Acute tandem occlusion stroke in internal carotid artery and fetal posterior cerebral artery: endovascular management

Pablo Ros-Arlanzón, Elena Elvira-Soler, Carlos Domínguez-Rodríguez

Introduction. When the posterior cerebral artery arises from the internal carotid artery with an absent P1 segment, it is called fetal posterior cerebral artery (FPCA). It is unclear whether FPCA increases the risk of acute ischemic stroke, and the endovascular treatment of acute ischemic stroke due to acute occlusion of FPCA is not well established.

Case report. We report a case of acute ischemic stroke due to tandem occlusion of internal carotid artery and ipsilateral fetal posterior cerebral artery treated successfully with acute stenting of proximal lesion and mechanical thrombectomy of distal lesion with excellent neurological and functional outcomes.

Conclusion. Although further investigations are needed to determine the best treatment of these patients, endovascular treatment of fetal posterior cerebral artery occlusion is feasible.

Key words. Carotid stent. Fetal posterior cerebral artery. Interventional neurology. Ischemic stroke. Mechanical thrombectomy. Tandem occlusion.

Neurology Department (P. Ros-Arlanzón, E. Elvira-Soler). Interventional Neuroradiology Department. Hospital General Universitario de Alicante. Alicante, Spain (C. Domínguez-Rodríguez).

Corresponding author:
Dr. Pablo Ros-Arlanzón. Servicio de Neurología. Hospital General Universitario de Alicante. Calle Pintor Baeza, 11. E-03010 Alicante.

E-mail:
ros_pabarl@gva.es

ORCID:
orcid.org/0000-0002-4082-5942 (P.R.A.)

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Introduction

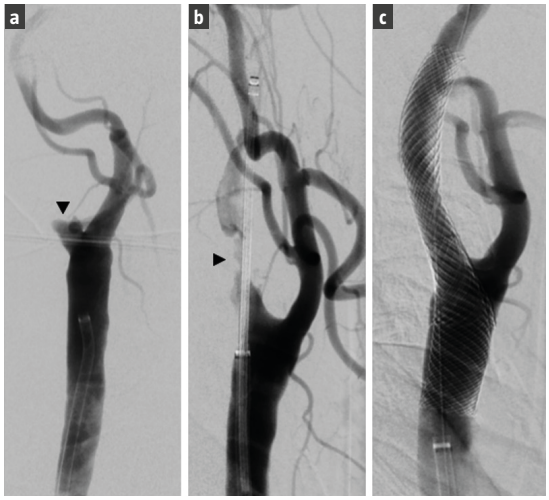
Posterior cerebral artery (PCA) normally arises from basilar artery as part of the vertebrobasilar system. When the PCA continues from the internal carotid artery (ICA), with an absent P1 segment, we are in front of a fetal posterior cerebral artery (FPCA) [1]. FPCA's blood flow becomes dependent of anterior circulation.

It is not clear that the fetal origin of the posterior cerebral artery accounts for an increased risk of acute ischemic stroke. Furthermore, the benefit of endovascular treatment of acute ischemic stroke due to emergent occlusion of FPCA is not well stablished [2]. Here we present a case of acute ischemic stroke due to tandem occlusion of proximal ICA and ipsilateral FPCA treated by anterograde approach with acute ICA stenting and distal mechanical thrombectomy.

Case report

A 69-year-old man with medical history of hypertension, dyslipidemia, and atrial fibrillation anticoagulated with apixaban 5 mg/12 hours, with a favorable baseline situation (modified Rankin Scale: 0) came to the emergency department of a tertiary hospital for sudden onset of left extremities weakness and speech disturbance while playing guitar 30 minutes ago. On arrival he presented with symptoms compatible with right total anterior circulation ischemia (right TACI stroke) with a National Institutes of Health Stroke Scale (NIHSS) of 18 points (0/0/0/1/2/2/4/0/3/0/2/0/2/2) at admission time. A head computed tomography scan and computed tomography angiogram demonstrated an Alberta Stroke Program Early CT Score of 9 and a large vessel occlusion of the right internal carotid artery (ICA) just after the carotid bulb, and another occlusion at the level of a P2 segment of the ipsilateral FPCA. Patient was not eligible for intravenous alteplase due to anticoagulant treatment with apixaban. Based on severity of symptoms, imaging characteristics and an extremely favorable timing of presentation (less than two hours from the onset of symptoms) emergent angiography to apply endovascular treatment under general anesthesia was performed (time door-to-groin, one hour). Catheterization of the right common carotid artery was performed through right femoral puncture with a NeuronMax088 catheter, revealing an occlusion of the right ICA from its origin (Fig. 1a). Angioplasty was made at with a Sterling balloon (4 × 40 mm) and because of residual critical stenosis of ICA, a carotid Wallstent (9 × 40 mm) was placed in the

Figure 1. Digital subtraction angiography: treatment of the proximal lesion. a) Black arrow shows the occlusion of the origin of the right internal carotid artery (ICA); b) Black arrow shows the residual stenosis post-angioplasty of the right ICA and the stent prior to its placement; c) Stent positioned in the right ICA with adequate morphological outcome without significant residual stenosis.



right common carotid artery and the right ICA after passing the occlusion (Fig. 1b-c). After this anterograde approach (proximal-to-distal), a single aspiration pass was performed in right P2 segment of the FPCA with a reperfusion catheter 3MAX and Traxcess 14 guidewire, successfully revascularizing the right PCA circulation (Modified Thrombolysis in Cerebral Infarction Score: 3) (Fig. 2). After the procedure, the patient was extubated and admitted to the stroke unit. Clinical and functional evolution of the patient was favorable and double antiplatelet therapy was initiated (intravenous lysine acetylsalicylate during the mechanical thrombectomy and oral clopidogrel at 24 hours of the procedure after a head computed tomography scan). Because of atrial fibrillation, anticoagulation was reinitiated with apixaban 5 mg/12 hours. At discharge, patient had only a mild hemi-sensitive impairment (NIHSS: 1 point) and received triple antithrombotic therapy with acetylsalicylic acid, 100 mg orally once per day, clopidogrel, 75 mg orally once per day, and apixaban, 5 mg/12 hours. One month after the discharge, clinical stability was assessed during a follow-up visit and a neurosonological study was performed showing permeability of the stent, so clopidogrel was discontinued. Patient received single antiplatelet therapy with acetylsalicylic acid and anticoagulation with apixaban. 90 day modified Rankin Scale after the procedure was 1, NIHSS was 0.

Discussion

Prevalence of FPCA on angiographic studies varies from 9.3% to 32% [3,4]. The association between FPCA and acute ischemic stroke varies within studies, but even if this association exists it seems to be weak [3,5]. The importance of FPCA in acute ischemic stroke lies on its capacity of changing the clinical profile of thromboembolic events and on its implications on the acute revascularization therapies. In fetal cerebral circulation, the occipital blood supply comes from a branch of the ICA. In most individuals, as the vertebrobasilar system develops and increases in caliber, the diameter of the branch from the ICA decreases. Finally, the usual configuration of the Willis polygon develops, with a posterior communicating artery that maintains functionally nonexistent flow from the anterior to the posterior circulation under normal conditions, with a smaller diameter than the P1 segment of the PCA, which arises from the basilar artery.

There is a percentage of individuals in whom the embryological remnant from the ICA to the PCA persists, with a larger diameter than the P1 segment of the PCA (hypoplastic P1) or with an absent, undeveloped P1 segment (FPCA). In this way, in FPCA, the occipital flow depends on the ICA, as in fetal cerebral circulation. Due to major blood flow from anterior to posterior circulation through persistent embryological remanent of terminal ICA into PCA, the FPCA can be an important passage point for embolism due to this flow diversion [6].

Even there is no well-stablished evidence, anterograde approach (extracranial first) versus the retrograde approach (intracranial first) in the endovascular treatment of acute ischemic stroke due to tandem occlusions has been compared in multiple studies showing slightly better results in the retrograde approach [7,8]. We decided to make an anterograde approach because of the absence of ipsilateral intracranial compensation from vertebrobasilar system due to FPCA. Once the blood flow from right cerebral hemisphere was restored, we tried to solve FPCA occlusion.

Homonymous hemianopsia from PCA stroke could be very disabling even if only accounts for 2 points in NIHSS and the risks of the procedure, once we were inside, seemed acceptable. In a similar presentation case of tandem ICA-FPCA occlu-

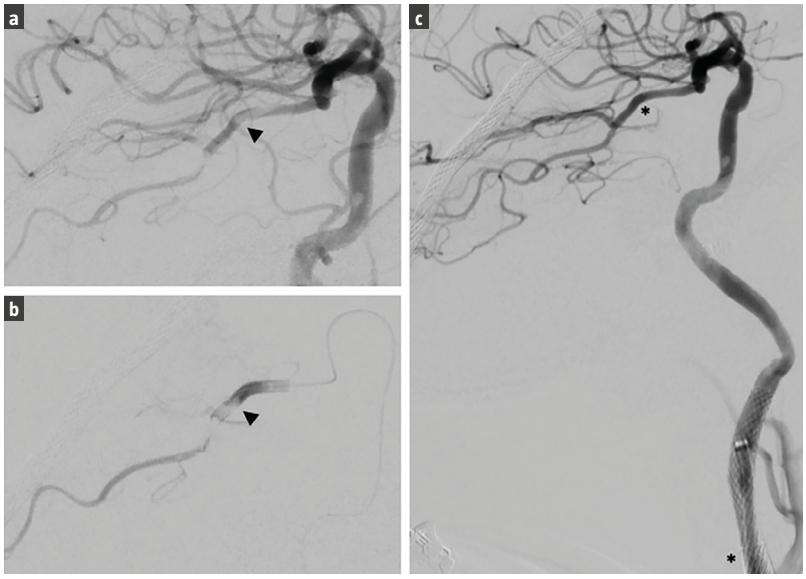
sion, patient was treated with ICA recanalization and no further intervention was performed, leaving the patient with residual contralateral homonymous hemianopia and mild left sided weakness [9].

Reports of successful endovascular treatment of acute ischemic stroke due to FPCA occlusion are scarce [9,10]. As far as we know this is the first reported case of tandem occlusion of proximal ICA and ipsilateral FPCA treated by endovascular treatment with excellent neurological and functional outcomes.

Conclusion

Ischemic stroke due to fetal posterior cerebral artery occlusion, even if rare, can be the origin of important disability. Endovascular treatment is possible as mentioned here and in medical literature. Further investigation is needed to stablish the best management on those patients.

Figure 2. Digital subtraction angiography: treatment of the distal lesion. a) Black arrow shows the occlusion of the P2 segment of right fetal posterior cerebral artery (FPCA); b) Black arrow shows the occlusion of the P2 segment of right FPCA prior to mechanical thrombectomy; c) Final result of the procedure with the stent positioned in the right ICA and no filling defects seen on previously occluded P2 segment of right FPCA and origin of the right ICA. Asterisks (*) show the sites of previous occlusions.



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Ictus isquémico agudo por oclusión en tándem de la arteria carótida interna y la arteria cerebral posterior fetal: tratamiento endovascular

Introducción. Cuando la arteria cerebral posterior se origina desde la arteria carótida interna con un segmento P1 ausente, se denomina arteria cerebral posterior de origen fetal (ACPF). No está claro si la ACPF aumenta el riesgo de ictus isquémico agudo, y el tratamiento endovascular del ictus isquémico agudo debido a la oclusión aguda de la ACPF no está bien establecido.

Caso clínico. Presentamos un caso de ictus isquémico agudo debido a la oclusión en tándem de la arteria carótida interna y la arteria cerebral posterior fetal ipsilateral tratado con éxito mediante la colocación de una endoprótesis en la lesión proximal y trombectomía mecánica de la lesión distal, con excelentes resultados neurológicos y funcionales.

Conclusión. Aunque se necesitan más investigaciones para determinar el mejor tratamiento de estos pacientes, el tratamiento endovascular de la oclusión de la arteria cerebral posterior fetal es factible.

Palabras clave. Arteria cerebral posterior fetal. Endoprótesis carotídea. Ictus isquémico. Neurología intervencionista. Oclusión en tándem. Trombectomía mecánica.