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Aneurysm

Efficacy of a direct puncture approach for anterior circulation aneurysms using a newly developed guiding catheter—especially for geriatric patients

Izumi Yuzawa[a,*], Akira Kurata, MD[a], Sachio Suzuki, MD[a], Hitoshi Ozawa, MD[a], Hiroyuki Hagiwara[a], Jun Niki[a], Masaru Yamada, MD[a], Kiyotaka Fujii, MD[a], Shinichi Kan, MD[b], Takao Kitahara, MD[c]

Departments of [a]Neurosurgery, [b]Radiology, and [c]Critical Care Medicine, Kitasato University School of Medicine, 228-8555 Sagamihara, Japan

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Abstract

Background: Endovascular surgery is being increasingly used as an alternative to craniotomy clipping surgery, especially for aged patients and complicated cases. However, tortuous atherosclerotic arteries sometimes interfere with advancement of catheters so that direct puncture may be necessary. Short guiding catheters for use with this approach have been newly developed, as discussed in this article.

Methods: One hundred twenty three anterior circulation aneurysms in 121 patients were consecutively treated by endovascular coil embolization, of which 42 (34%) were older than 70 years.

Results: With 21 aneurysms, coil embolization via the transfemoral approach failed, but all could be successfully treated with the direct puncture approach with minor complications such as 1 transient ischemic attack and 1 nonsymptomatic minor leakage. In the aged patients, the direct puncture approach with short guiding catheter resulted in complete obliteration of aneurysms in 20 (71%) of 28 with follow-up angiography.

Conclusion: Direct puncture using newly developed short guiding catheters is an alternative to femoral approaches for patients with anterior circulation aneurysm with tortuous arteries and obvious atherosclerotic change at bifurcations of the common carotid artery.

Keywords: Geriatric patients; Endovascular surgery; Direct puncture approach; Guiding catheter; Complications

1. Introduction

For geriatric patients with aneurysms, endovascular surgery has the benefit of being less invasive than craniotomy clipping but sometimes fails owing to tortuous arteries, which make catheter advancement difficult. Even though catheters can be introduced into aneurysm sacs, rigidity may interfere with gentle introduction of platinum coils, with occurrence of aneurysm rupture as a possible result. We have developed a short guiding catheter for carotid direct puncture, which facilitates smooth advancement and support of microcatheters. In our institute, the direct approach using this guiding catheter has been applied consecutively for all cases which were unsuccessful with the femoral approach.

2. Clinical material and methods

Since 1990, in our institute, endovascular coil embolization has been performed for 121 patients with 123 anterior circulation aneurysms, 67 of which were ruptured. Ages ranged from 19 to 88 years (average, 64 years). Patients older than 70 years accounted for 41 with 42 aneurysms (ruptured 28, unruptured 14). In the 80 nonaged patients younger than 69 years, the 81 aneurysms were ruptured in 39 and unruptured in 42 cases (Table 1).

The unruptured aneurysms were all treated under sedation and local anesthesia, whereas general anesthesia was applied for ruptured cases. For all patients, a 4-vessel study via the transfemoral approach (Seldinger method) was

Abbreviations: WFNS, World Federation of Neurosurgical Societies.

* Corresponding author. Tel.: +81 042 778 9337; fax: +81 042 778 9337.

E-mail address: yuzawa@yk.rim.or.jp (I. Yuzawa).

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Table 1
Number of anterior circulation aneurysms in aged and nonaged patients

	Aged patients (≥70 y)	Nonaged patients (≤69 y)
Unruptured	14	42
Ruptured	28	39
Total	42	81

initially performed. Those for which selective catheterization into the internal carotid artery failed then underwent common carotid angiography.

When adequate selective advancement of the guiding catheter could not be achieved, the direct punctual approach was selected after definition without obvious atherosclerotic change at the carotid bifurcation. This was the case for 21 of the 123 aneurysms. Direct puncture was applied for 0 of 42 patients with unruptured aneurysm younger than 70 years but 5 of 14 older than 70 years. The corresponding figures for ruptured aneurysms were 1 of 39 and 16 of 28 (Table 2).

2.1. Direct puncture approach with new developed short guiding catheter

Direct puncture of the common carotid artery was performed with an elastic 18-gauge needle at the level of 1.5 fingerbreadths under the thyroid cartilage. A 5F sheath 10 cm long was introduced into internal carotid artery under roadmapping function. Thereafter, a 35-cm-long, 5F guiding catheter ("Avantguide" catheter; IR Co Ltd, Tokyo, Japan) (Fig. 1) was advanced to just before the carotid canal to keep stability of the guiding catheter under magnified road mapping image, which enables excellent manipulation and smooth advancement of the microcatheter.

3. Results

In all 21 patients undergoing direct puncture, introduction of the microcatheter and embolization of the aneurysms could be successfully performed. Data for complications during endovascular surgery are shown for ruptured aneurysm cases in Table 3.

In ruptured aneurysms, hemorrhagic complications occurred in 2 of the 67 cases, both of which were treated via the transfemoral approach, with immediate cessation by adding coil embolization resulting in only minor leakage. One was younger than 70 years (2.6% [1/39]) and the other was older than 70 years (3.6% [1/28]). Ischemic complications were observed in 1 (3.6%) of 28 aged patients, but was transient, via the transfemoral approach. In 17 of 28 aged patients,

Table 2
Number of direct puncture of the carotid artery in aged patients

Site	Unruptured	Ruptured
ACA	1	7
IC	3	7
MCA	1	2
Total	5	16

ACA indicates anterior cerebral artery; IC, internal carotid artery; MCA, middle cerebral artery.

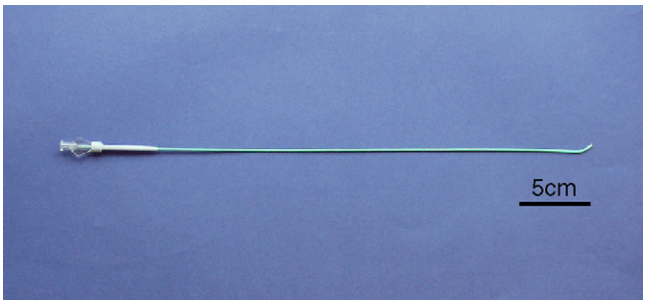

Fig. 1. Photogram showing our developed 5F-type 35 cm in length Avantguide guiding catheter produced by IR Co Ltd. A tip of the catheter is available with 30° curve already shaped. Inner diameter is 0.051 in, and outer diameter is 0.066 in, made by polypropylene.

follow-up angiography was available and ranged from 1 to 48 months (average, 9 months). Complete obliteration of aneurysms was established in 13 (76%) of 17 and neck remnant in 4 (24%). Dome filling was not recognized.

Data for unruptured aneurysm cases are summarized in Table 4.

In unruptured aneurysms with nonaged patients, hemorrhagic complications did not occur, but ischemia resulting in persistent neurologic deficit was encountered in 2 of 42 (4.8%). In aged patients, hemorrhage occurred in 1 (7.1%) of 14, which was via direct puncture approach, but leakage was minor and nonsymptomatic and only evident on computed tomography. Ischemic complications were observed in 2 (14.3%) of the 14, both of which were transient, one via the direct puncture and the other with the transfemoral approach. In 12 of 14 aged patients, follow-up angiography was available and ranged from 1 to 96 months (average, 34 months). Complete obliteration of aneurysms was established in 8 (67%) of 12, neck remnant in 3 (25%), and dome filling in 1 (8%).

3.1. Representative cases

A 76-year-old woman presented with sudden onset of headache and vomiting and was immediately transported to our hospital (Fig. 2). On admission, she showed mild disturbance of consciousness (WFNS grade 2). Angiography revealed a tortuous aortic arch resulting in failure of selective internal carotid angiography. Right common carotid angiography demonstrated no atherosclerotic change at the carotid bifurcation and an internal carotid artery

Table 3
Procedural complication of endosaccular anterior circulation ruptured aneurysms coil embolization

Age (y)	Rupture	Thromboembolic event	Overall morbidity/mortality
<70 (n = 39)	2.6% (1/39[a])	0%	
Morbidity/mortality	0%/0%	0%/0%	0%/0%
≥70 (n = 28)	3.6% (1/28[b])	3.6% (1/28)	
Morbidity/mortality	0/0%	0/0%	0/0%

[a] Of 39, 1 was via direct approach.
[b] Of 28, 16 were via direct approach.