

Case report

Meningeal carcinomatosis presenting with leukoencephalopathy-like imaging findings



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ABSTRACT

Meningeal carcinomatosis is a unique and rare form of metastasis observed in patients with malignant tumours. Diagnosis is simple when the primary lesion of the malignant tumour is clear, and when multiple miliary lesions are confirmed via cranial contrast MRI; however, many patients exhibit atypical imaging findings. In the present report, we discuss the case of a 72-year-old man who presented with subacute consciousness impairment and MRI findings suggestive of progressive, bilateral leukoencephalopathy-like lesions around the ventricles. Idiopathic hydrocephalus was initially suspected due to increased cerebrospinal fluid (CSF) pressure accompanied by normal cell counts. Although the patient underwent a ventriculoperitoneal shunt operation, his symptoms did not improve. Whole-body CT revealed findings suggestive of adenocarcinoma in the left lung. Paraneoplastic syndrome was suspected, and he was treated with three courses of high-dose intravenous methylprednisolone. However, his neurological symptoms did not improve, and he died 2 months after admission. The patient was ultimately diagnosed with meningeal carcinomatosis due to lung adenocarcinoma upon autopsy. In this case, we suspected that the white matter lesions observed on MRI resulted from secondary hydrocephalus due to obstruction of the CSF circulation. This is the first reported case of progressive leukoencephalopathy-like imaging findings in a patient with meningeal carcinomatosis.

1. Introduction

Meningeal carcinomatosis, also known as carcinomatous encephalitis or miliary brain metastasis, is a unique and rare form of metastasis observed in patients with malignant tumours [1]. Diagnosis is simple when the primary lesion of the malignant tumour is clear, and when multiple miliary lesions are confirmed via cranial contrast MRI; however, many patients exhibit atypical imaging findings [2]. In the present report, we discuss the case of a patient whose primary symptom was subacute impaired consciousness. Although meningeal carcinomatosis due to lung adenocarcinoma was ultimately diagnosed at autopsy, imaging revealed seemingly progressive leukoencephalopathy-

like lesions.

2. Case

A 72-year-old man presented with chief concerns of confusion and progressive gait disorder. Nine years earlier, the patient underwent cranial MRI for headache at a different hospital. However, as no abnormalities were detected, he was diagnosed with tension headache, which naturally receded (Fig. 1A). Gait disturbances began to manifest 3 months prior to his initial visit. One month prior to the initial visit, he was hospitalized due to deteriorating ambulatory function, nonsensical speech, and easy irritability.

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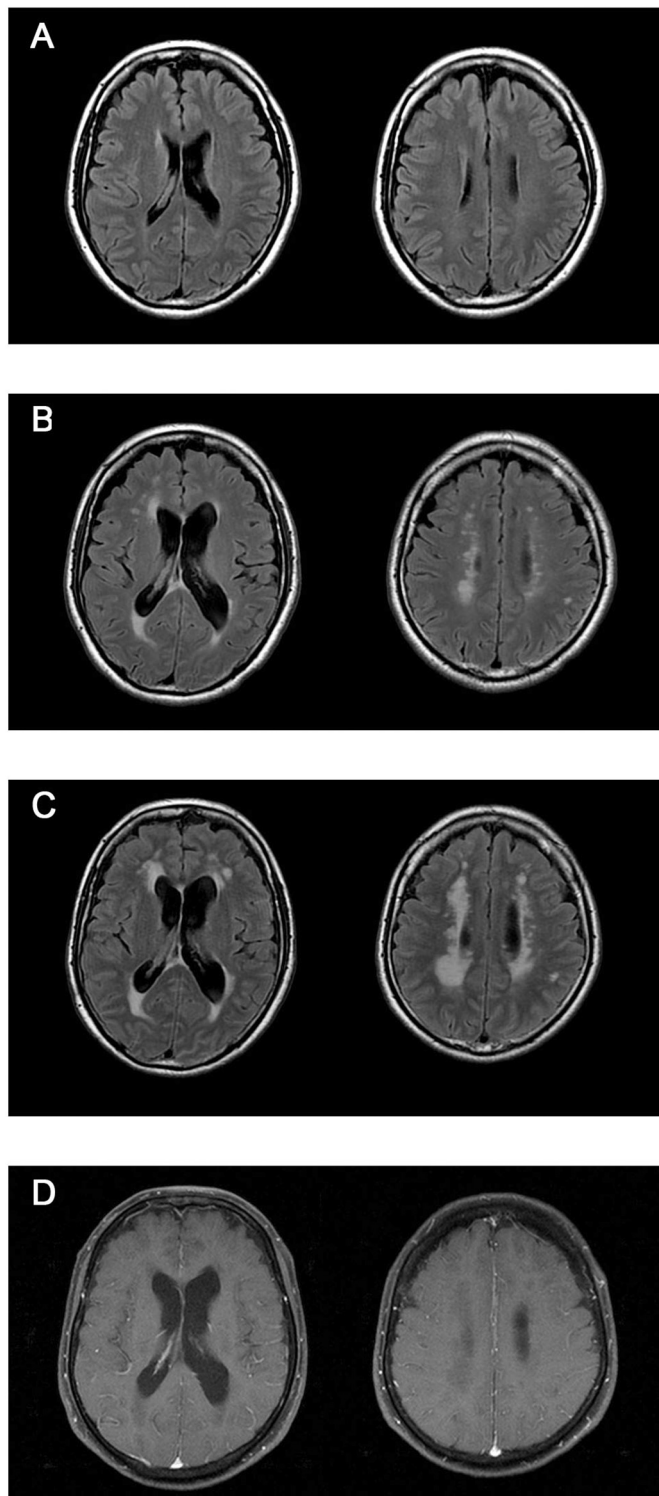


Fig. 1. Cranial MRI scans at different time points. A. No major abnormalities were observed on fluid-attenuated inversion recovery (FLAIR) images obtained 9 years prior to admission. B. Three months prior to admission, hyperintense lesions appeared in the region surrounding the lateral ventricles. C. Enlargement of the lesions surrounding the cerebral ventricles was observed at the time of the patient's admission, along with increases in ventricle size. D. No abnormalities were detected on contrast-enhanced MR images.

Upon admission, the patient appeared agitated and confused: He could not accurately state his own medical history and began to walk in his will.

Blood counts and biochemical findings were normal. Tests for serum HIV antibodies, HTLV-1 antibodies, and syphilis were negative. Initial cerebrospinal fluid (CSF) pressure was elevated (34 cmH₂O), while CSF protein, glucose, and cell count values were 21 mg/dl, 64 mg/dl, and 2/mm³, respectively. Bacterial, fungal, and tuberculosis cultures were negative, as were PCR findings for herpes virus and John Cunningham (JC virus). CSF cytology was regarded as class I.

High-signal areas were observed around the lateral ventricles on cranial fluid-attenuated inversion recovery (FLAIR) images (Fig. 1C). However, no such lesions were observed on gadolinium-enhanced images (Fig. 1D). Enlargement of the bilateral cerebral ventricles was observed, relative to the cranial MRI obtained 9 years earlier (Fig. 1A and C). Relative to the cranial MRI obtained 3 months prior to admission, the patient's most recent images revealed enlargement of the high-intensity lesions surrounding the lateral ventricles (Fig. 1B and C).

The patient was diagnosed with hydrocephalus due to bilateral lateral ventricle enlargement (Fig. 1C) and increased CSF pressure. Although he underwent ventriculoperitoneal shunt surgery 2 weeks later, his symptoms did not improve, and his overall physical condition had deteriorated. Whole-body CT findings were suggestive of lung adenocarcinoma in the S1 area of the left lung (Fig. 2A). Due to the patient's poor physical status, further testing of the lung adenocarcinoma could not be conducted. Paraneoplastic syndrome was suspected. The patient was treated with three courses of high-dose intravenous methylprednisolone. However, his neurological symptoms did not improve, and he died 2 months after admission.

Autopsy revealed a nodular lesion in the left upper lung (Fig. 3A), and lung adenocarcinoma was confirmed via light microscopy (Fig. 3B). Brain weight was 1410 g, and the cerebral pia mater was clouded. We also observed infiltration of cancer cells into the pia mater and Virchow-Robin space, along with partial microscopic metastasis into the cortex (Fig. 3C). Decreased myelin staining and axonal loss were observed in the white matter, although no infiltration of cancer cells had occurred (Fig. 3D). Based on these findings, the patient was diagnosed with meningeal carcinomatosis due to lung adenocarcinoma.

3. Discussion

Contrast MRI is useful for diagnostic imaging in patients with meningeal carcinomatosis. Typically, multiple lesions are observed on T2-weighted images, and gadolinium-enhanced images of the affected regions are used to confirm the diagnosis [2]. However, in patients with atypical imaging findings, diagnosis becomes extremely difficult. Previous reports have described cases in which simple cranial MRI revealed no abnormalities, despite the presence of multiple metastatic lesions on contrast MRI [3]. Conversely, other reports have described cases in which abnormalities were observed on simple T2-weighted images only [4]. Moreover, some reports have demonstrated that abnormalities need not be present on cranial MRI, in which case diagnoses can only be verified via autopsy [5].

Enlargement of the white matter lesions surrounding the lateral ventricles was considered to have occurred due to hydrocephalus, as the autopsy did not reveal direct infiltration of the lung adenocarcinoma into the white matter (Fig. 3D). Indeed, previous reports have indicated that both enlargement of the lateral ventricles and high T2 and FLAIR signals in the white matter surrounding the lateral ventricles can be observed on cranial MRI in patients with hydrocephalus [6].

In the present case, the patient was ultimately diagnosed with meningeal carcinomatosis due to lung adenocarcinoma upon autopsy. Cranial MR images were obtained prior to onset, enabling us to observe increases in the extent of white matter lesions around the ventricles over time (Fig. 1). Notably, no previous reports have described leukoencephalopathy-like imaging findings in a patient with meningeal carcinomatosis. As such, this case is of critical instructional value for oncologists and other clinicians.

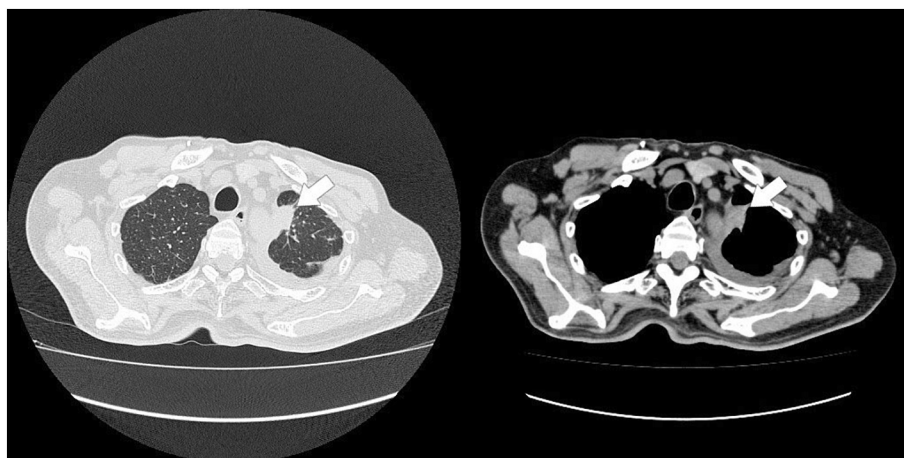


Fig. 2. Chest CT after several days of hospitalization revealed a tumour shadow in the left S1 region (arrow), as well as accumulation of pleural fluid.

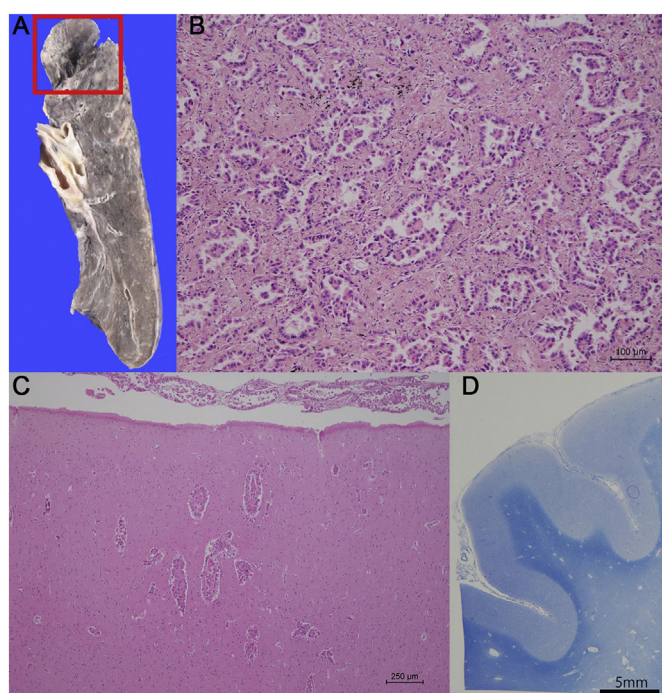


Fig. 3. Pathological findings. A. 5 × 20 × 15-mm nodular lesion with irregular edges was observed directly below the pleura in left upper lobe (square). B. Light microscopy revealed an adenocarcinoma displaying papillary and acinar proliferation. C. Infiltration of tumour cells into the pia mater and Virchow-Robin spaces. Microscopic metastases in the cortex (haematoxylin & eosin staining). D. Decreased staining intensity of the pia mater in the white matter (Klüver-Barrera staining).

Conflicts of interest

The authors declare that there is no conflict of interest.

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