Glioblastoma with extracranial metastasis through ventriculopleural shunt

Case report

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Extracranial metastasis of an intracranial glioblastoma through a ventriculopleural shunt to the right thorax is reported in a 22-year-old man following a ventriculopleural shunt and telecobalt therapy. Autopsy 8 months after the shunt showed cerebral tumor involving the ventricular system, and irregularly thickened pleura in the right thorax. The primary intracranial tumor and the tumor located extracranially showed the same morphological appearance of glioblastoma.

KEY WORDS - astrocytoma - brain tumor - cerebrospinal fluid - extracranial metastasis - glioblastoma multiforme - ventriculopleural shunt


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EXTRACRANIAL metastasis of intracranial tumors is an unusual occurrence. Metastases of gliomas to other organs in particular are extremely rare. The following case report pertains to an even more unusual circumstance: metastasis of glioblastoma to the pleura through a ventriculopleural shunt.

Case Report

A 22-year-old college student had progressively increasing headache and drowsiness.

Examination. When hospitalized in the Kanto-Rosai Hospital, Kawasaki, Japan, there was marked bilateral papilledema, a positive Romberg test, and weakness of the legs. The cerebral angiogram revealed a vascular stain in the pineal region and anterior and superior displacement of the anterior cerebral arteries, suggesting dilatation of the lateral ventricles. A pneumoventriculogram performed on the next day confirmed the hydrocephalus, and also demonstrated a rough irregular wall of the lateral ventricles and the presence of a space-occupying lesion in the left thalamic region. The next day the patient became unconscious, had anisocoria, and a seizure.

Operation. A right trephine for ventricular tapping was done and shortly thereafter, because of increasing intracranial pressure, a right ventriculopleural shunt was established using a Holter tube.

Postoperative Course. Telecobalt therapy (6000 R) was given. His mental state improved gradually. He was able to take oral feeding and walk with assistance, and returned home.

Second Examination. The patient was referred to the Nagasaki University Hospital 5
months after operation because of severe headache, nausea and vomiting, fever, and coughing of sputum. The leucocyte count was 16,300. The chest film showed complete opacity on the right. The right thoracentesis revealed yellowish-brown serous fluid with 20 cells per cu mm, 20 mg of protein, 75 mg of sugar; culture of the fluid was negative.

Second Operation. A ventriculoatrial shunt was done because several thoracenteses were ineffective.

Second Postoperative Course. The patient gradually deteriorated. Unconsciousness became more marked, repeated convulsive seizures occurred, and he died 9 months after the onset of his illness (8 months after the ventriculopleural anastomosis).

Gross Autopsy Findings. The head was normocephalic. The pupils were round and asymmetric. The leptomeninges were generally slightly opaque and the cerebrospinal fluid slightly turbid. The brain was swollen and congested, weighing 1420 gm. The medulla and the cerebellopontine areas were brownish-red and granular. The basilar arteries and the cranial nerves from abducens to hypoglossal were surrounded by tumor and could not be traced. Uncal and tonsillar herniations were present. On section, brownish, turbid fluid poured out from the dilated ventricles which were lined with a fragile yellowish-brown tissue (Fig. 1). The medulla oblongata and the upper cervical spinal cord were encircled by the tumor tissue.

The mediastinal structures were pushed to the left. There were 2000 ml of yellowish-brown and slightly turbid sero-fibrinous fluid in the right pleural cavity. The right parietal pleura was markedly thickened, measuring up to 1.7 cm. There were multiple gray-white nodules 2.0 cm in diameter in the upper part near the end of the plastic tube and also in the hilar and diaphragmatic regions (Fig. 2).

There was no appreciable amount of fluid in the left pleural cavity. The pleural surfaces were smooth and glistening on the left. The pericardial cavity contained a moderate amount of pale yellowish and slightly turbid fluid. The pericardial surfaces, however, were smooth and free from adhesion. The abdominal organs were normally disposed and showed no remarkable changes. The musculoskeletal system was also not remarkable.

Fig. 1. Cut sections of the anterior half of the cerebrum. The lining of the irregularly dilated ventricular system is replaced by fragile and necrotic tissue.

Fig. 2. Gross specimen of the right thorax shows marked thickening of the parietal pleura. There are multiple gray-white nodules in the apical, hilar, and diaphragmatic regions. There was a large amount of accumulation of yellowish-brown and slightly turbid sero-fibrinous fluid measuring approximately 2,000 ml in the right pleural cavity.
Histological Examination. The tumor showed the histological characteristics of a glioblastoma (Fig. 3). It entered the third and fourth ventricles, extended posteriorly into the cisterna cerebellomedullaris and into the cisterna ambiens, invaded the choroid plexus of the ventricles, and passed along the walls of the atria and of the anterior and occipital horns of the lateral ventricles into the deep white matter of the parietal, temporal, and occipital lobes bilaterally. It had invaded the fornix and corpus callosum. It reached the cisterna cerebellomedullaris through the foramina of Magendie and of Luschka, and spread widely in the subarachnoid space about the cerebrum, cerebellum, brain stem, and spinal cord. The tumor cells had grown in the lining of the right pleural cavity with a histological picture similar to that of the intracranial tumor. It extended to invade the right lung, pericardium, and diaphragm. The primary intracranial tumor and the tumor located extracranially showed the same morphological appearances of a glioblastoma: pseudopalisading hyperchromatic spindle cells about a central fibrillar zone of necrosis, marked vascular proliferation with very cellular walls, pleomorphism, and the presence of mono- and multinuclear giant cells. These similarities strongly suggest that the tumors were of the same origin and that the extracranial tumors were metastases from the intracranial one (Fig. 4).\textsuperscript{10}

Discussion
There have been only two cases reported of intracranial tumors with metastases through an artificial channel. One is the case of medulloblastoma that metastasized to the lungs, pleura, lymph nodes, and diaphragm through a ventriculovenous shunt.\textsuperscript{6} Another case similar to ours described metastases of a glioblastoma to the pleura, bone, and lymph nodes through a ventriculopleural shunt.\textsuperscript{12}

Some authors attribute the rarity of metastases of brain tumors to the inability of brain tumor cells to survive in other organs.
Let: Metastatic glioblastoma of the right pleura showing the same morphological features as those of the brain lesion. There are pseudopalisading hyperchromatic spindle cells around the central fibrillar zone of necrosis. H & E, × 150. Right: Metastatic glioblastoma of the pericardium reveals some glial fibrils, pleomorphic tumor cells, and newly formed vessels with very cellular walls. H & E, × 300.

Although it is said that even the most malignant gliomas do not seem to invade intracranial vascular channels, there are a few valid examples of metastasis of a glioma to other organs when a surgical operation has been done and extracranial extension of the tumor has given access to the extracranial blood and lymph channels.\textsuperscript{2,9,12} Other authors emphasize the role of irradiation treatment or immunosuppressive agents.\textsuperscript{1,4,8} There are many reports of heterogeneous transplantation of human neural tumors.\textsuperscript{3,5,7,11} The pleural cavity, on the other hand, may be a favorable site because of the limited rate of absorption of cerebrospinal fluid from the pleural surface.

In our case, the plastic tube leading from the ventricle into the pleural cavity had apparently served as a channel through which not only cerebrospinal fluid but also neoplastic cells were delivered from the ventricle into the pleural cavity. Although there is no absolute proof in this case that the tumor metastasized by way of the cerebrospinal fluid through the ventriculopleural shunt, it seems most likely that this was the route.

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