Abstract

Background: The difficulty of clipping aneurysm of the anterior communicating artery (AcomA) depends on the size, direction, positional relationship with the parent artery, and height from the anterior frontal base. Cases of clipping unruptured AcomA aneurysm through pterional approach were analyzed to investigate the importance of the horizontal distance from the base of the anterior clinoid process.

Methods: Twenty-six consecutive unruptured AcomA aneurysms were treated by clipping through pterional approach in 10 males and 11 females aged 37–77 years (mean 61.8 years). Size and direction of the aneurysm, and vertical distance from the anterior frontal base and horizontal distance from the base of the anterior clinoid process were measured by preoperative three-dimensional computed tomography angiography (3D-CTA). Correlations with occurrence of clinical complications and computed tomography (CT) abnormalities after operation were investigated.

Results: The aneurysms had a mean size of 4.7 mm (range 2.1–8.9 mm). Three patients suffered complications and all had anosmia. Three patients had CT abnormality and all were contusion. The mean horizontal distance from the base of the anterior clinoid process was −4.7 mm (range −12.3–3.5 mm). The patients were divided into the anterior and posterior groups with the boundary set at −5 mm. There were no significant complications between two groups (P = 0.26). There were statistically significant CT abnormalities in posterior group (P = 0.025).

Conclusion: The horizontal distance from the base of the anterior clinoid process is important to predict CT abnormalities and complications in clipping of AcomA aneurysm through pterional approach.

Key Words: Anterior communicating artery aneurysm, clipping, surgical approach, surgical outcome
INTRODUCTION

Clipping of anterior communicating artery (AcomA) aneurysm can be performed through the pterional or interhemispheric approach. The difficulty of clipping AcomA aneurysm depends on the aneurysm size, direction, positional relationship with the parent artery, and height from the anterior frontal base.\[3,7\]-\[9,12\] The usefulness of three-dimensional computed tomography angiography (3D-CTA) in the evaluation of these structure and aneurysm is well established.\[3,5\] Our protocol is to use the pterional approach to clip aneurysms which are relatively small, with low height between the neck of the aneurysm and anterior frontal base and dome projection other than posterior. Previous studies have investigated the selection of surgical approach based on the vertical distance between the aneurysm and anterior frontal base, but not the correlation between the horizontal distance from the anterior clinoid process and postoperative outcome.

The present study investigated the correlation between horizontal distance from the base of the anterior clinoid process to the neck of the AcomA aneurysm, and the occurrence of complications and abnormality on computed tomography after clipping via the pterional approach.

MATERIALS AND METHODS

This study was approved by the Institutional Review of National Defense Medical College Hospital. Written informed consent was waived because of the retrospective design.

A retrospective analysis was conducted on the clinical and radiological data of AcomA that have been clipped in our institution between 2006 and 2016. The pterional approach was used with relatively small size, low height from the anterior frontal base, and dome projection not posterior. The size was smaller than 10 mm, and the height from anterior frontal base was lower than 13 mm. In other cases, we performed interhemispheric approach. Preoperative head 3D-CTA was performed to measure the aneurysm dome and neck size, distance in the vertical direction from the anterior frontal base to the neck of the aneurysm, and distance in the horizontal direction from the base of the anterior clinoid process to the neck of the aneurysm [Figure 1]. Postoperative head CT findings and surgical complications causing clinical symptoms were evaluated. Neurological test, Glasgow outcome scale (GOS), and modified Rankin Scale (mRS) after operation were also noted at the time of discharge. Clinical data were obtained through a review of the patient’s electronic medical record and available imaging studies.

RESULTS

This study reviewed 206 cases of clipping of unruptured aneurysm in our institution between May 2006 and June 2016. A total of 54 (26.2%) cases involved AcomA aneurysm and 152 (73.8%) cases involved other locations. The pterional approach was performed to clip 21 (38.9%) aneurysms, and the interhemispheric approach or supraorbital approach was performed to clip 33 aneurysms (61.1%) [Figure 2].

There were no multiple aneurysms. All aneurysms were saccular type. There were 10 males (47.6%) and 11 female patients (52.4%). The mean age was 61.8 years (range 37 to 77 years). The AcomA aneurysms had a mean size of 4.7 mm (range 2.1–8.9 mm) and mean neck size of 3.3 mm (range 1.3–4.7 mm). The mean distance from the base of the anterior clinoid process was −4.7 mm (range −12.3–3.5 mm). The patients were divided into the anterior and posterior groups with...
the boundary set at −5 mm [Figure 3]. No significant differences were detected between the two groups in age, sex, neck size, dome size, and distance in the vertical direction from the anterior frontal base to the neck of the aneurysm except for the horizontal distance from the base of the anterior clinoid process to the neck of the aneurysm (P < 0.001) [Table 1].

Three patients (14.3%) suffered complications and all were anosmia. Three patients had CT abnormality (14.3%) and all were frontal base contusion. Two out of three patients with anosmia were included in the posterior group. All 3 patients with contusion were included in the posterior group, with significant difference compared with the anterior group (P = 0.025) [Table 2]. Postoperative CT angiography showed complete clipping in all cases. Postoperative mRS score was 0 in 17 patients and 1 in 3 patients, and all patients had good recovery on the GOS. The mRS of anterior group was better than posterior group with statistically significant difference (P = 0.025).

**DISCUSSION**

A retrospective was conducted on the clinical and radiological data of AcomA that have been clipped via pterional approach in our institution between 2006 and 2016. The aim of this study is to investigate the importance of the horizontal distance of aneurysmal neck from the base of anterior clinoid process to clip via pterional approach. We evaluate the correlation between the horizontal distance of aneurysmal neck from the base of anterior clinoid process by preoperative 3D-CTA and the neurological findings at the time of discharge and the postoperative CT abnormality. The anterior clinoid process has some variation such as interosseous bridge and caroticoclinoid process foramen. Each size of the anterior clinoid process is also broken. However, we choose the base of the anterior clinoid process as the measuring point because it was not affected by these factors above and can be easily measured by 3D-CTA. The result of this study suggests that clipping of aneurysms located far from base of anterior clinoid process in horizontal distance via pterional approach tend to have complications.

The location of AcomA aneurysm is surrounded with important anatomical structures. In particular, attention is required during surgery to preserve the parent arteries such as the bilateral A1 and A2 and perforators such as the hypothalamic artery and Heubner artery. The difficulty of clipping AcomA aneurysm depends on the aneurysm size, dome projection, height from the anterior frontal base, and relationship with the parent artery.[3,7-9,12] The
The height of the AcomA aneurysm neck has been discussed from the points of difficulty in clipping or choice of approach. The present study has demonstrated that the horizontal neck location is critical to predict the occurrence of postoperative complications in AcomA aneurysm clipping via the pterional approach. The boundary between the anterior and posterior groups was set at −5 mm from the base of the anterior clinoid process. The posterior group tended to develop more complications, and significantly more postoperative head CT abnormalities. Therefore, we suggest that AcomA aneurysm with posterior location should be clipped via the interhemispheric approach, or via the pterional approach with intentionally wide opening of the sylvian fissure.

CONCLUSION

Preoperative measurement of the horizontal distance of AcomA from the base of the anterior clinoid process, as well as aneurysm height, is important in the selection of the optimum approach for clipping.

Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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Conflicts of interest

There are no conflicts of interest.

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