Unusual Location of Anterior Communicating Artery
Aneurysm Located on the Planum Sphenoidale
Due to Long A₁ Segments
—Case Report—

Masatou KAWASHIMA, Masataka ENDO, Takao KITAHARA*,
Kazui SOMA*, and Kiyotaka FUJII

Departments of Neurosurgery and *Emergency and Critical Care Medicine,
Kitasato University, School of Medicine, Sagamihara, Kanagawa

Abstract
A 51-year-old woman presented with a rare variation in the location of the anterior communicating artery (AComA) complex associated with aneurysm manifesting as sudden onset of headache. Computed tomography (CT) revealed widespread subarachnoid hemorrhage with intracerebral hematoma and intraventricular hemorrhage. Three-dimensional (3D)-CT angiography revealed an aneurysm located at the AComA complex on the planum sphenoidale. Surgical clipping of the aneurysm through the right pterional approach was performed without complication. AComA aneurysm located on the planum sphenoidale is extremely rare, but should be recognized in the planning of surgery in the AComA region. 3D-CT angiography is very useful for understanding the relationships between aneurysms and the surrounding structures.

Key words: anterior communicating artery aneurysm, frontal skull base, planum sphenoidale, three-dimensional computed tomography angiography

Introduction
The anatomy of the anterior cerebral artery (ACA) is known to be highly variable. Morphological variants of ACA, including duplicated A₁, duplicated or multichanneled anterior communicating artery (AComA), and failure of pairing of the distal ACA, have been frequently reported.²,³,⁵,⁷–⁹ However, variations in the location of the AComA complex are not so well known.

We treated a patient with a rare variation of the AComA aneurysm, with the AComA-aneurysm complex located on the planum sphenoidale.

Case Report
A 51-year-old previously healthy woman was transferred to our hospital after sudden onset of headache. On admission, she was comatose with shallow respiration (World Federation of Neurosurgical Societies grade V). Computed tomography (CT) revealed widespread subarachnoid hemorrhage (SAH) with intracerebral hematoma in the right frontal lobe and intraventricular hemorrhage (Fig. 1). Three-dimensional (3D)-CT angiography revealed an aneurysm located at the AComA complex on the planum sphenoidale. Both A₁s traveled straight to the planum sphenoidale over the tuberculum sellae to join the AComA (Fig. 2A, B). The lengths of the left and right A₁s were 20.5 and 16.0 mm, respectively (Fig. 2C). The aneurysm was located on the planum sphenoidale in the right lateral view (Fig. 2D). No other aneurysms were identified. Conventional cerebral angiography was not performed because of the patient’s condition.

Surgical clipping of the aneurysm through the right pterional approach was performed without complication. The long right A₁ segment continued beyond the right optic canal on the planum sphenoidale (Fig. 3A). The aneurysm was located on the pla-
Fig. 1 Axial computed tomography scans of the head revealing widespread subarachnoid hemorrhage with intracerebral (A) and intraventricular (B) hemorrhage.

Fig. 2 Three-dimensional computed tomography angiograms. (A) Superior view of the circle of Willis showing the anterior communicating artery (AComA) aneurysm (arrow) on the planum sphenoidale. (B) Right supraanterior view of the A1-AComA aneurysm complex (arrow) on the planum sphenoidale. Neither A1 is tortuous. (C) Lengths of right and left A1s are 16.0 mm and 20.5 mm, respectively. (D) Right lateral view showing the aneurysm located on the planum sphenoidale. ICA: internal carotid artery.

Fig. 3 Intraoperative photographs of the right pterional approach. (A) The right sylvian fissure is widely opened and the right frontal lobe is retracted superiorly. The long right A1 segment (1) continues beyond the right optic nerve (2). (B) The A1-anterior communicating artery (AComA) aneurysm complex (arrow) is located on the planum sphenoidale (3). The proximal part of the right A1 is temporarily clipped. (C) The right A1 (1) passes straight above the right optic nerve (2) to join the left A1 on the frontal cranial base. The neck of the AComA aneurysm has been obliterated using two clips. 4: Right A2, 5: left A2, 6: right frontal lobe, 7: superficial sylvian veins.

The present patient had an unusual variant of AComA aneurysm located on the planum sphenoidale. Previous cases of intrasellar aneurysms originating from the AComA had the AComA complex located above the chiasm or optic nerves in spite of the unusual aneurysm location.1,6) The A1 normally courses above the optic chiasm or nerves to join the AComA. The junction of the AComA with the right and left A1s is usually above the chiasm (70% of cases) rather than above the optic nerves (30%).7) Cases of AComA passing above the optic nerves usually course above the nerve near the chiasm rather than distally. Arteries with a more forward course are often tortuous and elongated, with some resting on the tuberculum sellae or planum sphenoidale. The A1 varies in length from 7.2 to 18.0 mm (mean 12.7 mm).7) In the present case, neither the initial SAH (Fig. 4C, D). The patient remained severely disabled due to the initial brain damage.

Discussion

The present patient had an unusual variant of AComA aneurysm located on the planum sphenoidale. Previous cases of intrasellar aneurysms originating from the AComA had the AComA complex located above the chiasm or optic nerves in spite of the unusual aneurysm location.1,6) The A1 normally courses above the optic chiasm or nerves to join the AComA. The junction of the AComA with the right and left A1s is usually above the chiasm (70% of cases) rather than above the optic nerves (30%).7) Cases of AComA passing above the optic nerves usually course above the nerve near the chiasm rather than distally. Arteries with a more forward course are often tortuous and elongated, with some resting on the tuberculum sellae or planum sphenoidale. The A1 varies in length from 7.2 to 18.0 mm (mean 12.7 mm).7) In the present case, neither
Fig. 4  (A, B) Postoperative right internal carotid angiogram, anteroposterior (A) and right lateral (B) views, revealing complete obliteration of the anterior communicating artery aneurysm.  (C, D) Postoperative computed tomography scans, showing a low density area in the right frontal lobe due to intracranial hematoma and the ventriculoperitoneal shunt catheter placed in the left frontal horn.

A\textsubscript{1} was tortuous, but coursed straight to the planum sphenoidale. The left A\textsubscript{1} was 20.5 mm in length, which is the longest so far reported.

Surgical clipping of the aneurysm was performed without complication. The abnormal location of the aneurysm was recognized from the preoperative 3D-CT angiogram. Therefore, premature intraoperative rupture from excessive retraction of the frontal lobe, which could have occurred if the abnormal location of the aneurysm had not been recognized, was avoided. 3D-CT angiography is superior to magnetic resonance angiography and conventional angiography for demonstrating the relationships between aneurysms and the surrounding structures in spite of artifacts near bony structures.\textsuperscript{4)} The procedure was performed through the right pterional approach. We chose the pterional approach because we are used to applying this approach to almost all anterior circulation aneurysms. In addition, the aneurysm was located low enough to access the lesion through pterional approach. Opening the sylvian fissure widely avoided damage to the right frontal lobe by retraction and olfactory nerve injury. The interhemispheric approach may be an option for surgery, because the AComA complex is located on the frontal cranial base.

Variant AComA aneurysm located on the planum sphenoidale due to long A\textsubscript{1} segments is extremely rare, and should be recognized in the planning of surgery in the AComA region.

References


Address reprint requests to: Masatou Kawashima, M.D., Department of Neurosurgery, Saga University Faculty of Medicine, 5–1–1 Nabeshima, Saga 849–8501, Japan.
e-mail: MasatouAzu@aol.com