Recanalization of the aneurysm originating from the posterior communicating artery after coil embolization: Incidence and Risk Factors

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Introduction

Recanalization is a major problem in the embolization of cerebral aneurysms.

We aimed to analyze the recanalization of the aneurysm originating from the posterior communicating artery (P-Com) and its risk factors after coil embolization.

Materials and Methods

Patient population

From January 2011 to August 2017, we retrospectively analyzed 37 patients who underwent coil embolization of the aneurysm originating from the posterior communicating artery and whose follow-up period was at least 6 months. The primary study endpoint was when recanalization was observed in follow-up images.

To analysis of association of various factors, various parameters in medical records were reviewed, including age; gender; clinical presentation (unruptured intracranial aneurysm [UIA] or subarachnoid hemorrhage [SAH]); and histories of hypertension, smoking.

Endovascular technique

Coil embolization for ruptured aneurysms was performed as soon as possible following subarachnoid hemorrhage and was based on a review of CTA or DSA to confirm that the morphology of the aneurysm is suitable for coil embolization. UIAs underwent DSA before coil embolization, and after discussion in the outpatient department, coil embolization was determined.

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In case, presence of fetal origin posterior communicating artery, vertebral angiogram accompanied by carotid artery compression (Allcock test) was performed to confirm collateral circulation. However, procedure was performed as carefully as possible to maintain patency of posterior communicating artery.

Aneurysmal and Procedure-Related Factors

We analyzed the association of various factors (the shape and size of aneurysm, presence of fetal origin posterior communicating artery, use of stents, coil packing density, and modified Raymond-Roy classification).

The size of the aneurysm was defined based on the longest length in the working projection on DSA. And wide-neck aneurysms were defined as having at least 1 of the following criteria: neck size ≥ 4 mm, dome-to-neck ratio < 1.5 , or a cylindric neck. Bilobed aneurysms, aneurysms with daughter blebs and multilobulated morphology were all classified as irregular.

In order to reflect hemodynamic stress, we classified the fetal origin posterior communicating artery and non-fetal origin posterior communicating artery.

To calculate the coil packing density, we used an on-line system available at www.angiocalc.com.

Follow-up

Follow-up radiographs were usually recommended at 6, 12, 24, and 36 months postoperatively (or longer). MRA was mainly taken and DSA was performed when recanalization was suspected on MRA.

The Angiographic Outcome (Figure 1) was divided into the follows: stable, minor recanalization, or major recanalization. The aneurysm was considered "stable" if there was no change compared to the initial post embolization angiogram. Recanalization was "mild" if there was an increase in the contrast opacification within the neck that was greater than the initial obliteration. Recanalization was "significant" if there was an increase in the contrast opacification of the aneurysm body which was greater than the initial and re-treatment was considered.

Figure 1. Angiographic Outcomes **A, B.** There was no change with angiogram immediately after embolization in the angiogram after 14 months. **C, D.** Significant recanalization was observed in DSA after 23 months.

Results

Recanalization developed in 13 (35.1%) out of 37 patients (Table 1). Four of the 13 patients were major recanalization requiring re-treatment.

Multiple logistic regression analysis indicated that recanalization of coiled aneurysm was associated with fetal origin posterior communicating artery presentation ($P=0.045$) and coil packing density $\geq 18\%$ ($P=0.037$) (Table 2).

	Total=37	No recanalization(N=24)	Recanalization(N=13)	P-value
Patient factors				
Age(mean $\pm$ SD)		60.17 $\pm$ 11.59	60.08 $\pm$ 11.41	0.894
Female		4	0	0.276
HTN		8	7	0.300
Smoking		5	1	0.394
Aneurysm factors				
SAH		9	7	0.489
Irregular		12	9	0.315
Wide neck		11	8	0.495
FTP		8	9	0.047 *
Aneurysm size(<7mm)		16	6	0.300
Aneurysm volume(mm ³)(mean $\pm$ SD)		125.01 $\pm$ 108.26	236.65 $\pm$ 162.74	0.009 *
Procedural factors				
Stent		8	3	0.771
VER(≥ 18)		18	5	0.039 *
Modified Raymond-Roy classification				
1		14	3	
2		2	1	
3a		6	2	
3b		2	7	
Postprocedural factors				
Antiplatelet medication		8	3	0.771
F/U period (months)(mean $\pm$ SD)		16.75 $\pm$ 11.92	18.92 $\pm$ 10.48	0.448

TABLE 1. Demographic and Angiographic Characteristics of Aneurysms Showing Recanalization After Initial Coiling

Factors	Odds ratio	95% CI	P-value
FTP	0.195	0.039-0.963	0.045
VER(≥ 18)	5.462	1.111-26.847	0.037

TABLE 2. Demographic and Angiographic Characteristics of Aneurysms Showing Recanalization After Initial Coiling

Conclusions

Our data suggest that presenting with FTP and low coil packing density ($< 18\%$) are predisposed recanalization of aneurysms originating from P-Com after coil embolization.