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## **Endocranium mater warp to repair tear of aneurysm neck assist clipping: A Case Report**

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## **Abstract**

**Background and importance** We describe a patient who occurred intraoperative aneurysm ruptured (IAR) of aneurysms neck and the surgeon use a piece of endocranium to assisted clip and achieve a good result.

**Clinical presentation** A 62-year-old women was admitted with an acute subarachnoid hemorrhage (SAH). She underwent, after 2h, a right frontotemporal craniotomy for clip ligation of the subarachnoid aneurysms. IAR occurred during the dissection of the aneurysm neck, and then surgeon selected a free piece of endocranium (about 3cm×2cm) wrapping to repair tear of aneurysm neck assist clipping. Long-term clinical follow up shows that patient recuperate well and with a 0' Modified Rankin scale scores eventually.

**Conclusion** This report illustrates that The IAR of neck is the most devastating complication. Endocranium-clipping technique is an effective measure to repair tear at the neck.

**Key words:**Aneurysm; Intraoperative aneurysm rupture; Aneurysm clipping

## **Abbreviations**

SAH Subarachnoid hemorrhage

IAR Intraoperative aneurysm rupture

CT Computer tomography

CTA Computer tomography angiography

PCoAA Posterior communicating artery aneurysm

DSA Digital subtraction angiography

## **Introduction**

It is well recognized that intraoperative aneurysm rupture (IAR) was a serious event which is difficult to manage and has a relatively serious influence in the patients' prognosis [13,14], though IARs are infrequent events. The actual clinical showed that IAR brought the poor outcome [2,4,6,7,14]. The IAR of neck is the most devastating complication [1,4,8,10,14]. Inappropriate treatment will carry the patient negative consequences. In this report, we describe a patient who occurred IAR of aneurysms neck and our cerebrovascular surgeon used a piece of endocranium to repair the tear and finally achieve a good result.

## **Case History (Fig.1)**

A 62-year-old women was admitted for “sudden disturbance of consciousness for about 1h”, she presented with a Hunt and Hess Grade IV SAH. CT revealed that high density shade in the suprasellar, bilateral sylvian cisterna, longitudinal cistern, and little shade hematocoele in the bilateral posteior horn of lateral ventricle. CTA revealed a left PCoAA (12.3mm×5.2mm) that was considered the source of the hemorrhage. This patient immediately received an aneurysm clipping operation 2 hour after being admitted. She underwent a right frontotemporal craniotomy for clip ligation of the subarachnoid aneurysms. After resect the arachnoid of sylvian and carotid cistern, the left carotid artery was exposed. The PCoAA was noted and it was at the lower back of left internal carotid artery. IAR occurred during the dissection of the aneurysm neck, and the bleeding position was the aneurysm neck. Bleed was surge. Cerebrovascular surgeon used two suctions to clean up the operative working space due to the IAR, and then the surgeon selected a free piece of endocranium (about 3cm×2cm) which was taken from the patient's herself. The bleeding halted immediately after endocranium was used to cover the place and compressed against the tear on the aneurysm neck, then used the clips (T654 and T642, Braun, Germany) clipped the aneurysm. After the surgery, we review the CTA image, showed the clip is in its right place, the carotid artery, bilateral middle cerebral artery and its branch was normal.

The CT showed the changes after clipping of aneurysm, which the left frontal lobe was slightly bulging and there was a shade of metal clips on the left side of saddle. Patient's ventricular system expanded. This patient got out of hospital after the surgery 15d. At the 1m, 3m and 6m clinical follow-up visit, final modified Rankin scale scores was 0'.

## **Discussion**

In the event of an untimely intraoperative rupture of an aneurysm, the cerebrovascular surgeon faces two issues: (1) control of the bleeding and (2) definitive repair of the aneurysm and arterial defect [4,14]. The profuse bleeding from the tear and poor integrity of vessel wall not only bring a lot of trouble to clip the aneurysm, but also stress much on cerebrovascular surgeon as well. From the previous experience, there are many techniques can deal with such occasion, including microsuturing, sundt-clip graft, extracranial-to-intracranial (or intracranial-to-intracranial) bybass. But these surgeries are often of highly difficulty and can not be successfully completed for those inexperienced cerebrovascular surgeon whose preoperative preparation is not sufficient. Besides, if there is no perfect evaluation of the patients' individual differences before the surgery, a large area of brain tissue infarction can ultimately cause adverse outcomes such as limb paralysis, difficulty regaining consciousness or even death because of the frequent-happening intolerance of the intracranial hemodynamic changes after receiving the above-mentioned techniques. For the reason, the use of relatively simple and direct technical function in assistance of smoothly aneurysm clipping is of particular significance.

Spetzler and others used a piece of cotton to wrap the neck of aneurysm to assist rupture clipping. As reported [4,8], they use the method of clipping assistance in four cases that neck aneurysm rupture and achieved decent results. The appropriate amount of cotton brain wrapping to a certain extent can repair neck aneurysm rupture and help suction better clear the blood to maintain a relatively clear operative field. Meanwhile,

the brain aneurysm neck cotton can increase the surface area and make the aneurysm clip be possible to clip in a relatively remote site of the aneurysm neck, and then assure lumen patency of the arteries [4,8]. Of course there are disadvantages of using brain cotton as well. Because of the rejection caused by excessive brain cotton, as a foreign tissues, optochiasmal arachnoiditis occurs and has an impact on the organizational structure of the optic nerves and perforating artery around the aneurysm [5,9]. Meanwhile, lacking use of brain cotton not only cannot play auxiliary effect of clipping, but also may lead to further expansion of the rupture. In this case, main reasons that we use endocranium as repair materials to assist clipping are: (1) In comparison of the loose brain cotton, the endocranium which features a homogeneous flake style and is relatively thick and flexible, also has more capillaries that can trigger clotting mechanism. Hence it can have better packable, repairable and coagulable effects of the neck aneurysm rupture. (2) The endocranium that used during operation coming from the patient herself contributes to the avoidance of the rejections (*Fig. 2*).

Because of its strong hemostatic properties, it is also suggested that the smashed muscle would be a good choice for repairing a tear at the neck of an aneurysm [1, 11]. Yet in our view, the neck tear repaired by smashed muscle is small, the aneurysmal wall is thick and intensity enough. For the aneurysm with weak wall and large tear of rupture, it can't control bleeding. Endocranium combined with adopt clip have sufficient strength to be used for warping parent artery which should be reconstructed. Nonetheless, no practice, no right to speak. Smashed muscle and endocranium is readily available in the subsequent operations, which one has more advantages needs much more practice. We will make detailed comparison and discussion for a more considerable conclusion eventually.

The choice of clips derive from the aneurysm positions, neck width and curvature parent artery. If the clipping is not parallel, parent artery would distort result in lumen stenosis, also the dog-ear remnant and recurrence. In this case, ruptured aneurysm was on the back of artery, so we choose the crooked fenestrated clips so that the clip blade was parallel with the long axis of the artery. The correct placement of clip influenced

by many factors, and the incorrect placement will induce the neck remnant and recurrence. It can't be ignored that fully recognize of aneurysm information through the pre-operation [CTA](#) or [DSA](#). After all, the experience and technology of the cerebrovascular surgeon are only controllable factors [3,12,14].

## **Conclusion**

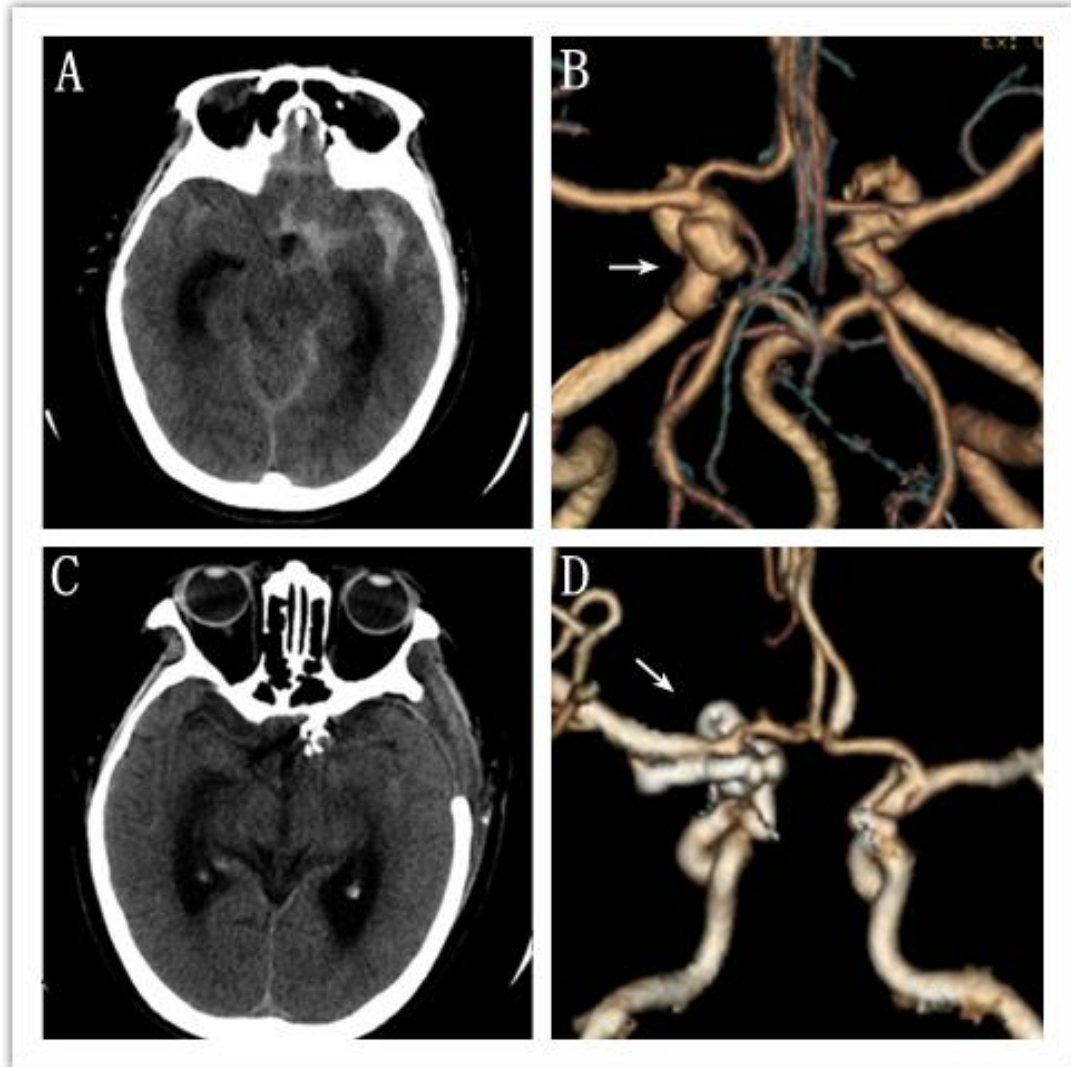
In conclusion, a patient is reported with a SAH treated by clipping of left PCoAA who occurred IAR of the aneurysm neck. Through using a piece of endocranium to wrap and repair the tear. The aneurysm was finally clipped well and patient recovered well without any neurological deficit. Long-term clinical follow up shows that patient recovered well and final modified Rankin scale scores was 0<sup>1</sup>. In this case, the choice of endocranium to assist clip can be regard as a innovation of material selection and it aims to encourage cerebrovascular surgeons to consider the endocranium-clipping technique and the exploration of material selection that be used for repairing.

## **Conflict of interest**

None.

## Figure legends

**Fig.1**



**A**, CT revealed that high density shade in the suprasellar, bilateral sylvian cisterna, longitudinal cistern, there little shade hematocele in the bilateral posteior horn of lateral ventricle.

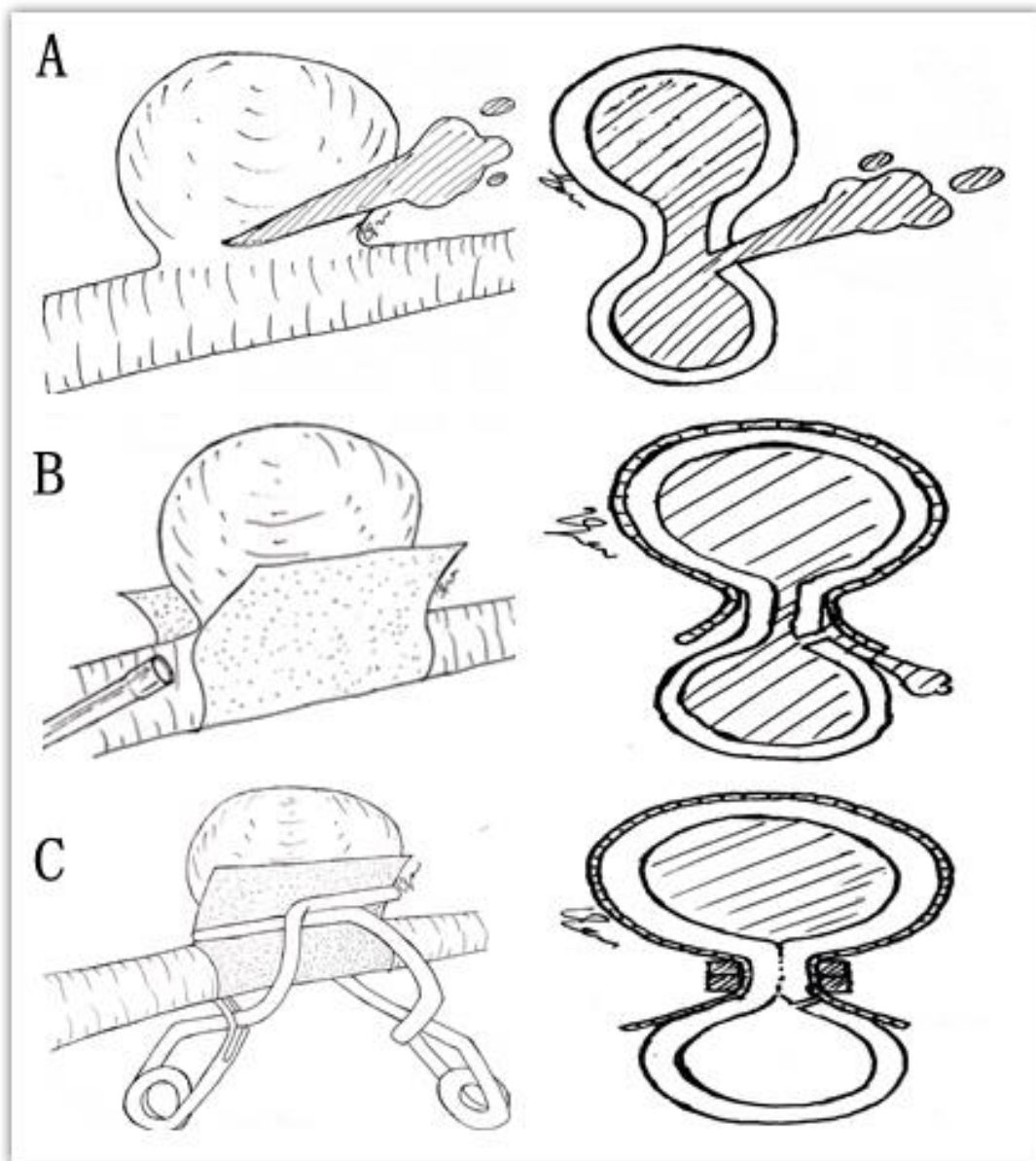
**B** CTA revealed a left PCoA aneurysm (12.3mm×5.2mm) that was considered the source of the hemorrhage (arrow).

**C**, The CT shows that changes after clipping of aneurysm, the left frontal lobe was slightly bulging. There was a shade of metal clips on the left side of saddle. Patient's ventricular system expanded.

**D**, CTA image, showed the clip in its right place, the carotid artery, bilateral middle cerebral artery

and its branch was normal (arrow).

**Fig.2**



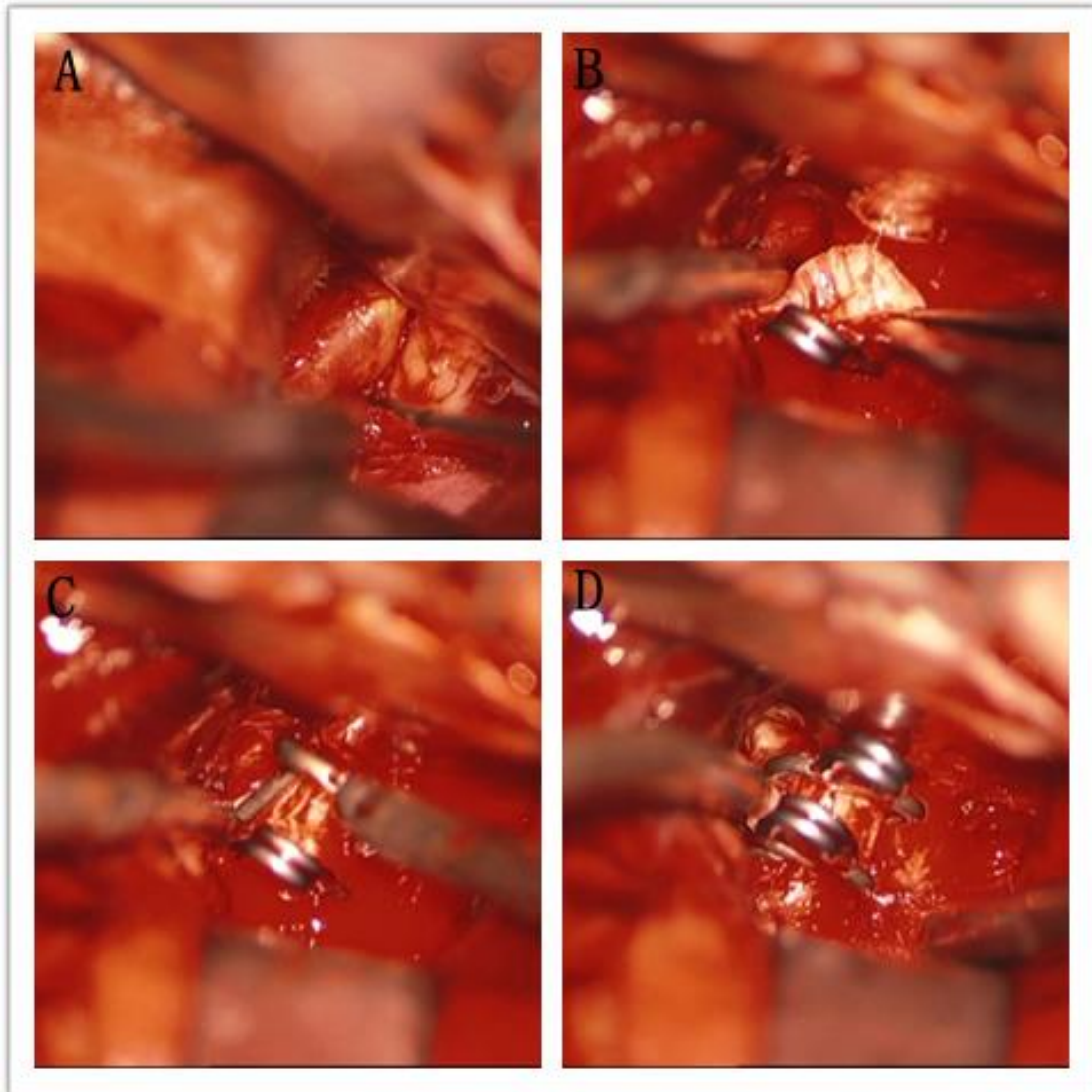
**A,** Illustration depicting the intraoperative partial avulsion of aneurysm neck and bleeding.

**B,** A piece of patient's self cerebral dura wrap around the parent artery and aneurysmal neck, using a suction to keep the operation field clear.

**C,** Two crooked fenestrated clips were applied to clip the neck. The cerebral dura beneath the fenestrated clips to against tear without compromising the parent artery.



**Fig.3**



**A,** Intraoperative photograph shows the PCoA aneurysm was noted and it was at the lower back of left internal carotid artery.

**B, C,** Surgeon used selected a free piece of dura (about 3cm×2cm) to cover the place and compressed against the tear on the aneurysm neck, then used the clips (T654 and T642, Braun, Germany) clipped the aneurysm.

**D,** The bleeding halted immediately.

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