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Letter to the Editor

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Is there a Causal Chain between Intracerebral Haemorrhage, Vertebral Artery Dissection, and RCVS?

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LETTER TO THE EDITOR

We read with interest Sousa, *et al*., article about a 30-year-old female with SARS-CoV-2-associated extracranial bilateral vertebral artery dissection (VAD), which was complicated by reversible cerebral vasoconstriction syndrome (RCVS) and intracerebral haemorrhage (ICH) in the territory of the left middle cerebral artery (LMCA) [Sousa, Í. A. *et al*., 2023]. For ICB the index patient underwent a decompressive craniotomy but did not receive specific treatment for vertebral artery dissection or the RCVS [Sousa, Í. A. *et al*., 2023]. The outcome was poor with the modified Rankin scale (mRS) of 5 [Sousa, Í. A. *et al*., 2023]. The study is impressive, but several limitations require discussion.

The first limitation is that the diagnosis of RCVS was not confirmed by follow-up angiography [Sousa, Í. A. *et al*., 2023]. RCVS is typically characterised by reversibility of the artery narrowings after hours or days [Sano, K. *et al*., 2022]. However, reversibility of the LMCA branch has not been documented [Sousa, Í. A. *et al*., 2023]. Therefore, the RCVS diagnosis remains unsupported. In addition, vasospasms can occur not only in patients with RCVS or subarachnoid hemorrhage (SAH), but also in patients with ICH [Tikhonov, N. C. *et al*., 2018]. Therefore, it is conceivable that LMCA vasospasm was a complication of ICH but was not due to RCVS or VAD.

A second limitation is that SAH was not definitively ruled out. In particular, bleeding from MCA aneurysms can lead to ICH plus SAH [Hara, T. *et al*., 2023]. SAH should be considered as both suspected RCVS and suspected VAD could both be vasospasm secondary to SAH. SAH should also be considered because the index patient was described in the discussion with SAH over the convexity [Sousa, Í. A. *et al*., 2023]. Thunderclap headache suggests not only RCVS, but also SAH.

A third limitation of the study is that alternative causes of ICH were not sufficiently ruled out. We should know whether the patient had a history of arterial hypertension, elevated blood pressure at admission or during hospitalisation, whether aneurysm, AV malformation, or cavernoma, and amyloid angiopathy were definitively excluded, and whether coagulopathy was present or not at admission. We should also know if the family history was positive for cerebral haemorrhage. Bleeding after an ischemic stroke had also not been definitively ruled out.

A fourth limitation is that the suspected VAD was not confirmed by documentation of a second lumen on axial, fat-saturated T1 (FS) sequences and contrast medium or by improved motion-sensitized driven-equilibrium (missed)-prepared 3D T1-weighted magnetic resonance imaging (MRI) [Choi, J. W. *et al*., 2018]. Has nimodipine ever been administered intravenously to differentiate between dissection and vasospasm?

A fifth limitation is that no causal relationship between VAD and ICH has been established. Why should dissection of an extracranial artery result in bleeding from an intracranial, supratentorial artery?

We disagree with the description of poststenotic dilatation of the right and left vertebral arteries and the diagnosis of “dissection” in figure 2 [Sousa, Í. A. *et al*., 2023]. The digital subtraction angiography (DSA) images in figure 2 do not convincingly demonstrate poststenotic dilatation of the vertebral arteries. The artery diameter is the same before and after the stenosis.

We also do not believe that a normal poststenotic diameter of an artery indicates vasospasm and that

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poststenotic dilatation indicates dissection. If vasospasm persists for a long time, poststenotic dilatation can also occur in association with vasospasm. Furthermore, poststenotic dilatation is unlikely in acute dissection. How many days after the bleeding was the DSA performed?

We also do not believe that RCVS and PRES share similar characteristics as claimed in the discussion [Sousa, Í. A. *et al*., 2023]. PRES is thought to be more due to dilatation of the arteries whereas RCVS is more likely due to vasoconstriction.

In summary, the excellent study has limitations that should be addressed before drawing final conclusions. Clarifying the weaknesses would strengthen the conclusions and could improve the study.

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