Letter to the Editor
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New Perspectives into the Combined Pterional and Interhemispheric Approach during Ruptured Anterior Communicating Artery Aneurysm Surgery in the Endovascular Treatment Era

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To the editor,

Since the ISUIA (unruptured intracranial aneurysms : natural history, clinical outcome, and risk of surgical and endovascular treatment [EVT]) paper was published, the surgical method for cerebral aneurysms has gradually changed from craniotomy to coil embolization (CE). In addition, because resident training in Korea is limited to 80 hours per week, surgeries for ruptured cerebral aneurysms performed after regular hours or at night are often conducted with the assistance of a less experienced junior residents[5]. This situation also contributes to the decline in craniotomies for cerebral aneurysms. The aim of our study was to investigate the new perspectives of a combined pterional and interhemispheric approach (IHA) in patients with ruptured anterior communicating artery (AComA) aneurysms deemed unfavorable for endovascular CE and inoperable using the single pterional approach (PA) or IHA in this EVT era.

For recent 3 years, patients who visited with a ruptured AComA aneurysm and considered difficult to treat by embolization as a primary treatment modality, and patients considered difficult to treat using a single PA or IHA approach as craniotomy underwent combined PA and IHA. Aneurysm clipping was performed within 24 hours of visiting.

Surgical procedure was as follows. After the skin incision was made, pterional and frontal craniotomy was performed using one piece (Fig. 1A). A cruciate dural incision was performed, and the thickened arachnoid membrane covering the dorsal surface of the ipsilateral optic nerves was identified. Dissection was performed to the AComA area. The prechiasmatic cistern was then dissected to secure a surgical space for cerebrospinal fluid drainage, and the AComA area was exposed along the ipsilateral dominant A1 (Fig. 1B). The position of the patient was then changed and the IHA was adopted. The IHA was easily approached, and the cerebral aneurysm was dissected along the A2 on both sides. At this time, the location and direction of the dominant A1, which had already been secured through the PA, were easily determined, allowing proximal control (Fig. 1C).

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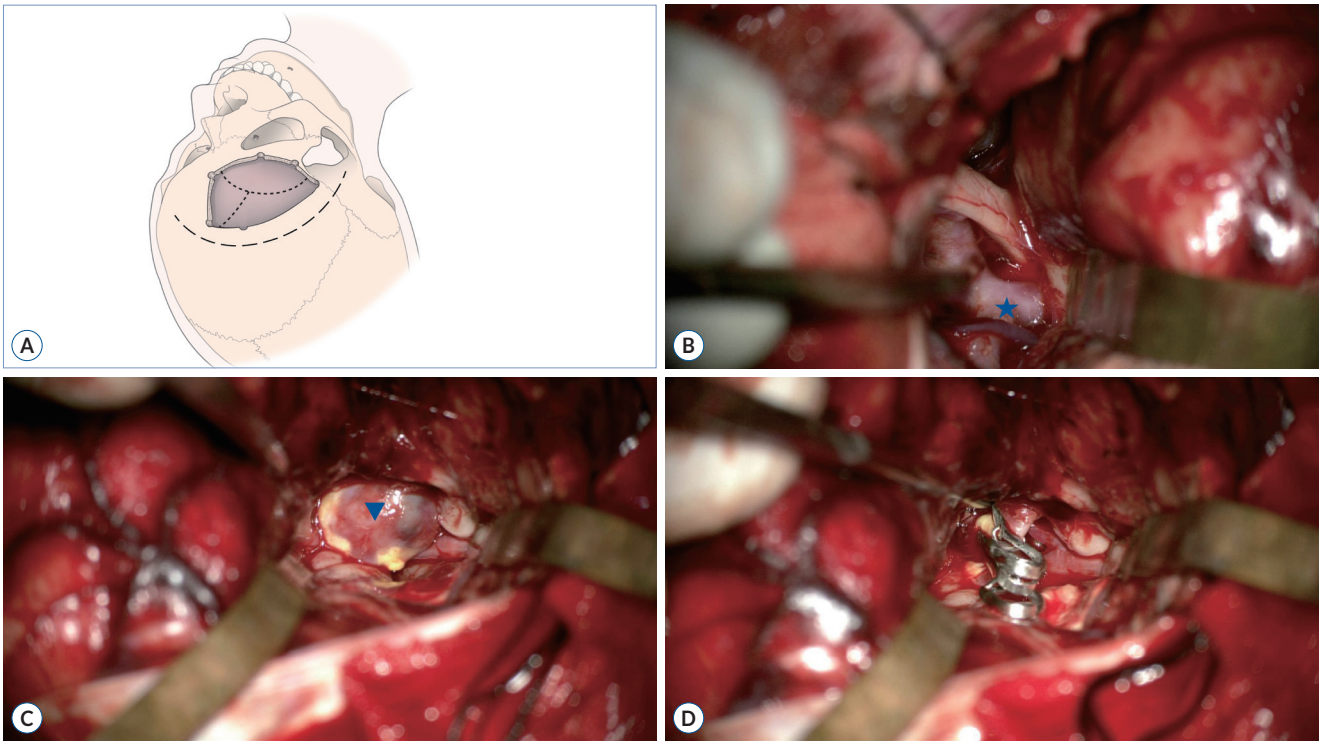

Fig. 1. Skin incision, craniotomy and operative findings. The long dotted line indicates skin incision and the short dotted line indicates dural incision (A). The left pterional approach (PA) was performed and the dominant A1 (star) was sufficiently secured through arachnoid dissection to prepare for proximal control (B). After sufficient CSF drainage through the PA, the aneurysm (arrowhead) was approached by changing to the interhemispheric approach and neck clipping was performed with two straight clips (C and D).

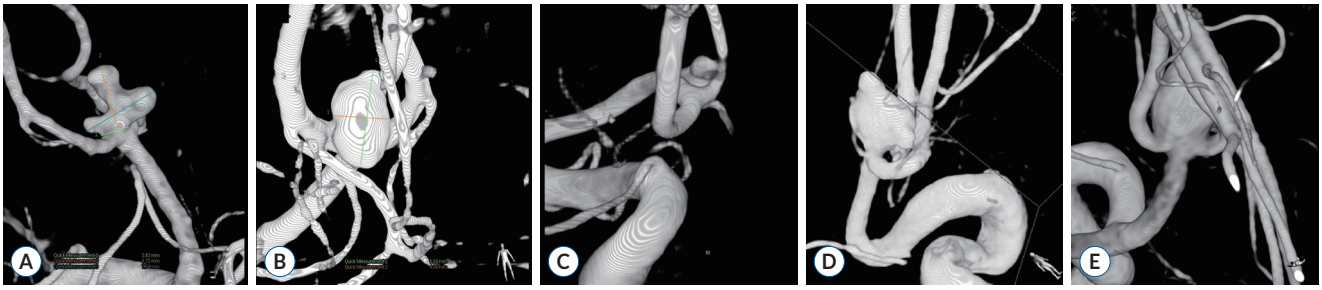

Fig. 2. A-E : 3D rotational angiographic configurations of five patients.

Table 1. Summary of five patients with ruptured anterior communicating artery aneurysms deemed unfavorable for endovascular coil embolization treated using combined pterional and interhemispheric approach surgeries

No.	HH/FG	Sex	Age (years)	Size (mm)	Direction	Dominance	3D-RA	Character	Complication
1	2/2	M	60	6.4×6.0	Posterior	Lt	Refer to Fig. 2A	Multibolbular with UIA, left MCAB	None
2	3/3	M	47	6.8×4.8	Superior	Lt	Refer to Fig. 2B	High lying	Normal pressure hydrocephalus
3	2/2	M	35	4.7×3.0	Posterior	Rt	Refer to Fig. 2C	Hidden location on both pterional view	None
4	2/2	F	55	6.0×4.5	Posterior	Lt	Refer to Fig. 2D	Multilobulated	Minimal hemorrhagic infarction
5	2/2	M	41	10.0×8.6	Superior	Lt	Refer to Fig. 2E	Broad neck	None

HH : Hunter-Hess clinical grade, FG : Fisher grade, 3D-RA : 3D rotational angiography, M : male, Lt : left, UIA : unruptured intracranial aneurysms, MCAB : middle cerebral artery bifurcation, Rt : right, F : female

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The aneurysm located between A1 and A2 on both sides was neck clipped accurately using clips (Fig. 1D).

Of five patients, four were male, and one was female; average age was 48 years (range, 35–60). Average aneurysm size was 6.7×5.4 mm and the direction of the aneurysms was superior in two cases and posterior in three cases (Fig. 2). The dominant A1 was on the left side in four cases and on the right side in one case. A1 aplasia was observed in four cases on the contralateral side. There were three cases of multi-lobular aneurysms, one case of a high-lying aneurysm, and one case of a broad-necked aneurysm. Complete cerebral aneurysm clipping was confirmed in all cases by computed tomography angiography after surgery. Three months after the procedure, one case developed normal pressure hydrocephalus and the others recovered without complications (Table 1).

Microsurgery for AComA aneurysms can be complicated due to surrounding structures and a challenge for neurosurgeons. The most important vascular structures that must be preserved are AComA, both A1 and A2, recurrent artery of Heubner, and hypothalamic and chiasmal perforates[3,4]. Despite advancements in techniques and devices in the EVT era, open surgery should also be considered. However, surgical experience is essential when an aneurysm is large, has a wide neck, and is superiorly or posteriorly directed, especially in the case of a highly located aneurysm far from the sphenoidal plane, and thus, safer, effective, surgical treatment methods are required [1,2,7].

In this EVT era, the number of craniotomies performed gradually decreased, and this has been matched by a reduction in surgical experience of craniotomy. Nonetheless, the safest treatment method should always be considered when performing ruptured AComA aneurysm surgery. Accordingly, the authors utilized a combined PA/IHA approach for patients with complicated AComA aneurysms. In particular, it is difficult to safely perform AComA clipping when only PA or IHA are used in cases where the aneurysm has a superior or posterior direction, is located high above the planum sphenoidale, is relatively large in size, has an irregular shape, or has a broad neck. Therefore, we considered that the safest method involves securing the dominant A1 by PA to prepare for premature rupture, draining CSF appropriately to minimize brain traction, clearly dissecting the aneurysm configuration through IHA, and performing accurate neck clipping. We chose CE as the primary treatment for ruptured AComA aneurysms and excluded patients with intracerebral hematoma who underwent PA or IHA surgery, and thus, only five cases have been treated using the combined approach over the past 3 years.

We know the combined PA and IHA are a well-established surgical method, and Park[6] has introduced it as a method of proximal vascular control to prevent premature rupture in pericallosal artery aneurysms. However, as mentioned, the reason why the authors applied the established treatment method from a "new perspectives" in clinical practice is 1) considering the technical difficulty of clipping complex ruptured AcomA aneurysms due to the decrease in craniotomy experiences in the endovascular era and 2) because of the shortened training time for residents, we had to perform ruptured cerebral aneurysm surgeries with the assistance of a less experienced junior residents[5]. Therefore, we looked at these combined PA and IHA method, which was judged to be safe, from a "new perspectives" and contributed our experience of five cases as this letter.

AUTHORS' DECLARATION

Conflicts of interest

Bum-Tae Kim has been editorial board of JKNS since May 2017. He was not involved in the review process of this article. No potential conflict of interest relevant to this article was reported.

Informed consent

This type of study does not require informed consent.

Author contributions

Conceptualization : BTK; Data curation : DSS, HJY, SJL, BTK; Funding acquisition : BTK; Methodology : BTK; Project administration : BTK; Writing - original draft : DSS, HJY, BTK; Writing - review & editing : BTK

Data sharing

None

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