Restricted Diffusion in a Ring-Enhancing Mucoid Metastasis With Histological Confirmation: Case Report

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Abstract: We present a case of restricted diffusion in a ring-enhancing cerebellar metastasis in a 58-year-old man. Diffusion imaging showed restriction with low apparent diffusion coefficient values within the cavity. Diagnosis of abscess was suggested based on radiological findings. A suspicious lung nodule was found in the systemic evaluation, and histological examination of the brain lesion confirmed metastatic adenocarcinoma with mucoid content confirmed by further specific pathological tests. We discuss the reason of diffusion findings and the importance of the correct interpretation of this technique in a clinical situation. Our case confirms previous hypothesis about restricted diffusion related to mucoid content in metastasis.

Key Words: diffusion-weighted imaging, brain metastasis, differential diagnosis, abscess

(*J Comput Assist Tomogr* 2010;34: 770–772)

CASE REPORT

A 58-year-old man presented with sleep disruption and left occipital headaches that improved during the day and worsened with cough. The patient was referred to the radiology department. Unenhanced computed tomography scan showed a left cerebellar low-attenuation lesion with mass effect that compressed the fourth ventricle. Contrast-enhanced magnetic resonance imaging (MRI) demonstrated a ring-enhancing left cerebellar lesion surrounded by edema (Figs. 1 and 2). The central portion of the tumor suggested necrosis and showed restriction in diffusion-weighted imaging (DWI) with low apparent diffusion coefficient (ADC) map values (Fig. 3). Neuroradiological findings supported the diagnosis of a cerebellar abscess.

The patient also underwent full-body computed tomography scan as part of the systemic evaluation looking for a primary tumor. A parahilar nodule of 2.6 cm was found in the right superior lobe of the lung. Clinical and systemic evidence suggested metastasis.

The patient was admitted for surgery. The material extracted during the operation was viscous and macroscopically looked like an abscess. Pathological evaluation (Figs. 4 and 5) showed a lesion composed of a neoplastic proliferation of epithelial cells with marked atypia, hyperchromatic nuclei with prominent nucleoli, eosinophilic cytoplasm, and frequent mitosis. The growth pattern was solid with occasional glandular differentiation. Glands were filled with an amorphous mucoid material, which stained with periodic acid-Schiff stain and Alcian blue, which are specific tests that confirmed the presence of mucinous content.

Inmunohistochemistry showed positive stain for cytokeratin 7 (expressed in cases of breast or lung cancer) and TTF1 (specific marker of lung cancer) and negative stain for cytokeratin 20 (marker of gastrointestinal cancer) and melan-A (melanocyte's specific protein).

DISCUSSION

Differential diagnosis of ring-enhancing central nervous system lesions is troublesome with conventional MRI alone. It includes primary brain tumors (eg, necrotic gliomas), metastasis, abscesses, resolving hematomas, subacute infarctions, and pseudotumoral demyelinating lesions, among others. Diffusion-weighted imaging and ADC have been previously reported to be valuable in the differential diagnosis between abscess and cystic or necrotic brain tumors.[1–3] Diffusion-weighted imaging is highly reliable and practical because of its short duration, especially in the setting of neurological emergencies. For this reason, other techniques that may also be useful such as perfusion or spectroscopy are sometimes not used to solve this diagnostic dilemma.

Nevertheless, our case demonstrated that DWI findings must be interpreted with caution and in the clinical context.

An important issue is to exclude from the diffusion analysis those lesions containing any stage of hemoglobin, because it spoils the signal and eventually leads to misinterpretations. Susceptibility sequences (SWI, T2*, T1) are the best way to detect hemorrhage with MRI and must be included when evaluating mass lesions.

Brain abscesses have high signal on DWI and low ADC map values. The reason for these findings is, in fact, poorly understood. Restricted diffusion might reflect high viscosity of proteinaceous fluid with high concentration of inflammatory cells,[1,3,4] but these conditions are also present in various other brain diseases. On the other hand, most cystic or necrotic tumors have high ADC map values corresponding to facilitated diffusion. This is due to an increase in free water in the cystic or necrotic portion of the tumor.

In our case, the metastatic adenocarcinoma behaved as an abscess. Some authors have reported that the reason for restricted diffusion within a metastasis,[5–8] although unclear and not confirmed, may be an increased protein concentration in the form

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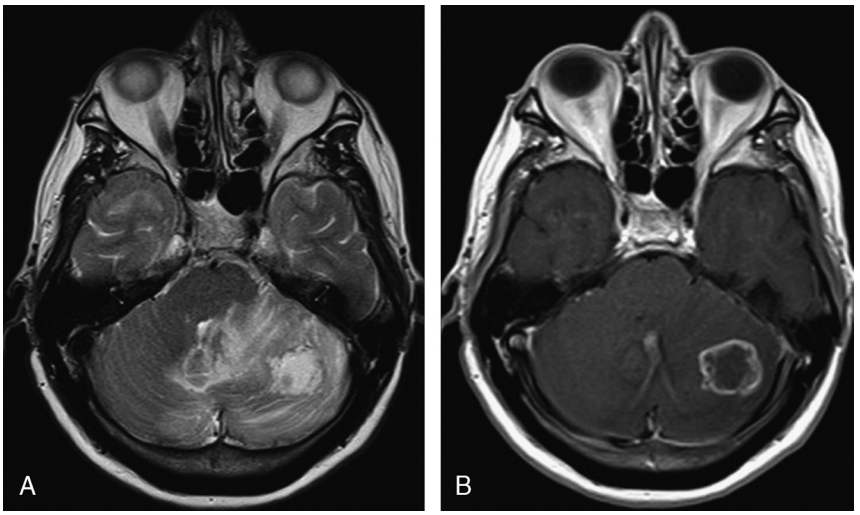

FIGURE 1. A, Axial T2-weighted image shows a hyperintense mass with peripheral edema in the left cerebellar lobe. B, Gadolinium-enhanced T1-weighted image showing ring enhancement of the lesion.

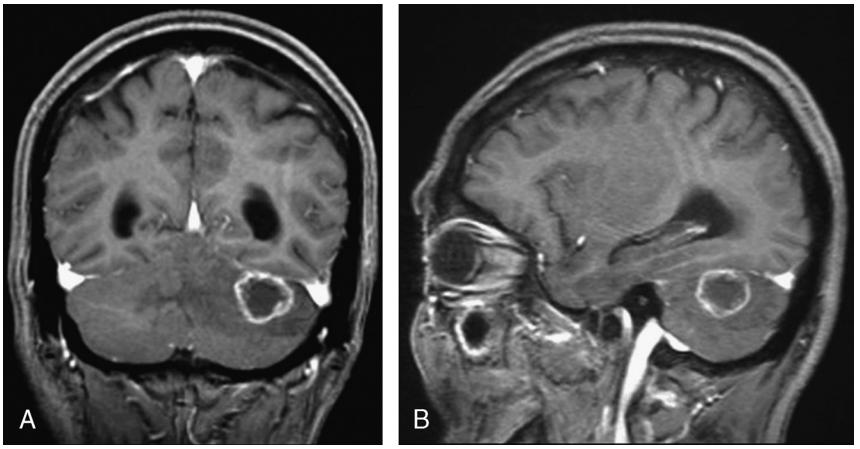

FIGURE 2. Coronal (A) and sagittal (B) contrast-enhanced T1.

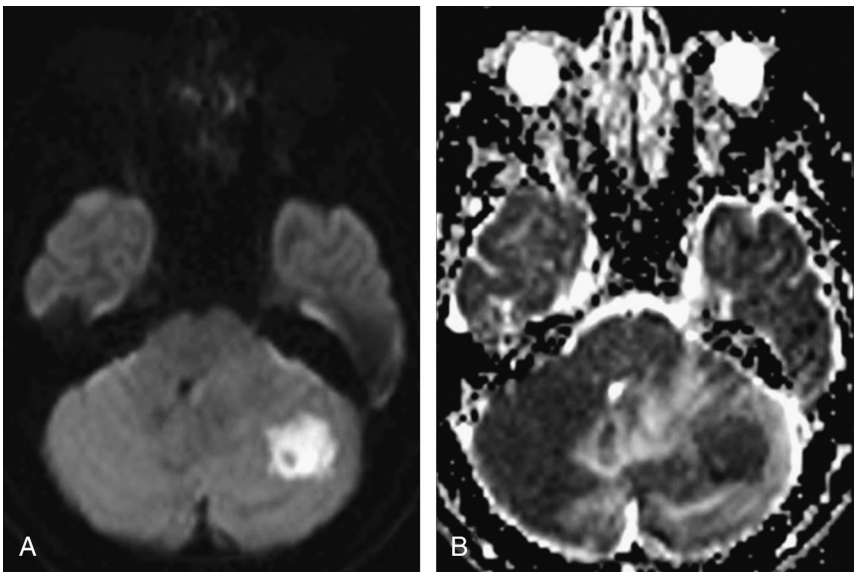

FIGURE 3. A, Diffusion-weighted image shows marked hyperintensity in the central portion of the tumor. B, Apparent diffusion coefficient map reveals low values, indicating restricted diffusion related to the presence of mucin.

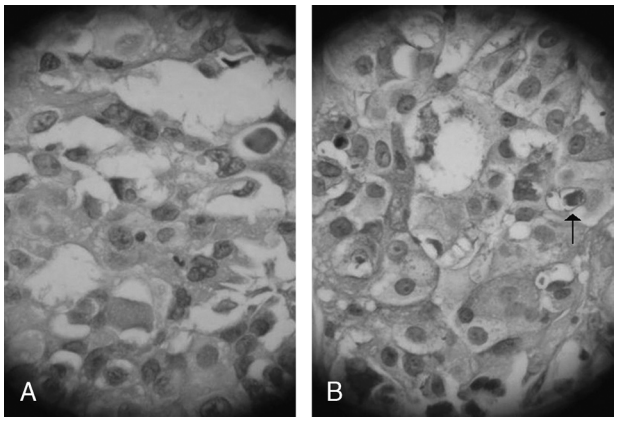

FIGURE 4. A, Hematoxylin-eosin stain (original magnification ×400). Neoplastic proliferation of epithelial cells with marked atypia and hyperchromatic nuclei with spared prominent nucleoli. Solid growth pattern is seen with occasional glandular differentiation. B, Periodic acid-Schiff stain (original magnification ×400)–positive glands are filled with an amorphous mucoid material (arrow).

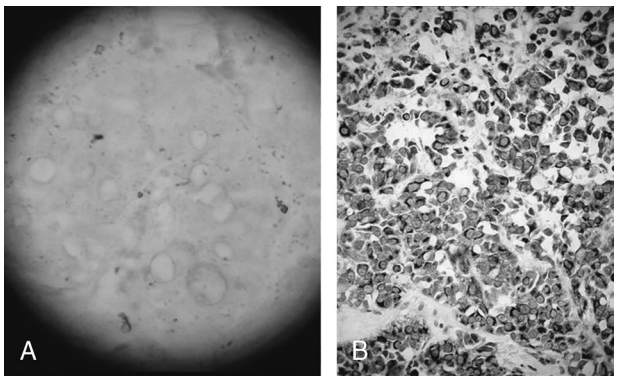

FIGURE 5. A, Positive Alcian blue, showing the presence of mucinous content. B, Positive for TTIF-1, demonstrating the lung origin.

of highly viscous mucin. Other hypotheses include early necrosis with intracellular edema.

To our knowledge, none of the cases reported previously have had a pathological confirmation as in our case. Because of the DWI findings and pathological results, we performed specific pathological tests to prove the presence of mucin.

In conclusion, even when DWI is a highly reliable method to differentiate abscesses from cystic or necrotic tumors in most clinical situations, there are some unusual conditions to be considered to avoid pitfalls, such as metastatic adenocarcinomas with mucinous content. Our results confirm that mucinoid materials containing metastases are responsible for restricted diffusion as much as purulent abscesses. Clinical suspicion related to medical history remains a very important guide.

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