Mechanical thrombectomy for acute fetal posterior cerebral artery occlusion with a hidden unruptured cerebral aneurysm: illustrative case

Kohei Ishikawa, MD,1,2 Hideki Endo, MD, PhD,1,2 Koichiro Shindo, MD,1,2 Ryota Nomura, MD,1,2 Koji Oka, MD,1 and Hirohiko Nakamura, MD, PhD2

1Department of Neurosurgery, Nakamura Memorial South Hospital, Sapporo, Hokkaido, Japan; and 2Department of Neurosurgery, Nakamura Memorial Hospital, Sapporo, Hokkaido, Japan

BACKGROUND Fetal posterior cerebral artery occlusion is rare and often presents with severe neurological symptoms. Although acute recanalization therapy is commonly used for cerebral vessel occlusion, unruptured cerebral aneurysms can be hidden distal to the occluded vessels.

OBSERVATIONS An 87-year-old man presented with consciousness disturbance and right hemiparesis. The authors diagnosed left fetal posterior cerebral artery occlusion and performed mechanical thrombectomy. A stent retriever was deployed from the middle cerebral artery M1 segment across the mural thrombus of the internal carotid artery. After the first pass, the fetal posterior cerebral artery remained occluded, with confirmation of a contrast effect around the thrombus. Because the anatomical course of the fetal posterior cerebral artery was unidentified, the procedure was stopped. At 1-week recovery, magnetic resonance imaging revealed complete recanalization and a fetal posterior cerebral artery aneurysm hidden within the occluded site. Blood flow was directed to the aneurysm, and the thrombus within the aneurysm simultaneously occluded the fetal posterior cerebral artery.

LESSONS To avoid critical complications following mechanical thrombectomy for fetal posterior cerebral artery occlusion, hidden aneurysms should be suspected when a “fried egg–like” contrast effect is observed around the thrombus.

https://thejns.org/doi/abs/10.3171/CASE22291

KEYWORDS mechanical thrombectomy; fetal posterior cerebral artery occlusion; posterior communicating artery; cerebral aneurysm; hidden aneurysm

Illustrative Case

An 87-year-old man with a medical history of arterial fibrillation presented with consciousness disturbance and right hemiparesis. His initial National Institutes of Health Stroke Scale score was 17. Magnetic resonance imaging (MRI) showed infarction of the left hypothalamus and thalamus (Fig. 1A). A T2* sequence showed a susceptibility vessel sign at the left internal carotid artery (ICA). A T2-weighted sequence revealed a bold flow void along the course of the posterior communicating artery, and no aneurysm was detected (Fig. 1B). Magnetic resonance angiography showed a left ICA defect (Fig. 1C), with hypoplasia of the left PCA from the P1 segment. Cerebral angiography revealed a mural thrombus on the C2 segment.
of the left ICA (Fig. 2A). Thus, we diagnosed a left FPCO and performed MT.

We were unable to insert a microcatheter into the FPCA, because the FPCA orifice was not detected. A microcatheter (Phenom 27, Medtronic) was advanced to the M1 segment of the middle cerebral artery (MCA) along a microwire (ASAHI CHIKAI 14, Asahi Intecc Co. Ltd.). We deployed a stent retriever (6 x 40 mm, Solitaire Platinum, Medtronic) from the M1 segment of the MCA across the mural thrombus. The stent retriever was withdrawn with an aspiration catheter (ACE 68, Penumbra Inc.) inserted just proximal to the thrombus (Fig. 2B). Although a red thrombus was removed, the FPCA remained occluded.

Intraoperative angiography after the first pass detected the FPCA orifice. A “fried egg-like” contrast effect was observed around the thrombus, which differed from the general findings of embolic vessel occlusion (e.g., the “claw sign”) (Fig. 2C). Because the anatomical course of the FPCA was unidentified and collateral flow to the ipsilateral PCA territory was confirmed (Fig. 2D), the procedure was ended. After MT, the patient’s National Institutes of Health Stroke Scale score was improved to 11. At 1 week after the procedure, MRI revealed complete recanalization and an unruptured FPCA aneurysm at the occluded site. Follow-up digital subtraction angiography showed the anatomical relationship between the aneurysm and the FPCA (Fig. 3A–C).

Discussion

Observations

We report a rare case of an FPCO with a hidden unruptured cerebral aneurysm. The fried egg-like contrast effect is an important finding for detecting a hidden aneurysm. The prevalence of hidden aneurysms was reported to be 3.7%. A few studies have also reported critical complications associated with rupture of hidden aneurysms due to mechanical stimulation of the stent retriever or thrombolysis. Hidden cerebral aneurysms are frequently bifurcating (e.g., of the MCA and basilar artery tip), which is likely because blood flow is directed toward the aneurysms. As such, sidewall-type hidden aneurysms are rare. A case of a sidewall-type ICA aneurysm hidden distal to the ICA occlusion was previously reported. However, to our knowledge, there are no reports of an FPCO in which the thrombus located within the ICA aneurysm secondarily occluded the FPCA. Thus, clinicians should be aware of hidden aneurysms at the occluded site when performing MT for FPCO.

It is rare for a thrombus to occlude only the FPCA, which is a sidewall branch of the ICA. The posterior communicating artery originates from the posterior wall of the C2 segment of the ICA and runs posterior medially to Anastomose with the ipsilateral PCA. According to flow dynamics and the thrombus trajectory, FPCO alone is improbable. Nevertheless, Matz et al. reported a case of FPCO caused by changes in flow dynamics, which involved increasing blood flow to the FPCA with ipsilateral chronic MCA occlusion. In the present case, the C2 to C1 segments of the left ICA were positioned more upright than normal, and the FPCA originated vertically from the ICA. The aneurysm was located on the FPCA, and blood flow was directed to the aneurysm rather than to the MCA or the
tion angiography should be considered. The fried egg effect is an angiographic sign suggestive of a hidden aneurysm, which is different from the characteristic claw sign observed in embolic stroke. Detection of this sign is important for avoiding critical complications associated with MT in patients with hidden aneurysms.

Lessons
 Because the ICA-FPCA bifurcation is the common site of cerebral aneurysms, an FPCO can coexist with a hidden aneurysm. To avoid a critical complication in MT for FPCO, a hidden aneurysm should be suspected when a contrast effect is observed around the thrombus.

Acknowledgments
 We thank Daisuke Mori, Tamio Ito, and Yoshihiro Suni for their support. We also thank Edanz for editing a draft of the manuscript.

References
 1. Shaban A, Albright KC, Boehme AK, Martin-Schild S. Circle of Willis variants: fetal PCA. Stroke Res Treat. 2013;2013:105937.
 2. Abdalkader M, Sahoo A, Dmytrw AA, et al. Mechanical thrombectomy of the fetal posterior cerebral artery. Stroke Vasc Interv Neurol. 2021;1:e000115.
 3. Zibold F, Kleine JF, Zimmer C, Poppert H, Boechk-Behrens T. Aneurysms in the target vessels of stroke patients subjected to mechanical thrombectomy: prevalence and impact on treatment. J Neurointerv Surg. 2016;8(10):1016–1020.
 4. Torikoshi S, Akiyama Y. A concealed intracranial aneurysm detected after recanalization of an occluded vessel: a case report and literature review. Intervent Neurol. 2016;4(3–4):90–95.
 5. Nozaki T, Noda M, Ishibashi T, Monta A. Ruptured hidden intracranial aneurysm during mechanical thrombectomy: a case report. Surg Neurol Int. 2020;11:446.
 6. Saito N, Hayashi N, Okubo T, et al. Internal carotid artery aneurysm visualized during successful endovascular treatment of carotid embolism. AJNR Am J Neuroradiol. 2000;21(3):546–548.
 7. Ryu JC, Kim JS. Mechanisms of stroke in patients with fetal posterior cerebral artery. J Stroke Cerebrovasc Dis. 2022;31(8):106518.
 8. Matz K, Apetroe A, Chemelli A, Brunner C, Nasel C. Flow dynamics in acute ischemic stroke due to embolic occlusion of a fetal posterior cerebral artery treated with endovascular thrombectomy - report of two cases. Radiol Case Rep. 2022;17(5):1727–1733.
 9. Abdalkader M, Sahoo A, Shulman JG, et al. Acute occlusion of the fetal posterior cerebral artery: diagnosis and management paradigms. Neuroradiol J. Published online June 6, 2021. doi: 10.1177/19714009211019383.
 10. Yamamoto Y, Yamamoto N, Kanematsu Y, et al. The claw sign: an angiographic predictor of recanalization after mechanical thrombectomy for cerebral large vessel occlusion. J Stroke Cerebrovasc Dis. 2019;28(6):1555–1560.

Disclosures
 The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions
 Conception and design: Ishikawa, Endo, Shindo. Acquisition of data: Ishikawa, Endo. Analysis and interpretation of data: Ishikawa, Endo, Nomura. Drafting the article: Ishikawa, Endo. Critically revising the article: Ishikawa, Endo, Shindo, Nomura. Reviewed submitted version of manuscript: Ishikawa, Endo, Nomura. Approved the final version of the manuscript on behalf of all authors: Ishikawa. Administrative/technical/material support: Endo, Shindo, Nomura. Study supervision: Endo, Oka, Nakamura.

Correspondence
 Kohei Ishikawa: Nakamura Memorial Hospital, Hokkaido, Japan. k.ishikawa@med.nmh.or.jp.