



## Artery of Percheron territory infarct due to bilateral carotid artery dissection: when anterior circulation supplies the posterior one

Nicola Morelli<sup>1,2</sup> · Eugenia Rota<sup>3</sup> · Massimo Nolli<sup>4</sup> · Donata Guidetti<sup>1</sup> · Emanuele Michieletti<sup>2</sup>

Received: 7 June 2018 / Accepted: 11 September 2018 / Published online: 17 September 2018  
© Springer-Verlag Italia S.r.l., part of Springer Nature 2018

To the Editor,

Multiple small vessels, originating from the posterior communicating artery (PcomA) and P1 and P2 segments of the posterior cerebral arteries (PCAs), predominately supply the thalamus. The artery of Percheron (AOP), first described by Gérard Percheron in 1973, is a rare variant of the posterior cerebral circulation, where a solitary arterial trunk supplies blood to the paramedian thalami and rostral midbrain bilaterally [1]. An ischemic stroke in the territory of an artery of Percheron usually presents with vertical gaze palsy, coma, and memory impairment.

The case of a 52-year-old man is reported. Patient's clinical history was uneventful, although he was found in an unwitnessed comatose state, with an ischemic stroke in the AOP territory, due to a bilateral carotid artery dissection (CAD), with fetal origin of posterior cerebral arteries (f-PCA). History of a recent trauma or of a recurrent headache was negative, as well as the presence of vascular risk factors and known connective tissue disorders. Moreover, no family history of migraine was present. On admission to the casualty department, the neurological examination revealed a Glasgow Coma Scale (GCS) score of 8 and a National Institutes of Health Scale Score (NIHSS) of 13. When deeply stimulated,

he could only open his eyes, verbal communication was absent and he was not able to perform any command. On cranial nerve examination, vertical gaze palsy was detected, while no other motor deficits could be identified. Brain CT was unremarkable, CT angiography of neck vessels evidenced a bilateral CAD and f-PCA. MRI evidenced DWI cytotoxic edema in both paramedian thalamic regions with negative FLAIR images (DWI-FLAIR mismatch), hence rt-PA was administered, according to imaging-based stroke duration (onset < 4.5 h) [2]. Two days later, an area of hyperintensity of bilateral thalami was seen on FLAIR sequences and MR angiography confirmed luminal hematoma of the carotid arteries (Fig. 1). The patient was wakeful at discharge with an NIHSS score of 1, with only an oculomotor disturbance (vertical palsy), mild dysarthria, and mnemonic disturbance. Anticoagulation was started, and recanalization of the affected vessels was documented at a 2-month follow-up.

Bilateral paramedian thalamic infarct is a rare condition [3, 4]. CAD frequently leads to stroke in young- and middle-aged patients [5, 6]. To the best of our knowledge, this is the first case of artery of Percheron territory infarct due to bilateral CAD, as the f-PCA supplies the posterior circulation. From an etiopathogenetic point of view, an artery-to-artery embolism was postulated from the dissected carotid arteries to posterior circulation via f-PCA. In the fetal origin of the PCA, the caliber of the posterior communicating artery may be equal to, or greater than, the ipsilateral P1 segment while the dominant blood supply to the occipital lobes comes from the internal carotid artery. f-PCA occurs when the embryonic posterior cerebral artery fails to regress bilaterally, found in 8% of the general population [7]. Furthermore, other conditions of posterior circulation infarction due to anterior circulation vasculopathy may exist. This is the case of carotid-vertebrobasilar anastomoses which are variant anatomical arterial communications between the anterior and posterior circulations due to abnormal embryological development of the

---

Nicola Morelli, Eugenia Rota, Massimo Nolli, Donata Guidetti and Emanuele Michieletti contributed equally to this work.

---

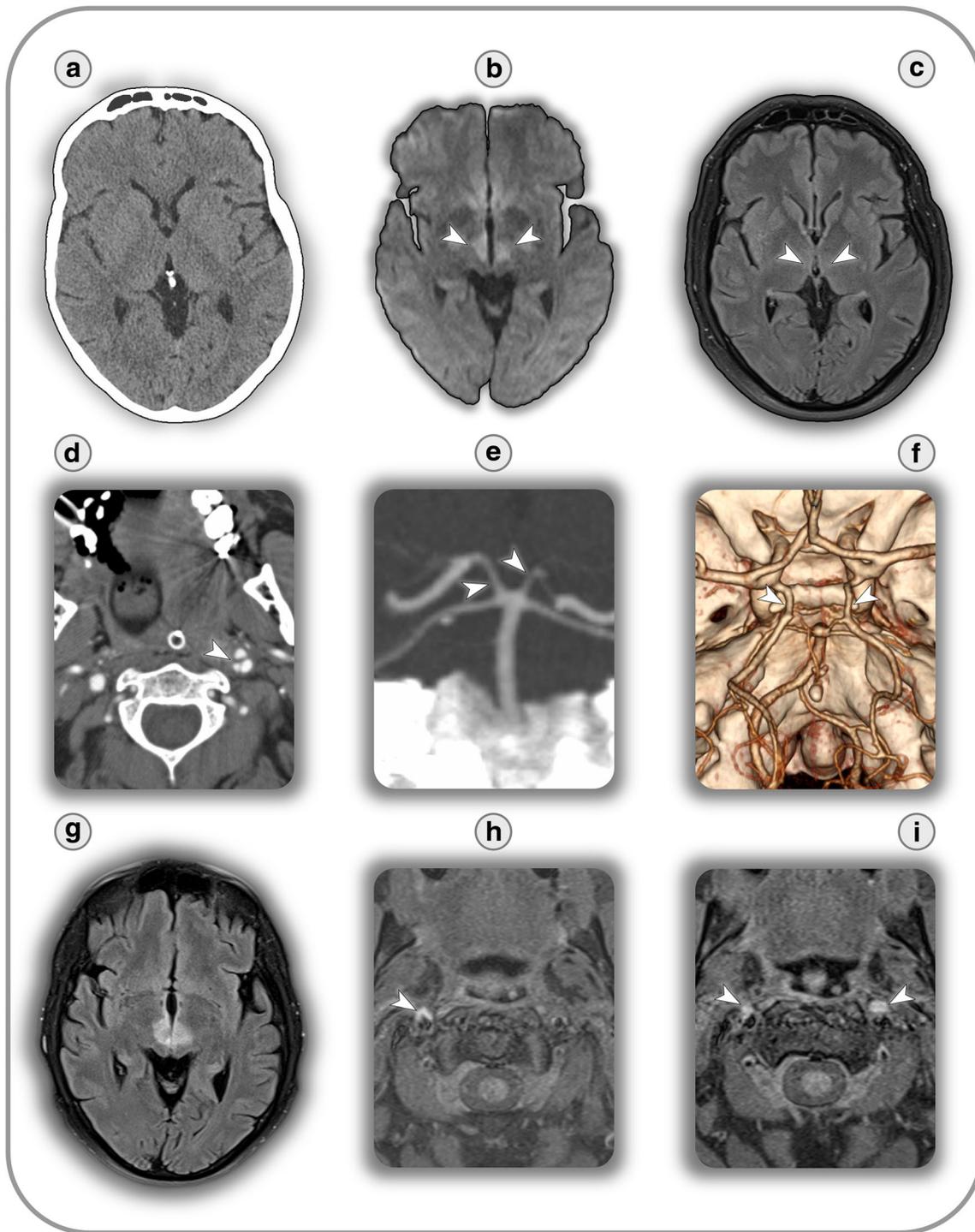
✉ Nicola Morelli  
nicola.morelli.md@gmail.com

<sup>1</sup> Neurology Unit, Guglielmo da Saliceto Hospital, Piacenza, Italy

<sup>2</sup> Radiology Unit, Guglielmo da Saliceto Hospital, Piacenza, Italy

<sup>3</sup> Neurology Unit, San Giacomo Hospital, Novi Ligure, Alessandria, Italy

<sup>4</sup> Department of Anesthesia and Critical Care, Guglielmo da Saliceto Hospital, Piacenza, Italy



**Fig. 1** Normal unenhanced CT brain scan (**a**). Axial DWI images at the thalamus level demonstrate bilateral paramedian thalamic cytotoxic edema, due to an irreversible ischemic injury with negative FLAIR images (**b, c**), consistent with DWI-FLAIR mismatch. CT Angiography shows left CAD (**d**, the right is not shown). Maximum intensity projection (MIP) of the posterior circulation (coronal view); hypoplasia of P1 segments (arrows, **e**). Volume rendering showed bilateral fetal origin of

the posterior cerebral arteries (**f**, arrowheads). Although both P1 segments are present, they are hypoplastic. Bilateral large posterior communicating arteries provide most of the blood supply to the posterior cerebral artery territory. FLAIR, with hyperintensity signal at follow-up, in bilateral thalamic region (**g**). MR angiography confirmed intramural hematoma at the C1–C2 level of the carotid arteries, as did hyperintensity signals on Fat-Sat SE-T1-weighted sequence (arrows, **h, i**).

vertebrobasilar system [8]. They are mainly named using the cranial nerves with which they run: primitive

trigeminal artery, persistent otic (acoustic) artery, persistent hypoglossal artery, and proatlantal artery. In such

conditions, anterior emboli may travel via anastomosis to the posterior circulation.

The clinician and radiologist must consider CAD also in strokes of the posterior circulation, especially in young patients when f-CPA is present. Therefore, an extensive neuroimaging study is advisable. A high level of suspicion of this entity, based on clinical examination and imaging is essential for early diagnosis and prompt therapy.

**Authors' contribution** 1. Study concept: N. Morelli  
2. Study design: N. Morelli, Eugenia Rota  
3. Data analysis/interpretation: N. Morelli, E. Rota  
4. Manuscript preparation and definition of intellectual content: N. Morelli, E. Rota  
5. Manuscript editing: N. Morelli, E. Rota  
6. Manuscript revision/review: M. Nolli, D. Guidetti, E. Michieletti

### Compliance with ethical standards

Human and animal studies have been approved by local ethics committee and therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Specific national laws have been observed, too.

Informed consent (written) of the patient has been obtained.

All data of research materials related to this paper (for example data, samples, or models) can be accessed.

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

### References

1. Matheus MG, Castillo M (2003) Imaging of acute bilateral paramedian thalamic and mesencephalic infarcts. *AJNR Am J Neuroradiol* 24:2005–2008
2. Wu O, Schwamm LH, Sorensen AG (2011) Imaging stroke patients with unclear onset times. *Neuroimaging Clin N Am* 21:327–344, xi. <https://doi.org/10.1016/j.nic.2011.02.008>
3. Hawkes MA, Arena JE, Rollán C, Pujol-Lereis VA, Romero C, Ameriso SF, Ameriso SF (2015) Bilateral paramedian thalamic infarction. *Neurologist* 20:89–92. <https://doi.org/10.1097/NRL.000000000000047>
4. Qian J, Wu C, Peng J, Liu H (2017) Bilateral paramedian thalamic and midbrain infarction due to occlusion of the artery of percheron in an elderly male: a case report. *Neurol Sci* 38:1123–1126. <https://doi.org/10.1007/s10072-017-2860-6>
5. Robertson JJ, Koyfman A (2016) Cervical artery dissections: a review. *J Emerg Med* 51:508–518. <https://doi.org/10.1016/j.jemermed.2015.10.044>
6. Giannini N, Ulivi L, Maccarrone M, Montano V, Orlandi G, Ferrari E, Cravencco C, Bonuccelli U, Mancuso M (2017) Epidemiology and cerebrovascular events related to cervical and intracranial arteries dissection: the experience of the city of Pisa. *Neurol Sci* 38:1985–1991. <https://doi.org/10.1007/s10072-017-3084-5>
7. Van Overbeeke JJ, Hillen B, Tulleken CA (1991) A comparative study of the circle of Willis in fetal and adult life: the configuration of the posterior bifurcation of the posterior communicating artery. *J Anat* 176:45–54
8. Bosco D, Consoli D, Lanza PL, Plastino M, Nicoletti F, Ceccotti C (2010) Complete oculomotor palsy caused by persistent trigeminal artery. *Neurol Sci* 31:657–659. <https://doi.org/10.1007/s10072-010-0342-1>