

Case Report

Added Diagnostic Value of Cerebrospinal Fluid Carcinoembryonic Antigen in a Patient with Leptomeningeal Carcinomatosis as the Initial Manifestation of Gastric Cancer

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A 77-year-old woman with no history of malignancy presented with anorexia and bilateral lower extremity weakness. Her consciousness level worsened daily, so we performed a lumbar puncture. Cerebrospinal fluid (CSF) analysis indicated meningitis, but three rounds of CSF cytology showed no malignant cells. The patient's carcinoembryonic antigen (CEA) level was highly elevated in CSF, but normal in serum. Through gadolinium-enhanced brain/spinal magnetic resonance imaging and gastrointestinal endoscopy, she was diagnosed with leptomeningeal carcinomatosis (LC) from gastric cancer. CEA level in CSF facilitated the diagnosis of LC from gastric cancer because there were no malignant cells on CSF cytology.

Keywords: leptomeningeal carcinomatosis, gastric cancer, carcinoembryonic antigen, cerebrospinal fluid cytology

Leptomeningeal carcinomatosis (LC) is the multifocal spreading of malignant tumour cells along the meninges. LC occurs in 5% of all patients diagnosed with cancer, but rarely in patients with gastric cancer [1, 2]. Almost all patients with LC have already been diagnosed with advanced cancers with distant metastases and present neurological symptoms, such as cranial nerve palsies, headache, psychiatric symptoms, quadriplegia, nausea, and vomiting [3]. Although the cytologic examination of cerebral spinal fluid (CSF) is the gold standard for the diagnosis of LC, its sensitivity reaches only 90%, even after repeated tests [4]. Several reports have shown the utility of tumour marker levels in CSF to diagnose LC in patients with cancer, compared with the cytologic examination of CSF [5-7].

Here, we report a patient with LC as an initial symptom of gastric cancer. Her carcinoembryonic antigen (CEA) level in CSF facilitated the LC diagnosis because no malignant cells were found in a total of three rounds of CSF cytologic examination.

Case Description

A 77-year-old woman who had suffered from anorexia for 3 weeks and bilateral lower extremity weakness for a few days was admitted to our hospital. She presented with general malaise, mild posterior neck pain, and gait disturbance, but had no headache or digestive symptoms. Her consciousness was clear, and her vital signs included a body temperature of 36.7°C, blood pressure of 189/95 mmHg, pulse rate of 73/min,

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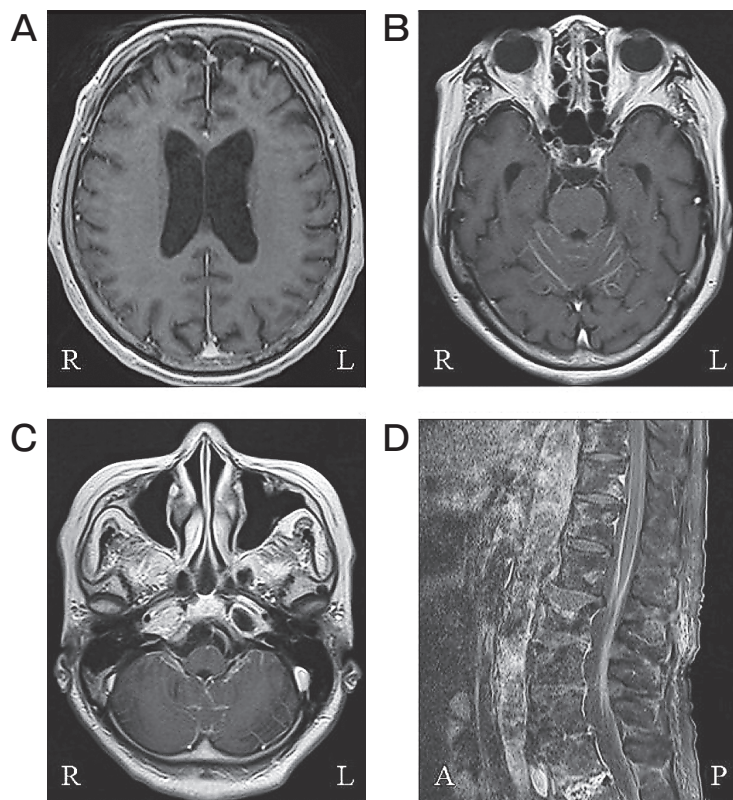


Fig. 1 Gadolinium-enhanced T1-weighted MRI showing diffuse leptomeningeal contrast enhancement following the cortical surface of the cerebrum (A), the cerebellar folia (B), the ventral surface of the brainstem (C), and linear or nodular enhancement along the surface of the spinal cord and cauda equina (D).

and respiratory rate of 16/min. She had no neck stiffness or sensory neurologic deficits. Manual muscle testing showed mild quadriceps and iliopsoas weakness. Her abdomen was flat and soft, and no tenderness was found. Her serum CEA level was 2.9 ng/mL. Whole-body computed tomography and brain spinal magnetic resonance imaging (MRI) without contrast showed no specific findings, including hydrocephalus. Her level of consciousness worsened daily and we therefore performed a lumbar puncture. Her CSF opening pressure was 17 cm H₂O. CSF analysis revealed nine mononuclear and four polynuclear cells/ μ L, a glucose level of 27 mg/dL (CSF-blood glucose ratio: 0.18), and a total protein value of 261 mg/dL, indicating meningitis. CSF gram staining was negative, a total of three rounds of CSF cytology showed no malignant cells, and her CSF CEA level was highly elevated at 117.1 ng/mL. Gadolinium-enhanced T1-weighted MRI showed diffuse leptomeningeal contrast enhancement following the cortical surface of the cerebrum, the cerebellar folia, and the ventral surface of the brainstem, as well as linear and nodular enhancement along the surface of the spinal cord and cauda equina, indicating LC (Fig. 1).

The patient's bilateral lower extremity muscle weakness was considered to be due to a lesion in the spinal pyramidal tract. When exploring the primary site, a gastric tumor was found by gastrointestinal endoscopy and histologically diagnosed as human epidermal growth factor receptor 2 (HER2)-negative poorly differentiated adenocarcinoma (Fig. 2). The patient's level of consciousness deteriorated rapidly, and she died 25 days after admission.

Discussion

We experienced a patient with LC as an initial symptom of gastric cancer, and her CEA levels in CSF facilitated the diagnosis of gastric LC. To the best of our knowledge, this is the first report on the utility of CEA levels in CSF for the diagnosis of gastric LC in a patient with no malignant cells on cytologic examination of CSF and normal serum CEA levels.

LC rarely develops as an initial symptom of gastric cancer. It occurs in approximately 8% of patients with solid cancers [1], but in only 0.17-0.69% of patients with gastric cancer [2], and the majority of patients

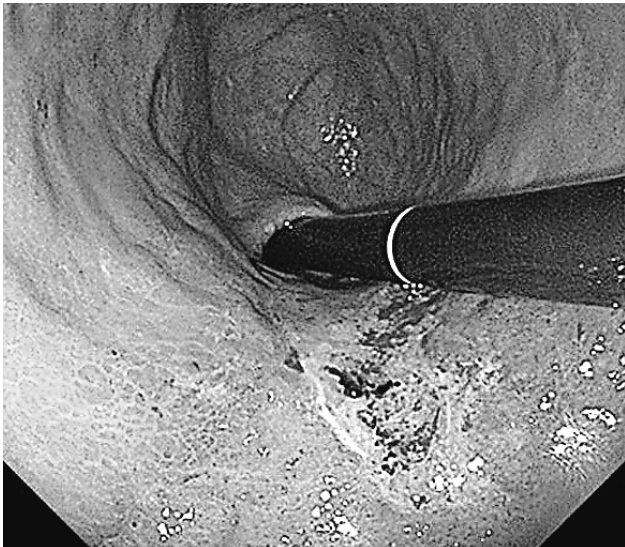


Fig. 2 Gastrointestinal endoscopy showing advanced gastric cancer.

with LC have already been diagnosed with advanced cancers with distant metastases [3]. The most frequent symptoms of LC include cranial nerve palsies (75%), headache (66%), psychiatric symptoms (45%), quadriplegia (44%), and nausea and vomiting (20%) [2]. Although there have been previous case reports in which LC was an initial symptom of gastric cancer, the patients in these reports had certain neurological symptoms [8,9]. Because our patient presented with only mild symptoms and had no history of malignancy, we did not initially consider the possibility of LC. A previous report found that brain metastasis is frequent in breast cancer patients with HER2-positive or triple-negative disease, and the patients with triple-negative disease had the worst prognosis [10]. Therefore, HER2-negative status in this case might also be associated with a poor prognosis in gastric cancer patients with metastasis to the central nervous system, as triple-negative disease in breast cancer. CEA levels in CSF may contribute to the diagnosis of LC, even if no malignant cells are found on cytologic examination. Although the cytologic examination of CSF is the gold standard for the diagnosis of meningeal carcinomatosis, its sensitivity reaches only 90%, even after repeated tests [4]. A previous study reported the utility of CEA levels in CSF to diagnose meningeal carcinomatosis in patients with cancer, compared with cytologic examination as the gold standard [5]. Our patients showed no malignant cells in a total of 3 rounds of CSF cyto-

logic examination but showed elevated CEA levels in CSF and normal serum CEA levels. Therefore, the measurement of CEA levels in CSF, in addition to a cytologic examination, may improve sensitivity for diagnosing LC.

In conclusion, it is uncommon to consider the possibility of LC in patients who present mild symptoms and have no history of malignancy. However, CEA levels in CSF with cytologic examination may be helpful in diagnosing gastric LC, despite a lack of malignant cells on cytologic examination of CSF and normal serum CEA levels.

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