприятливим, особливо у випадках, коли вдається досягти лише часткової резекції пухлини. Наведено клінічний випадок впливу часткової резекції на результати виживання пацієнта з гліобластомою. У 44-річного чоловіка мала місце сукупність симптомів, зокрема порушення мови, періодичний головний біль, щотижневі судоми та геміпарез. Через розташування пухлини поблизу моторної смуги, що пов'язано з високим ризиком неврологічного дефіциту, було прийнято рішення провести часткову резекцію. Видалено близько 74 % маси пухлини. Після хірургічного втручання пацієнт пройшов шеститижневий курс хіміотерапії з використанням темозоломіду (75 мг/м^2) без додаткової променевої терапії. Варто уваги, що пацієнт відзначив поліпшення симптомів після завершення терапії. Тривалість виживання — 5 міс після встановлення діагнозу. Цей випадок свідчить про потенційну терапевтичну корисність часткової резекції як можливого підходу до лікування гліобластоми, особливо коли досягнення повного видалення пухлини є неможливим з урахуванням анатомії, а також про необхідність індивідуального вибору стратегії лікування відповідно до клінічних обставин у пацієнта. Існує потреба в постійних дослідницьких зусиллях, спрямованих на вдосконалення підходів до лікування пацієнтів із гліобластомою та поліпшення його результатів, особливо в разі несприятливого прогностичного профілю.

Ключові слова: гліобластома, часткова резекція, обсяг резекції, виживання.

ДЛЯ ЦИТУВАННЯ

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