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CASE REPORT **OLGU SUNUMU**

SYMPTOMATIC CAROTIS STENTING IN FETAL POSTERIOR CEREBRAL ARTERY INFARCT: A CASE REPORT

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ABSTRACT

Fetal posterior cerebral artery (fPCA) is a common variant in the posterior cerebral circulation, in which the posterior cerebral artery perfuses this region as a branch of the internal carotid artery (ICA). The importance of fPCA in the risk of acute ischemic stroke is not clear. In this article, we aimed to present a case with ipsilateral fPCA detected in the acute infarction of the posterior circulation and stent applied to the ipsilateral carotid artery. A 55-year-old female patient was admitted to the emergency service with complaints of inability to see her right side and numbness in her right hand, which started after chemotherapy and continued for three days. In the angiogram, it was observed that there was a filling defect compatible with 99% stenosis in the left ICA cervical segment with injection from the left common carotid artery, and only fPCA filling in its distal, and the left subclavian artery was occluded from the proximal with injection from the aortic arch. Using the distal embolism-retaining filter, first balloon angioplasty and then carotid artery stenting were performed. In the post-procedure image, the stent was intact there was no residual stenosis, and there was clear filling of the left MCA and both PCAs (left fPCA) in the distal. The presence of carotid stenosis and fPCA may not always be considered in posterior circulation strokes. The connection between PCA and ICA is provided by the posterior communicating artery (PCoA). fPCA is an anatomical variant of ICA. In the presence of fPCA, especially in cases with stenosis or occlusion in the ipsilateral hemodynamically significant ICA, adequate collateral circulation may be lacking, and when cerebral perfusion is impaired (e.g. due to hypotension), watershed infarcts may occur in PCA-perfused areas.
Keywords: Fetal posterior cerebral artery, acute stroke, carotis stenting.

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FETAL POSTERİOR SEREBRAL ARTER ENFARKTINDA SEMPTOMATİK KAROTİS STENTLEME: OLGU SUNUMU

ÖZ

Fetal posterior serebral arter (fPCA), posterior serebral dolaşımda posterior serebral arterin internal karotid arter (ICA) dalı olarak bu bölgeyi perfüze ettiği yaygın gözüken bir varyanttır. fPCA'nın akut iskemik inme riskinde önemi net değildir. Biz bu yazıda posterior dolaşıma ait akut enfarkt tablosunda saptanan ipsilateral fPCA varlığı ve ipsilateral karotis artere stent uygulanan bir vakayı sunmayı amaçladık. 55 yaşında kadın hasta kemoterapi sonrası başlayan ve üç gündür devam eden sağ tarafını görememe, sağ ağız kenarında ve sağ el parmaklarında uyuşma şikayeti ile acil servise başvurdu. Anjiogramda, sol kommon karotis arterden enjeksiyonla sol ICA servikal segmentte %99 stenoz ile uyumlu dolum defekti ve distalinde sadece fPCA'da dolumu olduğu, arkus aortadan enjeksiyonla sol subklavian arterin proksimalden itibaren oklude olduğu izlendi. Distal emboli tutucu filtre kullanılarak, önce balon anjiyoplasti ve ardından karotis arter stentleme yapıldı İşlem sonrası alınan görüntüde stentin intakt ve rezidü stenozun olmadığı ve distalde sol MCA ile her iki PCA (sol fPCA)'nın net dolumu izlendi. Posterior sirkülasyon inmelerinde karotis stenozu ve fPCA varlığı her zaman akla gelmeyebilir. PCA ve ICA arasındaki bağlantı, posterior komünikan arter (PCoA) tarafından sağlanır. fPCA, ICA'nın anatomik bir varyantıdır. fPCA varlığında, özellikle ipsilateral hemodinamik açıdan anlamlı ICA'da stenoz veya oklüzyon olan vakalarda yeterli kollateral dolaşımdan yoksun olabilir ve serebral perfüzyon bozulduğunda (örn. hipotansiyon nedeniyle), PCA ile perfüze olan bölgelerde watershed enfarktlar meydana gelebilir.

Anahtar Sözcükler: Fetal posterior serebral arter, akut inme, karotis stentleme.

INTRODUCTION

The fetal posterior cerebral artery (fPCA) is a common variant in the posterior cerebral circulation in which the posterior cerebral artery (PCA) perfuses this region as a branch of the internal carotid artery (ICA) (1). Anatomically and angiographically, it is observed between 11% and 46% (2-5). The relevance of fPCA in the risk of acute ischemic stroke is not clear. fPCA anatomic variants are usually asymptomatic and, although found incidentally, may rarely be associated with stroke (6). In this article, we aimed to present a case of ipsilateral fPCA detected in an acute infarct of the posterior circulation and carotid artery stenting in ipsilateral carotid stenosis.

CASE REPORT

A 55-year-old woman presented to the emergency department with complaints of loss of vision on her right side, and numbness in the right side of the mouth and fingers of the right hand, which started after chemotherapy and continued for three days. Her past medical history included cirrhosis, cholelithiasis, breast cancer, and lymph metastasis. Electrocardiography (ECG) was in normal sinus rhythm, and vital signs were stable.

General condition was normal, consciousness was clear, coherent, and oriented, pupils were isochoric, light reflex was +/+, eye movements were natural, and homonymous hemianopsia was observed on the right side on neurologic examination (NE). No facial asymmetry and no motor or sensory deficit were present. Other NE results were normal.

Laboratory parameters were normal except for a hemoglobin value of 7.6 g/dL. There was no history of active hemorrhage. Brain computed tomography (CT) showed a normal appearance. Cervical CT angiography showed a lesion compatible with stenosis over 95% at the bulb level in the proximal left ICA cervical segment (Image 1 A,B,C) and fPCA on the left (Image 1 D). The left subclavian artery was not clearly visualized. No intracranial major vessel occlusion was observed. Diffusion Magnetic Resonance Imaging (MRI) revealed lesions compatible with acute infarction in the left thalamus and left occipital region (Image 2 A,B,C,D).

The patient was followed up in the neurology clinic and echocardiography (ECHO) revealed an ejection fraction of 65%. Carotid and vertebral Doppler ultrasonography showed a plaque formation of approximately 40x4 mm in size with an irregular surface and mixed pattern in the proximal part of the left ICA, and stenosis in the range of 70-99% (peak systolic velocity 400 cm/sec) according to the The North American Symptomatic Carotid Endarterectomy Trial (NASCET) (7) criteria was detected in the most prominent part. In addition, when the left vertebral artery flow direction and form were

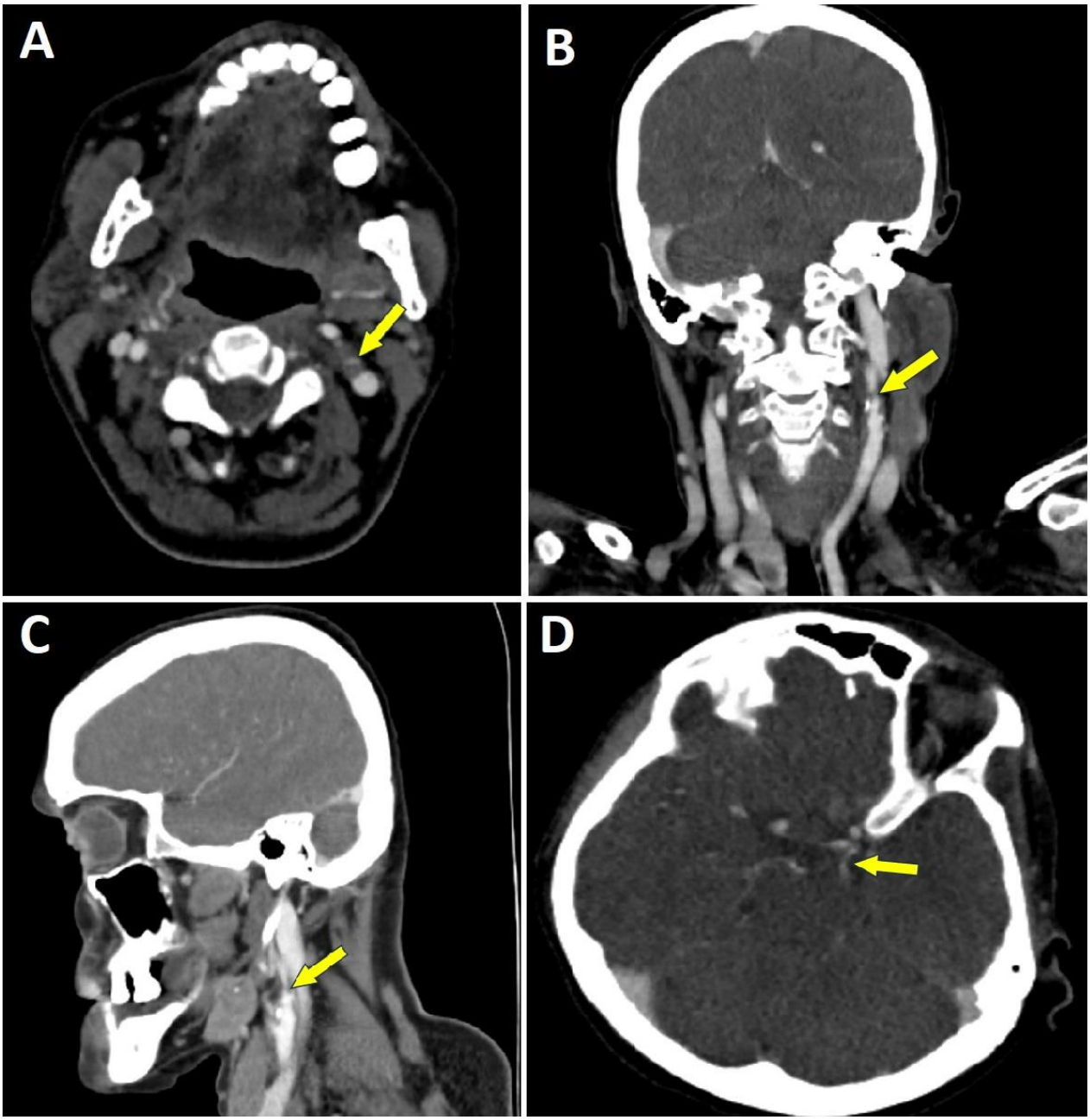

Figure 1. In cervical CT angiography, over 90% stenosis was observed at the bulbus in the proximal left ICA cervical segment in A) axial section, B) coronal section, C) sagittal section, and D) Left fPCA was observed in the axial section in cranial CT angiography.

examined, the end-diastolic flow velocity (EDV) value was 0 cm/sec on spectral examination, suggesting stenosis-occlusion in the distal segments. The patient was consulted at the cardiovascular surgery clinic for endarterectomy. The patient was considered unsuitable for surgery because of comorbid diseases, and angiography was planned for carotid artery stenting.

After hemodynamic stabilization was achieved, the patient underwent elective Digital Subtraction Angiography (DSA) on day 7 of the stroke. Angiogram showed normal filling of both middle cerebral arteries (MCA) and anterior cerebral arteries (ACA) with injection from the right common carotid artery (CCA) (Image 3 A) and normal filling of the right vertebral artery,

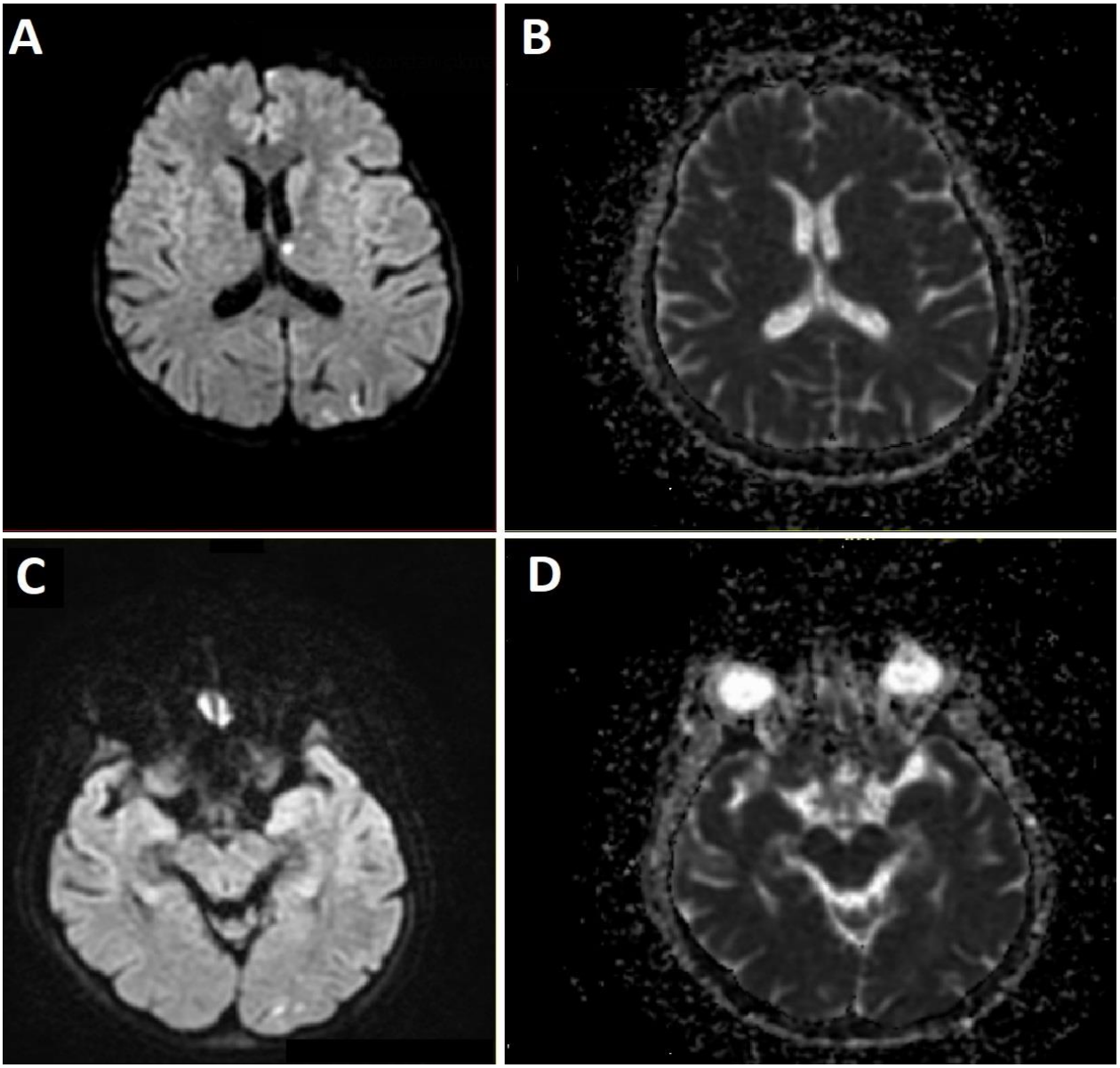

Figure 2. In diffusion MRI, a lesion compatible with an acute infarct is observed, A) hyperintense in the left thalamic and left occipital cortical areas in the b1000 sequence, B) hypointense in the ADC sequence, C) hyperintense in the left occipital region in the b1000 sequence, and D) hypointense in the ADC sequence.

both superior cerebellar arteries and right posterior cerebral artery (PCA) with injection from the right subclavian artery (Image 3 B,C). Injection from the left common carotid artery showed a filling defect consistent with 99% stenosis in the cervical segment of the left ICA (Image 3 D) and distal filling only in the fPCA (Image 3-E). The left subclavian artery was occluded proximally by injection from the aortic arch (Image 3 F). Balloon angioplasty followed by carotid artery stenting with a 7x40 mm closed-cell self-expanding carotid stent using a distal embolus arresting filter was performed. The post-procedural image showed an intact stent with no residual stenosis (Image 3-G) and clear filling of the distal left MCA and both PCAs (left fPCA) (Image 3-H). No periprocedural complications developed, and neurologic examination after angiography was normal. Of note, signed informed consent was obtained from the patient.

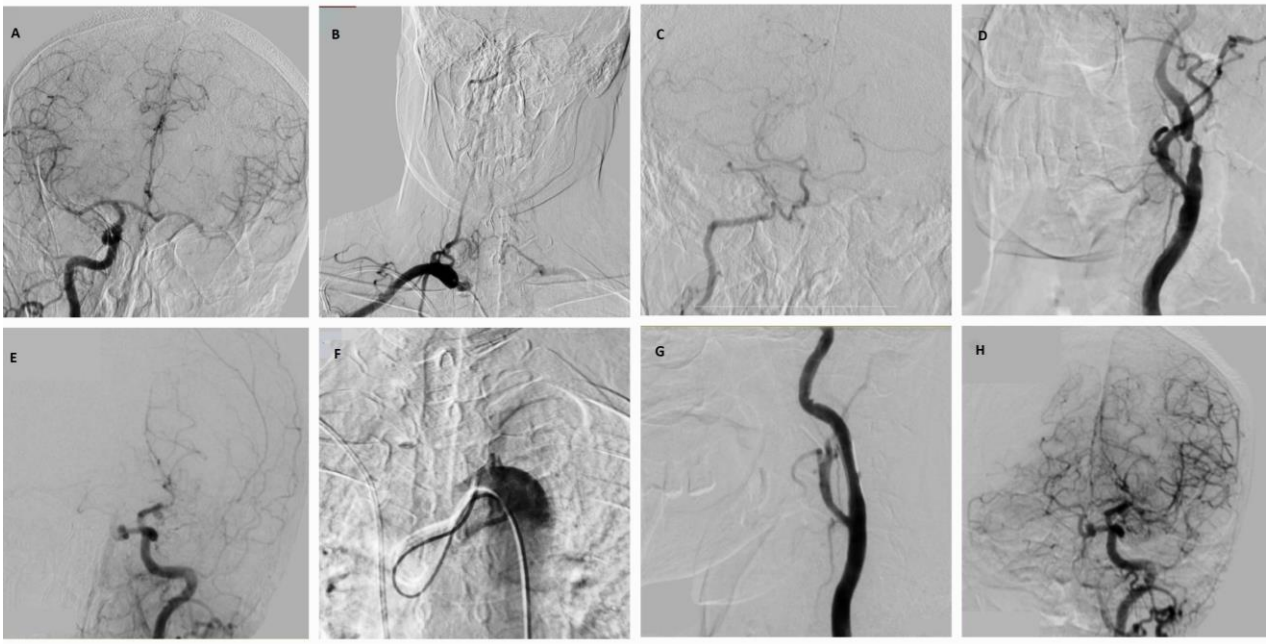

Figure 3. A) Bilateral middle cerebral artery (MCA) and anterior cerebral artery (ACA) fillings with injection from the right common carotid artery (CCA) in antero-posterior (AP) cranial angiogram, B) Right vertebral artery filling with injection from the right subclavian artery in AP angiogram, C) In the AP cranial angiogram, the right posterior cerebral artery (PCA) and bilateral superior cerebellar arteries are filled with injection from the right subclavian artery, D) In the left oblique angiogram, there is a filling defect in the left ICA cervical segment compatible with 99% stenosis with the injection from the left common carotid artery, E) In the AP cranial angiogram, Filling only in the fPCA with left CCA injection, F) Appearance of occluded left subclavian artery with the injection from the arch of the aorta on the AP angiogram, G) The stent is intact after balloon angioplasty and stenting to the left ICA, with no residual stenosis. H) Left CCA on the post-procedure AP cranial angiogram injection, left MCA and both PCA fillings were monitored.

DISCUSSION AND CONCLUSION

The presence of fPCA in posterior circulation strokes may obscure the possibility that symptomatic carotid artery stenosis may be involved in the etiology of posterior system stroke. Posterior cerebral arteries are often supplied from the vertebrobasilar system. It provides blood supply to the occipital, temporal, and posterior inferior parietal lobes (8,9). The connection between the PCA and ICA is provided by the posterior communicating artery (PCoA) (10,11). fPCA is an anatomical variant of the ICA (12). According to the definition of Van Raamt et al., the P2 segment originates from the ICA in fPCA types (13). However, the P1 segment of the PCA may or may not be hypoplastic (14).

While no significant statistical relationship was found between fPCA and gender or age according to some studies (10), unilateral fPCAs were reported to be more common in women in some studies (15). When a recent retrospective series of 139 CT angiograms was analyzed, fPCA was found in 13 cases and fPCA was found only unilaterally in 10 cases (10). Although it was reported that patients with partial fPCA may be more prone to develop ischemic stroke (16) and that it is frequently detected on the right side (17-19), in our case, left fPCA was detected and was associated with ischemic stroke. In cases of fPCA, more area is perfused by the anterior circulation since PCA perfusion is completely provided by the ICA. Furthermore, leptomeningeal collaterals cannot develop between the ICA and the vertebrobasilar system because the MCA and PCA are connected to the internal carotid system. Although small vessel occlusion and ventrolateral thalamic involvement have been found more frequently in fPCA stroke cases, possibly associated with altered hemodynamic status in the P2 portion of the PCA where the thalamic perforators branch, currently relatively inadequate information is available on how fPCA affects the characteristics of ischemic stroke (19).

Additionally, the angiogram showed filling of the right ICA, both anterior cerebral arteries (ACA)

and middle cerebral artery (MCA) by injection from the right CCA, whereas filling of the left PCA by injection from the left CCA was observed only from the left ICA (fPCA). These results show that cerebral flow directions changed due to advanced stenosis in the carotid artery and the flow towards the fPCA became more prominent. It can be explained that after stenting, the cerebral flow directions returned to the expected pattern. After the stenting procedure, it was clearly observed that the cerebral flow directions returned to the expected pattern and the left MCA and both PCAs were filled.

In a study of 751 patients (348 females, 403 males), Willis Polygon variants were retrospectively analyzed. Among the arteries, anatomical variations related to the PcoA were the most common, while anatomical variations related to the MCA were the least common. The most common variation of ACA was found to be A1 segment hypoplasia (20). Except for a case of right fPCA with severe brachiocephalic artery stenosis and left subclavian artery occlusion, no other case similar to our case is reported in the literature (21).

In the presence of fPCA, it may lack adequate collateral circulation, especially in cases with stenosis or occlusion of the ipsilateral hemodynamically significant ICA; when cerebral perfusion is impaired (e.g., due to hypotension), watershed infarcts may occur in areas perfused by the PCA (10). Iron deficiency anemia is also among the risk factors for ischemic stroke due to the hemodynamic disturbance that may occur. It accounts for about half of anemia cases. Mortality rate was shown to be higher in patients with anemia in atherosclerosis-associated strokes (22).

In atherosclerosis-related stenoses of the cerebral arteries, the degree of stenosis, plaque characteristics, as well as whether the stenosis is symptomatic or asymptomatic, affect the treatment decision. It should be kept in mind that posterior system infarcts on CBCT and brain MRI may be emboli developing in stenoses of the arteries supplying the posterior system, but this situation may vary depending on vascular variations of the cerebral arteries. Embolic infarcts in the PCA territory may originate from the atherothrombotic ipsilateral carotid artery. This case highlights the clinical implications of anatomical variants in cerebral perfusion. In particular, the frequency of anterior circulation strokes may increase in the presence of fPCA. It can also cause additional damage to the PCA territory. Although the presence of malignancy, chemotherapy, and anemia in our case initially led us to other etiologies, after detailed examination and evaluation, ipsilateral carotid stenosis and fPCA were determined and the patient was successfully stented.

Cases with fPCA and concomitant atherosclerotic carotid artery disease are prone to ischemic events in the PCA territory. Although the vast majority of normal variations have no major clinical impact, their assessment may assist in planning surgical and interventional procedures and may clarify rare and unexpected post-treatment findings (20).

In summary, the possibility of fPCA should be considered in patients presenting with simultaneous posterior and anterior system infarction or in individuals with suspected embolism but with posterior system infarction without a clear cardiac cause.

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Ethics

Informed Consent: The authors declared that informed consent form was signed by the patient.

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