A patient with pulmonary arteriovenous fistulas (P-AVFs) in whom migraine disappeared after transcatheter coil embolization for the secondary prevention of paradoxical infarction. A case report

Dear Editor,

We experienced a patient, a 40-year-old woman, with left visual field disturbance immediately following a migraine attack. She had a history of migraine with aura (scintillating scotoma) since 10 years of age, and of hereditary hemorrhagic telangiectasia (HHT). Right occipital infarction and right posterior cerebral artery stenosis were confirmed on magnetic resonance imaging and angiography. The blood test revealed hypoxia. Fourteen pulmonary arteriovenous fistulas (P-AVFs) were confirmed on computed tomography (Figure 1). For 11 P-AVFs, coil embolization was performed. By postoperative transesophageal echocardiography, a patent foramen ovale (PFO) couldn’t be detected. The patient has had no episodes of migraine during three years of follow-up.

Two mechanisms of migraine in patients with right-to-left shunt (RLS) have been proposed. One is

Figure 1. Pulmonary arteriovenous fistulas were confirmed on computed tomographic (CT) scans of the chest (a)–(f).
paradoxical embolization to the brain of microemboli. The other is a shunt of chemical substances. These triggers might enter the systemic circulation through RLS instead of being trapped in the pulmonary capillaries, and initiate cortical spreading depression, which causes the migraine with aura. These mechanisms explain why RLS closure is effective for reducing migraine.

Indeed, it has been reported in patients who had P-AVFs associated with HHT that an association exists between migraine and P-AVFs and that coil embolization has been related to an improvement in migraine (1). Otherwise, the effectiveness of PFO closure remains unclear. In the Migraine Intervention with STARFlex™ Technology (MIST) trial, PFO closure performed in patients who had migraine associated with a PFO regardless of the quantity of shunt flow was not shown to be effective for migraine (2). On the other hand, Wahl et al. reported that shunt closure performed for the secondary prevention of paradoxical embolism in a patient with PFO was effective for reducing migraine (3), and it was assumed that the shunt volume was greater than in the MIST trial. This might be the reason for the difference in the effectiveness of the shunt closure for migraine.

Although both PFO and P-AVFs are associated with RLS, the effectiveness of shunt closure is clearer for P-AVFs than for PFO. In patients with PFO, it is difficult for a left-to-right shunt (LRS) to switch over to an RLS without a Valsalva maneuver. In P-AVFs, an RLS is consistently present. Because the RLS volume is larger in patients with P-AVFs, the effectiveness of shunt closure may be greater than that in PFO.

In our patient, we did not measure the quantity of shunt flow, but the presence of hypoxemia indicated that the shunt volume was considerable. On closure of the P-AVFs, the shunt flow was reduced appreciably, but we could not completely embolize all of the fistulas. Although some shunt flow persisted, the migraine resolved in our patient, suggesting the relative shunt volume, not the presence or absence of shunt, is associated with migraine headache. In our case, a chance occurrence is possible and we can’t deny a placebo effect. To prove the association between migraine and RLS and the effectiveness of shunt closure for migraine, large clinical trials and further case studies are considered necessary.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal.

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