

## A case of atypical sporadic hemiplegic migraine associated with PFO and hypoplasia of vertebro-basilar system

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Received: 16 March 2009 / Accepted: 10 April 2009 / Published online: 7 May 2009  
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**Abstract** We describe the case of a patient with atypical hemiplegic migraine and associated basilar symptoms, where a large patent foramen ovale (PFO) and hypoplasia of basilar artery were found. The longer period of 4-year remission of the headache attacks was coincident with the percutaneous PFO closure. When 5 years after, hemiplegic migraine attacks relapsed, with more relevant basilar symptoms, a mild re-opening of PFO was found. The atypical presentation of attacks with basilar symptoms and prolonged hemiplegia does not strictly fit the diagnostic criteria of ICHD-II.

**Keywords** Migraine with aura · Hemiplegic migraine · PFO · Basilar type migraine · Vertebro-basilar system hypoplasia

### Introduction

Particular presentations of migraine aura include hemiplegic migraine, in which aura consists of fully reversible motor weakness together with visual, sensory or speech disturbances, and basilar type migraine (BTM). This is a rare form of migraine that could present with a dramatic clinical picture, mimicking other severe neurological disorders. This could be particularly puzzling when complications of migraine as “persistent aura without infarction” occur [1]. BTM presents symptoms referred to posterior

cerebral circulation involvement: dysarthria, vertigo, tinnitus, hypoacusia, diplopia, ataxias, bilateral sensitive or visual deficits, and decreased level of consciousness.

According to symptoms of typical aura (ICHD-II), in both conditions aura lasts from 5 to 60 min, except for motor weakness (in hemiplegic migraine) that can last till 24 h [2]. Patent foramen ovale (PFO) has been reported to have an elevated prevalence in patients suffering from migraine with aura (MA) [3]. The possibility that right-to-left shunt may be a “trigger” in the genesis of aura has also been suggested [4], even if it is yet debated whether the primary mechanisms of migraine are vascular or neurogenic. Recent reports concerning the relationship between MA and PFO included patients with motor weakness also [5, 6]. In particular, in the report by Anzola et al. [6] 12% of patients with right-to-left shunt exhibited motor symptoms. Here, we describe a peculiar case of a patient with features “suggestive” for hemiplegic migraine (with prolonged hemiplegia and basilar symptoms) associated with a basilar artery hypoplasia and in which a large PFO was found and surgically treated by percutaneous closure.

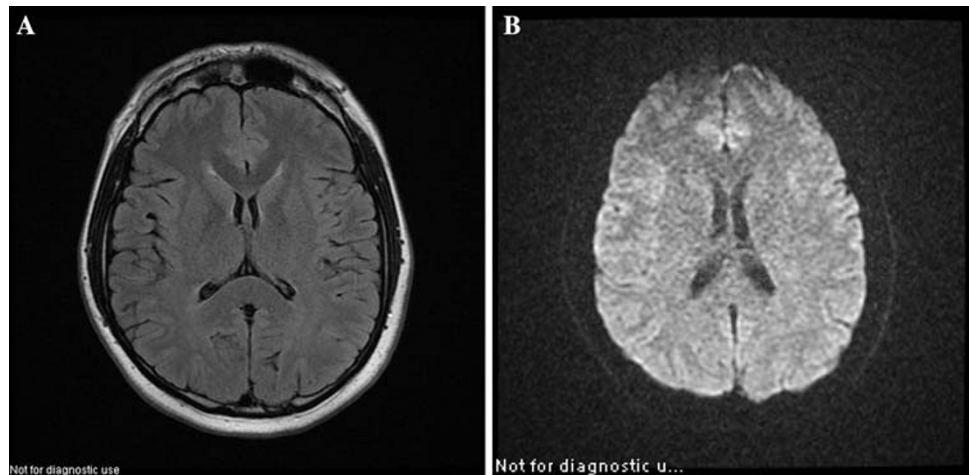
### Case report

A 35-year-old male patient came to our attention 5-years ago because of acute motor weakness in the left side of his body, together with a slurred speech, dizziness, and mild headache. These symptoms underwent a complete resolution after 3 weeks. The patient underwent the first episode 2-years before, when acutely he complained of same symptoms (that lasted for 3 weeks). He was a non smoker, and had a familial and medical history negative for nervous system disorders (including migraine). Hematological screening for thrombophilic risk factors (LAC, thrombocythemia, etc.), brain CT,

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**Fig. 1** **a** RM scan with T2-FLAIR (Fluid-Attenuated-Inversion-Recovery) technique, which shows a normal cerebral parenchyma. **b** a DWI-RMI scan, performed using the ADC (Apparent Diffusion Coefficient) protocol, which shows no alteration of signal



and MR imaging (including DWI scan) as in Fig. 1a, b were all normal. No pathological enhancements with gadolinium were observed.

A mild hypertension (150/90 mm Hg) was found, and a trans-esophageal-echocardiography (TEE) showed a PFO with a large right-to-left shunt.

On such basis a presumptive “cerebro-vascular” accident was diagnosed. Antiplatelet inhibitor and anti-hypertensive drug (ACE-inhibitor) were prescribed, and the patient was subsequently referred to an interventional center for trans-catheter PFO closure. A further diagnostic work-up with magnetic resonance angiography showed a marked hypoplasia of vertebro-basilar system, ruling out

other abnormalities of cerebral vessels and also deep venous thrombosis (Fig. 2).

After the PFO closure, our patient experienced a full well-being until the summer 2007, when he was referred to an emergency area for a new episode of acute weakness of the left side, prevalent in the arm and dysarthria, that completely recovered after 72 h. High blood pressure values were found and the CT scan of brain did not reveal ischemic or hemorrhagic acute lesion. Then a MR imaging and a MR angiography were obtained, confirming the basilar artery hypoplasia, previously observed. The patient underwent a new TEE, which showed a “re-open” PFO with a “mild” right-to-left shunt.

The patient was hospitalized in a medical university center, and was evaluated for a new heart surgical treatment. After admission, he experienced a new episode with weakness of his left body, and again difficulty in the speech and dizziness. Neuro-radiological studies did not show any further abnormality. Clinical picture gradually subsided within few days, and he was discharged with diagnosis of “possible hemiplegic migraine associated to basilar symptoms and stenosis of the basilar artery”. Based on the entity of the shunt, surgical PFO closure was not considered, and anticoagulant therapy (warfarin) was prescribed.

One month later, the patient came back to our observation because of a severe and abrupt dizziness with unsteady gait, suddenly followed by difficulty of speech articulation, diplopia, paresthesia, progressive weakness of the left side, nausea, and vomiting. In the next hours the clinical picture worsened evolving to anarthria and left hemiplegia.

This condition lasted for almost 5 h; then the patient partially recovered, complaining of a mild throbbing occipital headache. Complete recovery of speech occurred after 1 week persisting with only slight hyposthenia of the left arm. CT scan of the brain remained negative. This was the last episode until now.



**Fig. 2** An angiographic RM scan (using the time of flight technique, TOF, with digital three-dimensional reconstruction and planar projection on a T1-weighted sequence), which shows the stenosis of the basilar artery

## Discussion

In our case some of the clinical features of the aura (dysarthria, diplopia, dizziness etc.) during attacks were expression of brainstem dysfunction, so fulfilling the criteria for diagnosis of basilar-type migraine (ICHD-II) [2]. However, the presence of the motor weakness (consistent across attacks) and the length of the aura (more than 1 week), made the inclusion in this nosographic category inadequate. Indeed, according to the last International Classification of Headache Disorders 2nd Edition revision (ICHD-II) [2], basilar-type migraine should be diagnosed only when no motor weakness occurs; therefore the diagnosis of sporadic hemiplegic migraine (no familial history of migraine in our patient) could appear more appropriated, even if the lack of visual or sensory symptoms makes diagnosis very puzzling. Moreover the slow resolution of the motor aura that went beyond 24 h could be interpreted as “persistent aura without infarction” and the attacks classifiable as “probable migraine with aura”. Namely, repeated neuroimaging examination excluded ischemic damage or other cerebral pathologies underlying symptoms.

Familial hemiplegic migraine has basilar-type symptoms in 60% of cases and recently a novel mutation in the *ATP1A2* gene (R548H) in members of a family with BTM has been detected, suggesting that BTM and familial hemiplegic migraine (FHM) may be allelic disorders [7, 8]. The most intriguing aspect in our case was the presence of a large PFO. Several data in literature indicate an increased incidence of PFO in MA patients compared with general population [9, 10]. A closure of PFO in patients with transient cerebral ischemia suffering from MA induced an improvement of MA episodes [11]. However, the role of PFO in migraine pathogenesis remains to be established and, based on the recently published MIST trial data [12], there is no sufficient evidence that recurrence of migraine is improved by PFO closure.

On such basis, in the present case the 4-year persisting remission of migraine cannot be convincingly attributed to the PFO closure. Similarly, taking the natural history of hemiplegic migraine also into account, notoriously difficult to predict, it is not obvious to establish a causal link between PFO re-opening and attack relapsing. Nevertheless, it cannot be excluded that, in our patient, PFO plays a role, at least as cofactor, in the complex pathogenetic mechanisms of migraine.

Finally, it is interesting to note that our patient also had a marked hypoplasia of the basilar artery. There is a causal relationship between these conditions or is the association just coincidental?

It is worth noting that in our patient, symptoms of brainstem dysfunction were consistent across all attacks.

Since the original description of Birkerstaff [13] that attributed the brainstem dysfunction in BTM to the “constriction” of the basilar artery, “reversible vertebro-basilar ischemia” has been described in patients with BTM and FHM [14, 15]. Recently, it has been reported in a case of basilar artery fenestration and hypoplasia of the right posterior cerebral artery in a woman with basilar-type migraine [16]. About the possible role of basilar artery stenosis, it is to be noted that a higher frequency of hypoplastic vertebral artery (VA) was found in MA [17]. The authors suggested that hypoplasia of VA may be an additional factor leading to hypoperfusion in the posterior circulation during the aura phase. More recently Chuang et al. hypothesized that VA hypoplasia contributes to migraine through complex neurovascular pathways rather than through its low-flow volume [18].

Although vascular mechanisms are recently considered less relevant in migraine pathogenesis, vascular factors could play a role in some phases of the cascade underlying the migraine attack. The question remains open.

**Conflict of interest** None.

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