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Case Report

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# Endovascular management of a persistent primitive trigeminal artery aneurysm initially misdiagnosed as pituitary adenoma: A Case Report

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**Abstract**

Persistence of primitive intracranial embryonic anastomoses such as the permanent primitive trigeminal artery (PPTA) is rare, with the PPTA representing 80-85% of these cases. Aneurysms associated with PPTA are rare. This presents diagnostic and therapeutic challenges. We report a 64-year-old woman, initially evaluated for headache and dizziness, where cranial computed tomography (CT) incidentally suggested a hypodense sellar lesion. Subsequently, on CT angiography, a 9 mm saccular aneurysm in the PPTA and an 18 mm aneurysm in the right internal carotid artery (ICA) cavernous segment were identified. Endovascular treatment with flow diverter stent implantation was successfully performed, followed by post-operative ticagrelor and acetylsalicylic acid therapy. The patient was discharged neurologically intact after three days of care in the hospital and there was no deterioration in neurological examination at 1-year follow-up. This case underscores the necessity of careful angiographic evaluation in patients with suspected pituitary masses to avoid potentially catastrophic misdiagnoses. It also highlights the critical role of imaging techniques in identifying rare vascular anomalies.

**Keywords:** Aneurysm, carotid-vertebrobasilar anastomoses, case report, endovascular technique, persistent primitive trigeminal artery

## 1. Introduction

PPTA is one of the four fetal anastomoses that spontaneously closes with the development of the posterior communicating (PCOM) arteries and vertebral arteries, which provide posterior blood flow between the carotid and vertebrobasilar circulations during the fetal period. In rare cases where closure fails, these anastomoses persist into adulthood and are called permanent carotid-vertebrobasilar anastomoses (1, 2). PPTA is the most common type of permanent carotid-basilar anastomosis (1-3).

It is usually found incidentally in cases of aneurysms accompanying PPTAs or patients with hormonal disorders due to pituitary compression (4,5). Various vascular abnormalities such as trigeminal artery-cavernous fistulas, Moyamoya disease may be associated with PPTA (6).

The literature shows that cases accompanied by aneurysms are encountered in patients with PPTA, but aneurysms originating from PPTA are rare. Treatment can be performed with surgical and endovascular methods (7, 8).

In this article, a case of PPTA incidentally detected in a patient with suspected pituitary mass due to headache and dizziness during cranial imaging was presented.

## 2. Case presentation

A 64-year-old woman without a previous medical history presented with a two-month history of headaches and dizziness. Her neurological examination had no significant findings. In the cranial computed tomography (CT) imaging, a 13 mm hypodense nodular lesion was observed in the right half of the sella turcica (Fig. 1). Further evaluation with cranial CT angiography revealed the presence of two saccular aneurysms: an approximately 9 mm aneurysm in the proximal region of the PPTA at the cavernous segment of left ICA and an 18 mm aneurysm at the cavernous segment of the right ICA (Fig. 1 and 2). The location of the aneurysms and their presence in two vessels were evaluated by the neurovascular council and the endovascular method was recommended.

After premedication with 300 mg of acetylsalicylic acid and 180 mg of ticagrelor 12 hours before treatment. While the patient was under general anesthesia, a 6F 088 long sheath (Neuron MAX, Penumbra, Alameda, CA, USA) and a Sofia distal access catheter (Microvention, Tustin, California, USA) were placed through the right femoral arterial access to provide access.

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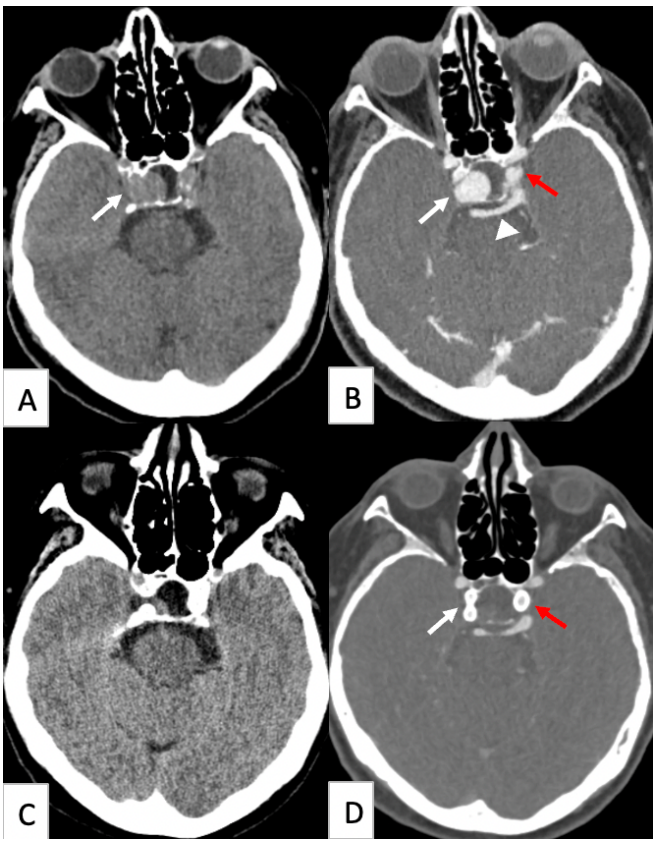


**Fig. 1.** Preoperative (A-B) and first year (C-D) cranial CT and CT angiography axial images. A: White arrow shows the lesion in the right half of the sella confused with the pituitary mass. B: White arrow shows cavernous segment aneurysm of the right internal carotid artery, triangular head shows PPTA and red arrow shows PPTA aneurysm. C: Postop first year control cranial CT, D: Postop first year control cranial CT angiography

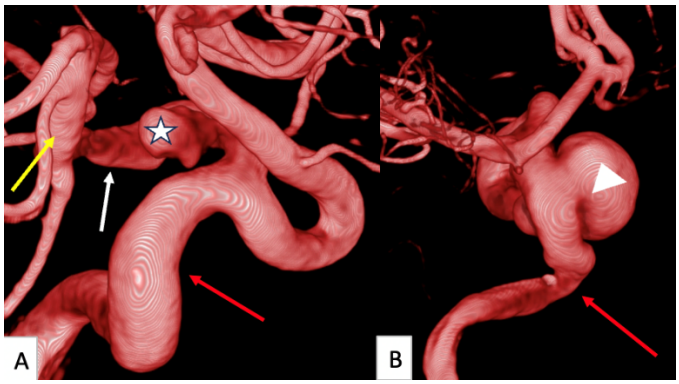


**Fig. 2.** Images of the patient's aneurysm. A: Red arrow indicates internal carotid artery (ICA), white arrow indicates PPTA, yellow arrow indicates basilar artery, asterisk indicates PPTA aneurysm. B: Arrowhead indicates cavernous segment aneurysm of the right internal carotid artery

Due to the position, size and symptomatology, it was decided that coils would not be suitable for treatment and flow-directing stent placement would be more suitable. While irrigating with heparin (total 12500 IU), a guiding catheter was introduced to the right ICA and 5.5x40 mm and 5x25 mm Pipeline Embolisation Device (PED-Shield, Medtronic Neurovascular, Irvine, California, USA) flow-directing stent were placed in the aneurysm neck in the cavernous segment under roadmap guidance. In the same session, a guiding catheter was placed in the ICA on the left side and a 6x16 mm Pipeline Embolization Device (PED-Shield, Medtronic Neurovascular, Irvine, California, USA) flow-directing stent was placed in the neck of the aneurysm in the PPTA localization under the road map. On control angiography images, it was observed that the aneurysm necks were closed by the stents and flow in the aneurysm lumens was reduced (Fig. 3). The intervention was concluded without complications.

The patient was started on ticagrelor 90 mg ticagrelor daily and acetylsalicylic acid 300 mg acetylsalicylic acid daily. The patient was discharged after 3 days of follow-up without any change in neurological examination and no residual aneurysm was found in the control first-year cranial CT angiography images (Fig. 3).

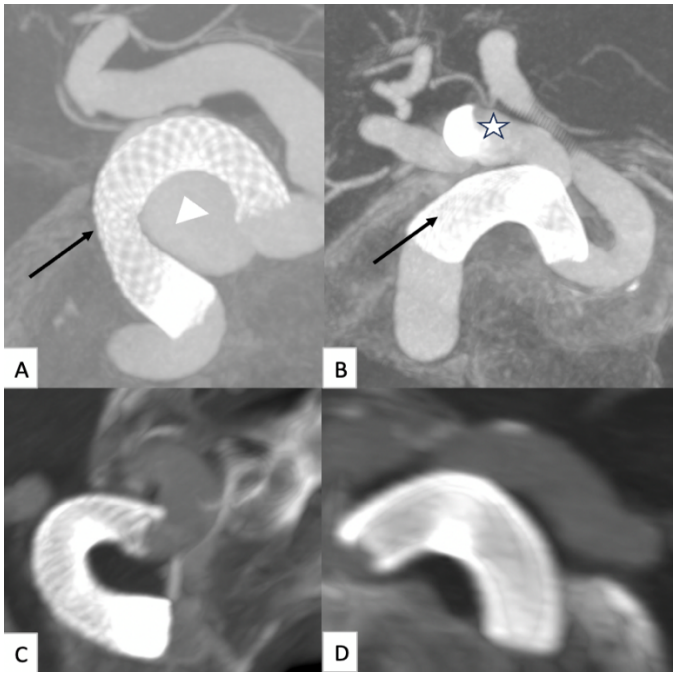


**Fig. 3**. Postoperative (A-B) and first-year (C-D) control CT angiography images of the patient. No residual aneurysm was seen in the control first year cranial CT angiography images. Black arrow: flow diverter stent, arrowhead: right ICA cavernous segment aneurysm, asterisk: PPTA aneurysm

## 3. Discussion

It is very significant to investigate the presence of PPTA when planning surgical approaches to the skull base. The presence of an unrecognized PPTA may lead to injuries following approaches to the sellar or para-sellar regions and the cavernous sinus (2-4, 9). There are different results regarding the frequency of the association of PPTA with intracranial aneurysms and other vascular pathologies. Aneurysms in PPTA can occur at the PPTA-ICA junction, PPTA-basilar artery junction (7, 10). Aneurysms can be saccular, fusiform, small, large, single or multiple. It is rare for multiple aneurysms to accompany PPTA patients (11). Because of the rarity of PPTA aneurysms and the paucity of relevant studies,

the bleeding risk of PPTA aneurysms is unknown (10). Since PPTA aneurysms are usually located deep in the vicinity of cranial nerves and perforating vessels, surgical treatment is difficult and endovascular treatment is often preferred (12, 13). We planned endovascular treatment of the aneurysm instead of follow-up for our patient.

In PPTA classifications, Salas and modified Saltzman classifications are used (2,3,14). Salas et al. (14) classified PPTAs as sphenoidal and petrosal types according to their course on angiography. In the sphenoidal subtype, PPTA closely surrounds the pituitary gland with an intrasellar, trans-pituitary course and can cause hormonal disorders such as hyperprolactinemia and hypopituitarism by compressing the stalk (5). Similarly, due to PTA's close anatomical relationship with nerves, it can cause ophthalmoparesis, trigeminal neuralgia, and oculomotor and abducens nerve palsies (15).

The modified Saltzman classification consists of 3 types. In type I, PPTA supplies the basilar artery, superior cerebellar artery, and posterior cerebral arteries. PCOM arteries, vertebral artery, and proximal BA may be absent or hypoplastic. For this reason, PPTA-related pathologies during the interventional procedure may result in infarction in the posterior circulation of the brain. In Saltzman type 2, preservation of PPTA may not be necessary as blood flow to the posterior circulation is predominantly via the PCOM arteries (6). Our case had Saltzman type 2 and PPTA was preserved during the procedure. Detailed examination of the vascular anatomical structure of the PPTA is important in the success of the treatment and studies with new classifications are performed with CT and MRI imaging in current studies. Weon also classified PTA into five subtypes according to haemodynamic characteristics (16, 17). Consequently, aneurysm cases associated with PPTA are rare in the literature, and as case reports increase, we will gain more knowledge about diagnosis and treatment.

**Informed consent**

Written informed consent was obtained from the patient.

**Conflict of interest**

No conflict of interest was declared by the authors.

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**Authors' contributions**

Concept: H.B, C.Ç., Design: H.B, C.Ç., Data Collection or Processing: A.E, M.S.B, B.B.A., Analysis or Interpretation: A.E, M.S.B, B.B.A., Literature Review: H.B, C.Ç, M.S.B, B.B.A., Drafting: A.E, M.S.B.

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