Subdural Hematoma Associated with Dural Metastasis of Gastric Carcinoma: Report of Two Cases

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Abstract. We treated two cases of a subdural hematoma associated with dural metastasis of gastric cancer, from which both patients died. Case 1: A 60-year-old female patient was hospitalized with a diagnosis of type 4 gastric cancer of the antrum. The patient suddenly collapsed, and, subsequently, left hemiplegia and a depressed level of consciousness were noted. A head computed tomography (CT) scan revealed a subdural hematoma with midline shift. The patient was diagnosed with chronic subdural hematoma and underwent emergency burr hole irrigation. Case 2: A 73-year-old man was diagnosed with type 4 gastric cancer and a total gastrectomy plus splenectomy were performed together with dissection of the N1 and N2 lymph node groups (D2 dissection) in March 2006 (T3, N2, P0, H0, INF−, ly3, v0, por2). Postoperative adjuvant chemotherapy was performed using oral TS-1; following tests revealed no recurrence in the abdomen. In December 2006, gingival bleeding was noted with disseminated intravascular coagulation (DIC) and 10 days later, the patient was hospitalized with chief complaints of impaired consciousness and anorexia. CT scan revealed a right subdural hematoma with a midline shift. The patient was diagnosed with chronic subdural hematoma and underwent emergency burr hole irrigation and drainage. The dural biopsy of the two cases revealed adenocarcinoma noted in the dural blood vessel. Special staining revealed CEA-positive adenocarcinoma, and a diagnosis of the dural metastasis of gastric cancer was made. These patients’ level of consciousness significantly improved postoperatively. However, DIC developed concurrently, and the patients died on the 13th and 14th postoperative day, respectively.

Subdural hematoma has rarely been associated with the dural metastasis of a malignant tumor (1). Since 1904, when Westenhoeffer et al. (2) first described a subdural hematoma associated with the dural metastasis of gastric cancer, only a few cases have been reported. We herein present the cases of two patients who had subdural hematoma associated with the synchronous or metachronous dural metastasis of gastric cancer.

Case Report

Case 1. A 60-year-old woman visited a nearby hospital with chief complaints of postprandial epigastric pain and vomiting with body weight loss of approximately 10 kg over 3 months. The patient was referred to our department and hospitalized with a diagnosis of type 4 gastric cancer of the antrum. On admission, the patient had a height of 158 cm and body weight of 38 kg. Her hemoglobin level was 10 g/dl indicating anemia, and increased tumor marker levels were noted (carcinoembryonic antigen [CEA], 26 ng/ml). A contrast-enhanced upper gastrointestinal examination and an endoscopy were performed. The results showed an encircling irregular and stenotic image and hemorrhagic mucosa in the region from the gastric corpus to the antrum. The biopsy led to the histopathological diagnosis of signet-ring cell carcinoma.

After admission, the patient experienced sudden lightheadedness and 3 days later the patient’s level of consciousness suddenly decreased to III-100 as graded according to the Japan Coma Scale (JCS). Left hemiplegia was also noted. A head computed tomography (CT) scan revealed left subdural hematoma with a midline shift (Figure 1a). An emergency burr hole irrigation and a daily biopsy were performed. Although the collected fluid was slightly bloody, the intracranial pressure was high and the accumulated fluid spouted. The results of the dural biopsy showed an embolism associated with the accumulation of highly atypical epithelium-like cells noted in the dural blood vessel. The patient’s level of consciousness significantly improved postoperatively. However, DIC developed concurrently, and the patient died on the 13th and 14th postoperative day, respectively.

Key Words: Subdural hematoma, dural metastasis, gastric carcinoma.

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vessel. Special staining revealed a CEA-positive adenocarcinoma and a diagnosis of dural metastasis of gastric cancer was made (Figure 2a and b). The patient’s level of consciousness significantly improved postoperatively to I-1 as graded according to the JCS and the left hemiplegia resolved. A head CT examination showed that the midline shift had disappeared (Figure 1b), but thereafter the patient’s level of consciousness suddenly declined to JCS III-100 again on the second postoperative day. A head CT scan revealed marked diffuse brain edema and an enlarged lateral cerebral ventricle, and ventricular drainage was performed. However, bloody spinal fluid discharge from the cerebral ventricle persisted. Disseminated intravascular coagulation (DIC) developed concurrently and the patient died without improvement of the level of consciousness on the 13th postoperative day.

**Case 2.** A 73-year-old man visited our department with chief complaints of impaired consciousness and anorexia. In March 2006, the patient was diagnosed with type 4 gastric cancer extending from the gastric corpus to the pylorus. A total gastrectomy plus splenectomy were performed together with dissection of the N1 and N2 lymph node groups (D2 dissection). The resected specimen showed type 4 advanced cancer (Figure 3a), and it was histopathologically classified as T3, N2, P0, H0, INFv, ly3, v0, por2, and a scirrhous type (Figure 3b), with curability assessed as B. Postoperative adjuvant chemotherapy was performed using oral TS-1 at a dose of 100 mg/body for 2 weeks followed by a 2-week washout period. A series of tests revealed no recurrence in the abdomen.

In December 2006, gingival bleeding was noted, and DIC developed with a tendency to bleed. Ten days later, the patient was admitted to our department due to the occurrence of lightheadedness and a mildly decreased level of consciousness (JCS I-2). A head CT examination after admission revealed a right subdural hematoma with a midline shift (Figure 4a). The patient was diagnosed with chronic subdural hematoma and underwent emergency burr hole irrigation and drainage. A dural biopsy was also performed. Accumulated clots were observed. The intracranial pressure was high, and the accumulated fluid spouted. A biopsy revealed poorly-differentiated adenocarcinoma noted in the dura, and CD31 staining of vascular endothelial cells confirmed embolization associated with the adenocarcinoma. Specific staining was positive for CEA (Figure 5a-d). After operation, the patient’s level of consciousness markedly improved to JCS I-1. A head CT performed on the first postoperative day showed an improvement of the midline shift (Figure 4b). However, bleeding from the drainage persisted. A craniotomy performed on the 4th postoperative day failed...
Figure 2. The results of the dural biopsy of patient 1 showed an embolism associated with the accumulation of highly atypical epithelium-like cells noted in the dural blood vessel (a), while specific staining revealed a CEA-positive adenocarcinoma (b).

Figure 3. The resected specimen of patient 2. The resected specimen showed type 4 advanced cancer (a). It was histopathologically classified as a por2 and a scirrhus type (b).
to achieve hemostasis, and the level of consciousness decreased on the 10th postoperative day. The patient died on the 14th postoperative day.

**Discussion**

The dural metastasis of a malignant tumor has been detected in 10% of autopsy cases and its frequency is highest in patients with breast cancer, followed by those with lung cancer, malignant melanoma and gastrointestinal cancer (3). However, subdural hematoma associated with dural metastasis has rarely been reported: its incidence is approximately 0.02% of autopsy cases (1). Kunii *et al.* (4) analyzed 51 reported cases of subdural hematoma and showed that the most common histological type was adenocarcinoma and the most common primary tumor was located in the stomach, although, as shown above, gastric cancer has not been associated with the highest frequencies of dural metastasis. Several cases with primary gastric cancer (5-12) have been reported since Westenhoeffer *et al.*'s report (2) in 1904, but there have not been many articles regarding the clinical pathology of gastric cancer in such cases.

In this article, we report two patients with subdural hematoma associated with the synchronous or metachronous dural metastasis of gastric cancer. With respect to synchronous dural metastasis of gastric cancer, 2 cases have been histologically determined as the scirrhous type (5, 7), and the tumor was located in the gastric corpus (5) in one and the cardia (6) in the other. Another case was macroscopically classified as type 1 (8). In addition, cases with lymph node metastasis (6) or systemic metastases (7, 8) have been reported. In the present case of synchronous dural metastasis, the tumor was located in the gastric antrum and was classified histologically as signet-ring cell carcinoma and macroscopically as type 4. Paraaortic lymph node metastasis was also observed. For reported cases of metachronous dural metastasis (5, 9-12), the follow-up period from gastric cancer excision ranged from 15 months to 10 years, but no information was available regarding the pathology of the resected gastric cancer. In the present case of metachronous dural metastasis, the time from operation to disease onset was relatively short, i.e. 9 months, and the resected gastric cancer was histopathologically diagnosed as por2 and macroscopically as type 4. The cancer was also classified as T3, N2, P0, H0, INFγ, ly3, v0, por2, and as the scirrhous type. Metastases to other sites, such as multiple metastases to bones (9) and systemic lymph node metastases (10), have been reported, while the recurrence of a tumor was not found in the present case. However, Itoyama *et al.* (12) confirmed histological metastasis and recurrence in the dura and lymph nodes in autopsy cases without any macroscopic recurrent tumors.

In all the above reported cases (5-2), dural metastasis was observed as part of the systemic metastases of gastric cancer. Severe lymphatic invasion noted in our cases, as well as a high frequency of metastases, suggested that the primary gastric cancer was highly malignant. Subdural hematoma associated with dural metastasis has been reported to occur due to an edema formed by secreted material from a tumor (13) or an angiosmoplastic response to a tumor (14).
However, most widely accepted is the theory of Russel et al. (7), which suggests that impaired blood perfusion occurs due to tumor embolism in the dural vein, thereby causing the dilation and breakdown of capillary vessels, resulting in subdural hematoma. For such tumor embolization, two routes have been proposed: one via the artery and the other via the Batson’s plexus (6); the latter, without a venous valve, is now attracting attention as a route related to dural metastasis of the intraabdominal tumor (15). Moreover, as shown in our second case, it has been pointed out that a tendency to bleed, especially concurrent DIC, is a big trigger for subdural hematoma (1). Tasaki et al. (15) also examined the presence or absence of tumor embolism in the dura as well as blood coagulation impairment in patients with dural metastasis, indicating that 70% of these patients had tumor embolism and half of when also had blood coagulation impairment. The initial symptom noted in our two patients was lightheadedness. One patient had a decreased level of consciousness (JCS III-100) 3 days later, while the other had mild impairment of consciousness (JCS I-2) concurrently with the onset of DIC. Hashiguchi et al. (9) summarized the reported cases, and reported that consciousness impairment developed within 7 days after the onset of the initial symptom such as headache at a frequency of 73%. They suggested that progressive intracranial hypertension was considered a possible cause (9). In our two patients, the accumulated fluid spouted during emergency burr hole irrigation and increased intracranial pressure was noted. In
these patients, the level of consciousness improved to an extent where the patients were able to have a conversation with their family after operation. Left hemiplegia resolved in one patient. Although an article stated that one such patient was able to intake food (9), our patients required second surgery due to another decreased level of consciousness and persistent bleeding from the subdural hematoma.

It has been reported that subdural hematoma associated with dural metastasis causes a mortality rate of 69% within 3 weeks (9). In patients with such subdural hematoma, the anticipated life expectancy at the time of diagnosis is obviously shorter than those with metastasis of gastric cancer to the meninges (16) and others, in which the effectiveness of intramedullary infusion of anticancer drugs has been reported. Treatments of subdural hematoma, especially surgical treatment, have been controversial, and it is considered that surgery should be indicated on an exact basis in patients with a tendency to bleed (17). Our two patients died within a short period of time, i.e. 13 and 14 days after the initial surgery, respectively. Kinjo et al. (5) reported their patients responded to conservative therapy with mannitol or steroids. Therefore, therapy should focus on the prolongation of meaningful survival.

Conclusion

We treated two patients with subdural hematoma associated with the synchronous or metachronous dural metastasis of gastric cancer. Gastric cancer, which was the primary tumor associated with the disease, is highly malignant and its prognosis is very poor. When treating the disease, treatment should be performed focusing on the prolongation of meaningful survival.

References


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