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All that glitters is not gold: increased signal in the subarachnoid space on fluid-attenuated inversion recovery imaging after gadolinium injection

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A 61-year-old woman arrived at the emergency department of the Hospital Nossa Senhora das Graças, Canoas, southern Brazil, with suspected ischemic stroke. After clinical and laboratory examination, the clinical diagnosis of ischemic stroke was made, without fulfilling criteria for thrombolysis. The patient had no history of renal failure. Three days later, she performed a magnetic resonance imaging (MRI) examination that confirmed the suspected diagnosis. This examination was performed without sedation or supplemental oxygen. Brain MRI was performed after gadolinium injection, using fluid-attenuated inversion recovery (FLAIR) imaging, T1-weighted image, diffusion-weighted imaging, and T2-weighted image sequences that revealed signs of subacute watershed stroke in the left cerebral hemisphere (Figures 1, 2 and 3). There was a hyperintense cerebrospinal fluid (CSF) in the subarachnoid space (SAS) on FLAIR imaging, a finding that has been reported in many pathologic conditions[1] such as superior sagittal thrombosis, subarachnoid hemorrhage[2], meningitis, meningeal carcinomatosis, next to tumors, status epilepticus and stroke[3-7]. It has also been reported in otherwise healthy patients undergoing anesthesia with supplemental oxygen[8]. The exact mechanism by which CSF diffuses into the SAS in patients with or without renal insufficiency is not completely explained. Some authores have suggested that in patients with renal failure, the gadolinium may shift across an osmotic gradient at the circumventricular organs in the setting of proctracted elevation of plasma concentrations[9]. We believe that the cause of this imaging phenomenon of hyperintense signal of the CSF in the SAS which has already been noted in patients with compromised cerebral perfusion, including cases of acute ischemic stroke, was due to the recent stroke[10,11].

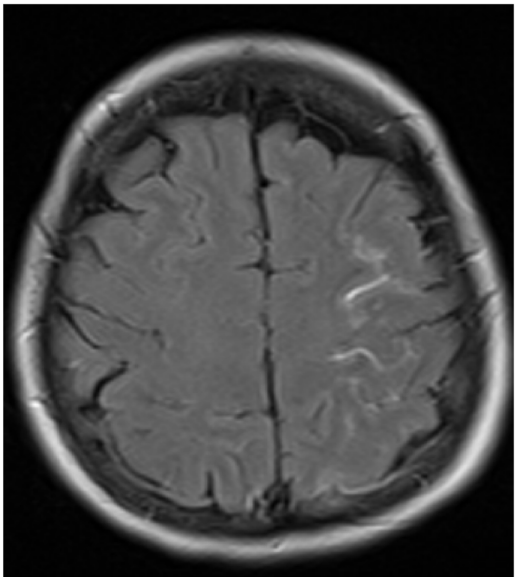

Figure 1: Axial Flair WI sequence demonstrates the hyperintensity on SAS on the left brain hemisphere.

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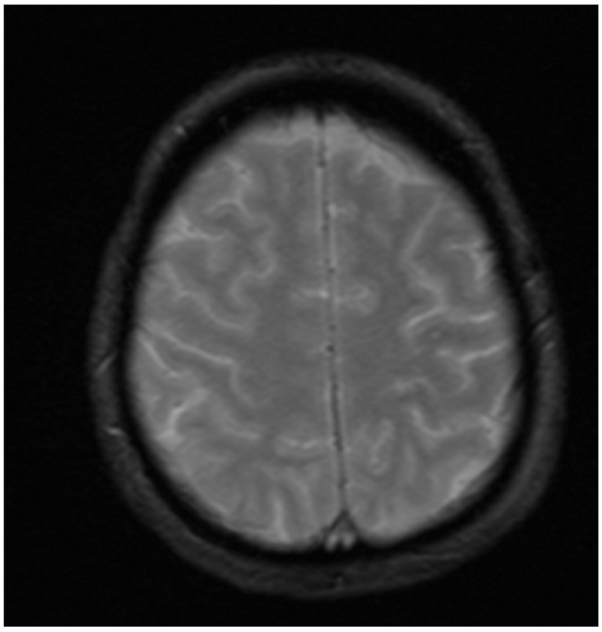

Figure 2: Axial T2* sequence without low signal on SA ruled out hemorrhage.

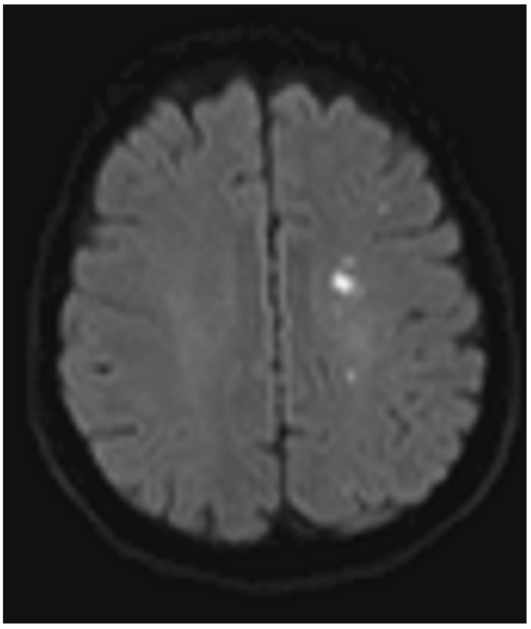

Figure 3: Axial DWI sequence showed restricted diffusion on watershed infarcts.

REFERENCES

1. Morris JM, Miller GM. Increased signal in the subarachnoid space on fluid-attenuated inversion recovery imaging associated with the clearance dynamics of gadolinium chelate: a potential diagnostic pitfall. *AJNR Am J Neuroradiol*. 2007;28(10):1964-7. http://dx.doi.org/10.3174/ajnr.A0694. PMid:17893215.

2. Noguchi K, Ogawa T, Inugami A, Toyoshima H, Sugawara S, Hatazawa J, et al. Acute subarachnoid hemorrhage: diagnosis with fluid-attenuated inversion-recovery MR imaging. *Radiology*. 1995;196:773-7. http://dx.doi.org/10.1148/radiology.196.3.7644642. PMid:7644642.

3. Singer MB, Atlas SW, Drayer BP. Subarachnoid space disease: diagnosis with fluid: attenuated inversion-recovery MR imaging and comparisons with gadolinium-enhanced spin-echo MR imaging: blinded reader study. *Radiology*. 1998;208(2):417-22. http://dx.doi.org/10.1148/radiology.208.2.9680570. PMid:9680570.

4. Mathews VP, Caldemeyer KS, Lowe MJ, Greenspan SL, Weber DM, Ulmer JL. Brain: gadolinium-enhanced fast fluid-attenuated inversion-recovery MR imaging. *Radiology*. 2000;215:922-4. PMid:10831726.

5. Dechambre SD, Duprez T, Grandin CB, Lecouvet FE, Peeters A, Cosnard G. High signal in cerebrospinal fluid mimicking subarachnoid haemorrhage on FLAIR following acute stroke and intravenous contrast medium. *Neuroradiology*. 2000;42(8):608-11. http://dx.doi.org/10.1007/s002340000347. PMid:10997567.

6. Rumpel H, Chan LL. Serial FLAIR imaging after Gd-DTPA contrast: pitfalls in stroke trial magnetic resonance imaging. *Stroke*. 2003;34(3):797-8. http://dx.doi.org/10.1161/01.STR.0000056528.05390.58. PMid:12624311.

7. Warach S, Latour LL. Evidence of reperfusion injury, exacerbated by thrombolytic therapy, in human focal brain ischemia using a novel imaging marker of early blood-brain barrier disruption. *Stroke*. 2004;35(11 Suppl 1):2659-61. http://dx.doi.org/10.1161/01.STR.0000144051.32131.09. PMid:15472105.

8. Frigon C, Jardine DS, Weinberger E, Heckbert SR, Shaw DW. Fraction of inspired oxygen in relation to cerebrospinal fluid hyperintensity on FLAIR MR imaging of the brain in children and young adults undergoing anesthesia. *AJR Am J Neuroradiol*. 2002;179(3):791-6. PMid:12185066.

9. Kanamalla US, Boyko OB. Gadolinium diffusion into orbital vitreous and aqueous humor, perivascular space, and ventricles in patients with chronic renal disease. *AJR Am J Roentgenol*. 2002;179(5):1350-2. http://dx.doi.org/10.2214/ajr.179.5.1791350. PMid:12388535.

10. Dechambre SD, Duprez T, Grandin CB, Lecouvet FE, Peeters A, Cosnard G. High signal in cerebrospinal fluid mimicking subarachnoid haemorrhage on FLAIR following acute stroke and intravenous contrast medium. *Neuroradiology*. 2000;42(8):608-11. http://dx.doi.org/10.1007/s002340000347. PMid:10997567.

11. Latour LL, Kang DW, Ezzeddine MA, Chalela JA, Warach S. Early blood: brain barrier disruption in human focal brain ischemia. *Ann Neurol*. 2004;56(4):468-77. http://dx.doi.org/10.1002/ana.20199. PMid:15389899.

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