

**OLGU SUNUMU****CASE REPORT****COIL EMBOLIZATION OF BASILAR TIP ANEURYSMS: Analysis of Complications**

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**ABSTRACT**

Although various treatments of cerebral aneurysms continue to be the methods of care, best treatment method is still controversial. Despite recent advances in endovascular techniques, coil herniation and parent artery occlusion may complicate the treatment, particularly in wide-necked aneurysms. Endovascular therapy is an effective alternative for treating basilar artery (BA) bifurcation aneurysms. It is important to select a suitable treatment option in each case depending on the patient's condition and the angiographic features of each aneurysm. In this report, the mechanism of early parent vessel occlusion by coils, and the pathogenesis of thrombosis associated with coil embolization are discussed. Endovascular treatment of cerebral aneurysms is not always safe method but efficacious therapeutic alternative to surgery in selected cases. The purpose of this study was to discuss the indication, limitations and complications of coil embolization for BA bifurcation aneurysms with illustrative Hunt-Hess high grade patient.

**Key Words:** Basilar tip aneurysm; endovascular coil; postmortem examination; subarachnoid hemorrhage

**BASİLER TEPE ANEVİZMASININ COIL EMBOLİZASYONU: KOMPLİKASYONLARIN ANALİZİ**

Serebral anevrizmalarda farklı tedavi yöntemleri kullanılıyor olmasına karşılık, en iyi tedavi yöntemi hala tartışmalıdır. Endovasküler yöntemlerdeki en yeni ilerlemelere, rağmen, coil'in yer değiştirmesi, parent arterin tıkanması özellikle geniş boyunlu anevrizmalarda tedaviyi komplike hale getirmektedir. Endovasküler tedavi basiler arter (BA) bifurkasyon anevrizmalarını tedavi etmekte etkin bir alternatiftir. Hastanın durumuna ve her bir anevrizmanın anjiyografik özelliğine göre uygun bir tedavi opsiyonunu seçmek önemlidir. Yazıda coil ile erken dönemde parent damar tıkanması ve coil embolizasyonu ile ilişkili trombozun patojenezi tartışıldı. Serebral anevrizmaların endovasküler tedavisi daima emin bir yöntem değildir, fakat iyi seçilmiş olgularda cerrahiye alternatif etkili bir tedavi yöntemidir. Bu çalışmanın amacı basiler arter bifurkasyon anevrizmasına sahip Hunt-Hess yüksek grade'li bir örnek hastada coil embolizasyonun endikasyonunu, sınırlamalarını ve komplikasyonlarını tartışmaktır.

**Anahtar Sözcükler:** Basiler tepe anevrizması; endovasküler coil; otopsi; subaraknoid kanama

**INTRODUCTION**

Guglielmi detachable coil (GDC) embolization seems to be an important alternative for treating posterior circulation aneurysms, especially for BA bifurcation aneurysms (1). Poor neurological condition is one of the criteria of choosing treatment option of coil embolization for basilar artery aneurysm. Other options are older age (over 75 years), general poor condition, patient's preference, location of the aneurysm in high position and large aneurysm. Although endovascular treatment of cerebral aneurysms continues to be the good standard of care, and certain situations arise for which endovascular embolisation may not be the best option. Coil embolization of wide-necked aneurysms is currently difficult. Despite recent advances in endovascular techniques, parent vessel coil herniation occasionally complicates successful GDC embolization, particularly in wide-necked aneurysms.

**ILLUSTRATIVE CASE**

A 57-year-old man presented with sudden-onset severe headache and fluctuating levels of consciousness. Computerized tomography (CT) on admission revealed Fisher Grade 4 subarachnoid hemorrhage (SAH) and hydrocephalus (figure 1A). Calcium channel blocker was administered in early period. An external ventricular drainage catheter was placed immediately, and the patient's neurological status improved from Hunt-Hess Grade (HHG) 3 to HHG 2 after cerebrospinal fluid was removed. A four-vessel angiographic study revealed a 2x2-cm basilar tip aneurysm protruding cranially (figure 1B). Three days after these diagnostic procedures were performed, the patient developed mild left hemiparesis and dysphasia. Neurological deterioration just after the diagnostic procedure may suggest technique related triggered vasospasm or pure SAH related vasospasm. There was no vasospasm in the internal cerebral artery territories. Heparin was used to prevent thrombus

neurological status, neurosurgical and neuroradiological interventional teams opted for endovascular coil treatment instead of surgery. Informed consent was obtained from the patient's next of kin. Post-coil embolization angiography showed complete occlusion of the aneurysm, but severe vasospasm throughout the distribution of both vertebral arteries (figure 2A). Intraarterial papaverine administration led to partial resolution of the vasospasm but no clinical improvement. Eighteen hours after embolization, the patient developed anisocoria and went into a coma (HHG 5). A CT scan revealed bilateral hemispheric infarction and midline shift (figure 2B). The patient died 1 day after embolization was performed.

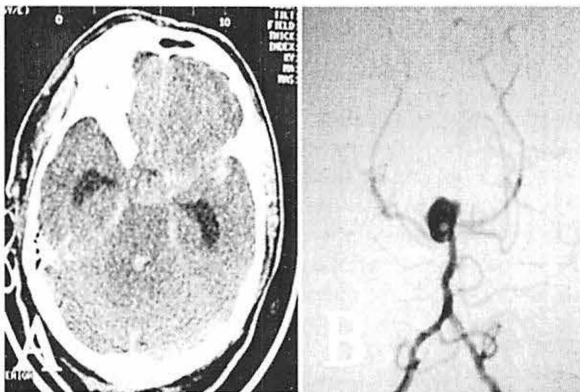


Figure 1: 1A. Axial non-contrast-enhanced CT scanning on admission showed Fisher Grade 4 SAH in the basal cisterns and sylvian fissures, as well as acute hydrocephalus. 1B: Cerebral angiography (AP) of the vertebrobasilar system on day 2 of hospitalization revealed a sacular aneurysm of the basilar tip protruding cranially.

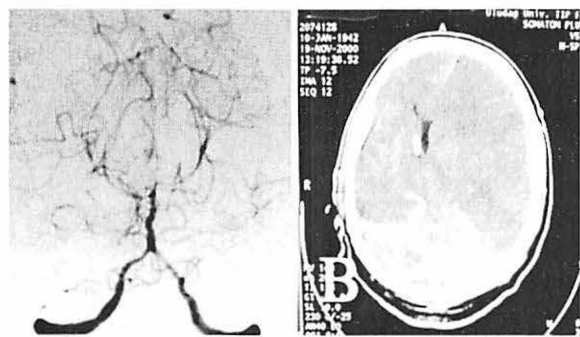


Figure 2: 2A. Cerebral angiography (AP) immediately after coil embolization demonstrated severe vasospasm of both vertebral arteries. 2B: Axial non-contrast-enhanced CT scanning 18 hours after embolization demonstrated hemispheric infarction with midline shift.

Postmortem examination of the brain showed that the coils had perforated the aneurysm wall. Although the coils had perforated the aneurysm wall, there was no extravasation of contrast material during angiography. The protruding coils were occluding both posterior cerebral arteries, and these vessels also contained thrombi (figure 3). Autopsy findings of brainstem parenchyma and bilateral internal carotid arterial systems were consistent with cerebral edema and ischemic infarction.

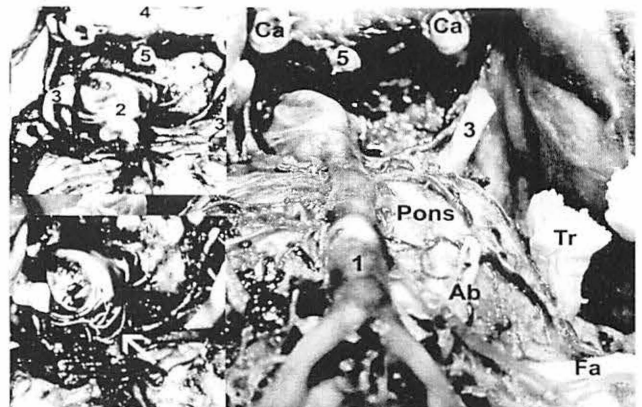


Figure 3: Vertebrobasilar system preparation of fixed brain autopsy specimens showed coils perforating the aneurysm wall\*, and showed the protruding coils (arrow) and thrombi occluding both posterior cerebral arteries. ([1] basilar artery; [2] coils inside the aneurysm; [3] oculomotor nerves coursing between the superior cerebellar and posterior cerebral arteries, which are occluded by protruding coils and thrombi; [4] optic chiasma; [5] pituitary stalk; [Ca] Carotid artery; [Tr] Trigeminal nerve; [Ab] Abducens nerve; [Fa] Facial nerve).

Table 1: Coil embolizations associated with coil migrations, herniations and aneurysm perforations as early procedural complications.

Authors	Patients (n)	Complications	Percentage
Shanno GB, et al <sup>9</sup>	241	Coil extrusion	31%
		Intraoperative aneurysm rupture	11.9%
Vinueza F, et al <sup>10</sup>	403	Aneurysm perforation	2.7%
		Intraoperative aneurysm rupture	0.3%
Debrun GM, et al <sup>1</sup>	329	Intraoperative aneurysm rupture	2.9%
Tummala RP, et al <sup>11</sup>	701	Intraoperative aneurysm rupture	3.9%
Guglielmi G, et al <sup>12</sup>	127	Intraoperative aneurysm rupture	3.9%

DISCUSSION

Treatment of a basilar tip aneurysm with endovascular coil occlusion is a reasonable urgent therapeutic option for patients with SAH. The

main advantage of this procedure is that it can be done without having to retract the affected brain tissue or dissect the parent artery and important perforators. Although complete coil-obliteration is difficult task in broad neck aneurysms, it considered to be impossible to embolize the basilar aneurysm with broad neck involving posterior cerebral artery and superior cerebellar artery. GDC is, however, not suitable for all aneurysms especially for wide-based, complex-shaped or partially thrombosed aneurysms. These factors influencing the successful rate of angiographic obliteration of the aneurysm by embolization are previously reported (2,3). In one study of 73 patients who underwent coil embolization for basilar tip aneurysm, 11% experienced technique-related complications, and the associated morbidity and mortality rates were 4.1% and 1.4%, respectively (4). The authors identified wall perforation and protrusion of coils from the aneurysmal sac as the most common technical complications. Other investigators noted that ischemic events after GDC procedures were associated with protrusion of coils into the lumen of the parent artery or into branch arteries (5). According to the literature, the most common cause of morbidity related to GDC procedures is thrombus formation at the neck of the aneurysm with concomitant local arterial occlusion or peripheral cerebral embolism (4). Thromboembolic events can occur at the time of coil treatment or in the hours or days following the procedure. As many as 11% of patients treated with GDCs have a thrombus extending into the parent artery from the endoluminal surface of the aneurysm at the time of the procedure, or else show emboli distal to the aneurysm when the coils are placed (6). Several authors have detected coil migration on post-procedure angiography (7, 8). Previously published data of coil embolization for early complications of coil migration and coil herniation showed in table 1 (1,4,5,9,10,11,12,13). Best timing of coil embolization is still debatable topic (14). Perhaps the embolization in this case should have done as early as possible, before the vasospasm occurs or during the first diagnostic procedure. Combination of vasospasm and coil protrusion seems to duplicate the risk of arterial narrowing and occlusion. Alternatively, interventional team that thinks the coil embolization should have postponed until the resolve of vasospasm.

## CONCLUSIONS

Selecting timing to treatment in each case is important based on the patient's condition and

angiographic features of each aneurysm as well as the suitable treatment options. This paper reported the complications with the illustrative course of one patient of basilar tip aneurysm who suffered from severe complication before and after endovascular treatment. Our patient developed a combination of problems before, during and after GDC placement: hydrocephalus, cerebral emboli, and early occlusion of the parent vessel due to coil migration, and associated severe vasospasm and subsequent thrombosis of both anterior and posterior circulation. It is possible to explain acute bi-hemispheric swelling by the occlusion of posterior cerebral arteries in such type vulnerable brain. Disturbed auto-regulatory function might affect not only vertebra-basilar system but also anterior circulatory systems.

## KAYNAKLAR

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