



## Surgical Management of an Unruptured True Posterior Communicating Artery Aneurysm

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### Abstract

A true posterior communicating artery (pcmA) aneurysm (AN) is rare. We describe our experience of clipping an unruptured true pcoma AN and discuss the indications for and points to consider during surgery.

The patient, a 76-year-old man, was referred to our department after a magnetic resonance imaging incidentally revealed a left internal carotid-posterior communicating artery AN. Angiography, performed to obtain detailed information about the neck of the AN showed that it arose from the pcoma immediately after the bifurcation of the internal carotid artery. The cerebral AN was 5 mm in length and directed laterally. Surgery was performed using a left pterional approach. The anterior choroidal artery, which was in contact with the dome of the AN, was dissected, clipping was performed, and the perforating branch of the pcoma on the dorsal side of the AN was confirmed. Postoperative 3D-computed tomography angiography confirmed complete clipping, and the patient was discharged without any neurological deficits.

Since small ANs may rupture in true Pcoma AN, aggressive surgical treatment should be considered even for small unruptured ANs. Furthermore, the wall of the AN may be fragile; therefore, extreme care should be taken during the surgery.

**Keywords:** Aneurysm; Aneurysm Rupture; Angiography; Neurological Deficit; Posterior Communicating Artery Aneurysm; Surgery

### Abbreviations

AN: Aneurysm; CT: Computed Tomography; IC-PC: Internal Carotid-Posterior Communicating; MRI: Magnetic Resonance Imaging; pcoma: Posterior Communicating Artery Aneurysm; MEP: Motor-Evoked Potential

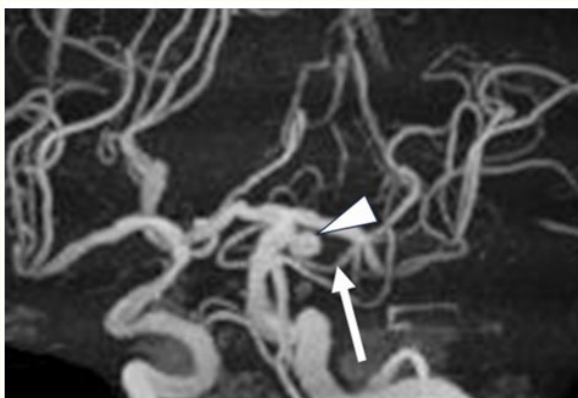
### Introduction

A true posterior communication artery (pcoma) aneurysm (AN) is a cerebral AN arising from the pcoma, unlike ANs of the internal carotid artery and pcoma bifurcation. True pcoma ANs are

rare, accounting for 0.1–2.8% of all ANs and 4.6–14.0% of internal carotid artery pcoma ANs (IC-PC ANs) [1-3]. Recently, unruptured cerebral ANs have been detected by magnetic resonance imaging (MRI), and indications for treatment are based on its size and shape. In this report, we describe a case of unruptured pcoma AN with a favorable surgical outcome and discuss the necessary precautions for surgical indication and procedure, in accordance with the literature.

**Case Presentation**

A 76-year-old man presented at our department for the treatment of the left IC-PC AN bifurcation, which was incidentally discovered on MRI (Figure 1). Medical history included diabetes mellitus, hypertension, and emphysema. Cerebral angiography performed to obtain detailed information about the cerebral aneurysmal neck showed that the AN arose from the pcoma, not the IC-PC bifurcation. It also showed a lateral projection that was 5 mm in length, irregularly shaped, and broad-necked (Figure 2 AB). We performed aneurysmal neck clipping, for a direct intraoperative visualization, to confirm the patency of the pcoma and perforating arteries.



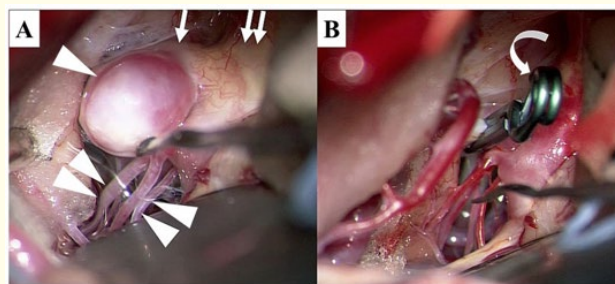
**Figure 1:** Preoperative magnetic resonance angiography. Magnetic resonance angiography (MRA) shows a left internal carotid-posterior communicating aneurysm (IC-PC AN) (arrowhead). Arrow: posterior communicating artery.



**Figure 2:** Preoperative cerebral angiography. Cerebral angiography reveals that the aneurysm (arrowhead) arises from the posterior communicating artery (pcoma) (arrow) and is true pcoma AN.

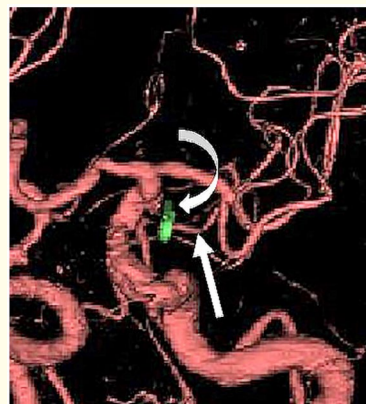
Surgery was performed using a conventional pterional approach through a left frontotemporal craniotomy. The intraoperative

motor-evoked potential (MEP) was continuously monitored. First, the Sylvian fissure was opened sufficiently to secure the proximal site of the left internal carotid artery. Dissection of the neck of the cerebral AN revealed that the AN arose from the proximal portion of the pcoma, as shown in the preoperative cerebral angiographic findings, with no obvious bifurcation of the vessel. The cerebral AN arose from a non-branching site, with the anterior choroidal artery running distal to its distal portion and in contact with its dome (Figure 3A). The aneurysmal wall was not fragile. The anterior choroidal artery was dissected from the AN to prevent occlusion, and it was clipped using a 12-mm straight clip (Figure 3B). To complete the procedure, intraoperative indocyanine green angiography and ultrasound Doppler showed sufficient patency of the anterior choroidal artery and pcoma.



**Figure 3:** Surgical views. A: The anterior choroidal arteries (double arrowheads) are in contact with the aneurysm (arrowhead), and dissection is performed. Arrow: pcoma double arrow: internal carotid artery. B: The complete clip (curbed arrow) was performed.

The postoperative course was uneventful. Postoperative 3D-computed tomography (CT) angiography (Figure 4) confirmed complete clipping. The patient was discharged 10 days after surgery with no neurological deficit.



**Figure 4:** Postoperative 3D-CT angiography. The complete clip was confirmed. Curbed arrow: clip arrow: pcoma.

## Discussion

Most true pcoma ANs arise within 5 mm of the pcoma bifurcation [2,3]. True pcoma ANs occur mainly at nonbranching sites, but there have been reports of ANs occurring at bifurcations with the anterior choroidal or premammillary arteries that diverged from the pcoma [2-4]. The AN is often located at the curvature of the pcoma, where the artery changes direction to the medio-posterior direction after traveling outward, and is often directed inferiorly or laterally [1-3]. Therefore, it has been suggested that hemodynamic stress may be involved in the pathogenesis of ANs [1-3]. In the present case, the AN was located at the origin of the pcoma immediately after the pcoma branched from the internal carotid artery; no branching arteries were observed, suggesting that the AN was related to hemodynamic stress.

Anatomically, the pcoma has many perforating arteries, and injury to these perforating arteries causes injury to the thalamus and internal capsule [4]. Injury must be avoided and careful intraoperative manipulation is required. Although reports of endovascular procedures exist [5-7], it has also been reported that neck clipping is better because it allows for the direct visualization of the perforating branch during surgery [8-10]. In the present case, neck clipping was performed because the aneurysmal neck was broad and endovascular surgery was considered difficult. In the case of a true pcoma AN, neck clipping, which is a direct therapeutic approach, may be better than endovascular treatment. When an AN occurs at the origin of the pcoma, as in the present case, the dome of the cerebral AN may be in close proximity and contact with the anterior choroidal artery, requiring a careful and accurate dissection procedure. Therefore, the AN neck must be dissected to avoid obstruction of the perforating branch from the pcoma on the dorsal side of the dome, and the entire AN neck must be dissected [3,8-10].

Shin, *et al.* conducted a retrospective study of the clinical and anatomical differences between true Pcoma AN and IC-PC AN based on 93 cases of subarachnoid hemorrhage [3]. The results showed that 46.2% of true Pcoma ANs had a diameter less than 4 mm, whereas 2.5% of IC-PC ANs had a diameter less than 4 mm [3]. A study on the natural history of unruptured cerebral ANs in Japan showed that ANs greater than 7 mm in diameter have a high risk of rupture, while those less than 4 mm in diameter have a low

risk of rupture [11,12]. True Pcoma ANs are prone to rupture even if they are small [2,3]. Shin, *et al.* also reported rupture during intraoperative dissection of the AN in 3 (60%) of 5 cases of clipping of ANs less than 4 mm in length [3]. No intraoperative rupture occurred in IC-PC AN of the same small size [3]. In the present case, the aneurysm wall was not fragile. A true pcoma AN indicates a fragile aneurysmal wall and requires extreme intraoperative care.

In the case of unruptured true pcoma ANs, the aneurysm wall is fragile, and even small aneurysms are prone to rupture [2,3]; therefore, we should aggressively consider surgical treatment, even in small cases.

## Conclusion

We encountered an unruptured true pcoma AN treated with aneurysmal neck clipping as a direct approach. True pcoma AN may rupture even in small cases, and aggressive surgical treatment should be considered even in unruptured cases.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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