Brain-to-brain embolism: an unknown pathway to consider in ischemic strokes

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Nowadays, despite a comprehensive investigation, the cause of stroke still remains unknown in one third of patients [1]. Patent foramen ovale (PFO) or its clinical combination with atrial septal anomalies is associated with stroke (mainly cryptogenic stroke) in younger than 55 [2]. Several hypotheses are local formation of clots or atrial injuries, but paradoxical embolism is thought to be the main mechanism in PFO patients [3]. Common sources of emboli are deep venous thrombosis in lower limbs, pelvic veins or infrequently catheter related venous thrombosis [4-6] but there are only two case reports suggesting paradoxical embolism from a sinus thrombosis to brain arteries through PFO leading to ischemic stroke [7,8]. This way, a brain-to-brain embolism is postulated as an uncommon stroke mechanism.

Case report. We report a 51-year-old woman, with hyperlipidemia, smoking habit, chronic iron-deficiency anemia related to perimenopause polymenorrhea and acute occipito-cervical cephalalgia steady along time since 2 weeks, underwent suddenly dysartria, partial right hemisensory-motor syndrome. CT-angiography of supra-aortic arteries within 5 hours after the onset ruled out carotid pathology. Brain-MRI demonstrated two acute ischemic strokes in left perirolandic cortex with embolic features and right transverse sinus thrombosis involving ipsilateral sigmoid sinus and jugular foramen, confirmed by MR-venography (Figure, a-f). Continuous-ECG in first 24 hours and subsequent single electrocardiograms discarded emboligenic arrytmia. Transcranial Doppler with bubble contrast evidenced an intense curtain effect during Valsalva maneuver, suggesting a PFO.

Transthoracic and transesophageal echocardiograms ruled out structural emboligenic disease. Doppler and pel-

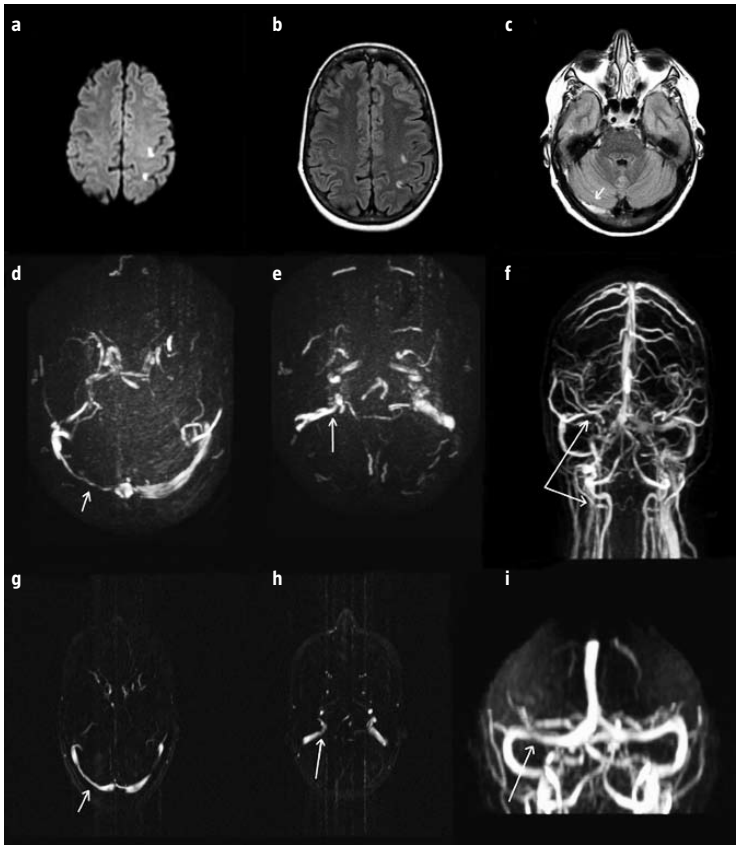

Figure. Brain-MRI, DWI-sequence (a) and FLAIR-sequence (b,c): two acute strokes with embolic features in left perirolandic cortex, sinus thrombosis (arrow). Brain-MRI venography, axial slides (d,e) and three-dimensional reconstruction of cerebral veins (f): it is observed a right transverse sinus thrombosis, irregular sigmoid sinus and jugular vein (arrows). Brain-MRI venography (g-i) two months later: restoration of sinus circulation (arrows).

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vic MR-venography discarded deep vein thromboembolic disease.

Tests showed hemoglobin 7.0 g/dL, normal homocysteine and platelets. Autoinmunity and thrombophilia screening was unremarkable. She received red blood cell transfusion, iron supplement and anticoagulation, recovering totally (Figure, g-i).

Discussion. Paradoxical embolism is a relevant mechanism of cryptogenic stroke in young adults with PFO [3]. Nevertheless, after a thorough anamnesis and a broad research, it is difficult to find the clot source, compatible history, relevant comorbidities or Valsalva maneuver preceding onset of symptoms suggesting a paradoxical embolism [9], as well as excluding securely minor emboligenic heart disease, atheroembolism and paroxysmal atrial fibrillation, whereby it remains uncertain as embolic stroke of undetermined source in most patients [10].

Prolonged cardiac monitoring could reduce this uncertainty in cryptogenic strokes detecting subclinical paroxysmal atrial fibrillation in a substantial number of patients [11,12] but the most effective duration of monitoring has not been clearly determined, hence current guidelines maintain at least 24-hour-monitoring as recommendation [13].

Most known sources of emboli are asymptomatic deep venous thrombosis or pelvic vein thrombosis [4,5] but the remaining venous system could be eventually an unknown origin in patients with PFO, such as a cerebral sinus source [7,8]. The presence of micro-embolisms in jugular veins in patients with sinus thrombosis could support this mechanism [14]. Besides brain-to-brain embolism seems to be exceptional and a bad-known pathway, it is a potential treatable entity we should consider in patients with acute stroke and previous acute headache with risk factors for sinus thrombosis, as our patient.

In conclusion, the combination of sinus thromboses, ischemic stroke and PFO as well as the chronopathology in this patient, suggests a paradoxical embolism as stroke mechanism. In ischemic strokes with PFO is justified a broad research of venous system, including brain, especially if a previous headache exists.

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