Long-Term Control of Recurrent Anaplastic Ependymoma
With Extracranial Metastasis: Importance of Multiple
Surgery and Stereotactic Radiosurgery Procedures

—Case Report—

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Abstract
An 11-year-old Japanese girl presented with a right frontal lobe anaplastic ependymoma. The tumor was removed surgically. However, she developed a secondary lesion and extracranial metastasis in the cervical lymph node. In total, she underwent eight intracranial tumor removal procedures, five stereotactic radiosurgeries with six targets, and five cervical lymph node removal surgeries during the course of 7 years. She is currently alive with a good quality of life, and has no major neurological deficits except right facial nerve palsy. The combination of surgery and radiosurgery can achieve local control of anaplastic ependymoma. Multiple surgery or radiosurgery procedures can result in good outcome, if the tumor does not involve crucial structures, even if extracranial metastasis occurs.

Key words: anaplastic ependymoma, extracranial metastasis, multiple surgery, stereotactic radiosurgery

Introduction
Ependymoma accounts for 2–5% of all brain tumors and 5–10% of childhood brain tumors, but progressive disease develops within 5 years in 40–70% of patients.15) The extent of tumor resection and control of local recurrence are the primary factors affecting the treatment outcome.6,14,15) We treated a pediatric patient with supratentorial anaplastic ependymoma who suffered multiple tumor recurrences and extracranial metastasis by surgery and radiosurgery, and who continues to live 7 years after disease detection without significant deficits.

Case Presentation
An 11-year-old Japanese girl was transferred to our hospital for the treatment of a cerebral tumor in the right frontal lobe manifesting as headache, nausea, and clumsiness of the left fingers. On admission, magnetic resonance (MR) imaging showed a 5.5-cm ring-shaped enhanced mass with a solid nodular compartment. The tumor was removed surgically. Histological examination established the diagnosis of anaplastic ependymoma (Fig. 1A–C). The Ki-67 staining index was 36%. She was given 50 Gy of local field radiation. However, 15 months later, she again presented with severe headache and a 5-cm mass was identified at the right temporal base. Surgery achieved gross total removal of the tumor. MR imaging identified a small residual tumor, so gamma knife radiosurgery was performed. The patient was followed up by MR imaging every 3 months to detect tumor recurrence before any neurological symptom emerged.

Surgery was again necessary 3 years after the initial treatment due to local recurrence at the temporal base and tent. Painless rapid swelling of her right cervical lymph node was observed and fine needle aspiration cytology revealed the presence of class V malignant cells. Head and neck surgery was performed to remove the right deep cervical lymph nodes. Tumor metastases to multiple lymph nodes of the internal jugular chain of the deep lateral cervical group were confirmed at the operation. As expected, histological examination confirmed metastasis of
the anaplastic ependymoma to the cervical lymph node. Although metastasis to other organs was feared, investigation of the whole body using Ga scintigraphy and computed tomography (CT) revealed no other metastatic sites.

She had suffered three episodes of intracranial and two episodes of neck lymph node recurrence, so chemotherapy with cyclophosphamide, VP-16, CDDP, vincristine, and dexamethasone, with intrathecal injection of methotrexate, was administered. This therapy resulted in 22 months of tumor remission, but she then developed local recurrence in the right frontal lobe and consecutive recurrences in the right cervical lymph node and right temporal base. Each recurrence required surgical removal of the tumor. The high rate of local recurrence at the right frontal lobe required too frequent surgical intervention, so we treated the recurrent intracranial lesions with stereotactic radiosurgery using a cyber knife and gamma knife to both reduce the need for reoperation and reduce the risk of motor deficit due to iatrogenic damage of the motor cortex. Stereotactic radiosurgery controlled the irradiated lesion for 3 to 15 months, but tumor regrowth was observed and the lesion was again surgically removed. The most recent surgical sample of the latest right frontal lesion showed evidence of both radiation necrosis and tumor recurrence (Fig. 1D–F).

In total, eight intracranial tumor removal operations, five stereotactic radiosurgery procedures with six targets, and five cervical lymph node removal operations...
Fig. 2  Illustration of the entire clinical course. The magnetic resonance images were obtained on the documented date. Tumor removals of intracranial lesions are recorded as arrows, stereotactic radiosurgeries as broken line arrows, and removals of the cervical lymph node as asterisks. The numbers following the broken arrows are the dose of the radiation (Gy) applied at each stereotactic radiosurgery.

operations have been required (Fig. 2). Every surgical procedure, both intracranial and extracranial, achieved gross total removal of the tumor. She continues to survive without neurological deficits other than right facial nerve palsy due to sacrifice of the right facial nerve in the course of right cervical lymph node removal. She manifests no cognitive disorders and maintains a good quality of life.

Discussion

The grading system proposed by the World Health Organization (WHO) classifies subependymoma as grade I, ependymoma as grade II, and anaplastic ependymoma as grade III. Low grade ependymoma tends to occur in infratentorial regions whereas high grade anaplastic ependymoma arises in the cerebral hemisphere. There are numerous prognostic factors such as resection extent, radiation strategy, chemotherapy, histological grade, location, and so on. As can be expected, high grade anaplastic ependymoma carries a poorer prognosis than low grade. The extent of resection is the key prognostic factor and the location of the tumor determines the extent to which removal is possible. Local field may be more effective than whole-brain irradiation. However, most studies question the effect of chemotherapy. Chemotherapy failed to improve the outcome in children with ependymoma.

In our case, the tumor arose in the supratentorial cerebral hemisphere and was anaplastic ependymoma (WHO grade III), which matches the previously reported characteristics. The very interesting characteristic of our case is that recurrence only occurred in the ipsilateral hemisphere and extracranial metastasis was observed only at the ip-
surgical exposure of the tissues. However, two vascular or lymphatic tumor cell seeding caused by tracranial metastasis of gliomas may occur via lesion. Recently, stereotactic radiosurgery has been motor cortex, and may reduce the number of direct if the tumor involves crucial structures such as the tumor involves crucial structures. Stereotactic be expected to provide a good outcome unless the patients with extracranial metastasis. Surgery can surgical control of the tumor is imperative, even in metastasis of primary brain tumors.

Our patient’s clinical course confirms the importance of control of local recurrence in patients with ependymoma. Surgical and/or stereotactic radiosurgical control of the tumor is imperative, even in patients with extracranial metastasis. Surgery can be expected to provide a good outcome unless the tumor involves crucial structures. Stereotactic radiosurgery may be useful for controlling the lesion if the tumor involves crucial structures such as the motor cortex, and may reduce the number of direct surgical interventions required for controlling the lesion. Recently, stereotactic radiosurgery has been useful for treating children with ependymomas. We suggest that the combination of direct surgery and stereotactic radiosurgery is very effective for controlling recurrent anaplastic ependymoma.

References


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