Intracranial Dissemination from Spinal Cord Anaplastic Astrocytoma

Seong Man Jeong, M.D., Yong Gu Chung, M.D., Jang Bo Lee, M.D., Il Young Shin, M.D., Ph.D.
Department of Neurosurgery, College of Medicine, Korea University, Republic of Korea

We report a case of intracranial dissemination developing approximately 4 months after partial removal of a spinal cord anaplastic astrocytoma in a 22-year-old male. He presented with paraplegia on initial admission at a local hospital. Spinal magnetic resonance (MR) images disclosed multiple intramedullary lesions at the T3-11. The tumor was partially removed. The final histologic diagnosis was anaplastic astrocytoma. Four months after the operation, he was admitted with the symptoms of headache and deterioration of consciousness. MR images showed enhanced lesions in the anterior horn of the left lateral ventricle, and septum pellucidum. He underwent computed tomography-guided stereotactic biopsy and histological appearance was consistent with anaplastic astrocytoma. The clinical course indicates that the tumor originated in the spinal cord and extended into the subarachnoid space, first the spinal canal and later intracranial.

KEY WORDS: Anaplastic astrocytoma • Spinal cord • Intracranial dissemination.

INTRODUCTION

Spinal cord gliomas are rare, accounting for only 1% of all primary neoplasms in the central nervous system. Intracranial dissemination from spinal cord are particularly rare. We describe a case of spinal cord anaplastic astrocytoma with intracranial dissemination which onset with paraplegia. The mechanism of dissemination of spinal cord gliomas to intracranial space is still unclear. It is considered to have metastasized intracranially through the spinal subarachnoid space and ventricles after partial removal of the primary lesion.

CASE REPORT

A 22-year-old male was admitted to a local hospital complaining of paraplegia. He was diagnosed as an acute transverse myelitis. Initial brain magnetic resonance (MR) images showed no abnormalities (Fig. 1). He was treated with high dose steroid intravenously. However, 7 months later, he was admitted to our hospital with progressive left upper limb numbness. Spinal MR images disclosed a mass lesion at the T3-11 levels appearing as a hyperintense area on both T1- and T2-weighted images (Fig. 2A). The tumor was partially removed through a laminectomy at T8-10. The histological diagnosis was anaplastic astrocytoma, immunochemical stain showing GFAP(+), P53(+), EGFR(+). Whole spine irradiation (total 50 Gy) was given. Four months after the operation, he was admitted with headache, and deterioration of consciousness. MR images showed enhanced lesions in the anterior horn of the left lateral ventricle, and septum pellucidum (Fig. 2B). He underwent CT-guided stereotactic biopsy and histological appearance was consistent with anaplastic astrocytoma (Fig. 3A, B). Immunochemical staining showed GFAP(+), P53(+), EGFR(+). Diagnosis was same anaplastic astrocytoma confirmed by immunocytochemistry. Despite the conservative treatment in the intensive care unit, his general condition and neurological status gradually deteriorated. He died from the tumor progression.

DISCUSSION

Growth of a spinal intramedullary glioma into the cranial cavity is a rare event, especially in cases of anaplastic...
intracranial dissemination of spinal cord glioma may occur due to dissemination of the tumor into the spinal subarachnoid space and subsequent intracranial spread into the cerebral subarachnoid space or brain parenchyma. In addition, there is a possibility that a spinal intramedullary astrocytoma may grow directly into the cranial cavity in an exophytic manner. However, exophytic growth of a spinal intramedullary glioma is extremely uncommon. Intracranial dissemination is more common in patients with malignant glioma after surgical manipulation. This possible mechanism can be also applicable to our case. Surgical manipulation of a spinal cord anaplastic astrocytoma may facilitate tumor cell seeding to the subarachnoid space, resulting in intracranial dissemination.

Also, previous studies show increasing values of Ki-67/MIB-1 labeling index correlates with increasing grade of malignancy and proliferation. Although there is not anaplastic astrocytoma, a report present that central neurocytomas with MIB-1 labeling index over 10% showing rapid tumor growth and dissemination. The spinal tumor immunohistochemistry present Ki-67/MIB-1 labeling index 10-20% in this case (Fig. 3C). Therefore, in spinal cord anaplastic astrocytoma patient, increased Ki-67/MIB-1 labeling index is very important factor that causes intracranial dissemination and poor prognosis.

The median survival from surgery to death is generally 6 months to 1 year in spinal cord anaplastic astrocytoma patient. Intracranial dissemination is an ominous feature characterizing the terminal stage of disease. In our patient, intracranial dissemination appeared suddenly, followed by rapid neurological deterioration and death. Intracranial dissemination is a major indicator of a poor prognosis and makes it difficult to treat local recurrence. Therefore, the first priority is the prevention of dissemination when initially treating spinal cord anaplastic astrocytoma. We conclude that an aggressive approach using radical surgery, entire neuraxis irradiation, and adjuvant chemotherapy should be considered as the initial treatment for high-risk young subjects with Ki-67/MIB-1 labeling index over 10%.
CONCLUSION

Growth of a spinal intramedullary glioma into the cranial cavity is rare event, especially in cases of anaplastic astrocytoma. Intracranial dissemination from a thoracic spinal cord anaplastic astrocytoma is associated with tumor cell proliferative state. Ki-67/MIB-1 labeling index presents tumor cell proliferation and prognosis. Ki-67/MIB-1 labeling index over 10% are considered with understanding the cause of rapidly dissemination of anaplastic astrocytoma.

References
1. Asano N, Kitamura K, Seo Y, Mukai K, Soga T, Hondo H, et al.: Spinal cord glioblastoma multiforme with intracranial dissemination-case report. Neurol Med Chir (Tokyo) 30: 489-494, 1990
2. Bell WO, Packer RJ, Seigel KR, Rorke LB, Sutton LN, Bruce DA, et al.: Leptomeningeal spread of intramedullary spinal cord tumors. Report of three cases. J Neurosurg 69: 295-300, 1988
3. Cohen AR, Wisoff JH, Allen JC, Epstein F: Malignant astrocytomas of the spinal cord. J Neurosurg 70: 50-54, 1989
4. Faria MH, Gonçalves BP, do Patrocínio RM, de Moraes-Filho MO, Rabenhorst SH: Expression of Ki-67, topoisomerase IIalpha and c-MYC in astrocytic tumors: correlation with the histopathological grade and proliferative status. Neuropathology 26: 519-527, 2006
5. Johannessen AL, Torp SH: The clinical value of Ki-67/MIB-1 labeling index in human astrocytomas. Pathol Oncol Res 12: 143-147, 2006
6. Ogawa Y, Sugawara T, Seki H, Sakuma T: Central neurocytomas with MIB-1 labeling index over 10% showing rapid tumor growth and dissemination. J Neurooncol 79: 211-216, 2006
7. Saitoh M, Kuwamura K: [Report of a case of intracranial metastases from malignant spinal cord astrocytoma.] Rinsho Hoshasen 34: 249-252, 1989
8. Umez U, Seki Y, Aiba T, Matsuya S: Intracranial seeding following surgery for spinal cord astrocytoma-case report. Neurol Med Chir (Tokyo) 32: 281-284, 1992
9. Yamashita Y, Kumabe T, Jokura H, Tominaga T, Yoshimoto T: Intracranial dissemination from thoracic spinal cord anaplastic astrocytoma in a patient with idiopathic CD4-positive T lymphocytopenia: a case report. Surg Neurol 56: 39-41, 2001

Fig. 3. A: Photomicrographs of a specimen from brain tumor. The photogragh reveals anaplastic astrocytoma with moderate cellularity and pleomorphic nuclei (H & E, ×400). B: Photomicrograph of a specimen from spinal tumor. The photogragh reveals same findings of brain specimen (H & E, ×400). C: Photomicrograph of a specimen from spinal tumor. The photogragh reveals Ki-67/MIB-1 labeling index 10-20%.