Neurological Sciences (2019) 40:1951–1953
https://doi.org/10.1007/s10072-019-03810-w

LETTER TO THE EDITOR

Posterior reversible encephalopathy syndrome overlapping contrast-induced encephalopathy after coronary angiography

Arturo de Falco[1] · Marta De Simone[2] · Florindo d'Onofrio[1] · Daniele Spitaleri[1] · Fabrizio Antonio de Falco[3]

Received: 7 November 2018 / Accepted: 26 February 2019 / Published online: 8 March 2019

Posterior reversible encephalopathy syndrome (PRES) is a clinicoradiological disorder characterised by acute-onset neurological symptoms (typically seizures, encephalopathy, headache and visual disturbances) and reversible subcortical vasogenic brain oedema related to heterogeneous aetiologies. Brain imaging usually reveals vasogenic oedema predominantly involving the parieto-occipital regions. PRES is generally reversible, both radiologically and clinically [1]. On the other hand, contrast-induced encephalopathy (CE) has been described as a rare complication of angiography. It was first reported in 1970 as a transient cortical blindness and focal neurological deficits after coronary angiography (CAG) [2]. Clinical effects of neurotoxicity from iodinated contrast agents include visual fields defects, encephalopathy, seizures and focal neurological deficits. Also, CE is extensively reported to have a benign clinical course [2]. The reported incidence is 0.06% of patients undergoing CAG, 0.3–1% of patients undergoing vertebral angioplasty and 2.9% with endovascular coil treatment of posterior circulation aneurysm [2]. As already supposed, there is a clinical and neuroradiological overlap between the two syndromes [3]. Here, we report a case of typical PRES following CAG, and we discuss the pathophysiological overlap with CE.

The patient was a 82-year-old female with atrial fibrillation on warfarin and moderate chronic kidney disease. She had a 2-week history of dyspnoea without relevant ECG and echocardiography abnormalities, normal blood pressure and laboratory findings. She underwent to a CAG showing atheromasic coronaries without critical stenosis and no stenting was performed. Procedure lasted 34 min. Radial access was used. Medium contrast was iohexol 350 mg I/ml, a non-ionic, monomeric, iodinated contrast agent. Six hours after the CAG, the patient referred headache and visual blurring. Afterwards, she presented a generalised tonic-clonic seizure. Non-contrast CT scan was normal. At the admission to our Neurology Unit, the patient presented right hemianopia and slight drowsiness. Blood pressure and ECG were normal. She underwent to brain MR showing high signal intensity on DWI and FLAIR in left cerebellar hemisphere, in the left calcarine fissure (Fig. 1) and the in right thalamus with normal diffusion coefficient on ADC map as for vasogenic oedema. EEG showed slowing of background activity without focal or paroxysmal abnormalities. Drowsiness and hemianopia improved and then remitted in 7 days. The brain MRI performed 7 days later showed DWI and FLAIR signal abnormalities disappearance (Fig. 2). PRES was diagnosed based on the typical clinical and neuroradiological findings. After 2 months, the patient showed a normal neurological evaluation. EEG showed normal background activity without paroxysmal abnormalities. Clinical and radiological features in our case are typical of PRES. However, PRES is not a conclusive diagnosis and it is mandatory to find the underlying aetiology. In our case, the onset of PRES after CAG in a normotensive patient strongly indicates that contrast media represent the PRES trigger suggesting an overlap with a CE. In fact, CE clinical symptoms are similar to those of PRES but they are generally milder. Nevertheless, cases with severe and not reversible clinical symptoms are reported in both PRES and CE [1, 2]. In CE, initial CT can show hyperattenuated lesions in occipital and posterior parietal cortices secondary to contrast extravasation but can also be absolutely normal as in our case. MRI features of CE are less known because only few cases with MRI have been described but can overlap features of PRES [2, 3]. Since there is a clinical and radiological overlap between CE and PRES as in our patient, we were looking for a common pathophysiological mechanism. The

✉ Arturo de Falco
arturodefalco@tin.it

[1] Neurology and Stroke Unit, Azienda Ospedaliera San G. Moscati, Contrada Amoretta, 83100 Avellino, Italy

[2] Neuroradiology Unit, Azienda Ospedaliera San G. Moscati, Contrada Amoretta, 83100 Avellino, Italy

[3] Neurology Unit, Ospedale del Mare, Via Enrico Russo, 80147 Naples, Italy

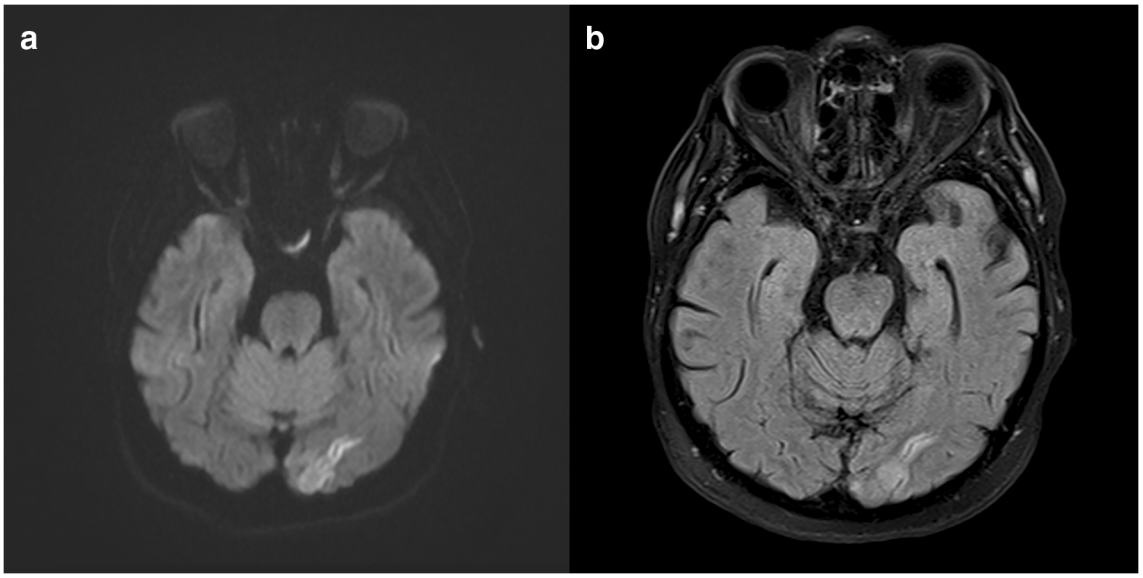

Fig. 1 Brain MR showing DWI (**a**) and FLAIR (**b**) high signal intensity in the left occipital scissure

pathophysiological theory underlying PRES supports an endothelial dysfunction related to abrupt blood pressure changes and/or to direct effects of cytokines. This leads to breakdown of the blood-brain barrier and subsequent brain oedema [1]. In normotensive patients with PRES, according to the "neuropeptide" theory, the release of potent vasoconstrictors such as endothelin-1 (ET-1) can lead to vasospasm, ischemia and cerebral oedema [4]. Endothelin family of peptides is largely involved also in CE pathogenesis. ET-1 levels after contrast media administration in patients undergoing percutaneous coronary interventions were significantly correlated with the amount of contrast media [5]. In this setting, contrast agents could directly induce endothelial cell activation disrupting the blood-brain barrier temporarily generating the same effect of human cytokines in PRES. ET-1 level in our patient has not been obtained, but its involvement could be a possible common pathway for both syndromes. Specific therapy for PRES particularly in normotensive patients is not available. If future studies would reveal high ET-1 levels in PRES, an ET-1 receptor antagonist such as clazosentan, which showed to reduce angiographic vasospasm in subarachnoid haemorrhage [6], could be tried in patients with PRES. In conclusion, CE initially described before the knowledge of PRES could be considered a type of PRES triggered by contrast media, and we

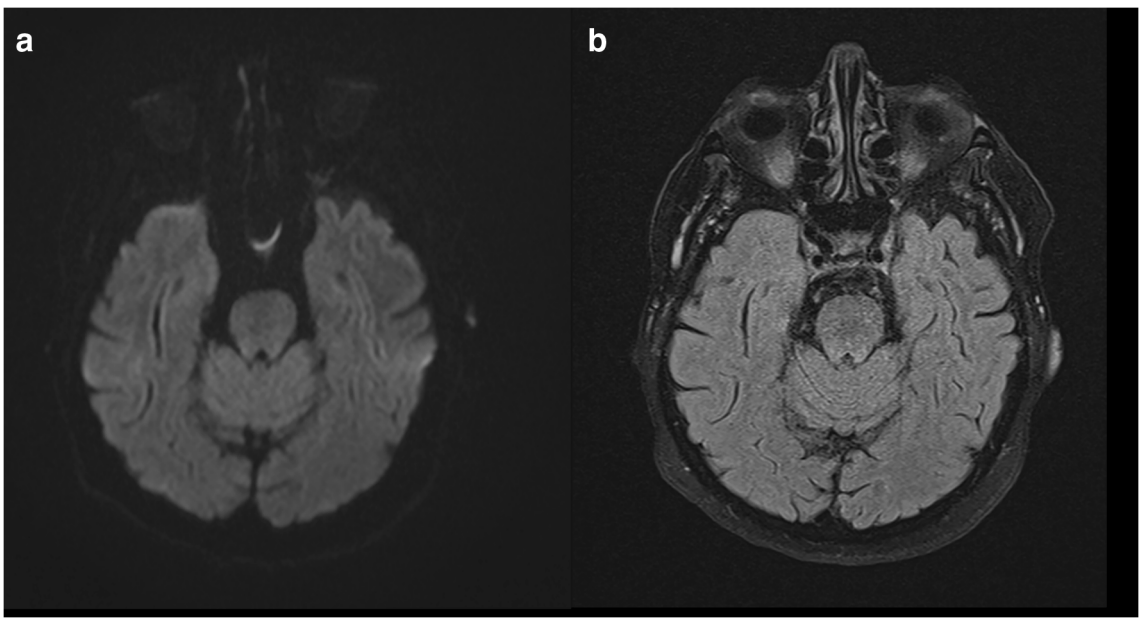

Fig. 2 Brain MR after 7 days showing DWI (**a**) and FLAIR (**b**) signal abnormalities disappearance

suggest that clinicians should suspect a PRES if typical clinical symptoms arise after endovascular procedures.

Compliance with ethical standards

Conflict of interest The authors declare that they they have no conflict of interest.

Ethical approval All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent For this type of study, formal consent is not required.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

1. Fugate JE, Rabinstein AA (2015) Posterior reversible encephalopathy syndrome: clinical and radiological manifestations, pathophysiology, and outstanding questions. Lancet Neurol 14:914–925
2. Leong S, Fanning NF (2012) Persistent neurological deficit from iodinated contrast encephalopathy following intracranial aneurysm coiling. a case report and review of the literature. Interv Neuroradiol 18:33–41
3. Saigal G, Bhatia R, Bhatia S, Wakhloo AKMR (2004) Findings of cortical blindness following cerebral angiography: is this entity related to posterior reversible leukoencephalopathy. Am J Neuroradiol 25:252–256
4. Granata G, Greco A, Iannella G, Granata M, Manno A, Savastano E, Magliulo G (2015) Posterior reversible encephalopathy syndrome–insight into pathogenesis, clinical variants and treatment approaches. Autoimmun Rev 14(9):830–836
5. Ulas T, Buyukhatipoglu H, Dal MS, Kirhan I, Kaya Z, Demir ME, Tursun I, Eren MA, Aydogan T, Sezen Y, Aksoy N (2013) Urotensin-II and endothelin-I levels after contrast media administration in patients undergoing percutaneous coronary interventions. J Res Med Sci 18(3):205–209
6. Macdonald RL, Higashida RT, Keller E, Mayer SA, Molyneux A, Raabe A, Vajkoczy P, Wanke I, Bach D, Frey A, Marr A, Roux S, Kassell N (2011) Clazosentan, an endothelin receptor antagonist, in patients with aneurysmal subarachnoid haemorrhage undergoing surgical clipping: a randomised, double-blind, placebo-controlled phase 3 trial (CONSCIOUS-2). Lancet Neurol 10(7):618–625