

Spinal Metastases from Supratentorial Glioblastoma

Seong Rok Han, M.D., Gi Taek Yee, M.D.,
Dong Jun Lee, Ph.D., Choong Jin Whang, M.D., Ph.D., FACS.

Department of Neurosurgery, Ilsan Paik Hospital, College of Medicine, Inje University, Goyang, Korea

The tendency of glioblastoma multiforme(GBM) to metastasize to the cerebrospinal fluid is well documented. However, symptomatic intradural extramedullary metastasis of GBM in the spinal cord are rarely reported. A 31-year-old female with a previously treated supratentorial GBM presented with back pain and lower extremities weakness. Magnetic resonance imaging of the thoracic spine demonstrated an intradural extramedullary mass at levels of T2-T4 and arachnoid membrane enhancement. The patient underwent an operation. Pathologic diagnosis was confirmed as spinal metastases of GBM. We present a case of spinal metastases from supratentorial GBM presented with paraparesis.

KEY WORDS : Glioblastoma multiforme · Metastases · Spinal cord.

Introduction

Glioblastoma multiforme(GBM) is highly malignant tumor originating from astrocytes, accounts for one fifth of all brain tumors. The prognosis is poor, with an average survival time of approximately 1 year²⁾.

GBM tends to recur locally but may spread along white matter tracts or via cerebrospinal fluid(CSF) pathways^{8,10)}. Metastases of intracranial GBM to the spinal cord has been described with increasing frequency in recent years. Autopsy series suggest that approximately 25% of patients with intracranial GBM have evidence of spinal subarachnoid seeding, although the exact incidence is unknown because postmortem examination of the spinal cord is not performed routinely^{5,8)}. Nevertheless, symptomatic intra- and extraspinal metastases in patients with primary intracerebral GBMs are rarely reported.

To date the cause of their metastatic spread still remains unknown⁷⁾. An iatrogenic spread due to surgical manipulations might just be possible as well as spontaneous scattering via CSF-pathways or blood. Choucair et al.⁴⁾ estimated the probability of such metastases at 1.2%. We describe a case of spinal metastases of supratentorial GBM and discuss clinical, radiographic features and pathogenesis.

Case Report

A 31-year-old woman presented with a 2 month-history of headache, nausea and vomiting. Magnetic resonance imaging(MRI) of the head demonstrated a mass in frontal horn of left lateral ventricle, which shows heterogeneous enhancement (Fig 1). She underwent stereotactic biopsy. The pathological diagnosis was confirmed as GBM. We commenced fractionated stereotactic radiosurgery using Novalis (Brain LAB AG, Germany). Once daily 2.2Gy for

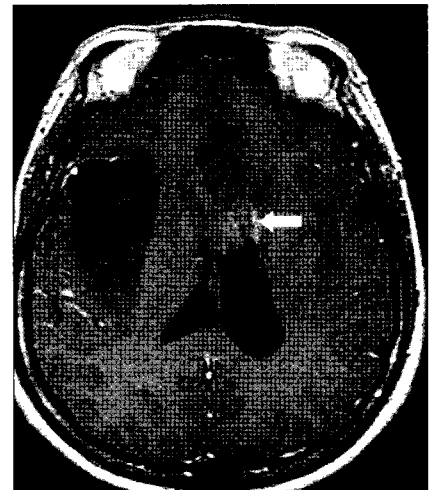


Fig. 1. Axial T1 weighted magnetic resonance image of the brain after gadolinium(Gd) injection demonstrated that an enhancing solid mass along ependyma of left lateral ventricle (arrow). Combined gliomatosis cerebri were seen in right temporal and both frontal lobe also.

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• Address for reprints : Seong Rok Han, M.D., Department of Neurosurgery, Ilsan Paik Hospital, College of Medicine, Inje University, 2240 Daehwadong, Ilsan-Seo-gu, Goyang 411-410, Korea Tel : +82-31-910-7730, 7740, Fax : +82-31-915-0885, E-mail : hsrkmj@ilsanpaik.ac.kr

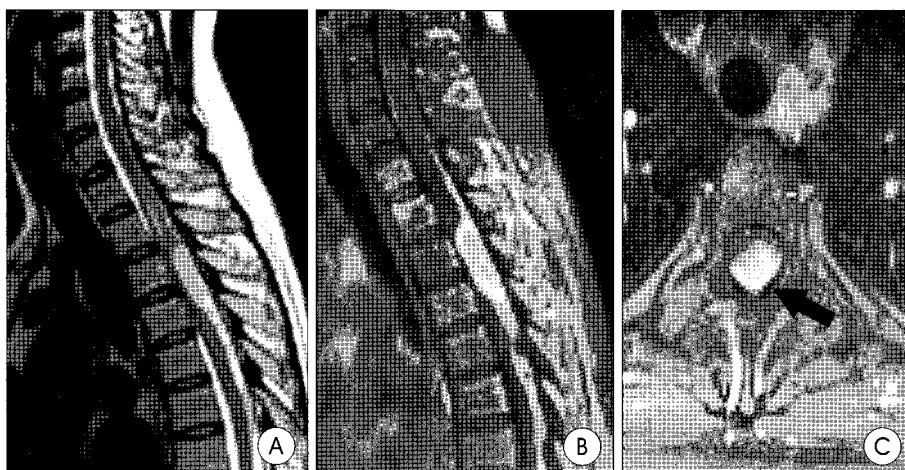


Fig. 2. Midsagittal thoracic T2 weighted magnetic resonance image (A) demonstrating that hyper signal intensity mass at the level of T2–T4. After Gd administration, sagittal T1 weighted MR image (B) revealing rim enhancement of mass. Axial Gd enhanced T1 weighted MR image at level T3 (C) showing intradural extramedullary mass, which is located dorsally (arrow) and compressed thoracic spinal cord.



Fig. 3. Sagittal Gd enhanced thoraco–lumbar T1 weighted magnetic resonance image revealing enhancement of arachnoid membranes, which are included lumbar spinal cord, conus medullaris and cauda equina.

reflexes were normoactive. Pathologic reflexes were not observed.

Radiologic examination

Plain radiographs of the thoraco-lumbar spine were normal. MRI of the thoracic spine showed an extensive intradural ex-

tramedullary mass of the spinal cord at level T2–T4 (Fig. 2). Upper thoracic spinal cord was compressed abundantly. After gadolinium injection, MRI of the thoracolumbar spine revealed that arachnoid membranes of lumbar spinal cord, conus medullaris and cauda equina were enhanced strongly (Fig. 3).

25 fractionation was performed. Total radiation dose was 55Gy. After radiosurgery, chemotherapy using temozolamide was administered. Twelve months after initial diagnosis, she presented with a two weeks history of back pain and progressive weakness of both legs.

Neurologic examination

The patient was alert consciousness. Motor power of low extremities are graded III/V strength. Below T4 level, hypesthesia were observed. Deep tendon

reflexes were normoactive. Pathologic reflexes were not observed.

Pathologic finding

Histological examination revealed that the nuclei of the tumor cells were pleomorphic with massive necrosis, which were confirmed as spinal metastases of GBM (Fig. 4).

Post operative course

External beam radiotherapy to the spine were done. But, the patient died in 4 months after diagnosis of spinal metastases and 16 months after the diagnosis of the primary supratentorial GBM.

Discussion

The neuroaxis spread of supratentorial GBM was once thought to be a rare event⁶. However, based on the findings of autopsied today, CSF dissemination occurs in 15 to 25% of cases of supratentorial GBM, with higher incidence up to 60% for infratentorial GBM^{1,6,7}.

The rate of spinal leptomeningeal seeding after diagnosis of a GBM has been variably reported. A review of the literature by Erlich and Davis⁵ in 1978 revealed only 14 well documented cases of spinal subarachnoid seeding from primary intracranial GBM since 1931. However, the incidence of spinal metastases from GBM to be increased recently^{7,9}. The reasons for the apparent increase in the incidence of this problem have not been conclusively identified. Mainly three reasons might be responsible for this increase in frequency. First diagnostic tools have improved since computed tomography scanning and MRI are available⁷. But better diagnostic techniques alone do

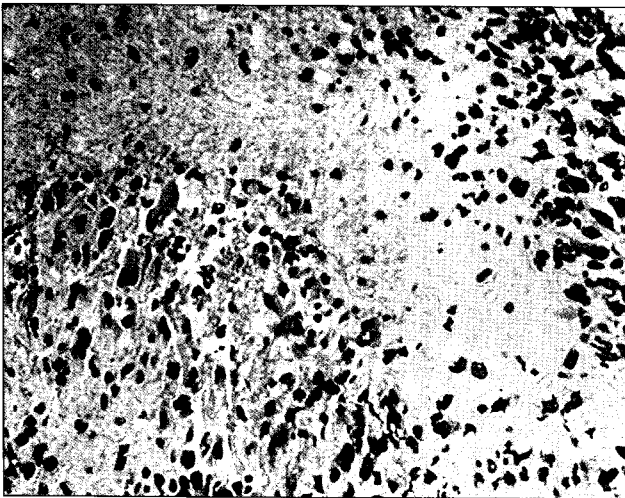


Fig. 4. High magnification microscopy of specimen showing that pseudopalisading necrosis and cellular pleomorphic glial cells with anaplastic large nuclei (H&E $\times 200$).

not explain the increasing number of metastases. The prolonged survival time due to improved therapy regimens might be the second explanation⁷. And the third explanation may be potentially to changes in the biological properties of tumors occurring as a result of surgery, radiation therapy, or chemotherapy⁹. Symptomatic CSF dissemination occurs relatively late in the course of GBM, because most patients not surviving long enough for spinal metastases to develop¹.

GBM almost shows microscopic infiltration of cerebral parenchyma. Invasion of the subarachnoid space or ventricles allows for dissemination of malignant cells via CSF pathways. Spinal cord involvement is usually more prominent dorsally, probably because of gravitational effects. Nerve roots of the cauda equina, root sleeves, and the thecal sac are other common sites of metastases⁸.

The most common sites for spinal GBM metastases are the lower thoracic, upper lumbar, and lumbosacral regions. Involvement of the mid-thoracic, cervical, or entire spinal cord is uncommon¹. Possible symptoms and signs are widespread and may include local radicular pain as well as creeping or acute paraparesis⁷. It has been suggested that the variability and lack of signs of leptomeningeal metastases are because of tumor cells infiltrating between nerve fibers rather than destroying them. Once destruction has occurred, symptoms and signs are permanent¹. MRI is the investigation of choice for leptomeningeal metastases of GBM, which has several advantages that lack of bone-derived artifacts, multiplane imaging, improved discrimination of intramedullary and extramedullary lesion, and provide optimal anatomic definition of the spinal

cord and thecal sac⁸.

There is no satisfactory treatment for spinal metastases. Surgical decompression allows for confirmation of the diagnosis and may be helpful for pain control. However, leptomeningeal metastases are often not amenable to surgical decompression because of the diffuse nature of the disease. Intravenous or intrathecal chemotherapy is sometimes use, but is more effective for extraneural metastasis. External beam radiotherapy is the most commonly used treatment modality, with 25 to 40Gy being delivered in 2.5Gy fractions, but it provides only temporary pain relief with no improvement in neurological deficit¹.

The prognosis in leptomeningeal metastases is dismal. The average time interval between diagnosis of leptomeningeal metastases and death is 2 to 3 months¹. None of treatment modalities (surgery, irradiation, chemotherapy) were able to stop the fast and finally fatal progression of the disease^{6,7}.

Conclusion

We should suspect that spinal metastases in patients with a past history of intracranial GBM, who presents with the clinical features of radiculopathy or myelopathy. Awareness of this condition will facilitate appropriate intervention.

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