

Cerebral amyloid angiopathy-related inflammation (CAA-ri) in a patient positive for SARS-CoV-2 – radiological findings and differential diagnosis

Zapalna postać angiopatii amyloidowej u pacjentki z infekcją SARS-CoV-2 – obraz radiologiczny i diagnostyka różnicowa

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KEYWORDS:

- cerebral amyloid angiopathy-related inflammation
- CAA-ri
- SARS-CoV-2
- radiological image
- diagnostic imaging
- MRI

ABSTRACT

84-year old female with confirmed, asymptomatic SARS-CoV-2 infection was admitted to Neurology Department after sudden onset of left-sided hemiparesis and impaired consciousness. Imaging played a key role in diagnostic process, in course of which the diagnosis of cerebral amyloid angiopathy-related inflammation (CAA-ri) was made.

According to latest research, SARS-CoV-2 infection is considered to cause various neurological complications. To my best knowledge this is the first case of CAA-ri and SARS-CoV-2 coexistence to be reported.

SŁOWA KLUCZOWE:

- zapalna angiopatia amyloidowa
- CAA-ri
- SARS-CoV-2
- obraz radiologiczny
- rezonans magnetyczny

STRESZCZENIE

84-letnia pacjentka z potwierdzonym, bezobjawowym zakażeniem SARS-CoV-2 została przyjęta do Oddziału Neurologii z powodu nagłego wystąpienia niedowładu lewostronnego i zaburzeń świadomości. W toku procesu diagnostycznego postawiono diagnozę zapalnej postaci angiopatii amyloidowej (CAA-ri). Kluczową rolę w diagnostyce pełnił obraz radiologiczny.

Według licznych autorów infekcja SARS-CoV-2 może być potencjalnym źródłem powikłań neurologicznych. Zgodnie z naszą wiedzą to pierwszy przypadek współistnienia CAA-ri z zakażeniem SARS-CoV-2.

Case presentation

84-year old female with confirmed, asymptomatic SARS-CoV-2 infection and Alzheimer's disease was admitted to Neurology Department after sudden onset of left-sided hemiparesis and impaired consciousness. The symptoms have been present for several hours before admission and stroke was considered a preliminary diagnosis. However, non-enhanced head CT performed as a part of initial diagnostic process revealed an extensive hypodense area in the right frontal lobe white matter, suggestive of vasogenic edema.

To further investigate the cause of these changes, contrast-enhanced MRI examination was performed. T2-weighted and fluid attenuation inversion recovery images showed right frontal lobe white matter hyperintensity, extending to subcortical white matter. On T2 FFE images multiple hypointense

foci, suggestive of microbleeds, were present in the right frontal lobe (Figure 1). The protocol was extended to include MR spectroscopy and perfusion weighted imaging, which revealed no evidence of tumor or nervous tissue infiltration in the area of edema (Figure 2, 3). According to these findings, diagnosis of cerebral amyloid angiopathy-related inflammation was made.

The patient was treated with dexamethasone with clinical improvement. After 12 days of hospitalization she was discharged with no residual neurological syndrome.

Discussion

Cerebral amyloid angiopathy (CAA) is a small vessel disease caused by amyloid deposition in arterioles and capillaries (1).

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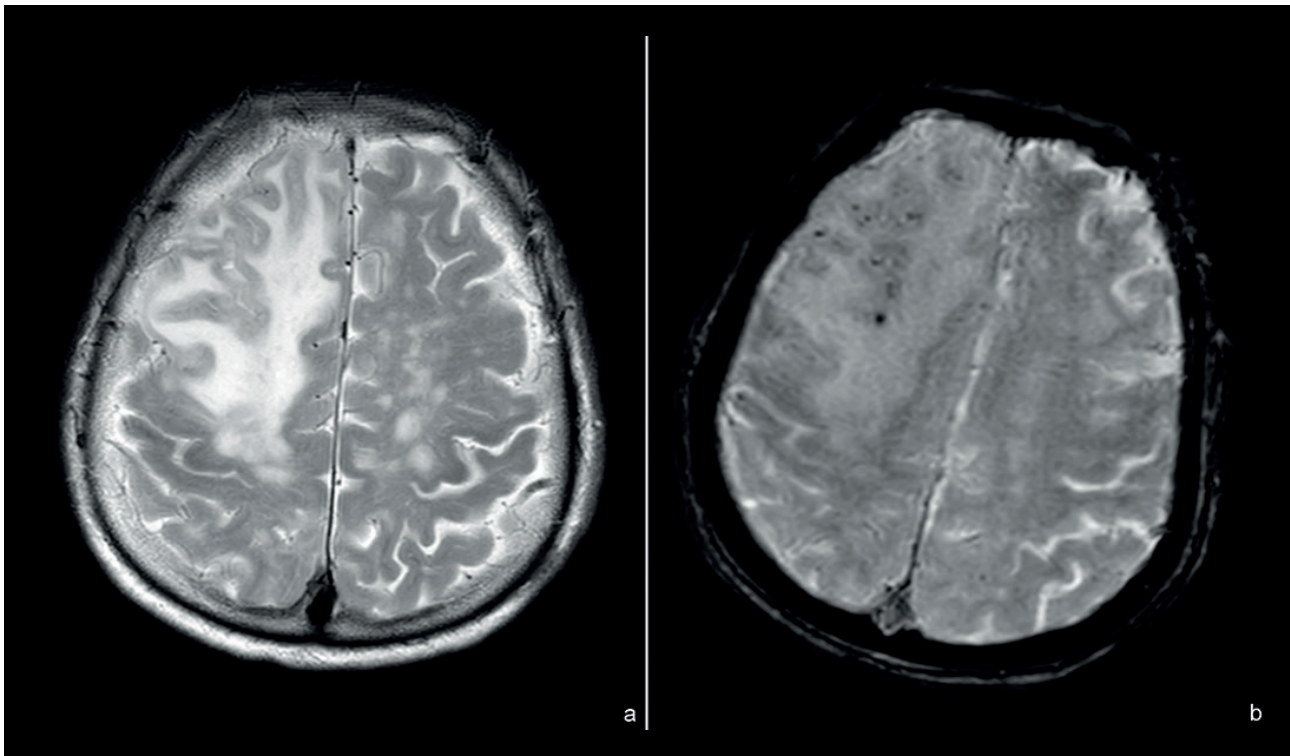


Figure 1. (a) T2-weighted image shows an extensive hyperintense area in the right frontal lobe, reaching subcortical regions. (b) T2 FFE images revealed multiple hypointense foci – suggestive of microbleeds in the affected area.

Source: own elaboration.

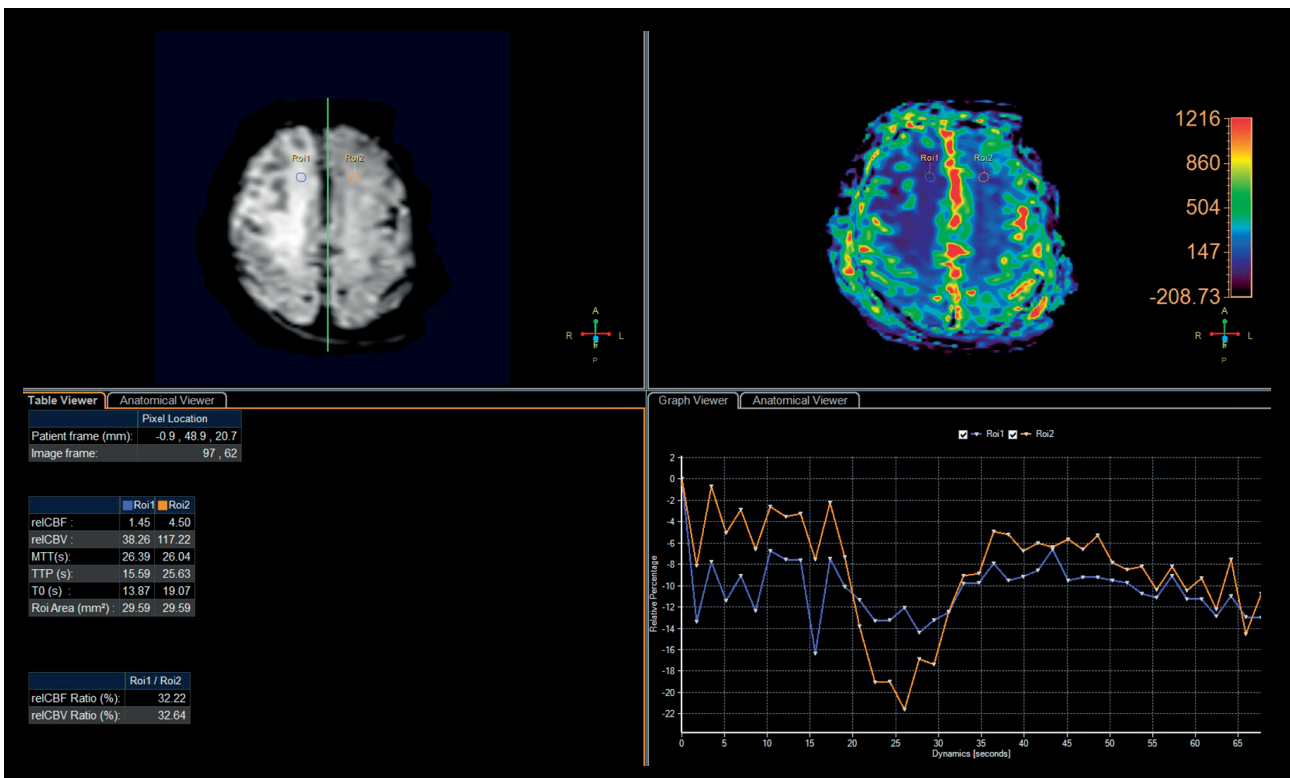


Figure 2. Perfusion weighted imaging shows CBV and CBF decrease in comparison to contralateral white matter – no signs of hyperperfusion, which would be suggestive of neoplastic infiltration.

Source: own elaboration.

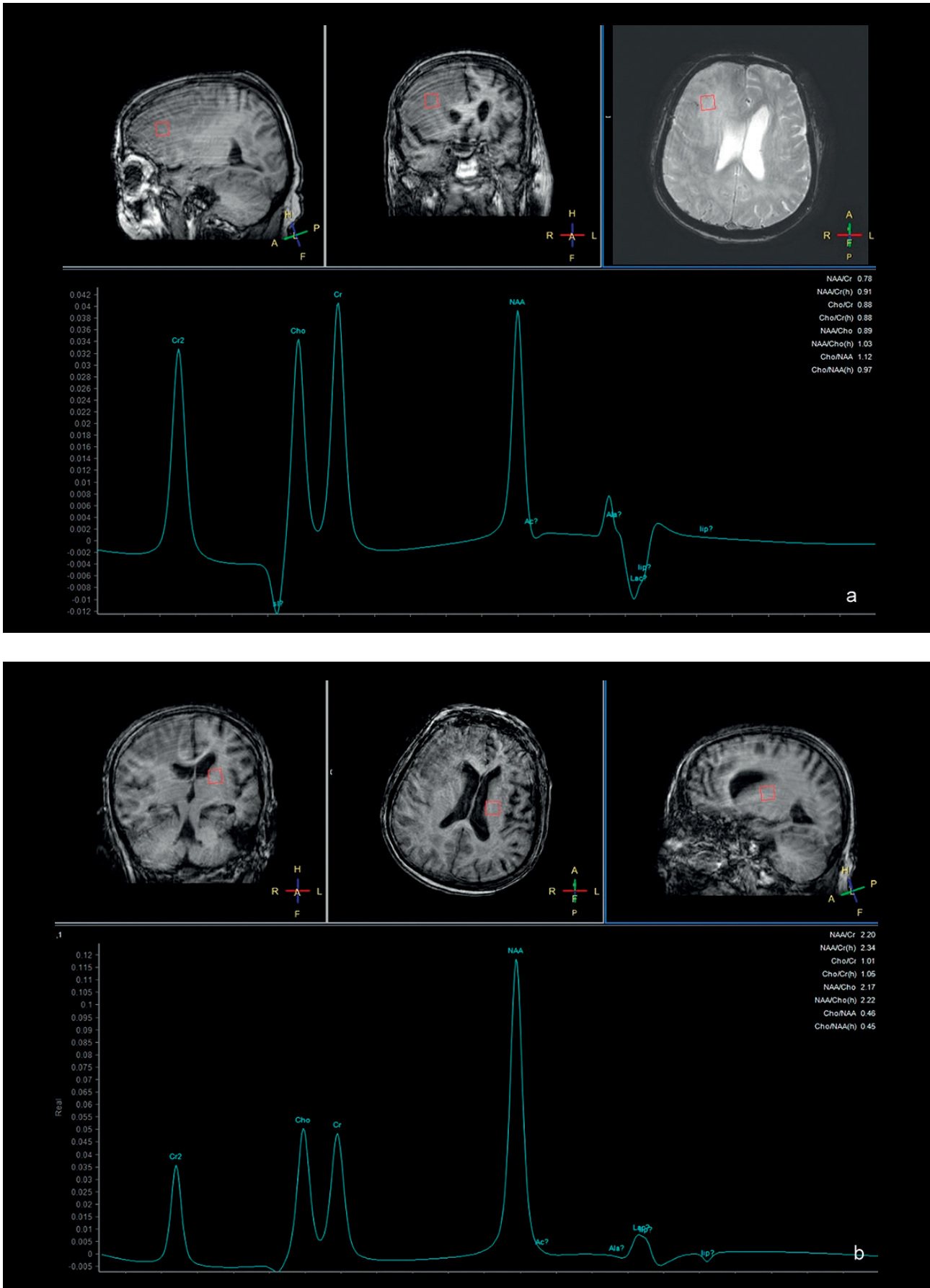


Figure 3. MR Spectroscopy. On long TE (144 ms) an inverted lactate peak is observed on the affected side, indicating presence of anaerobic metabolism (a). This finding can not be found on the opposite side (b). Also the Naa/Cr and Cho/Cr ratios are lower on the right side compared to normal white matter.

Source: own elaboration.

Pathological changes in the walls of small leptomeningeal and cortical vessels lead to hemorrhages, typically microbleeds. The disease has a chronic course and is relatively common among asymptomatic elderly population, according to histopathological studies (1). Less frequently it can be accompanied by inflammation and present with acute symptoms, such as encephalopathy, headache, seizures and focal neurological signs (2).

Definitive diagnosis of cerebral amyloid angiopathy related inflammation (CAA-ri) is made through histopathological examination of a sample collected during biopsy. Criteria for diagnosing CAA-ri only with clinical and radiological features were initially suggested by Chung, Auriel et. al. modified those criteria with division into possible and probable, reaching high sensitivity and specificity of the latter (respectively 82% and 97%) (3). The criteria include:

- 1) age above 40 years,
- 2) presence of at least one clinical symptom (authors mention headache, decrease in consciousness, behavioral change, focal neurological signs and seizures),
- 3) asymmetric hyperintense white matter lesions,
- 4) presence of cerebral macrobleeds, microbleeds or cortical superficial siderosis,
- 5) no other underlying cause.

Radiographic findings in CCA-ri require a broad spectrum of differential diagnoses. Asymmetric hyperintense white matter areas of similar morphology can be present in progressive multifocal leukoencephalopathy (PML), an inflammatory process caused by reactivation of JC virus, yet PML affects almost exclusively immunocompromised patients (4). Posterior reversible encephalopathy syndrome should also be taken into account. In this entity dysregulation of cerebral vasculature leads to vasogenic edema. Unlike CAA-ri white matter lesions are usually symmetric and typically involve parietal and occipital lobes (5). Malignancies, acute disseminated encephalomyelitis, and neurosarcoidosis should also be given consideration. Macro- and microbleeds can occur in hypertensive vasculopathy, however they are typically located in deeper parts of the brain (2, 3). Diffuse axonal

injury, thrombotic angiopathy, sepsis and malaria, which also cause multiple hemorrhagic foci, can usually be ruled out upon patient's history and clinical features.

Treatment of CAA-ri is based on immunosuppressive therapy, in particular high-dose corticosteroids (1, 3). In some cases other immunosuppressive drugs, such as cyclophosphamide, methotrexate, or mycophenolate mofetil are used (1). Clinical improvement during treatment is considered supportive of the diagnosis (3).

To my knowledge this is the first reported case of CAA-ri in a patient with SARS-CoV-2 infection.

In the state of pandemic, the pathogenesis and potential complications of new coronavirus disease are still under investigation. Many authors suggest the infection may result in neurological symptoms, either by viral nervous system invasion or as a result of secondary inflammatory or autoimmune processes.

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