Turkish Neurosurgery, 2004, Vol: 14, No: 1-2, 21-24

Ruptured Aneurysm Associated with Persistent Primitive Trigeminal Artery: Report of a Case With Three Dimensional CT Angiographic Evaluation

Persistan Primitif Trigeminal Arterde Rüptüre Anevrizma: Olgunun Üç Boyutlu Bilgisayarlı Beyin Tomografisi ile Sunulması

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ABSTRACT

We report an extremely rare case of ruptured saccular aneurysm at the junction of the hypoplastic basilar and the persistent primitive trigeminal artery (PPTA). Three-dimensional computed tomography (3D-CT) angiography can delineate the aneurysm of the right persistent primitive trigeminal artery and the anatomy relative to the bone structure simultaneously. The neck of the aneurysm of the right PPTA was successfully clipped via left orbitozygomatic-pterional craniotomy. Current diagnostic modalities and the surgical approaches for aneurysms of PPTA are discussed.

KEY WORDS: Cerebral aneurysm, persistent primitive trigeminal artery, computed tomography angiography

ÖZ

Bu çalışmada son derece nadir olup hipoplastik baziller arter ve persistan primitif trigeminal arter (PPTA) bileşkesinde görülen rübtüre sakküler anevrizma olgusu sunuldu. Üç boyutlu bilgisayarlı beyin tomografi (3-B BT) anjiografi, sağ persistan primitif trigeminal arterdeki anevrizmayı ve yakın komşuluğundaki kemik yapıları aynı anda belirleyebilir. Sağ PPTA daki anevrizma sol orbitozygomatik-pterional kraniotomi yaklaşımı ile başarılı bir şekilde kliplendi. Bu çalışmada PPTA anevrizmalarının teşhis ve cerrahi tedavisinde kullanılan güncel yöntemler tartışıldı.

ANAHTAR SÖZCÜKLER: Beyin anevrizması, persistan primitif trigeminal arter, bilgisayarlı beyin tomografi anjiografisi

Received : 28.04.2003
Accepted : 13.08.2003

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INTRODUCTION

Persistent primitive trigeminal artery is the most common carotid-basilar anastomotic channel observed in adult life and its occurrence probably represents a defect in cerebrovascular development (12). PPTA anastomoses with the basilar artery to supply some or all of the posterior fossa and the basilar or bilateral vertebral arteries are usually hypoplastic. The frequency of angiographic demonstration of PPTA is 0.1 to 0.3%. It is well recognized that approximately 14% of patients with PPTA also have intracranial aneurysms (8).

Aneurysms arising at or near the bifurcation of the basilar artery are some of the most difficult aneurysms encountered in the practice of the cerebrovascular surgery. The complex anatomy of the posterior fossa, the highly sophisticated neural content and the depth of the operative field make these lesions particularly difficult. Most aneurysms of the posterior circulation are reported to be operated on successfully by conventional approaches, such as the right pterional, subtemporal, or lateral suboccipital approaches (6).

We report a ruptured saccular aneurysm at the junction of the hypoplastic basilar artery and PPTA, which was successfully clipped via left orbitozygomatic-pterional craniotomy

CASE REPORT

A 65–year-old woman who presented with severe headache, vomiting, and progressive deterioration of the level of consciousness was admitted to another hospital. Computed tomography demonstrated a mild subarachnoid hemorrhage in the basilar cistern (Figure 1). The patient was transferred to our department for further work-up and management. On admission to our clinic, neurological examination revealed no neurological deficits and the physical examination was negative except for stiffness of the neck. Her clinical grade was evaluated as Yaşargil grade III a.

At transfemoral cerebral angiography, a right carotid artery contrast injection revealed a PPTA and a saccular aneurysm at the junction of the PPTA-basilar artery bifurcation (Figure 2). The contrast material flowed into the posterior circulation through the right PPTA (Figure 3). There was good

Figure 1. A CT scan shows a mild subarachnoid hemorrhage in the basilar cistern

Figure 2. A right carotid artery contrast injection reveals a PPTA (left arrow) and a saccular aneurysm at the junction of PPTA-basilar bifurcation (right arrow)

Figure 3. The contrast material flows into the posterior circulation through the right PPTA

visualization of both posterior cerebral arteries. A portion of the basilar artery caudal to the point of junction with the point was hypoplastic. The posterior communicating artery (PcomA) was not visualized (Figure 4). Both vertebral arteries were hypoplastic. These studies showed that the posterior circulation was supplied by the right PPTA. The left carotid angiogram was unremarkable.

Three-dimensional computed tomography angiography showed a right PPTA variant penetrating the lateral edge of the posterior clinoid process and running to the posterior medial side, and a PPTA aneurysm near the left posterior clinoid process (Figure 5). The patient underwent surgery on the post-bleeding tenth day successfully, by clipping via the left orbitozygomatic-pterional craniotomy. The postoperative right carotid angiogram showed no residual aneurysm with patent PPTA and posterior cerebral arteries (Figure 6). The patient's postoperative course was uneventful.

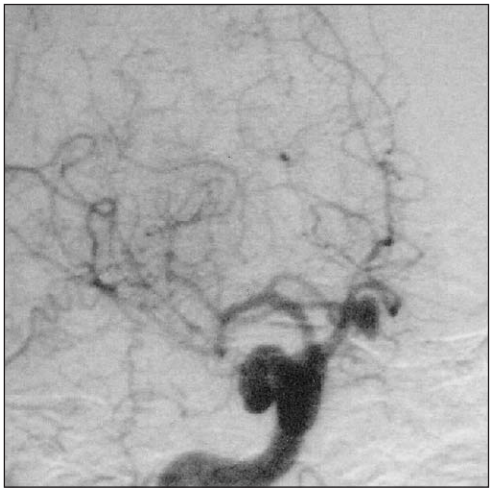

Figure 4. The posterior communicating artery (PcomA) is not visualized

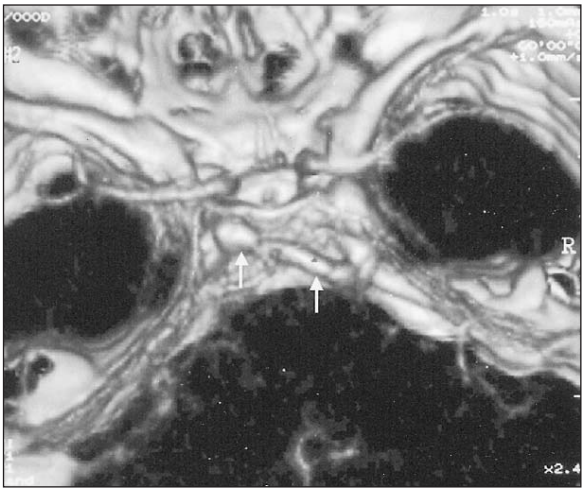

Figure 5. Three-dimensional computed tomography angiography shows a right PPTA variant penetrating the lateral edge of the posterior clinoid process and running to the posterior medial side (right arrow), and a PPTA aneurysm near the left posterior clinoid process (left arrow)

Figure 6. Postoperative right carotid angiogram shows no residual aneurysm with patent PPTA

DISCUSSION

The persistent primitive trigeminal artery arises from the cavernous internal carotid artery near the posterior genu and follows either a para- or an intrasellar course (2). A parasellar PPTA curves laterally and posteriorly around the dorsum sellae, following the trigeminal nerve. The course of an intrasellar PPTA is posterior and it pierces the dorsum sellae (9). Saltzman described the variants of PPTA (10). In the Saltzman type variant, the PPTA supplies the posterior cerebral and anterosuperior cerebellar territories and the midbasilar and PcomA are hypoplastic (7). In the Saltzman type 2 variant, the patent PcomA supplies the posterior cerebral territory, and the PPTA joins the basilar artery at the level of the anterosuperior cerebellar artery. Our case might be considered as the type 1 variant, in which the midbasilar and PcomA were hypoplastic. In the surgical treatment of this kind of aneurysm, it seems to be very important to recognize that when a PPTA is present the internal carotid artery may be the main source of the blood supply to the distal portion of the territories of the basilar, superior cerebellar, and posterior cerebral arteries (11).

Davis et al. (4) first reported an aneurysm of the PPTA in 1956. Cerebral aneurysms associated with PPTA have been reported to occur in relation with the bifurcations formed by the PPTA and the carotid and basilar arteries as well as other locations in the cerebral circulation (5). In the literature, the aneurysm was located at the junction with the basilar artery in only one case reported by Wolpert (13). This is, to our knowledge the second case where the location of the aneurysm was the junction of the basilar artery and PPTA.

Various surgical approaches have been described and proposed to treat cerebral aneurysms associated with PPTA such as direct clipping, internal carotid proximal ligation, EC-IC bypass and EC-IC vein graft bypass (1, 13). Surgical clipping is the accepted method of treatment for cerebral aneurysm but the aneurysm in the cavernous sinus is sometimes difficult and dangerous to clip directly. In our case, the neck of the aneurysm was successfully clipped via left orbitozygomatic-pterional craniotomy

The current diagnostic studies for aneurysm are digital subtraction (DS)-angiography, 3D-CT angiography, and MR- angiography. Accurate definition of aneurysm anatomy is a critical factor in choosing which treatment modalities, such as endovascular coiling or neurosurgical clipping, and which surgical approaches are to be used. High resolution of CT- angiography could provide information about aneurysm anatomy which is equal to or more detailed than that provided by DS-angiography. In addition, CT angiography can show information about aneurysm and nearby bone anatomy such as dorsum sellae and left or right posterior clinoid processes. Therefore, the information obtained from 3D- CT angiography might facilitate selection of the optimum surgical approach. Since the location of the PPTA aneurysm was near the left posterior clinoid process we decided that a left orbitozygomatic-pterional craniotomy was appropriate for this case.

In conclusion, 3D-CT angiography can delineate PPTA aneurysms and the anatomy relative to the bone structure simultaneously and we believe it is a very useful technique to choose the appropriate surgical approach.

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