

Pseudoaneurysm Formed by Slippage of Aneurysmal Clip

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We report a case of pseudoaneurysm formation after aneurysmal clipping. An aneurysm, which was located on the beginning of orbitofrontal artery, was clipped and wrapped with Surgicel[®] and fibrin glue. Four weeks later, an enlarged aneurysm was detected at the same site on postoperative angiography. We could not find a new aneurysm in the second operation except inflated wrapping region. And clip had been slipped from the original aneurysmal neck. So we concluded that a new aneurysm was a pseudoaneurysm made with surgicel and fibrin glue. And it had been formed from continuous minor leakage caused by slipped clip.

KEY WORDS : Aneurysm · Pseudoaneurysm · Slipped clip · Wrapping.

Introduction

A direct intracranial operative approach with clipping the neck of the aneurysm is generally considered to be the ideal treatment for the intracranial aneurysms. To achieve this, both appropriate clip selection and clip application are prerequisite^{1,2)}.

We report a case of pseudoaneurysm after clipping and wrapping by slippage of aneurysmal clip and discuss prevention of clip slippage.

Case Report

This 44-year-old woman suffered a sudden, severe headache for one day. On admission, she showed alert mentality, full degree of neurological functions and stable vital signs, however, acutely ill looking due to headache. Non-enhanced brain computed tomographic(CT) scan showed diffuse, symmetrical subarachnoid hemorrhage on the anterior interhemispheric and both sylvian fissures. Digital subtraction angiography(DSA) demonstrated an aneurysm on the beginning of orbitofrontal artery(Fig. 1, 2). Surgical obliteration of an aneurysm performed via the interhemispheric approach. In operative field, no significant brain edema, arterial vasospasm, or atherosclerosis was noted. Following sufficient interhemispheric dissection, the aneurysm was seen between the proximal part of orbitofrontal artery and anterior cerebral artery. The

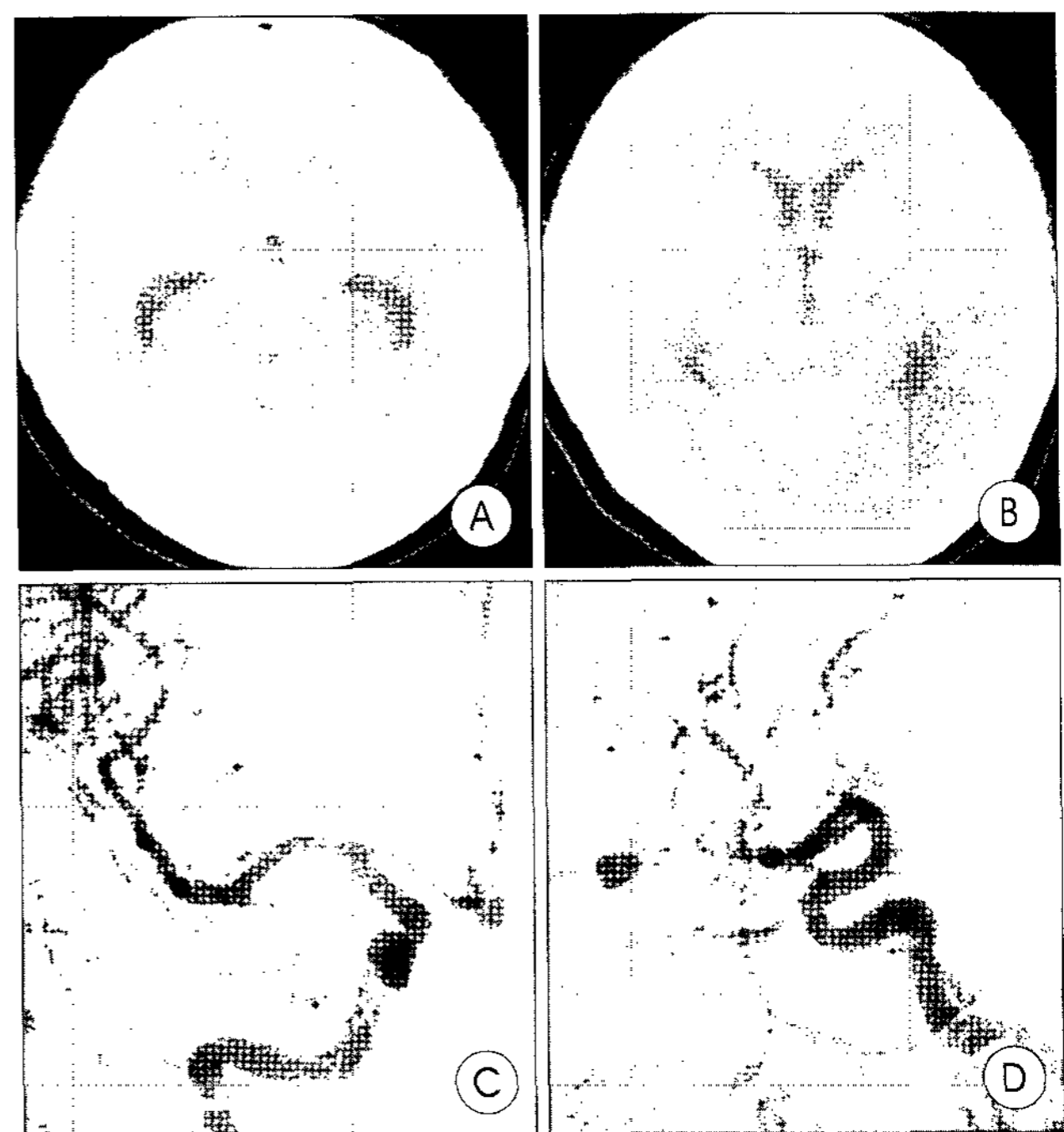


Fig. 1. Preoperative brain computed tomography(A,B) and internal carotid angiogram(C,D) show subarachnoid hemorrhage and an aneurysm on the beginning of orbitofrontal artery.

ruptured site was located near to aneurysmal neck. Yasargil titanium clip[®] No. 690, which had been unsealed from the original package, was implanted microsurgically. But complete clipping was not easy because the ruptured site was too close to main artery(Fig. 3). So after clipping in a hard way, supple-

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mentary wrapping with Surgicel[®] and fibrin glue was done. And then, full vascular patency was confirmed by exploring with portable transcranial Doppler microprobe[®]. During the immediate postoperative period, staying in neurosurgical intensive care unit, her systolic blood pressure maintained range of 140~180mmHg. Consecutive brain CT scans demonstrated no further bleeding or infarction. DSA obtained at postoperative four weeks showed enlarged and round aneurysm on the same site (Fig. 4). Reoperation was done on the next day. Following dural opening and dissection of the interhemispheric fissure, we could not find any new aneurysm which had been shown at DSA. There was only inflated wrapping region nearby previous aneurysm site. And the dissection of this wrapping

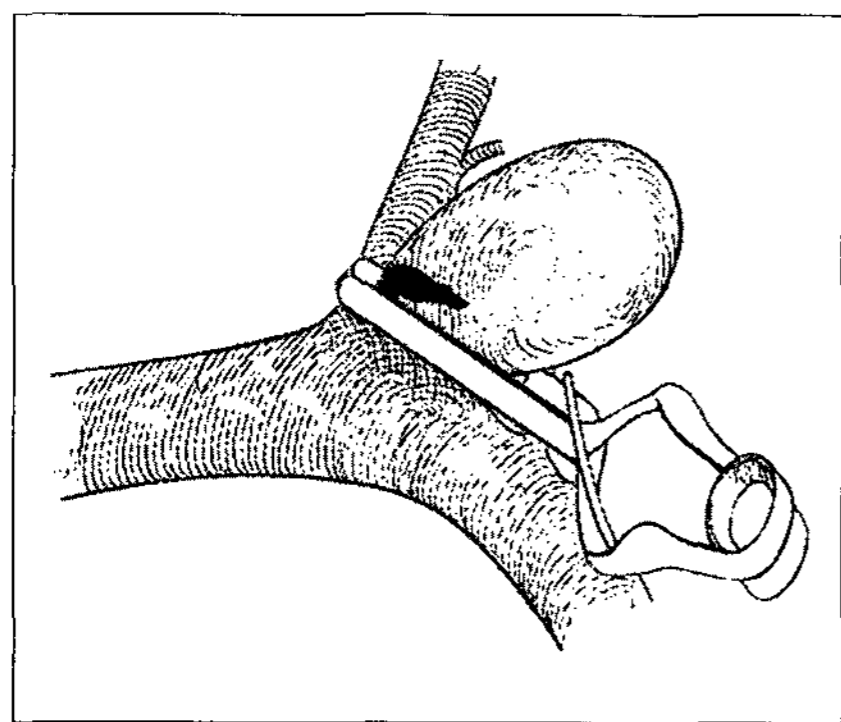


Fig. 2. Intraoperative finding. The ruptured site located near to aneurysmal neck.

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Fig. 3. Follow up internal carotid angiogram shows enlarged and round aneurysm on the same site.

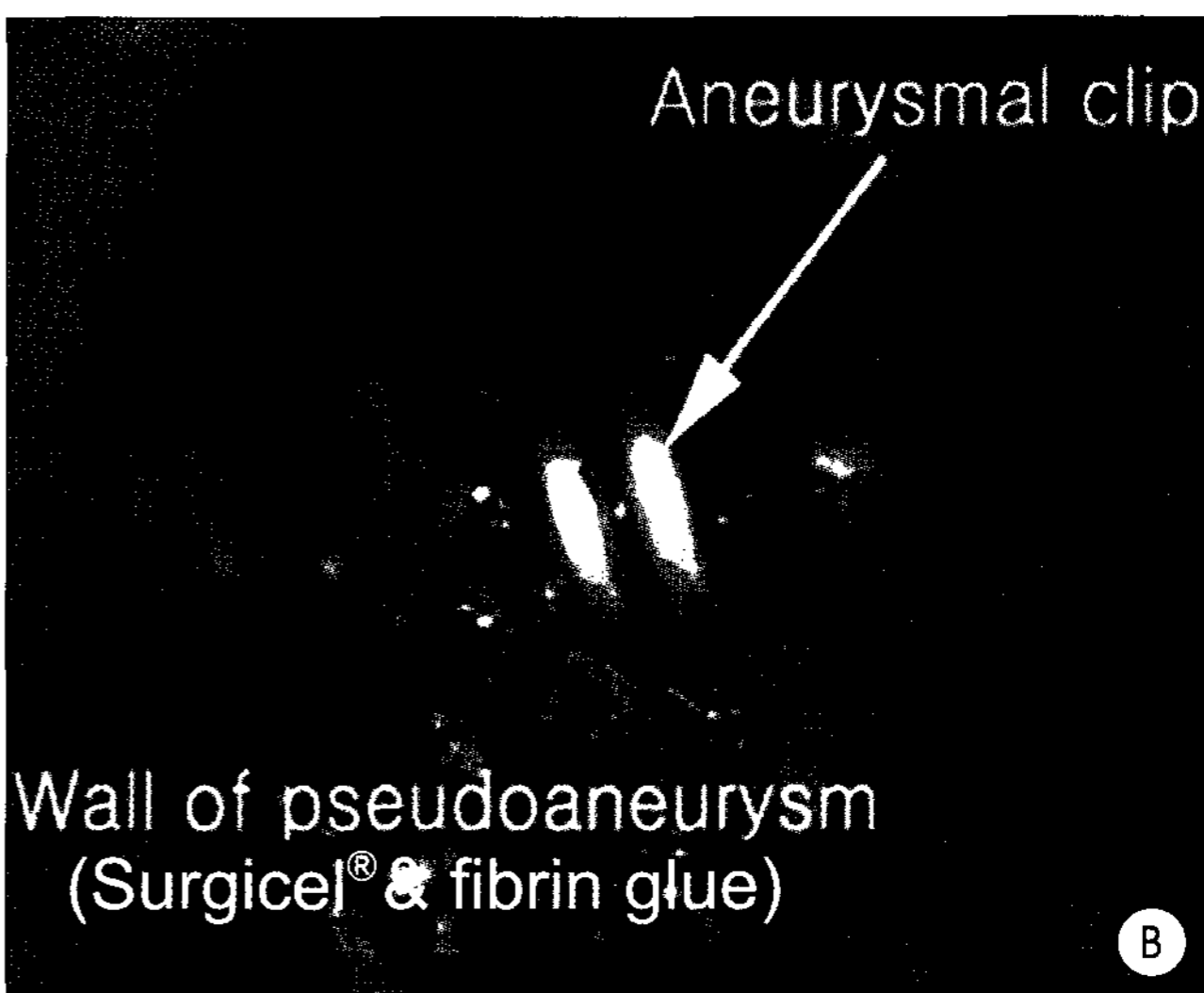
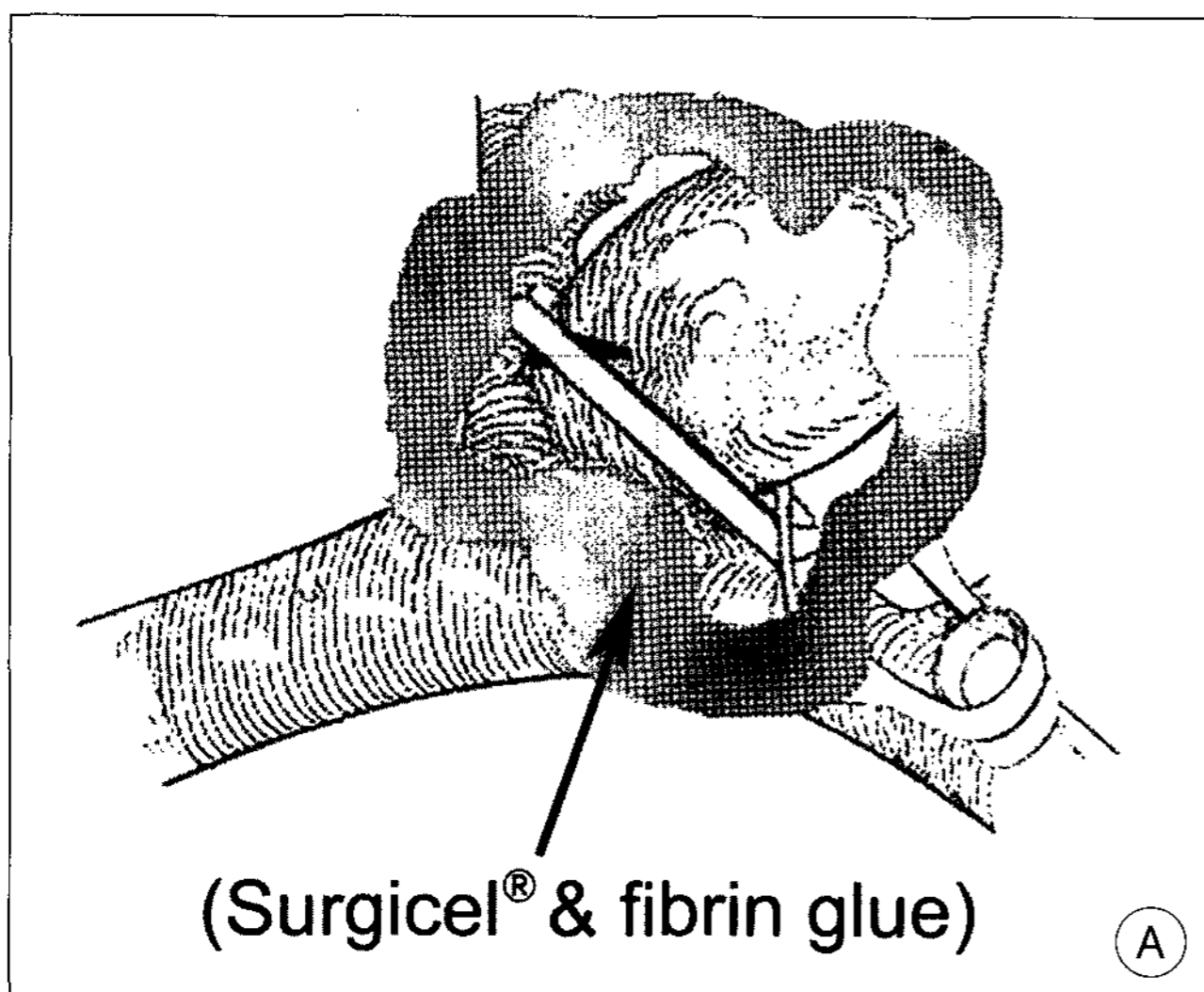


Fig. 4. Second operative findings. There is only inflated wrapping region nearby previous aneurysm site. The previously placed clip is slipped off upon the aneurysmal neck about 2mm. Schematic diagram (A) and operative view (B).

region was done. Bleeding occurred during dissection of the wrapping region. More dissection was done to find correct bleeding focus. Then we found that the previously placed clip had been slipped off upon the aneurysmal neck about 2mm and there was continuous blood leakage. The previous clip was repositioned to the neck with difficulty and reinforced with another clip, Yasagil No. 692 clip[®] (Fig. 5). Again, wrapping was done and the completeness of clipping was confirmed by using Doppler microprobe. Confirmative DSA at five weeks later did not show any aneurysm or spasm (Fig. 5).

Discussion

Permanent microsurgical clipping has been the standard procedure in the neurosurgical treatment of cerebral aneurysms.

Generally, selection of clip requires variable factors, such as size, shape, metallurgic characteristics and closing force of the clip, anatomic characteristics of the aneurysm neck and surrounding structures, and the configuration and design of the clip applicator, but the most important part often lies in a subjective decision based on the surgeon's experience, assessment of the anatomic field, and preference for clip design and ease of application¹⁾.

There are some reports of patients in whom aneurysm clips have slipped after aneurysm surgery^{2,4,9-11)}. In conventional clip era, clip failure may be observed intraoperatively, when normal levels of blood pressure are restored and the previously placed clip slips or flies off the aneurysmal neck. It may also occur at some time after the operation, possibly in the immediate postoperative period, when the patient may be transiently, but significantly hypertensive⁷⁾. Therefore, some insisted



Fig. 5. Confirmative internal carotid angiogram does not show any aneurysm or spasm.

that even if angiography during or immediately after surgery shows that the sac has been obliterated, it is still advisable to repeat the examination after a week, as clips may slip with the arterial pulsations and postoperative hypertension⁸⁾.

So Carvi, et al., suggested guidelines for avoid complications³⁾. 1) Use the mobile fulcrum clip type, which has the advantage that the blades do not cross and, similar to alpha clips⁶⁾, a lower degree of hysteresis. 2) If it is decided that an alpha titanium clip will be used, reduce the amount of aneurysm filling by decreasing blood pressure or by temporary clipping of the main vessel. 3) If the first clip slips off but does not rupture the aneurysm, place a second occluding clip parallel to the first and correct the blades of the first clip. 4) For broadneck aneurysms, never use a clip that has been left open on the instrument table or resterilized for a subsequent operation. 5) While inserting the clip, leave a depth of at least 2mm from the tip or deeper⁵⁾. 6) The complete resection of arachnoidal bundles surrounding the aneurysm neck or the well-known use of bipolar coagulation or a silk ligature placed around the neck of the aneurysm can in some cases be necessary. 7) The relationship between gap and vessel elasticity must especially be considered for ICA aneurysms or in cases in which the surgeon encounters an aneurysm with larger proportions than those observed angiographically. 8) The plane of clip insertion (perpendicular, parallel, or angular) to the ICA seems to determine how the clip moves (rotationally or translationally) in case of slippage. 9) Before clipping, the neck resistance between the branches of the bipolar coagulator should be felt. 10) New materials tests should be performed to check titanium generation.

At operation, we chose Yasargil titanium clip[®] No. 690, which had been unsealed from the original package. But we thought that this clip was sufficient to close completely, because there had been no broad neck, or no atherosclerosis. Considering the aneurysm configuration, curved contour clip seemed to be better. But the ruptured site was too close to original artery

to clip completely. So the tip couldn't be left at least 2mm or deeper. Supplementary method, wrapping with Surgicel[®] and fibrin glue, performed. After all, the factors responsible for the resultant clip slippage were the use of previously unsealed clip and insufficient clipping. But fortunately sudden awful bleeding after the slippage did not occur. Instead, continuous minor bleeding developed and this led to a bulging of wrapping region. This phenomenon could be explained as such that there was relatively high exterior pressure to aneurysmal wall in interhemispheric cistern comparing with basal cistern to overcome the pressure that bleed from the rupture site abruptly. So the bulging grew more and more.

Conclusion

The authors experienced an unusual case of pseudoaneurysm formed by clip slippage in aneurysm operation. Clip slippage is rare, but pseudoaneurysm formation due to slippage of clip is very peculiar phenomenon. So for preventing this case, the surgeons' consideration of the all factors that can make slippage of the clip and precautions application were utmost important.

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