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Brain metastasis from a lung mucoepidermoid carcinoma mimicking a brain abscess

Taiichi Saito[1,3], Hiroshi Ujiie[1], Shigeru Kadoyama[1], Takashi Higa[1], Saori Shiono[2], Akira Teramoto[1]

[1]Departments of Neurosurgery and [2]Pathology, Tokyo Rosai Hospital, Tokyo, Japan, [3]Department of Neurosurgery, Tokyo Women's Medical University, Tokyo, Japan

E-mail: *Taiichi Saito - taiichis@gmail.com; Hiroshi Ujiie - huji@tokyoh.rofuku.go.jp; Shigeru Kadoyama - shigekado@gmail.com; Takashi Higa - thiga@tokyoh.rofuku.go.jp; Saori Shiono - s7293@juntendo.ac.jp; Akira Teramoto - a-tera@nms.ac.jp
*Corresponding author

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Abstract

Background: Mucoepidermoid carcinoma (MEC) is a rare tumor of the lung that accounts for 0.1–0.2% of all pulmonary tumors. To the best of our knowledge, brain metastasis from lung MEC is rare and magnetic resonance imaging (MRI) findings of this lesion have not been documented.

Case Description: We herein report the case of a 72-year-old male. MRI revealed a left parietal tumor showing ring enhancement with medium gadolinium contrast and an evident high intensity area in the nonenhanced central portion on diffusion-weighted images (DWI) mimicking a brain abscess. Histologically, MEC is composed of a mixture of different cell types including mucin-secreting glandular cells and squamous cells. Accordingly, we suggest that the high DWI signal can be explained by the development of intracellular and intraluminal mucin, which have a high viscosity.

Conclusion: Further accumulation of cases with brain metastasis from MEC is needed to establish the characteristic image findings, which would lead to prompt and adequate treatment.

Key Words: Brain metastasis, brain abscess, diffusion-weighted images, mucoepidermoid carcinoma

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INTRODUCTION

Mucoepidermoid carcinoma (MEC) is not common in the lungs, accounting for only 0.1–0.2% of primary lung cancers.[8] We present a rare case with brain metastasis from a lung MEC in the left parietal lobe. To the best of our knowledge, brain metastasis from lung MEC is rare, and magnetic resonance imaging (MRI) findings of this lesion have not been documented. Brain metastases should be differentiated from glioblastoma and brain abscess. Generally, on diffusion-weighted images (DWI), the central content of brain abscess usually shows high intensity reflecting high viscosity, and this sequence is useful to differentiate brain abscess from other tumors.[1,3] Meanwhile, it is rare that the central content of brain metastasis without gadolinium contrast enhancement indicating mixed tumor and necrotic tissues show high intensity on DWI.[9] In the present case, the central part of the tumor showed marked high intensity on DWI, mimicking a brain abscess. We examined the correlation between the MRI findings and pathology in the present case.

CASE REPORT

A 72-year-old male presented with numbness and slight motor weakness in the right upper and lower limbs. He also had finger agnosia, acalculia, and agraphia. He had smoked one pack of cigarette a day for 40 years. He did not have fever or leukocytosis (5900/μl), but his C-reactive protein level was slightly elevated (1.25 mg/dl). He was pointed out to have a 3 cm left parietal mass lesion on MRI. The outer part of the tumor showed an iso intensity area on T1-weighted images (T1WI) and T2-weighted images (T2WI), while the central part showed a low intensity area on T1WI and a high intensity area on T2WI [Figure 1a and b].

The tumor was accompanied by wide perifocal edema on T2WI [Figure 1b]. It had ring enhancement with gadolinium contrast medium on T1WI [Figure 1c]. In addition, the central part of the tumor without gadolinium contrast enhancement exhibited a marked high intensity area on DWI (b = 1000 s/mm^2) [Figure 1d], and the mean apparent diffusion coefficient (ADC) value of the central part was low (0.85/10^3 mm^2/s). The lesion was first suspected as brain abscess, based on the MRI findings. However, on chest computed tomography (CT), he had a 4 cm mass lesion in the right middle lobe of the lung and enlargement of the right hilar lymph node. On proton magnetic resonance spectroscopy, elevated lipid and lactate peaks, but no abnormal signals for amino acids were identified [Figure 1e]. The choline peak was markedly elevated compared with the creatine peak. Consequently, we included brain metastasis in the differential diagnosis.

The patient underwent the removal surgery under general anesthesia. After left parietal craniotomy, we first made a test puncture into the mass lesion from the cortex of the left superior parietal lobule under ultrasonic guidance. We could not aspirate pus from the lesion, and thus ruled out a brain abscess. The tumor margin was demarcated, and the lesion was removed completely. The tumor was totally removed on postoperative MRI [Figure 1f]. After the operation, the patient's numbness, motor weakness, and higher brain dysfunction gradually improved. The patient underwent biopsy of the lung tumor with bronchoscopic examination 7 days after brain surgery in the Department of Respiratory Medicine. A sequence of pathological examinations of the brain and lung lesions confirmed the presence of brain metastasis arising from the right lung MEC. The tumor had both necrotic and solid growth areas. The tumor cells were predominantly arranged in sheets and smaller nests. The solid areas were composed

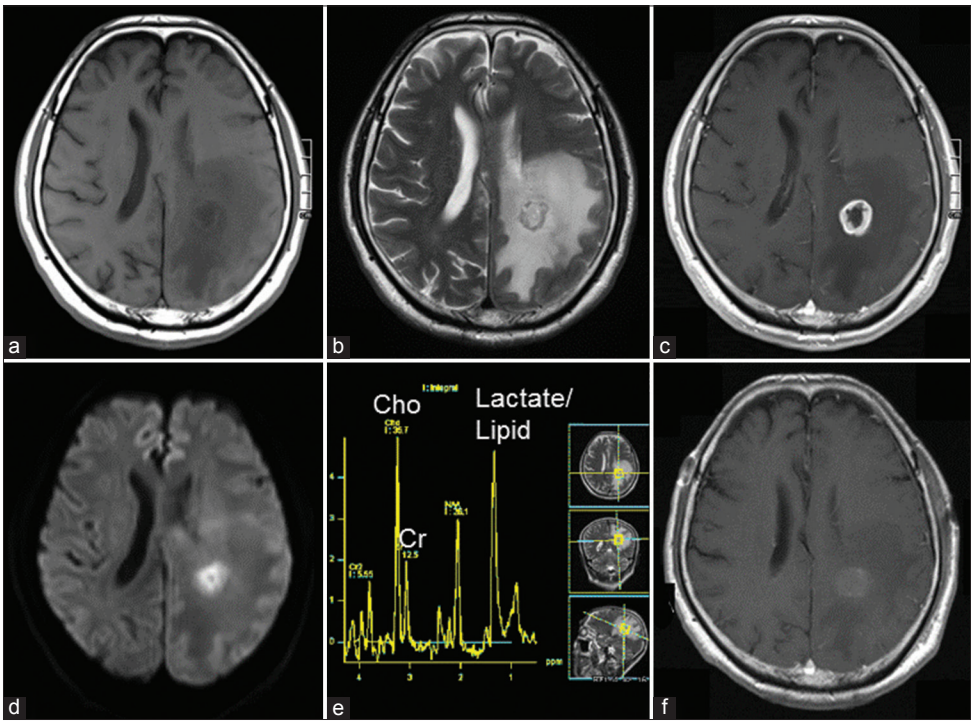

Figure 1: (a-e) MR images before the surgery demonstrating a tumor in the left parietal lobe. (a) The outer part of the tumor showed iso intensity, and the central part showed a low intensity area on T1-weighted imaging (T1WI). (b) The outer part of the tumor showed iso intensity, and the central part showed a high intensity area on T2-weighted imaging (T2WI). (c) The tumor had ring enhancement with gadolinium contrast medium on T1WI. (d) The central part of the tumor had a markedly high intensity area on diffusion-weighted imaging (DWI) (b = 1000 s/mm2). (e) On proton magnetic resonance spectroscopy, elevated lipid and lactate peaks were recognized. The choline peak was markedly elevated compared to the creatine peak. Cho: Choline. Cr: Creatine. (f) The tumor was confirmed to have been totally removed by postoperative MRI

of squamous epithelial, mucus-producing glandular and intermediate cells [Figure 2a]. Periodic acid schiff (PAS) staining revealed strong mucin positivity within the cytoplasm and intraluminal mucus [Figure 2b and c]. Immunohistochemical staining of p40 showed nuclear positivity for the squamous cell component [Figure 2d].

DISCUSSION

We experienced a rare case of brain metastasis from lung MEC, which was difficult to differentiate from a brain abscess preoperatively, because this tumor showed an evident high intensity area in the central portion on DWI, which was not enhanced with gadolinium contrast medium. MEC is a rare tumor of the lungs arising from bronchial glands.[8] Distant metastasis and lymph-node metastasis were reported in 15–35% of cases with MEC. Histologically, MEC is comprised of a mixture of different cell types, including mucin-secreting glandular cells and squamous cells. PAS staining in the present case revealed strong mucin positivity within the cytoplasm and intraluminal mucus. A few prior reports presented cases with brain metastasis from a lung MEC.[10,11] Hayashida *et al.* assessed conventional MR images, DWI, and ADC maps of 26 metastatic brain tumors including a lung MEC.[6] However, they did not report detail MRI findings of brain metastasis from a lung MEC. Additionally, they did not assess the central nonenhancing portion of brain tumors.

The differential diagnosis of metastasis from a brain abscess can be difficult with a conventional MRI study.

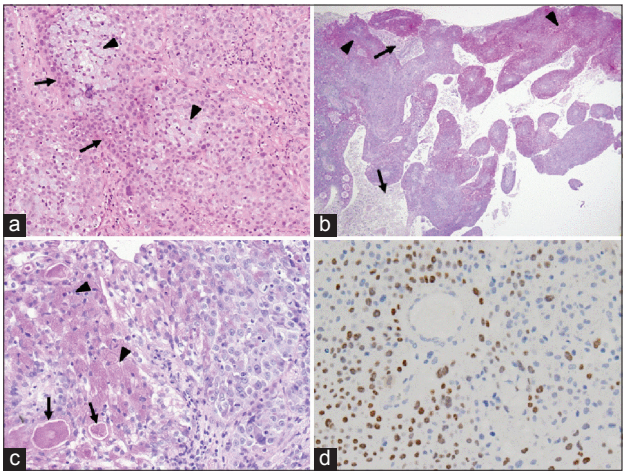

Figure 2: (a) Hematoxylin and eosin staining (×100). The tumor cells were predominantly arranged in sheets and small nests. The solid areas were composed of squamous epithelial (arrows), mucus-producing glandular (arrow heads) and intermediate cells. (b) PAS staining showed that the tumor had both necrotic (arrows) and solid mucin-positive areas (arrow heads) (×40). (c) PAS staining showed strong mucin positivity within the cytoplasm and intraluminal mucus (arrows) (×200). (d) Immunohistochemical staining of p40 showed nuclear positivity for the squamous cell component (×200)

This is especially true in cases of suspected brain abscess, for which an immediate correct diagnosis is necessary to allow for prompt, adequate treatment, including the drainage of the central contents and administration of antibiotics. In prior reports, DWI and ADC values have been suggested to be useful for the differential diagnosis between abscesses and cystic or necrotic tumors.[1,3] High intensity on DWI generally indicates high viscosity or high cellularity, which impede water proton mobility, causing a decrease in the ADC.[3] Recently, Fink *et al.* reviewed the imaging features of MRI common to brain metastases.[4] The metastases tended to demonstrate facilitated diffusion with elevated ADC values, and DWI may also distinguish metastases from brain abscess which demonstrate markedly restricted diffusion reflecting high viscosity in their central nonenhancing portions.[1]

In contrast, Holtas *et al.* reported a brain metastasis from a lung adenocarcinoma with a central high signal on DWI and a low ADC value.[7] Similarly, Hartmann *et al.* reported a metastatic adenocarcinoma with restricted diffusion within an area of necrosis.[5] Their findings suggested that an increased protein concentration in the form of highly viscous mucin might cause restricted diffusion. Recently, Duygulu *et al.* demonstrated cases showing metastasis with restricted diffusion in a larger patient cohort (87 patients).[2] They reported that 15 of these patients (19.7%) showed restricted diffusion. The primary malignancy was lung carcinoma in 10 of these cases (66.6%) (5 small cell carcinomas and 5 nonsmall cell carcinomas) and breast carcinoma in 3 cases (20%). However, this rate of 19.7% is a much higher proportion than our experience. To the best of our knowledge, there is no report indicating that a brain metastasis from a lung MEC could show a central high signal on DWI. In our case, we suggest that the high DWI signal and low ADC value in the central portion can be explained by the development of intracellular and intraluminal mucin in the viable tumor cells [Figure 2c], which caused high viscosity during the transition to complete necrosis.

In conclusion, brain metastasis from lung MEC is rare, and the MRI findings of these lesions are still unclear. However, our present case indicates that these lesions might show a high intensity area in the central portion on DWI mimicking a brain abscess. Although the incidence is very low, further accumulation of cases with brain metastasis from MEC will be needed to establish the characteristic image findings, which can lead to prompt and adequate treatment.

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