CASE REPORT

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Treatment of a Rare Intramedullary Primary Spinal Glioblastoma Multiforme Lesion in an Adult Patient

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ABSTRACT

Primary spinal cord tumors represent 2%–10% of all central nervous system tumors and mainly comprise astrocytoma, ependymoma, ganglioglioma, oligodendroglioma and subependymoma. Only 1%–3% of all spinal cord tumors show primary glioblastoma multiforme pathology.

Methods: Spinal glioblastoma multiforme was diagnosed as a result of MRI findings of the patient (The thoracic spinal MR revealed an intramedullary nodular expansile lesion), who had numbness in lower extremities.

Maximum safe resection was performed our patient. The lesion reported as GBM. Adjuvant radiotherapy and chemotherapy including temozolomide was applied subsequently.

The primary treatment of spinal glioblastoma multiforme includes surgery, radiotherapy and chemotherapy. Despite multidisciplinary approaches available to treat spinal glioblastoma multiforme, the prognosis remains poor, with survival rates of 10–12 months. Total resection is nevertheless the main therapy for spinal glioblastoma multiforme in spite of current developments. Although spinal intramedullary glioblastoma multiforme particularly is quite rare, its treatment is very difficult.

Key Words: Intramedullary tumor, Glioblastoma multiforme; Spinal cord; thoracic, Radiotherapy

Introduction

Primary SCTs represent 2%–10% of all central nervous system tumors and mainly comprise astrocytoma, ependymoma, ganglioglioma, oligodendroglioma, and subependymoma. Glioblastoma multiforme (GBM) accounts for 50% of primary intracranial neoplasms, however, only 1%–3% of all spinal cord tumors (SCTs) show primary GBM pathology (1). Cranial GBM has a survival rate of 14–18 months, whereas the survival rate for primary spinal cord GBM is only 10–12 months (2).

The clinical symptoms of spinal cord GBM are determined by the position of the tumor along the spinal canal (2). More than 60% of primary spinal GBM tumors are located in the cervical or cervicothoracic region and the majority of spinal neoplasms in adults are located extramedullarily (55%), with intramedullary tumors accounting for only 5% of cases (2).

Spinal cord GBM is treated with maximum safe surgical resection followed by adjuvant chemotherapy (CT) and radiotherapy (RT) (2). Despite the aggressive treatment modalities available to patients with spinal GBM, prognosis is generally poor.

Case Report

History and Examination: During a follow-up appointment for Type 1 diabetes mellitus (DM), a 41-year-old patient, reported the onset of numbness in the toes. This symptom was initially attributed to DM and later to an L3–L4 herniated disc. However, following surgery to repair the herniated disc, the numbness did not resolve, but, instead, spread to both legs, and the patient developed a dropped left foot.

During a consultation at the Department of Neurosurgery, a thorough physical examination of the patient was conducted, and cranial and spinal magnetic resonance (MR) imaging were performed. The thoracic spinal MR revealed an

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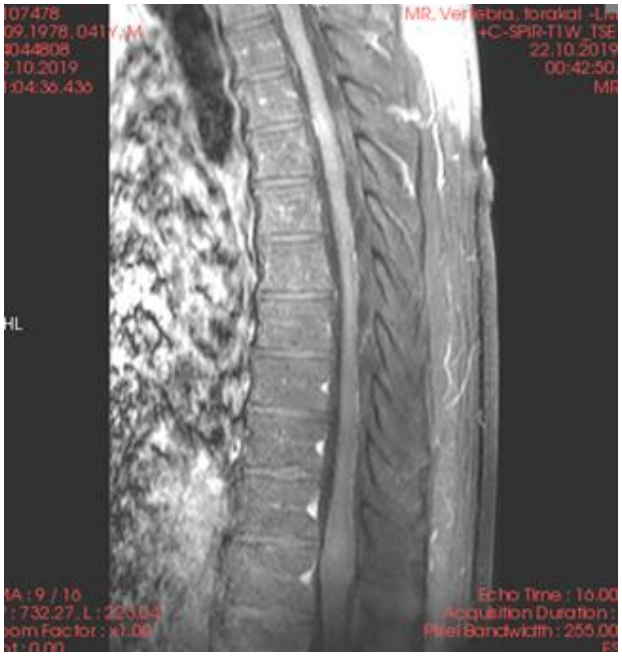

Fig. 1. Preoperative T1 post-contrast sagittal MRI image of intramedullary spinal GBM

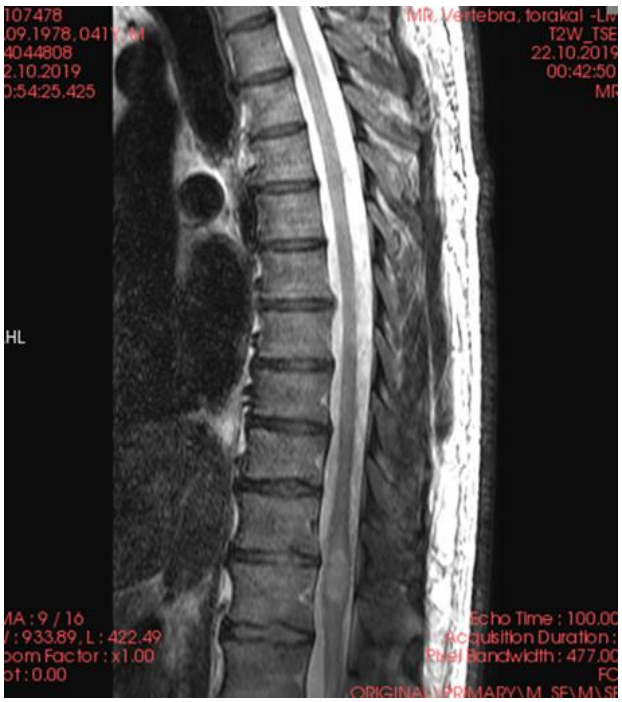

Fig. 2. Preoperative T2 sagittal MRI image of intramedullary spinal GBM

intramedullary nodular expansile lesion, with moderate contrast enhancement, starting from the T11–T12 disc and continuing to the T12 vertebral corpus. This resulted in an enlargement of the spinal cord measuring 21 × 12 mm on the sagittal plane (Figure 1). The lesion was hyperintense in the T2A series and isointense in the T1A series (Figure 2).

Following maximum safe resection surgery (Figure 3), the lesion reported as GBM (Figure 4) and the

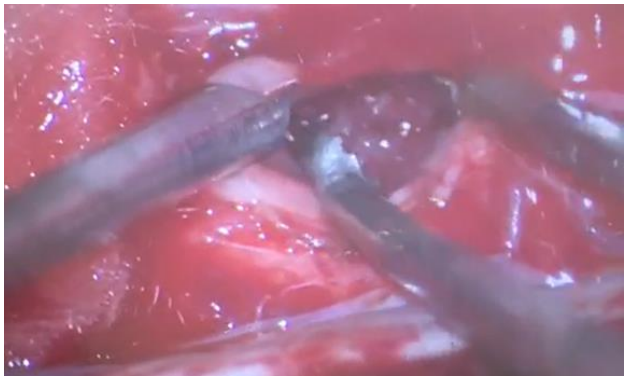

Fig. 3. Image of totally resected intrameduller spinal GBM during operation

patient reported continued numbness in the lower extremities, as well as weakness and lack of sensation in in the right hand. Radioimaging subsequent to surgery ensured totally resected tumor image (Figure 5).

External curative radiotherapy (RT) was administered according to a 5-week intensity-modulated radiation therapy (IMRT) treatment plan, with an initial phase comprising 25 RT fractions. The total radiation dose for Phase I was 25 × 180 cGy = 4500 cGy, and the total Phase II radiation dose was 4860 cGy. The maximum point dose delivered to the medulla was 4937 cGy. Throughout the RT treatment plan, weekly follow-up sessions were held in which the levels of toxicity experienced by the patient were monitored against the Radiation Therapy Oncology Group (RTOG) and European Organization for Research and Treatment of Cancer (EORTC) toxicity scales.

Weekly EORTC-RTOG toxicity levels remained consistently at Grade 1 throughout the 5-week RT treatment period (3). No hematological and neurological toxicity necessitating the interruption of treatment was observed. No further increase in the patient's neurological symptoms occurred during RT, and the previously reported postoperative numbness and tingling in the lower extremities disappeared in the week 3 of RT.

Postresection weakness in the right hand diminished in the third week of RT, and, over time, the patient regained dexterity in tasks such as eating, holding glasses, and daily physical activity. However, the lack of sensation in this hand continued until week 5 of RT.

The patient reported an absence of pain and an improvement in mobility. Postoperatively, he needed a wheelchair for work, but by week 3 of RT, he was able to work with the help of a walker. The full 5-week RT treatment plan was completed without any complications, and the patient was

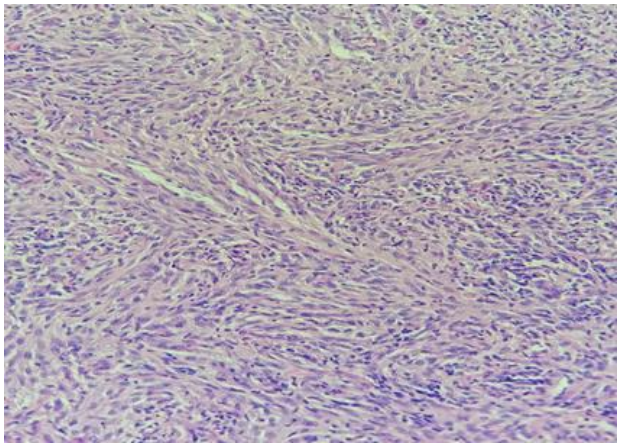

Fig. 4. Microscopic image of our totally resected spinal GBM. Hematoxylin-eosin (H&E) staining at x20 magnification reveals fibroblastic area (sarcomatous, grade IV)

discharged. An informed consent was obtained from the patient by radiation oncologist in order to make a publication about his disease.

Discussion

Primary spinal GBM occurs in young adults and presents with pain, numbness, tingling and paraplegia of the lower limbs, accompanied by sphincter dysfunction. Intramedullary tumors of this type may cause increased intracranial pressure (2). Although spinal GBM tumors, particularly intramedullary GBM tumors, are quite rare, their treatment is very difficult. The primary treatment of spinal GBM tumors includes surgery, RT, and CT. Despite multidisciplinary approaches available to treat spinal GBM, the prognosis remains poor, with survival rates of 10–12 months (2).

Surgical Treatment: Opinions differ regarding the surgical approach to treatment of high-grade spinal glial tumors. Some surgeons favor an aggressive surgical approach, whereas others prefer biopsy. McGirt et al. report that maximum surgical resection is associated with survival in patients with anaplastic SCTs (4). However, they add that the same is not true for spinal GBM cases, pointing to a significant difference in the survival rates of patients with anaplastic spinal cord gliomas who underwent total resection, as opposed to the higher survival rates of patients with subtotal resection. Toshitaka et al. noted that although surgical separation of GBM SCTs from healthy spinal cord tissue in situ is difficult, maximum surgical resection should still be used to improve the survival rates of patients with spinal GBM tumors located in the primary thoracic region (5).

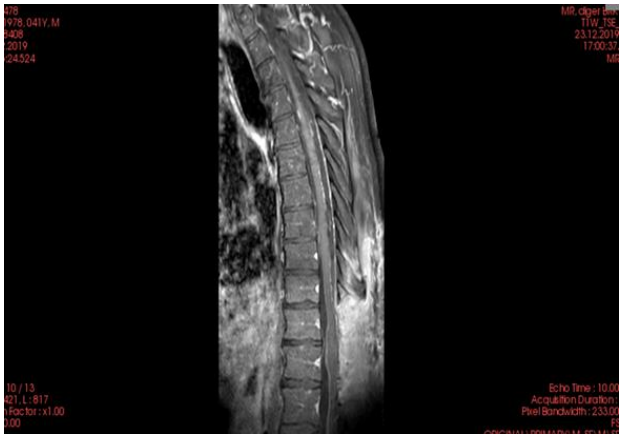

Fig. 5. Postoperative T1 post-contrast sagittal MRI image of totally resected intramedullary spinal GBM

Adjuvant Radiotherapy: Although the efficacy of adjuvant RT in high-grade gliomas has not yet been fully established, Minehan et al. noted that, despite impairment incurred to the lower extremities and bladder functions of patients treated with adjuvant RT, there is a significant overall survival (OS) benefit associated with this treatment in patients with high-grade SCTs (6).

In 1995, Shirato et al. showed that patients with spinal GBM lived for >4 years after treatment with adjuvant RT (7). et al. Katoh et al. reported a 5-year OS rate for patients with high-grade glial tumors treated with hypofractionated RT of 67%. This represented a significant improvement on the 5-year OS rate of 35% for patients treated with conventional RT (8).

It is well known that a RT dose of >40 Gy is needed to achieve local control of the disease and improve survival rates (9). Abdal-Wahab et al. reported a conventional fractionation median dose of 50 Gy as effective in the treatment of malignant SCTs (10).

Several studies have examined the effects of different doses of RT in the treatment of spinal GBM where dose is guided by the clinical condition of the patient (9,10). Chao-Xiong Shen et al. administered RT doses of 50 Gy in 25 fractions to a 15-year-old patient with spinal GBM. However, the patient's neurological and general condition continued to deteriorate for 12 months postoperatively. Prognosis was poor, and the patient died 13 months postoperatively (11) and Moraısı N et al. administered RT doses of 45 Gy in 28 fractions to a 19-year-old patient (12).

In 2014, Varghese et al. reported that a 22-year-old patient with spinal GBM, treated with adjuvant a total RT dose of 5040 cGy, delivered in 28 fractions, lived for >6 years post treatment (13). Similarly, Abhishek et al. administered a total

RT dose of 5040 cGy in 28 fractions to a 23-year-old patient with spinal GBM (14). Several studies show that both tumor recurrence and tumor dissemination are reduced with adjuvant RT (15).

We administered external curative RT by the IMRT treatment method with a spinal cord maximum point dose of 4937 cGy to improve the neurological functions and quality of life of our patient. Results showed that neurological functioning and quality of life improved following 5 weeks of this treatment. Feeling has been restored to the lower extremities, strength has returned to his right hand, and the patient no longer requires a wheelchair as he manages to do his work with the aid of a walker.

Adjuvant Radiotherapy and Chemotherapy: In some cases, postoperative patients with spinal GBM are treated with adjuvant temozolomide-based CT (TMZ), which is also administered in the treatment of cranial GBM (14). Studies comparing the effects of combined RT and TMZ treatments with RT-only treatments on patients with intracranial GBM show that disease-free survival rates increase from 5.0 months (RT-only) to 6.9 months (RT and TMZ), and the OS rates increase from 12.1 months (RT-only) to 14.6 months (RT and TMZ) (14,15). No similar comparative studies have yet been published for spinal GBM, although Tseng et al. reported that a 26-year-old patient with cervical spinal GBM survived for 33 months after total resection followed by adjuvant TMZ, having benefited from this treatment protocol (16). However, it has been shown that, despite adjuvant CT, the survival rates in spinal GBM remain low (around 10–12 months) (10, 4).

Spinal GBM tumors are very rare. However, the survival rates are low (around 10–12 months), and prognoses are generally poor for patients with this type of tumor (2). In 5% of cases GBM tumors are intramedullary and infiltrate normal spinal tissue, making total resection difficult (2). Maximum safe surgical resection of the tumor is, however, possible in some cases, using microsurgical methods. Our findings in this case support those of other studies indicating that total resection, particularly when combined with adjuvant RT and CT, offers local control of the tumor and significantly increases the OS rates and quality of life for patients with spinal GBM tumors.

Disclosure Statement: The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

References

1. Cheng X, Lou S, Huang S, Chen H, Liu J. Primary spinal cord glioblastoma multiforme: a retrospective study of patients at a single institution. World Neurosurg 2017; 106: 113-119.
2. Adams H, Avendaño J, Raza SM, Gokaslan ZL, Jallo GI, Quiñones-Hinojosa A. Prognostic factors and survival in primary malignant astrocytomas of the spinal cord. Spine (Phila Pa 1976) 2012; 37: 727-735.
3. Toxicity criteria of the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of Cancer (EORTC)." Cox JD et al. Int J Radiatıon Oncol Biol Phys. Version 1995; 30: 1341-1346.
4. McGirt MJ, Goldstein IM, Chaichana KL, Tobias ME, Kothbauer KF, Jallo GI. Extent of surgical resection of malignant astrocytomas of the spinal cord: outcome analysis of 35 patients. Neurosurgery 2008; 63: 55-60.
5. Seki T, Hida K, Yano S, Aoyama T, Koyanagi I, Houkin K. Surgical Outcomes of High-Grade Spinal Cord Gliomas. Asian Spine J. 2015; 9: 935-941.
6. Minehan KJ, Brown PD, Scheithauer BW, Krauss WE, Wright MP. Prognosis and treatment of spinal cord astrocytoma. Int J Radiat Oncol Biol Phys 2009; 73: 727-733.
7. Shirato H, Kamada T, Hida K, Koyanagi I, Iwasaki Y, Miyasaka K, et al. The role of radiotherapy in the management of spinal cord glioma. Int J Radiat Oncol Biol Phys 1995; 33: 323-328.
8. Katoh N, Shirato H, Aoyama H, et al. Hypofractionated radiotherapy boost for dose escalation as a treatment option for high-grade spinal cord astrocytic tumor. J Neurooncol 2006; 78: 63-69.
9. Perez CA, Thorstad WL, authors. Perez and Brady's Principles and Practice of Radiation Oncology. 2013. 6th ed. Philadelphia: Lippincott Williams and Wilkins, Wolters Kluwer Business; 659-694.
10. Abdel-Wahab M, Etuk B, Palermo J, Shirato H, Kresl J, Yapicier O, et al. Spinal cord gliomas: A multi-institutional retrospective analysis. Int J Radiat Oncol Biol Phys 2006; 64: 1060-1071.
11. Shen CX, Wu JF, Zhao W, Cai ZW, Cai RZ, Chen CM. Primary spinal glioblastoma multiforme. A case report and review of the literature. Medicine (Baltimore) 2017; 96: e6634.
12. Morais N, Mascarenha L, Fernandes JPS, Silva A, Magalhaes Z, Costa JA. Primary spinal

glioblastoma: A case report and review of the literature. Oncol Lett. 2013; 5: 992-996.

13. Varghese SS, Sebastian P, Joseph V, Chacko G, Backianathan S. An unusually long survival of a patient with glioblastoma of spinal cord: a case report. J Clin Diagn Res 2014; 8: QD01-03.
14. Purkayastha A, Sharma N, Sridhar MS, Abhishek D.Intramedullary Glioblastoma Multiforme of Spine with Intracranial Supratentorial Metastasis: Progressive Disease with a Multifocal Picture.Asian J Neurosurg 2018; 13: 1209-1212.
15. Behmanesh B, Setzer M, Konczalla J, et al: Management of patients with primary intramedullary spinal cord glioblastoma. World Neurosurg 2017; 98: 198-202.
16. Tseng HM, Kuo LT, Lien HC, et al. Prolonged survival of a patient with cervical intramedullary glioblastoma multiforme treated with total resection, radiation therapy, and temozolomide. Anticancer Drugs 2010; 21: 963-967.