

Unilateral Anterior Interhemispheric Approach for Anterior Communicating Artery Aneurysms With Horizontal Head Position

—Technical Note—

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Abstract

The horizontal head position was adopted in the unilateral anterior interhemispheric approach to treat an anterior communicating artery (ACoA) aneurysm. The patient was placed in the supine position. The patient's head was rotated to the right to orient the midline horizontally, and tilted 45 degrees superiorly. After bicoronal skin incision and bifrontal craniotomy, the dura on the right side (downside) was opened. Dissection of the right interhemispheric fissure allowed gravity to retract the right (downside) hemisphere, which fell away from the falx, while the falx supported the upside hemisphere. The present approach was used in three patients with ACoA aneurysm between January 2009 and April 2010. The aneurysms were adequately clipped with this approach. No complication related to the approach occurred. No patients exhibited anosmia after surgery. This approach is useful for ACoA aneurysms.

Key words: aneurysm, anosmia, anterior communicating artery, horizontal head position, interhemispheric approach

Introduction

The microsurgical interhemispheric approach for anterior communicating artery (ACoA) aneurysms is usually performed with the patient in the supine position with the head and neck in the neutral position, and the sagittal midline oriented vertically. The surgeon accesses the lesion through a narrow corridor because the interhemispheric fissure forms a vertical plane. However, the horizontal head position is also useful for the interhemispheric approach for distal anterior cerebral artery (ACA) aneurysms.^{2,3)} This position is more comfortable for the surgeon, allowing use of both hands with instruments in a horizontal rather than a vertical surgical field. The horizontal head position also permits gravity to retract the lower hemisphere and open the interhemispheric fissure, while the falx supports the upper hemisphere. In this study, the horizontal head position was adopted in the anterior interhemispheric approach to ACoA aneurysms.

Operative Technique

ACoA aneurysm is usually approached via a unilateral anterior interhemispheric approach through the nondominant (right) interhemispheric fissure. Under general anesthesia, the patient was placed in the supine position with head rotated to the right to orient the midline horizontally, and tilted 45 degrees superiorly (Fig. 1A, B). After a bicoronal skin incision, a bifrontal craniotomy was performed (Fig. 1C). During the craniotomy procedures, the surgeon stood on the right side of the patient and faced the forehead of the patient. The dura on the right side (downside) was opened with a C incision, and the right interhemispheric fissure was opened microsurgically, with dissection of the adhesions between the frontal lobe and the falx to allow gravity to retract the right (downside) hemisphere, which fell away from the falx, while the falx supported the left (upside) hemisphere (Fig. 1D).

Representative Case

A 32-year-old man presented with nausea and transient loss of consciousness, followed by weakness of

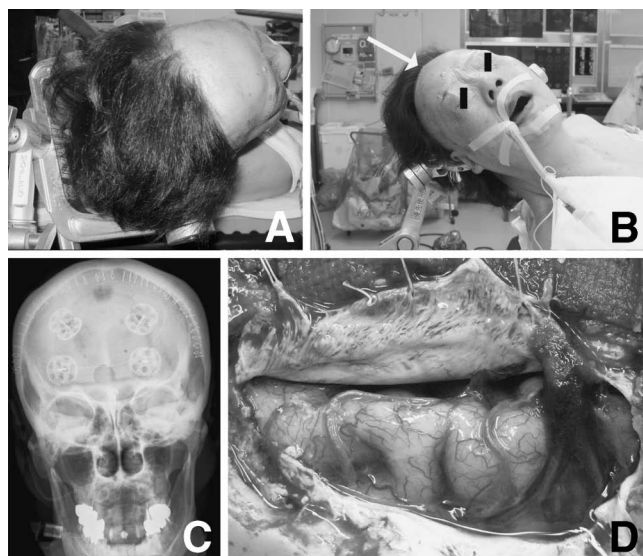


Fig. 1 A, B: Photographs showing the horizontal head position for the unilateral anterior interhemispheric approach to anterior communicating artery aneurysm. Arrow indicates the surgical trajectory. C: Postoperative skull radiograph showing the location of the craniotomy. D: Intraoperative photograph after dissection of the adhesions between the right frontal lobe and the falx. Note that the right (downside) frontal lobe is depressed by gravity and falls away from the falx.

the left lower extremity 12 days later. Magnetic resonance imaging revealed cerebral infarction in the right ACA territory (Fig. 2A). Angiography (Fig. 3) demonstrated an ACoA aneurysm and mild vasospasm in the right ACA. The aneurysm had two compartments; one was directed upward, and the other anterior to the ACoA. Surgical clipping of this aneurysm was performed about one month after the onset of motor weakness of the left lower extremity, which had fully recovered by the time of the surgery. This approach allowed the surgeon to easily use both hands with instruments in a horizontal surgical field (Fig. 4A). The left frontal lobe was held by a retractor to prevent a shift beyond the falx obstructing the surgical view. The A₃ segment of ACA was followed proximally to the A₂ segment, and the A₁ segment was identified and secured before dissection of the aneurysm (Fig. 4B). After meticulous dissection around the aneurysm, the ruptured component, which was directed upward (Fig. 4C), was identified and obliterated with a clip (Fig. 4D). Then the other component directed anterior to the ACoA was also obliterated with a clip. Postoperative computed tomography revealed no additional findings (Fig. 2C, D). Follow-up angiography demonstrated complete obliteration of the aneurysm, and the patient

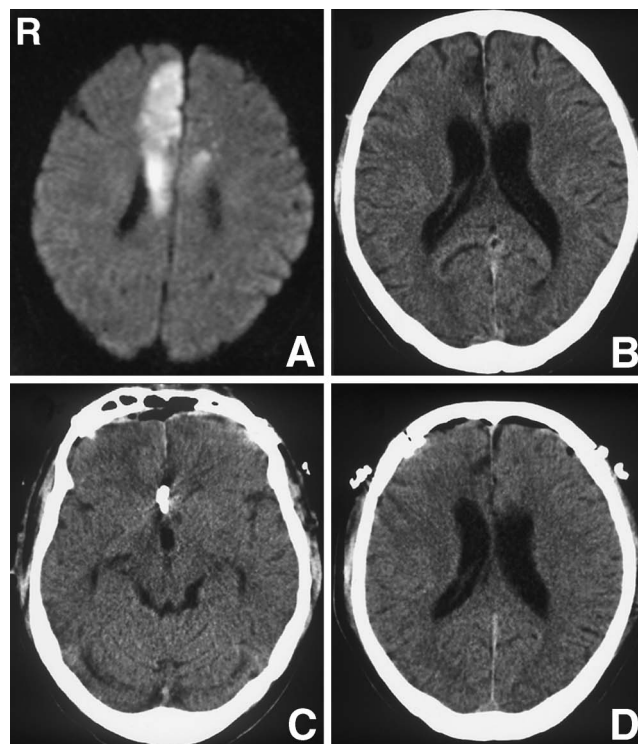


Fig. 2 Preoperative diffusion-weighted magnetic resonance image (A) and computed tomography scan (B), and postoperative computed tomography scans (C, D).

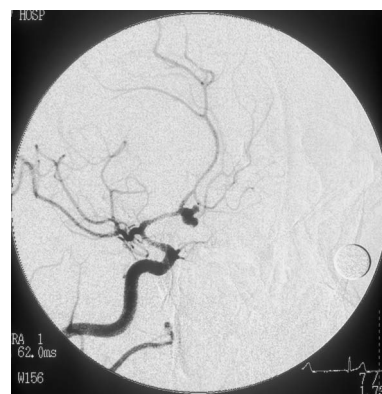


Fig. 3 Preoperative left carotid angiogram (oblique view) showing anterior communicating artery aneurysm.

was discharged without neurological deficits.

Results

The present approach was used in three patients with 2 ruptured and one unruptured ACoA aneurysm between January 2009 and April 2010.

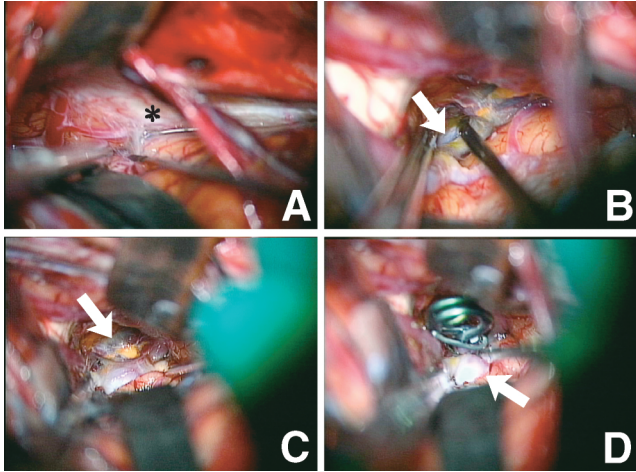


Fig. 4 Intraoperative photographs showing (A) dissection of the right interhemispheric fissure with both hands and the falx (asterisk), (B) identification of the A₁ segment (arrow), (C) dissection of the aneurysm with the ruptured component (arrow) directed upward, and (D) dissection of the neck of the unruptured component (arrow), directed anterior to the anterior communicating artery, after clipping of the ruptured component.

The operation was performed in the chronic stage after onset in the 2 patients with ruptured aneurysm. In all patients, the right side was selected for the unilateral anterior interhemispheric approach, and the aneurysms were adequately clipped with this approach. No complication related to the approach occurred. No patient exhibited anosmia after surgery.

Discussion

Rotation of the patient's head laterally to orient the midline horizontally was originally introduced for the transcallosal approach to the contralateral ventricle in 1985.⁵⁾ The usefulness of this approach with the horizontal head position for resection of lesions located laterally in or adjacent to the lateral ventricle was reported in 1996.⁴⁾ The horizontal head position appears to work well for lesions located close to the midline. Three major advantages have been described for use of the horizontal head position for distal ACA aneurysms: a comfortable operative field, minimal retraction of the brain, and ease of securing of the parent artery.²⁾ We used this head position in a unilateral anterior interhemispheric approach for ACoA aneurysm, and found that an additional advantage of this head position for ACoA aneurysms is preservation of normal olfaction.

Anosmia is not a rare complication after surgery for ACoA aneurysm via the interhemispheric approach.^{1,6)} Elevation of the frontal lobe from the an-

terior skull base is considered to be a principal cause of damage to the olfactory tract.¹⁾ Efforts to preserve olfactory function by dissection of the olfactory tract from the frontal lobe found that the olfactory tract was bilaterally or unilaterally preserved in over 65% of patients, but subjective anosmia occurred in 48% of the patients treated with the bifrontal interhemispheric approach.⁶⁾ Usually, in the interhemispheric approach, a patient is positioned supine with the head and neck in neutral position. Therefore, after the dura is incised and cerebrospinal fluid is drained, the frontal lobe is affected by gravity and falls away from the anterior skull base, and the olfactory tract may be stretched and damaged. Unilateral dural incision and unilateral brain retraction without elevation of the frontal lobe from the frontal base are important for protecting against injury of the olfactory nerve.¹⁾ The present unilateral anterior interhemispheric approach with the horizontal head position provides a reasonable and effective method to avoid traction injury of the olfactory tract. However, the number of our patients is too small to precisely determine the incidence of postoperative changes of olfactory function.

In the acute stage after onset of subarachnoid hemorrhage, the brain is tender and swollen, so gravity might not aid opening of the interhemispheric fissure. Therefore, we have not used this approach in patients with ruptured ACoA aneurysm in the acute stage. Sinking of the frontal lobe under its own weight may cause traction and injury of the interhemispheric bridging veins. Attention should be paid to preserve those veins. This approach is ideal if the right A₁ is dominant. If the left rectal gyrus shrinks and shifts to the right, thus obstructing the surgical view around the ACoA, the left A₁ cannot easily be seen. The left rectal gyrus should be held by a retractor to prevent a shift beyond the falx. If the left A₁ is dominant, a unilateral anterior interhemispheric approach through the left interhemispheric fissure might be indicated.

The unilateral anterior interhemispheric approach with horizontal head position allows gravity to retract the lower hemisphere and open the interhemispheric fissure, and the falx supports the upper hemisphere. This approach is useful for selected cases of ACoA aneurysm.

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