

“Phacing” a New Cause of Carotid Artery Dissection

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Introduction: Cervical arterial dissection (CAD) is a frequent and preventable cause of ischemic stroke in young patients. Several arguments suggest that genetic and developmental disorders could play an important role as part of a multifactorial predisposition of sporadic CAD. We present 2 cases of young patients with CAD in association with cutaneous lesions and nonatherosclerotic multivessel arteriopathy.

Case Reports: Our first patient was a 17-year-old white girl with sudden onset of weakness in her right upper limb. A magnetic resonance angiogram showed a severe stenosis along the extracranial and intracranial segments of the left internal carotid artery and the left middle cerebral artery. A complete ultrasound study confirmed the stenoses with characteristics suggestive of dissection. Our second patient was a 7-year-old white girl with a past history of left middle cerebral artery ischemic stroke. During the follow-up, an ultrasonographic examination discovered an asymptomatic dissection of the right internal carotid artery. Both patients reported a history of large unilateral hemangiomas; in the first case a coloboma of the left optic disc and an aortic aneurysm were also present. These findings were suggestive of PHACE—a neurocutaneous developmental syndrome associated with constitutional arteriopathy of the major cerebral vessels.

Conclusions: Noteworthy, among vascular abnormalities of PHACE, CADs have never been reported before. Our 2 cases suggest that CAD is an underrecognized cerebrovascular manifestation of PHACE and it should be searched for in these patients. Ultrasound, being noninvasive and portable, is a useful tool for the assessment and follow-up of these patients.

Key Words: PHACE syndrome, carotid artery dissection, pediatric stroke

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Acute cerebral ischemia in children and adolescents can represent a diagnostic challenge, as stroke mimics are much more frequent than in adults, and etiology often goes unanswered.¹ We present 2 cases of young patients with ischemic stroke occurring in association with cutaneous lesions and nonatherosclerotic multivessel arteriopathy.

CASE REPORTS

Our first patient was a 17-year-old white girl, who was admitted to our Stroke Unit because of a sudden and transient (2 h) weakness in her right upper limb. The patient's clinical history was remarkably

rich: at the age of 1 month, multiple large hemangiomas were detected on the skin over the left parotid gland, upper left lip, left eyelid, left preauricular skin, left orbital region, left side of epiglottis, and upper back (Fig. 1). A coloboma was also present in her left optic disc. At the age of 16, the patient had undergone surgery for a 6 cm aneurysm of the descending aorta replaced by a polyester graft. Physical examination at admission showed a slight pronation of her right hand and a convergent strabismus without diplopia. A brain magnetic resonance imaging was negative for acute events, whereas a cerebral magnetic resonance angiogram showed severe stenoses of the left carotid siphon and M1 segment of the left middle cerebral artery (MCA), along with moyo-moya like collaterals suggesting a slowly progressive nature of the lesion. A neurovascular ultrasound study, both extracranial and intracranial, though confirming the intracranial obstructive disease, also disclosed a cervical tapering stenosis of the left internal carotid artery (ICA) located about 1.5 cm above the carotid bifurcation, with a hypoechogenic thickening of the vessel wall representing an intramural hematoma—a pathognomonic sign of a dissection,² most likely the cause of the acute cerebral ischemia.

These ultrasonographical findings were confirmed by a cervical vessel angiography and, together with the clinical history, allowed us to make the diagnosis of PHACE, an acronym coined to describe a neurocutaneous syndrome encompassing posterior fossa brain malformations (P), large facial hemangiomas (H), arterial anomalies (A), cardiac anomalies/aortic coarctation (C), and eye abnormalities (E).

The second patient was a 7-year-old white girl with PHACES syndrome (PHACE + sternal defect) who underwent surgery in early childhood to remove multiple hemangiomas from her face and larynx. Her clinical history was positive for a left MCA ischemic stroke at the age of 8 months. The patient, who had been asymptomatic for the past 2 years, came to our Neurosonology Laboratory because a follow-up magnetic resonance angiogram detected a new stenosis in the right extracranial ICA. A complete neurovascular ultrasound study documented a distal tapering stenosis with a hypoechogenic thickening of the right ICA (Fig. 2), indicating a recent dissection and a multifocally reduced diameter of the left ICA mimicking a “hypoplasia”—the result of a past dissection, probably the cause of her left MCA stroke.

DISCUSSION

More than 300 cases of PHACE syndrome have been reported in the literature so far. Although the exact etiopathogenetic mechanism is unknown, it is widely accepted that this disease represents a developmental field defect occurring in early gestation; this hypothesis is supported by the observation that the facial hemangiomas are almost universally ipsilateral to structural anomalies, like in our patients. Current hypotheses regarding the developmental errors in PHACE syndrome have focused on the role of the neural crest, the adjacent cephalic mesoderm, and the neural plate in cases of brain structural lesions.³ An almost 100% female predominance is reported in the literature, thus suggesting the possibility of X-linked transmission with in utero lethality in males.⁴

Cerebral and cervical arterial abnormalities represent the most common noncutaneous anomalies of PHACE syndrome, occurring in about 84% of cases.^{5,6} The majority of these

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FIGURE 1. Hemangiomas in PHACE syndrome (patient 1 as a child).

abnormalities present as static anomalies, meaning they are congenital and remain unchanged during the lifetime of these patients⁷; the typical histopathologic alterations reported so far are mural zones of scarring and necrosis with almost complete loss of arterial smooth muscle cells and elastic fibers in the intima and media of affected arteries.⁸ However, a subset of patients with PHACE is at risk for postnatal progressive arterial narrowing and occlusion that might result in ischemic stroke.⁹ The progressive nature of the vascular lesions is underscored by the presence of moya-moya like collaterals, which develop over time to provide supplemental blood flow in response to the progressive hypoperfusion.⁶

Cervical arterial dissection (CAD) is a leading cause of ischemic stroke, although underdiagnosed.¹⁰ CAD is in most cases a multifactorial disease and patients often seem to have a predisposing arterial wall weakness, as suggested by many structural and functional arterial abnormalities described in association with CAD. Rarely, CAD can occur as a complication of inherited connective tissue disease such as Marfan syndrome or Ehlers-Danlos; it can also be correlated with other uncommon vascular disorders as for example fibromuscular dysplasia.¹¹ Among cervical and cerebral arteriopathies of PHACE syndrome, CADs have never been reported before;



FIGURE 2. Carotid dissection in patient 2. A, Extracranial ultrasound examination. B, Magnetic resonance angiogram showing a distal tapering stenosis with a hypoecogenic thickening of the internal carotid artery.

our 2 cases document that CAD is a possible complication of PHACE/S leading to acute cerebrovascular ischemic events.

CONCLUSIONS

Considering CAD's high stroke risk (about 70%), PHACE patients presenting with signs of acute cerebral ischemia should be screened for dissection. Ultrasound assessment represent a useful tool in the diagnostic pathway and in the follow-up of these patients.

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