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Case Report

Malignant Ascites after Subduroperitoneal Shunt in a Patient with Leptomeningeal Metastasis

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Leptomeningeal metastasis is a devastating complication of advanced stage cancer. It is frequently accompanied by hydrocephalus and intracranial hypertension that must be treated by ventriculoperitoneal shunts. However, there are actual risks of peritoneal seeding or accumulation of malignant ascites after the cerebrospinal fluid diversion procedure, though it has not been reported. Here, we present the case of a patient with non-small cell lung cancer with leptomeningeal metastasis in whom malignant ascites developed after a subduroperitoneal shunt.

Key Words : Leptomeningeal metastasis · Malignant ascites · Ventriculoperitoneal shunt.

INTRODUCTION

Leptomeningeal metastasis, the invasion of the subarachnoid space by metastatic cells, is a devastating complication of cancer that affects 5 to 8% of patients with solid tumors[1)]. These cells may be floating free in the cerebrospinal fluid (CSF) and symptoms may reflect focal lesions, tumor invasion of neural structures, or chronic diffuse inflammatory response that develops in the leptomeninges. Treatment options depend on the primary cancer type and may include radiotherapy and intrathecal or systemic chemotherapy[1,10)]. However, the prognosis remains poor, and the median overall survival ranges from 2 to 3 months[1,4,5)]. Frequently, leptomeningeal metastasis is complicated by intracranial hypertension and hydrocephalus presenting with headache, nausea, vomiting, ataxia and mental changes. Symptoms of intracranial hypertension are disabling and may not improve after treatment with corticosteroids or other palliative measures. Ventriculoperitoneal shunt (VPS) is the only effective palliative method in such cases. VPS may rapidly relieve intracranial hypertension, however, there is a possibility of peritoneal dissemination of cancer cells through VPS, although the actual risk is not known. We report a case of malignant ascites after subduro-peritoneal shunt in a patient with non-small cell lung cancer and leptomeningeal metastasis.

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CASE REPORT

A 55-year-old man presented to the outpatient clinic of our institute complaining of gait disturbance. He had been diagnosed with advanced adenocarcinoma of the lung two and half years prior. At that time, brain magnetic resonance imaging (MRI) scan disclosed a single brain metastasis of synchronous onset. Even though it has been well known that expected survival of this patient would be longer with combined radiosurgery and whole brain radiotherapy (WBRT) than WBRT alone, radiation-oncologist recommended WBRT alone according to predominant manner of practice in his society without consulting about radiosurgery. The patient had received palliative chemotherapy of various regimens after WBRT. Ten months after WBRT, gamma knife radiosurgery was done for the re-growing lesion with marginal dose of 15 Gy. Seven months after radiosurgery, the intracranial tumor size had increased again, and surgical resection was performed. The intracranial lesions continued to recur, and gamma knife radiosurgery was repeated twice after the initial surgery of the brain lesion.

Immediately before presenting recently to our department, the patient experienced aggravating gait disturbance, ataxia, and confusion. Brain computed tomography scan and brain MRI scan indicated subdural fluid collection with mass effect (Fig. 1). Burrhole trephination, drainage of subdural fluid and insertion of an external drainage catheter were performed. The patient's neurologic symptoms were improved immediately after surgery, but removal of the external drainage catheter was followed by recollection of subdural fluid and recurrence of symptoms. Repeated drainage of subdural fluid did not eliminate recurrence of symptoms, and cytological examination of the subdural fluid revealed

malignant cells, consistent with metastatic adenocarcinoma. An Ommaya reservoir and intraventricular catheter were inserted for intrathecal chemotheraphy with methotrexate. However, increased intracranial pressure resulted in CSF leakage through the burr-hole site, intractable headache, and deterioration of consciousness that mandated regular CSF drainage through the Ommaya reservoir at intervals of a several hours. It was not possible to continue intrathecal chemotherapy, and we decided to do CSF diversion procedure though CSF profile did not show cytological conversion. A subduroperitoneal shunt operation was performed using a shunt device with a programmable valve (proGAV®, Aesculap-Miethke, Germany) (Fig. 2). After the surgery, the patient's headache and mental status were improved and regular external drainage of CSF was no longer necessary. About 4 weeks after surgery, gradual abdominal distension was observed with accompanying dyspnea. Findings on physical examination and simple abdominal X-ray suggested acsites, and ultrasonography revealed ascites in the peritoneal and pelvic cavities (Fig. 3). At initial paracentesis, 2,100 mL of exudates were drained, and malignant cells consistent with metastatic adenocarcinoma were detected through cytological examination of ascitic fluids. There was no growth of infectious pathogen from CSF culture. The patient's liver function test showed normal findings except mildly raised levels of liver enzymes (AST=59 U/L ; ALT=123 U/L), and therefore we concluded that the ascites was not the result of infectious peritonitis or chronic liver disease. Paracentesis was necessary every three or four days to drain recurrent ascites until 3 weeks later, when the patient died due to respiratory failure resulting from intrapulmonary cancer spread and septic shock.

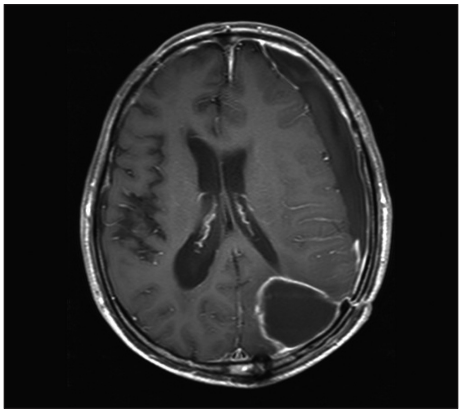

Fig. 1. Axial T1-weighted contarst-enhanced MRI shows subdural fluid collection around the left cerebral hemisphere resulting in midline shift and asymmetrical ventricles. Also, tissue defect from previous surgical resection of the metastatic lesion is shown in left parietal area. MRI : magnetic resonance image.

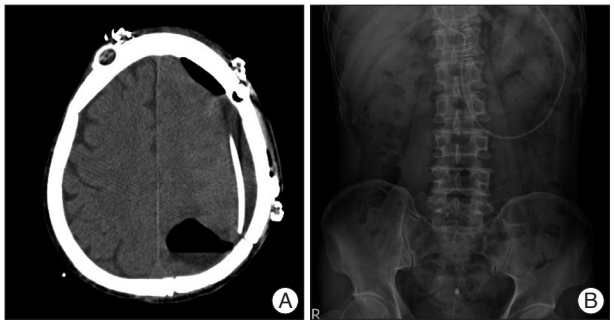

Fig. 2. A : Brain CT scan after subduroperitoneal shunt shows a subdural catheter around the left cerebral hemisphere and demonstrates communication between subdural space and previous tumor resection cavity by pneumocephalus in both space. B : Plain X-ray image of abdomen shows a distal shunt catheter within peritoneal cavity. CT : computed tomography.

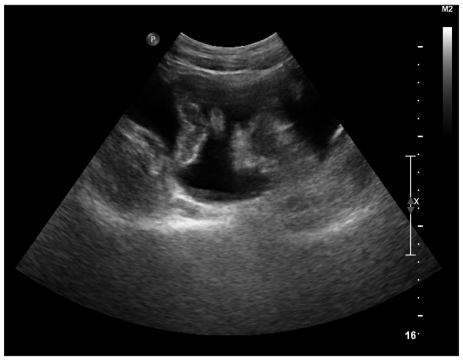

Fig. 3. Ultrasonography reveals a large amount of ascites in the abdominal and pelvic cavity.

DISCUSSION

Hydrocephalus is a common disorder that results from a disturbance of formation, flow, or absorption of CSF, leading to an accumulation of fluid in the central nervous system[8]. Dissemination of malignant cells through the CSF space is a well known phenomenon in patients with primary malignant brain tumors as well as extracranial malignancy spreading to the central nervous system (CNS)[2,3,6,9]. Leptomeningeal metastasis frequently causes hydrocephalus, and VPS can rapidly relieve symptoms and signs of intracranial hypertension. However, VPS placement requires invasive surgery and complications include hemorrhage, infection and shunt malfunction. Besides these common problems related to VPS for the treatment of hydrocephalus of various etiologies, additional risks in cases of leptomeningeal metastasis include dissemination of malignant cells into the peritoneal cavity[3]. Peritoneal seeding through a shunt system has been reported mostly in pediatric patients with primary malignant brain tumors such as medulloblastoma[6,9]. Theoretically, hydrocephalus due to leptomeningeal metastasis from extracranial tumors involves the same risks, although there are no relevant data available. This case demonstrates that the risk of peritoneal carcinomatosis by shunt device is not only theoretical but actually existing in clinical situation. Reasons why the incidence of peritoneal dissemination is apparently low can be explained in two ways. First of all, the prognoses of cancer patients undergoing VPS for hydrocephalus and leptomeningeal metastasis are usually very poor, and median survival after VPS is only 2 to 3 months[5,7]. Many patients probably die before overt clinical mani-

festations of peritoneal dissemination. In addition, such patients frequently have widespread metastatic cancer and multiple organ involvement along with CNS lesions. Therefore, it may be difficult to differentiate peritoneal seeding and subsequent involvement of abdominal organs from preexisting or newly developing invasion or hematogenous metastasis from the primary cancer. If the survival of patients with leptomenigeal metastasis is prolonged, the incidence of peritoneal seeding after VPS will probably increase and the potential risks should be noted before decisions regarding treatment are made.

Current therapeutic approaches to leptomeningeal metastasis include radiation therapy and intrathecal or systemic chemotherapy. Radiation therapy is an incomplete modality in principle when it does not cover the whole neuraxis. Moreover, WBRT or craniospinal irradiation is accompanied by substantial adverse effects and may not improve quality of life even though it slows the progression of CNS lesions. Therefore, intrathecal chemotherapy using methotrexate may be a better alternative; however, it cannot be continued in patients who have already undergone VPS. Though there are a few reports on successful intrathecal chemotherapy using programmable shunt systems.[11] practically there are no routinely reliable VPS systems that can completely shut down or reopen CSF flow as necessary. Development of new drugs or shunt devices is needed to overcome this problem. New drugs effective for the treatment of leptomeningeal seeding with systemic administration or controllable shunt devices enabling intrathecal chemotherapy after VPS by intermittent closure of CSF flow may improve survival and decrease the risk of secondary peritoneal carcinomatosis.

CONCLUSION

Although CSF diversion may be the only effective palliation available for patients with progressive hydrocephalus due to leptomeningeal metastasis, it should be noted that there are risks of peritoneal seeding or accumulation of malignant ascites after the procedure. Early diagnosis and treatment of leptomeningeal metastasis before widespread dissemination and hydrocephalus is important to avoid CSF diversion procedure and its complications including malignant ascites.

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