Subdural Hematoma Associated with Skull and Dural Metastasis of Gastric Carcinoma: A Case Report

Gastrik Karsinomun Kafatası ve Dural Metastazıyla İlişkili Subdural Hematom: Bir Olgu Sunumu

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ABSTRACT
Skull bone metastasis from the gastric cancer is rare. We reported a 52-year-old male proven to have stomach cancer and who underwent subtotal gastrectomy 5 months previously. Within the past 2 weeks, he experienced headache and dizziness followed by weakness of the left lower limb. A diagnosis of right chronic subdural hematoma (SDH) was made, and a burr hole was performed for drainage of the hematoma. However, 5 days later, the patient had sudden loss of consciousness without external evidence of trauma to the head. An emergency computed tomography (CT) scan revealed a high-density lesion consistent with an acute SDH on the right side. Histologically, metastasis of gastric adenocarcinoma was detected in both the dura mater and skull. It is suggested that the SDH was caused by the rupture of vessels in the metastasis or rupture of the inner dural vessels, possibly resulting from congestion of the outer vessels.

KEYWORDS: Gastric carcinoma, Calvarial metastasis, Dural metastasis, Subdural hematomas

INTRODUCTION
Metastases to the dura mater constitute one of the least frequent and least studied patterns of neoplastic spread to the craniocervical axis (5). Rarer still is the occurrence of subdural hematomas (SDHs) associated with the dural metastasis of a malignant tumor (8). Here, we report a case of a subdural hematoma caused by tumor located on the skull bone and dura mater. Furthermore, we review here the proposed mechanisms of induction of subdural hematoma with calvarial and dural metastatic neoplasm in the light of analysis of our own patient.

CASE REPORT
A 52-year-old male has a history of adenocarcinoma of the stomach and underwent subtotal gastrectomy, Roux-en-Y gastrojejunostomy anastomosis, cholecystectomy, and D2 lymph node dissection. The resected specimen showed type IV advanced cancer at the pylorus. It was histopathologically classified as adenocarcinoma with signet-ring cell differentiation, which invaded to deep muscle and the serosal layer. Lymphovascular space invasion was noted. Postoperative adjuvant chemotherapy was administered using oral tegafur/gimeracil/oteracil, and follow-up computed tomography (CT) of the abdomen revealed no recurrence.

During November 2009, he began suffering from occasional headache and dizziness. Later he had weakness of the left lower limb. The brain CT revealed a chronic subdural hematoma along the right cerebral convexity which caused mass effect with left-sided cerebral midline shift and mild uncal herniation (Figure 1). He was hemiplegic on the left side and had hyperesthesia along the left trunk. Prothrombin time and partial thromboplastin time were normal. He was diagnosed with right chronic SDH, and a burr hole was performed for evacuation of the hematoma. During the operation, the chronic SDH was drained and irrigated with warm normal saline until the effluent was clear. Biopsies of dural mater and skull bone were carried out. After the operation, weakness of left limbs improved gradually and...
the JP drain was removed smoothly. However, 5 days later, the patient had a sudden change in consciousness. On examination, the Glasgow coma scale (GCS) score was 5. Both pupils were dilated (right, 7 mm; left, 5 mm) and nonreactive to light. There was no external evidence of trauma to the head. Emergent brain CT scans revealed an acute SDH along the right cerebral convexity which caused uncal herniation with upper brainstem compression (Figure 2). Subsequently, a large acute SDH was evacuated through a right frontoparietal craniectomy. The skull bone and underlying dura mater were excised for histological examination. After the operation, slow neurological recovery was noted; however, left hemiplegia persisted. Three days later, severe gastrointestinal hemorrhage flared up. Upper gastrointestinal endoscopy was performed and it revealed two huge ulcerative masses with multiple bleeding sites. Microscopically, the sections showed a picture of some solid tumor cell nests with focally glandular differentiation infiltrated in bony and dural fragments (Figure 3 A,B). Histologically, metastasis of adenocarcinoma was detected in the dura mater and skull, which was quite similar to the gastric endoscopic biopsy specimens. The

Figure 1: Computed tomographic scan of head reveals a right chronic subdural hematoma with midline shift to the left side.

Figure 2: Computed tomographic examination of head shows high-density lesions on the right side consistent with an acute subdural hemorrhage; there is considerable midline displacement and uncal herniation.

Figure 3: The results of skull bone biopsy shows some solid tumor cell nests (shown by an arrow head) with focal glandular differentiation infiltrated in bony fragments (A), while immunohistochemical staining was cytokeratin (CK)-positive for adenocarcinoma (shown by an arrow head) (B) (× 400 original magnification).
diagnosis of recurrent gastric carcinoma with metastasis of adenocarcinoma of the dura mater and skull was made, and conservative treatment was provided. His general condition progressively deteriorated and he died 14 days after the operation from the complication of acute disseminated intravascular coagulopathy (DIC).

**DISCUSSION**

Metastatic bone disease can originate from almost any malignancy, but the most common primary foci are breast and prostate cancer (3). Skull metastasis demonstrates the same characteristic. In the past literatures, skull metastasis from stomach cancer demonstrates one of the least frequent incidences (15). The mechanism of the peculiar metastasis in these cases is difficult to elucidate. Multiple metastases were found at the terminals of branches of the external carotid artery, so the usual hematogenous circulation is the most likely (3, 9). Nevertheless, in our case, the skull metastasis was located at the right calvarias and directly invaded to the dura. This mode of tumor spread to the dura has been seen with lung, cerebral, prostatic, and breast carcinomas (9). In breast carcinomas such bone-to-dura spread has been hypothesized by Tsukada et al to arise from dissemination of tumor cells from bony metastases with retrograde reflux of tumor cells into veins and venous plexus and subsequently into the dura. It often results in carcinomatous meningitis, multiple cranial nerve palsies and non-obstructive hydrocephalus (13). Worth of being noted, our case manifested as subdural hematomas. This association of bone metastastic disease with a SDH is a rare event, occurring with a frequency of only 0.4 to 5% in autopsy studies of metastatic neoplasms involving the intracranial compartment (8, 11). The most widely accepted explanation is the theory of Russel et al. which suggests that tumor emboli occlude the dural veins without bone-based metastases, thereby causing the dilation and breakdown of capillary vessels, resulting in chronic SDH (1, 4, 12). Furthermore, an angioodesmoplastic response to the dural metastasis would cause chronic subdural hematoma (7). However, prostate cancer with bone-based metastases and secondary dural involvement has been reported to be associated with SDH (2). We suspected that the calvarial metastatic deposit, in the course of time, may have eroded the inner table and dura mater. During the process of erosion of the dura, meningeal vessels may rupture into subdural space causing an acute SDH (14). The clinical progression in such instances may be rapid and dramatic (6). The neurological status may deteriorate into a syndrome of uncal herniation within minutes to hours (10). Therefore, 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 and others. 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 (1).

**CONCLUSION**

Primary gastric cancer presenting with concomitant skull bone and dural metastasis resulting in subdural hemorrhage has rarely reported before in the literature. It is highly malignant and its prognosis is very poor. We stress the importance of early postoperative CT scanning and avoidance of coagulopathy or thrombocytopenia triggered by the surgical therapy-associated consumption to minimize the occurrence of a large acute subdural hemorrhage.

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