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Case Report

# Pyogenic brain abscess with atypical features resembling glioblastoma in advanced MRI imaging

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ABSTRACT

Differentiation between infectious and neoplastic brain processes is crucial for treatment planning. Advanced magnetic resonance imaging techniques, such as diffusion, perfusion, susceptibility weighted imaging, and magnetic resonance spectroscopy, enhance the imaging differences between these two pathologies. However, despite the utilization of these advanced techniques, the pathologic process may be confound by atypical findings. Here, we report a case of an autistic patient with multiple brain lesions with diffusion weighted imaging, susceptibility weighted imaging, and perfusion patterns resembling features of a multicentric glioblastoma, which were confirmed surgically, neuropathologically, and bacteriologically as brain abscesses. We discuss the differentiation of these different entities in the light of advanced magnetic resonance imaging techniques.



## Case report

A 31-year-old autistic male patient presented with acute headache and fever. A contrast-enhanced computed tomography scan was performed and showed space-occupying lesions in the right parietal and left frontal lobes with ring enhancement and perifocal edema. The initial differential diagnosis was abscess versus multicentric glioblastoma. Laboratory analysis showed elevated C reactive protein levels (47 mg/L; normal range <5 mg/L) and a leukocyte count within the normal range. Preoperative clinical diagnosis was hindered and delayed most likely due to the patient's autism and impaired communication skills.

The patient subsequently underwent magnetic resonance imaging (MRI) (Avanto 1.5T, Siemens, Erlangen, Germany) to further differentiate these masses, which showed a multilocular lesion with a diameter of 4.5 cm in the left frontal lobe with marginal circular diffusion restriction and a reduced apparent diffusion coefficient (ADC) map and central increased diffusivity. The susceptibility weighted imaging (SWI) showed a peripheral irregular ring with a decreased signal and no dual rim sign. The perfusion parameters indicated a marked peripheral increased in relative cerebral blood volume (rCBV), with markedly increased leakage coefficient (K2) in the ring lesion as well as in the surrounding extensive perifocal edema (Fig. 1). The ring enhancement was

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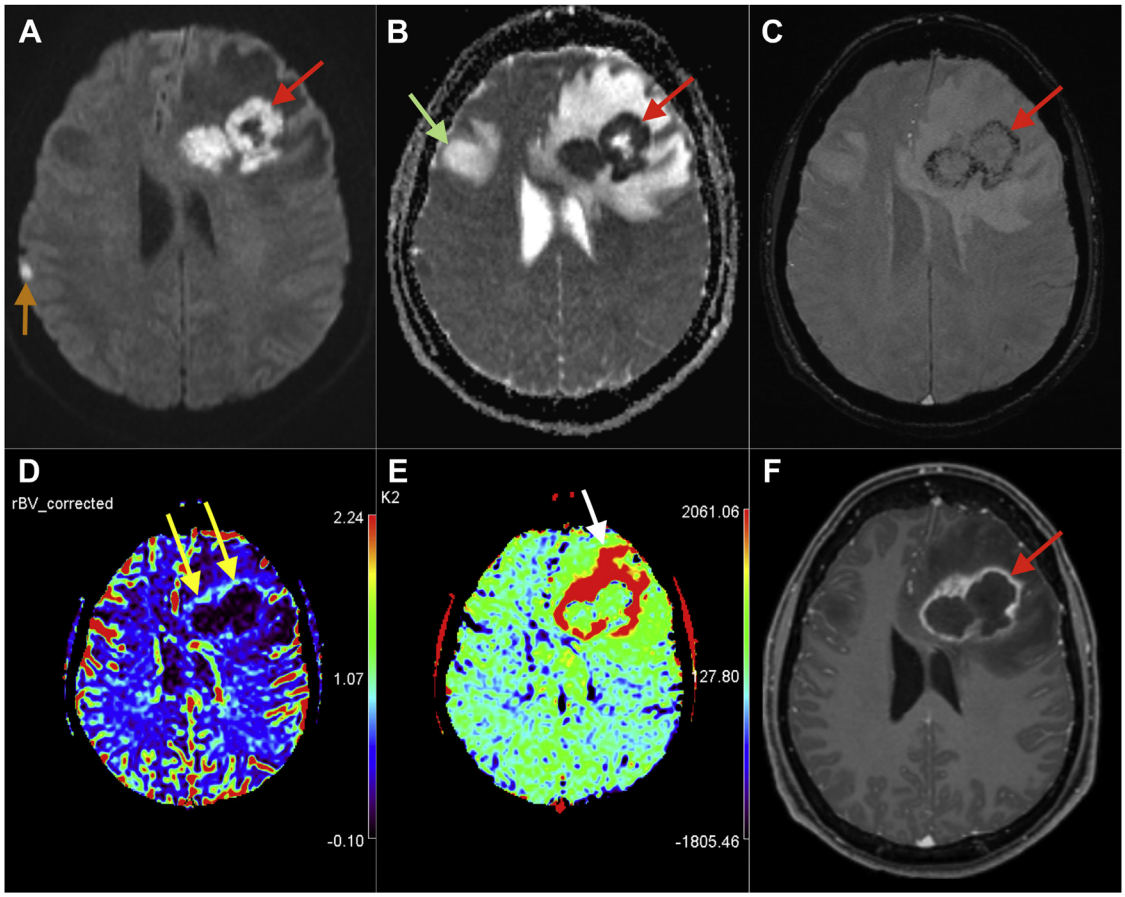


**Fig. 1 – MRI with DWI (A), ADC (B), SWI (C), corrected rCBV (D), K2 (E) maps of dynamic susceptibility contrast-enhanced perfusion (DSC) obtained by OSVD deconvolution approach, and postcontrast T1 (F) showing atypical features of brain abscess (red arrows) with ring enhancement (F) and ring diffusion restriction with central increased diffusivity (A and B) as well as irregular hypointense circular ring in SWI (C). The rCBV is increased [yellow arrows in (D)] in the ventral part of the ring, and K2 is increased, extending to the neighboring edema [white arrow in (E)]. Notice the perifocal edema located cranially to another lesion in the right frontal lobe [green arrow in (B)] and a third smaller lesion with diffusion restriction in the right parietal lobe [orange arrow in (A)]. MRI, magnetic resonance imaging; DWI, diffusion weighted imaging; SWI, susceptibility weighted imaging; rCBV, relative cerebral blood volume; K2, leakage coefficient.**

incomplete medially toward the lateral ventricle with increased signal intensity of the cerebrospinal fluid in the left frontal horn (Fig. 2). Other lesions with diffusion restriction were observed in the right frontal and parietal lobes with 2 cm and 6 mm diameters, respectively. Because of the emergency situation and the indication for immediate operation, additional MR spectroscopy was not performed.

Although the described imaging findings were atypical for an infectious process (no central diffusion restriction, no dual rim sign, and increased rCBV), the image features as a whole particularly the medially incomplete ring of enhancement and the clinical context clearly favored abscesses over multicentric glioblastoma or metastasis. For this reason, the patient underwent an emergency craniotomy with subsequent neuropathologic and microbiological examination, which confirmed the presence of intracranial abscesses with meningitis and ventriculitis. During the operation, evacuation of the frontal abscesses was performed, and a left-sided external ventricular drainage was placed. Bacteriological tests showed the presence of *Streptococcus milleri*. A follow-up MRI after the craniotomy showed abscess evacuation but also signs of ischemia and increased intracranial tension due to prolonged preoperative raised intracranial pressure, perifocal edema, and herniation. Despite rapid, adequate, and intensive adjuvant therapy, the patient did not recover substantially and ultimately passed away 10 days thereafter.

## Discussion

The differential diagnosis of multiple lesions with ring enhancement and prominent perifocal edema includes mainly infectious and neoplastic processes, such as brain abscess, metastasis, and multicentric glioblastoma [1,2]. Differentiation between these entities is of utmost importance to determine the indications and urgency of intervention and a suitable management plan. Advanced MRI techniques complement the role of conventional MRI in the differential diagnosis between these entities, and typically, more than one