

Author Response

Balaji Vaithialingam¹, Swaroop Gopal², Dheeraj Masapu³**Keywords:** Aneurysmal subarachnoid hemorrhage, Basilar artery, Locked in state.*Indian Journal of Critical Care Medicine* (2024): 10.5005/jp-journals-10071-24602**Dear Editor,**

We would like to thank Finsterer et al. for raising clinically important questions and highlighting several points for discussion in their article—Transient locked-in syndrome after aneurysmal subarachnoid bleeding due to spasm hypoxemia?¹

First, both computed tomography angiography (CTA) and digital subtraction angiography (DSA) are used to diagnose a patient with subarachnoid hemorrhage (SAH). The CTA has a reported sensitivity of 97–100% in patients with aneurysmal SAH and a detection failure rate of 5–30%.² Digital subtraction angiography is the gold standard for diagnosing intracranial vascular pathologies, with a sensitivity of 95%, and provides better three-dimensional orientation of the vascular anatomy.^{3,4} Despite the fact that CTA is non-invasive, the decision to perform CTA or DSA is determined by institutional policy, and we chose DSA as the direct option because the aneurysm was visible on plain computed tomography (CT) itself (Fig. 1A).

Second, the cerebrospinal fluid (CSF) analysis revealed a normal biochemistry profile, while the CSF gram stain/culture revealed no organism. Furthermore, the CSF viral markers were negative. In terms of CSF infection or autoimmune etiology (meningitis, encephalitis, Guillain Barre syndrome), we described the CSF finding as normal. An elevated red blood cell and xanthochromia are constant CSF findings in any case of aneurysmal SAH, so we didn't think it was necessary to mention it. If the external ventricular drain (EVD) is kept for more than seven days, the risk of central nervous system (CNS) infection increases.⁵ In our case, the EVD was placed in an outside peripheral

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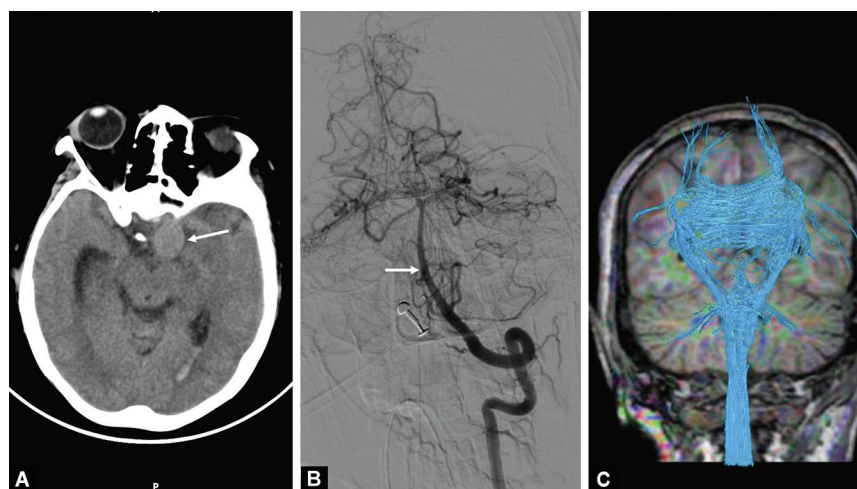
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hospital to reduce the intracranial pressure (ICP), and because the patient's family members were not ready for definitive therapy due to the patient's poor prognosis, the EVD was removed the next day, and the patient was discharged. Because the EVD was only kept for 24 hours, it is unlikely that a CNS infection would develop with elevated CSF white blood cells.

Third, we ruled out basilar spasm because post-coiling DSA imaging revealed good perfusion of the posterior circulation territory during the locked-in state (LIS) with no evidence of basilar artery spasm (Fig. 1B). We also ruled out the possibility of brain stem pathology using magnetic resonance imaging. The brain stem and cervical-medullary junction had normal bulk and signal patterns. The apparent diffusion coefficient (ADC) value and ADC map of



Figs 1A to C: (A) Preoperative plain CT scan showing left distal internal carotid artery aneurysm (arrow); (B) Post-coiling vertebral artery angiogram showing normal basilar artery without a spasm (arrow); (C) Post-coiling diffusion tensor imaging showing normal cranial-caudal tracts at the level of brain stem

the brain stem were both normal, ruling out cytotoxic edema. Diffusion tensor imaging revealed normal fibers in the brainstem and upper cord with no evidence of disruption or displacement (Fig. 1C). Susceptibility-weighted imaging sequences ruled out the possibility of microbleeds in the brain stem.

Fourth, we agree that all ruptured aneurysms should be clipped or coiled right away. In our case, the patient was initially transported to a nearby facility where an EVD was placed as significant hydrocephalus was present in the CT scan. The patient's family was given the option of immediate intervention, and the physician explained the poor prognosis given the patient's age and Glasgow Coma Score (GCS) of 3/15. We also believe the LIS was misinterpreted by the physician as a poor GCS. Due to the clinical scenario and financial implications, the family refused to consent to further management and left against medical advice. A couple of days later the family noticed that the patient was opening her eyes spontaneously and had fixated vision although she was unable to move limbs, then she was transported to our facility for a second opinion, when we were able to persuade family members to consent to the coiling procedure.

Finally, we thank the readers for raising pertinent clinical questions, but we completely ruled out the possibility of LIS due to spasm or brainstem pathology because the post-coiling DSA and MRI sequences revealed no abnormality.

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