

What is a True Less Invasiveness for a Patient?

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ABSTRACT

These days, a less invasive surgery is stressed. One current thought is that the endovascular surgery itself is the less invasive and safer surgery for a cerebral aneurysm, and not the microsurgery. Is this true? We have evaluated the merits and demerits of each method. Our conclusion is as follows. Endovascular Surgery should be considered as an alternative, only for the specific patients. Microsurgery itself retains its position of the first treatment of choice for a cerebral aneurysm. "Less invasive" cannot be equated with "less dangerous". We will show the above reasons using slides and videotapes of several patients. (Kor J Cerebrovascular Disease 4:5-8, 2002)

KEY WORDS : Cerebral aneurysm · Microsurgery · Endovascular surgery · Less invasiveness · Mild hypothermia · Vasospasm.

Introduction

The target of ruptured aneurysm treatment is to prevent re-rupture safely and completely, and to reduce the occurrence rate of vasospasm caused by subarachnoid hemorrhage (SAH).

Currently, there are two modalities of treatment, endovascular surgery and microsurgery. Which is truly "less invasive" and more beneficial for a patient?

Methods

Each representative case will be presented. To solve the demerits at Microsurgery, various means have been tried.

Results & Discussion

In endovascular surgery, there are such merits as 1) no general anesthesia, 2) no craniotomy, 3) no brain retraction, 4) no vein sacrifice, etc. But there are definite essential demerits (Table 1).

Fig. 1 shows the moment of rupture during endovascular surgery. Although emergent microsurgery fortunately saved

the patient, this risk of rupture during the procedure is inevitable and is an essential drawback.⁶⁾ Adding to this point, it was surprisingly found during this microsurgery that the wall of the parent artery had been injured at the near end of the aneurysmal neck probably by a guide-wire or a catheter, the phenomenon of which had not been observable during the endovascular surgery (Fig. 2).

As one of the merits of microsurgery, it has a definite effect to release the mass impact of Giant Aneurysm, even though endovascular surgery has only a questionable effect against it (Fig. 3).

During microsurgery, we can remove the subarachnoid clot as much as possible, which is a causative substance of vasospasm.²⁾ After microsurgery, a cisternal irrigation by Lactec solution containing urokinase⁴⁾ is performed to dissolve the subarachnoid clot more through two cisternal drains that were placed intraoperatively, with an aid of "Neuroshaker" (Fig. 4). With this procedure, we could decrease the occurrence rate of vasospasm and could raise the percentage of "Symptom-Free" from vasospasm, from 41% up to 73%.

On the other hand, however, there are, of course, demerits of microsurgery shown in Table 2. But almost all these demerits can be reduced and overcome through general anesthesia with mild hypothermia of 32-33 °C (Figs. 5 and 6)¹⁾⁵⁾⁷⁾ and the following surgical tactics.

The mild hypothermia is not only benefit in a case of a cerebral ischemia due to a long temporary clamp of a cerebral vessel, but also can protect the brain, especially of aged patients, while the brain is retracted during microsurgery.

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Table 1. Definite essential demerits of endovascular surgery

- Risk of aneurysm rupture
- Impossible to manage when ruptured
- Injury of arterial wall near the aneurysmal neck by guidewire or catheter during procedure

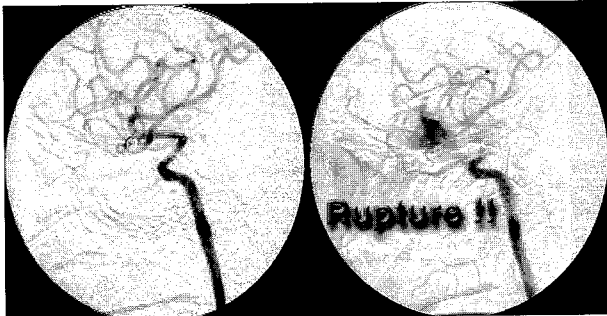


Fig. 1. The moment of RUPTURE ! during endovascular surgery.

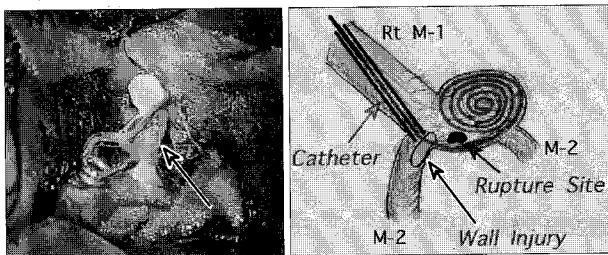


Fig. 2. Wall injury of the parent artery near the aneurysmal neck caused by a guide-wire or a catheter during endovascular surgery, which cannot be observable during the procedure.

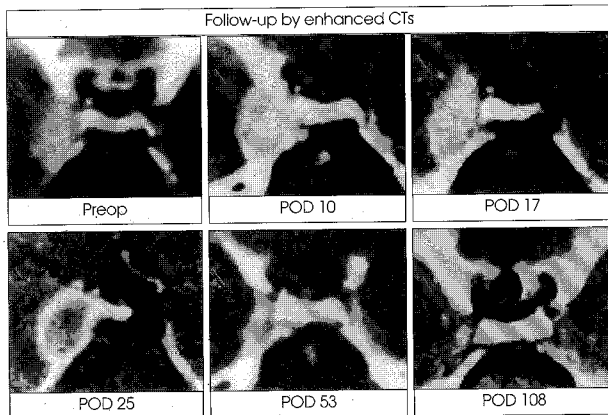


Fig. 3. Pre- and postoperative enhanced CTs of a 22 y/o male with a left giant intracavernous ICA aneurysm (arrow) which caused a left cavernous sinus syndrome. The left ICA was ligated at the neck to isolate the aneurysm from the cerebral circulation and to thrombose it, and a left STA-MCA anastomosis was done for the future risk of cerebral ischemia. The aneurysmal mass decreased in size with time, and vanished finally. This patient was cured from the cavernous sinus syndrome and has done well more than 20 years as a carpenter.

With the help of this intraoperative mild hypothermia, we can also perform the direct clipping safely even for a patient with a severe vasospasm (Figs. 7 and 8).

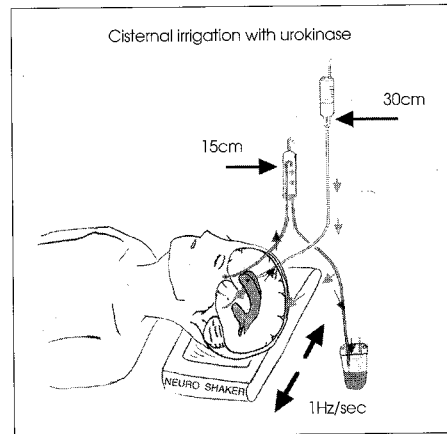


Fig. 4. Scheme of postoperative cisternal irrigation with urokinase with an aid of "Neuroshaker". This procedure is continued for 3-5 days till the CSF becomes clear.

Table 2. Demerits of microsurgery

- General anesthesia
- Craniotomy
- Brain retraction
- Temporary clamp of parent artery
- Some aneurysms are difficult for direct clipping
- Vein sacrifice
- Wound infection
- Risk in aged or compromised patients

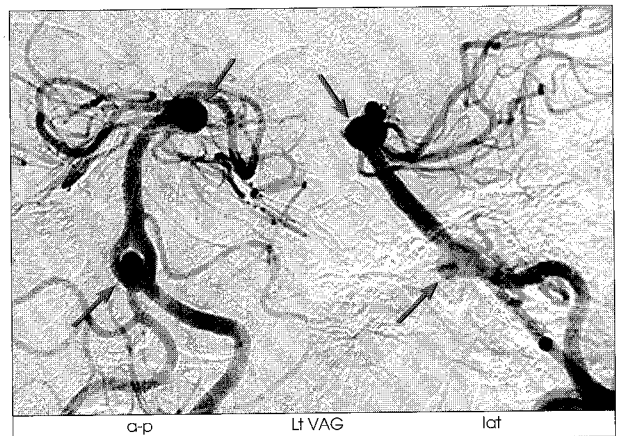


Fig. 5. A 59 y/o female with ruptured VA union aneurysm and a left unruptured BA-SCA aneurysm. She was operated on under mild hypothermia through right transpetrosal approach. The VA union aneurysm was clipped with a help of temporary clips which were placed on the basilar artery and vertebral arteries as long as 30min.

We developed a "Modified Pterional Approach" (Figs. 9 and 10) or the method to cut the superior sagittal sinus at the anterior part during the Interhemispheric Approach to get an enough operative field without sacrificing the cortical or bridging veins into the venous sinuses (Fig. 11).

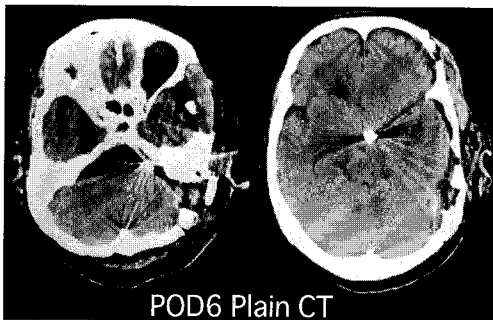


Fig. 6. The patient of Fig. 5. recovered from general anesthesia smoothly without delay. The postoperative CT showed no abnormal findings. The mild hypothermia had to protect the brain from ischemia during temporary clamp, which was placed as long as 30 min.

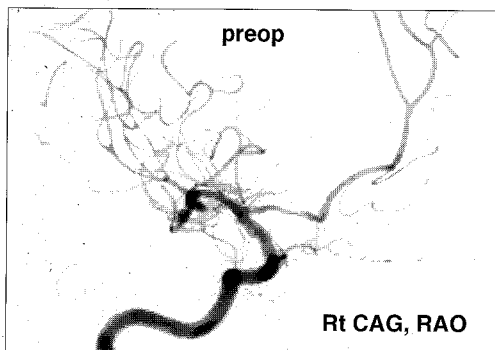


Fig. 7. This 69 y/o female was transferred to our clinic on Day 9 of SAH from a right middle cerebral artery aneurysm with a severe vasospasm, which was shown by the right cerebral angiography. Before the introduction of mild hypothermia into our clinic, this kind of patient had been scheduled for a delayed operation and many of them had died due to a cerebral infarction and/or rebleed. But this patient was operated on on Day 9 even with a severe vasospasm (Hunt & Kosnik Grade III) under mild hypothermia, and was treated intensively thereafter through the hypertensive, hypervolemic and hemodilution therapy with a good outcome.



Fig. 8. A photo of the same patient of Fig. 7. This patient was discharged to home on foot on 25th of postoperative day.

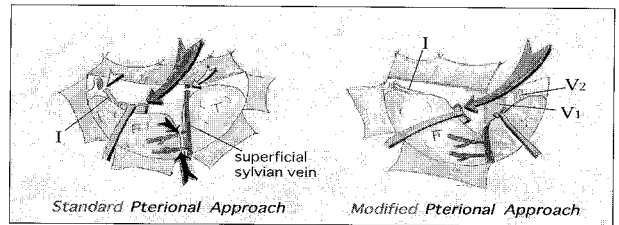


Fig. 9. Schematic draws of "Standard" and "Modified" pterional approach. In modified pterional approach, the temporal dura is divided into two layers preserving the sphenoparietal sinus and the temporal tip is pushed back while covered by the inner layer of the dura. All the cortical veins from the frontal lobe draining into the superficial sylvian vein are not necessary to be cut. The olfactory nerve can also be preserved in this procedure.



Fig. 10. Through "Modified" Pterional approach, we can get enough operative field. The A-com aneurysm has been clipped well.

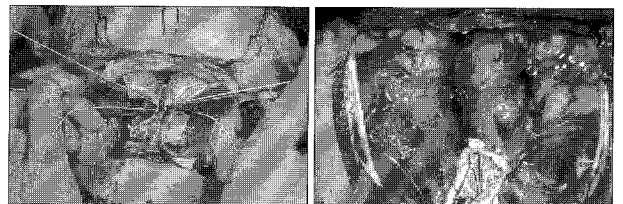


Fig. 11. The tactic to get enough space without sacrificing the bridging veins that drain into the superior sagittal sinus during the Interhemispheric approach.

With these surgical tactics, we can protect the brain from the complications of venous infarction or bleeding. Thus, the demerits of microsurgery can be overcome.

Conclusions

Endovascular surgery should be considered as an alternative only for specific patients such as those who can't tolerate the general anesthesia or whose aneurysms are located in a difficult site when surgically approached.³⁾ It must be stressed that "Less Invasive" cannot be equated with

“Less Dangerous”⁸⁾

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