Result of Neck Clipping and Coil Embolization as a Treatment for Subarachnoid Haemorrhage

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Summary

The report of the International Subarachnoid Aneurysm Trial (ISAT) study showed that coil embolization was superior to neck clipping as a treatment for subarachnoid haemorrhage (SAH)¹. We compared the results of coil embolization and neck clipping in our institute. Generally better outcomes were obtained by endovascular surgery than neck clipping. Symptomatic vasospasm and symptomatic hydrocephalus occurred less frequently in coil embolization than neck clipping.

Because not all cases of SAH can be treated by coil embolization due to the width of aneurysmal neck and relation of the aneurysm to parent arteries, we should also be able to perform neck clipping as another modality.

Introduction

The findings of ISAT were reported in 2003, and showed the advantage of endosaccular coil embolization over neck clipping for SAH because of ruptured aneurysm¹.

Following the result of the ISAT study, we chose coil embolization first as the treatment for SAH in cases where both coil embolization and neck clipping were considered possible since January 1, 2003. The purpose of this study is to compare the results of those modalities at our institute.

Methods

We performed endosaccular coil embolization for SAH in 23 patients (male 7, female 16), and performed neck clipping in 74 patients (male 24, female 50) from April 2000 through July 2004. We compared the locations, sizes, results of these two treatment groups.

Results

Endosaccular coil embolizations are gradually growing in number and the rate of coil embolization among the total treatment cases for SAH was just 50% in 2004 (figure 1). Regarding the locations of the ruptured aneurysm, MCA and anterior communicating artery (A com) and internal carotid – posterior communicating artery (IC-PC) account for 27% of all neck clipping cases, while vertebrobasilar aneurysms comprise 50% of embolization cases (figure 2A) because ruptured aneurysm in the posterior circulation, which is thought difficult to reach by direct surgery, was mainly treated via coil embolization before January 2003. These tendencies remained the same after 2003 (figure 2B). Figure 3 shows that the size of ruptured aneurysm treated by neck clipping is seen to be smaller than endovascular treatment group. The distribution of Hunt & Kosnik grade in both groups is demonstrated in figure 4, there seemed to be a greater number of severe cases

Figure 1 The rate of endosaccular coil embolizations among all treatment for SAH between April 2000 and July 2004.

in the endovascular group than in neck clipping group because endovascular surgery had been selected for more severe cases before 2003. Generally better outcomes were obtained by endovascular surgery than by neck clipping (figure 5). Outcomes at each Hunt & Kosnik grade are summarized in figure 6. In both treatment groups, better outcomes are indicated by a lower Hunt & Kosnik grade, and endovascular treatment result in a better outcome than direct surgery at each grade. Results of endovascular treatments on each aneurysmal location are better in the posterior circulation rather than anterior circulation (figure 7). Symptomatic vasospasm occurred in 12.2% of

Figure 2 Locations of ruptured aneurysms in all cases of SAH (A) and those after 2003 (B).

the direct surgery group, but in none in the endovascular group. Symptomatic hydrocephalus occurred more frequently in the direct surgery group than in the endovascular group, 31.1%, 21.7%, respectively.

Complications of coil embolization were presented as following, thromboembolisms from the coils in one case, inability to induce a micro catheter into the dome in one case, perforation of the dome by the coil or microcatheter in three cases. In thromboembolism cases, the patient showing Hunt & Kosnik grade 2 worsened to severe disability because of infarction after the treatment. In the second complication, the patient received direct surgery the day after endovascular treatment and left our hospital without neurological deficit. In the third complication, we continued coil embolization after the perforation and in all cases the aneurysms were embolized completely and a favorable result obtained.

Case presentation

Case 1

A 59-year-old female. She developed sudden onset of severe headache and was transferred to our hospital by ambulance. On admission, she was alert without neurological deficit (H &K grade 2). Computed tomography depicted SAH (Fisher group 2).

Angiogram demonstrated right IC-PC aneurysm, which was thought to have ruptured (figure 8). We decided to perform endovascular embolization. Because the ruptured aneurysm demonstrated a long and narrow shape with a small neck, we embolized the rupture point at the distal end of the aneurysm first, then embolizes the proximal portion using a balloon assist technique (figure 9). The postoperative course was

Figure 3 The sizes of ruptured aneurysms.

Figure 4 The distribution of Hunt & Kosnik grade in the neck clipping and coil embolization groups.

Figure 5 The Glasgow outcome scale in the neck clipping and coil embolization group.

Figure 6 The Glasgow outcome scale at every Hunt & Kosnik grade in neck clipping and coil embolization group.

Figure 7 The Glasgow outcome scale in the coil embolization group at each aneurismal location.

uneventful, and the patient was discharged from hospital without neurological deficit.

Case 2

A 63-year-old female. This case was diagnosed as SAH (H&K grade 2) due to ruptured left MCA aneurysm. On admission, we performed 3D-CT angiography, which showed that the aneurysm was a saccular type with a small neck (figure 10). The aneurysm was obliterated completely after the embolization (figure 11).

The patient discharged without neurological deficit.

Figure 8 Angiogram in case 1.

Discussion

Following the ISAT study, we chose coil embolization first as the treatment for SAH in cases where both coil embolization and neck clipping were considered possible since January 1, 2003. However, in one case, it was impossible to

introduce microcatheter into the dome, so not all SAH can be treated by coil embolization. We should consider neck clipping an alternative modality for treatment of SAH. For SAH caused by ruptured aneurysm in posterior circulation, it is very difficult to perform direct surgery. Therefore, endovascular treatment for

Figure 9 Coil embolization in case 1. We embolized the rupture point at the distal end of the aneurysm first, then embolized the proximal portion using balloon assist technique. Final angiogram demonstrated complete obliteration.

- 63-years-old female
- H&K grade 2

Figure 10 Three D-CT angiography in case 2.

these aneurysms had been selected before January 1, 2003. Since the results of endovascular treatments are more favorable in posterior circulation than in anterior circulation, the rate of endovascular treatment for SAH will be increasing especially in posterior circulation.

Both symptomatic vasospasm and hydrocephalus occurred less often in the endovascular group than in the direct surgery group,

which seems to be an advantage of endovascular treatment over direct surgery because additional treatment could induce complications or delayed recovery.

Conclusions

1) Generally, the results of endovascular treatment for ruptured aneurysm are more favorable than these of direct surgery.

2) In endovascular treatment, in contrast to direct surgery, the location of the ruptured aneurysm did not generally affect the result. In particular, endovascular treatment is more useful for aneurysm in the posterior fossa.

3) Width of the aneurysmal neck and relation of the aneurysm to parent arteries will affect the difficulties of treatment and may occasionally be contraindications, so we should also be able to perform neck clipping as another modality.

Reference

- 1 Molyneux A, Kerr R et al: International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coilings in 2143 patients with ruptured intracranial aneurysms: a randomized trial. *Lancet*; 360: 1267-1274, 2002.

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Figure 11 Coil embolization in case 2.
Final angiogram demonstrated complete obliteration.