

# East Asian Conference of Neurointervention 2010

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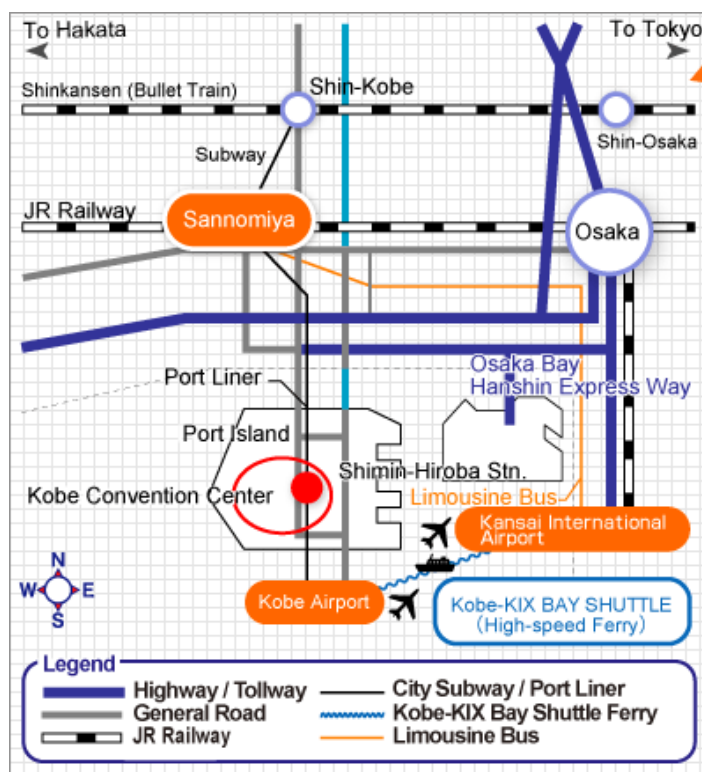
**Venue:** **Kobe International Conference Center**  
<http://kobe-cc.jp/english/kaigi/index.html>  
 6-9-1 Minatojima-Nakamachi, Chuo-ku, Kobe 650-0046, Japan  
 Tel; +81-78-302-5200, Fax; +81-78-302-6485

**Dates:**  
**Registration** June 12 (Sat) 18:30- at Welcome Party in Kobe Portopia Hotel  
 June 13 (Sun) 7:00- at Conference Venue  
**Conference** June 13 (Sun) 8:10-16:30

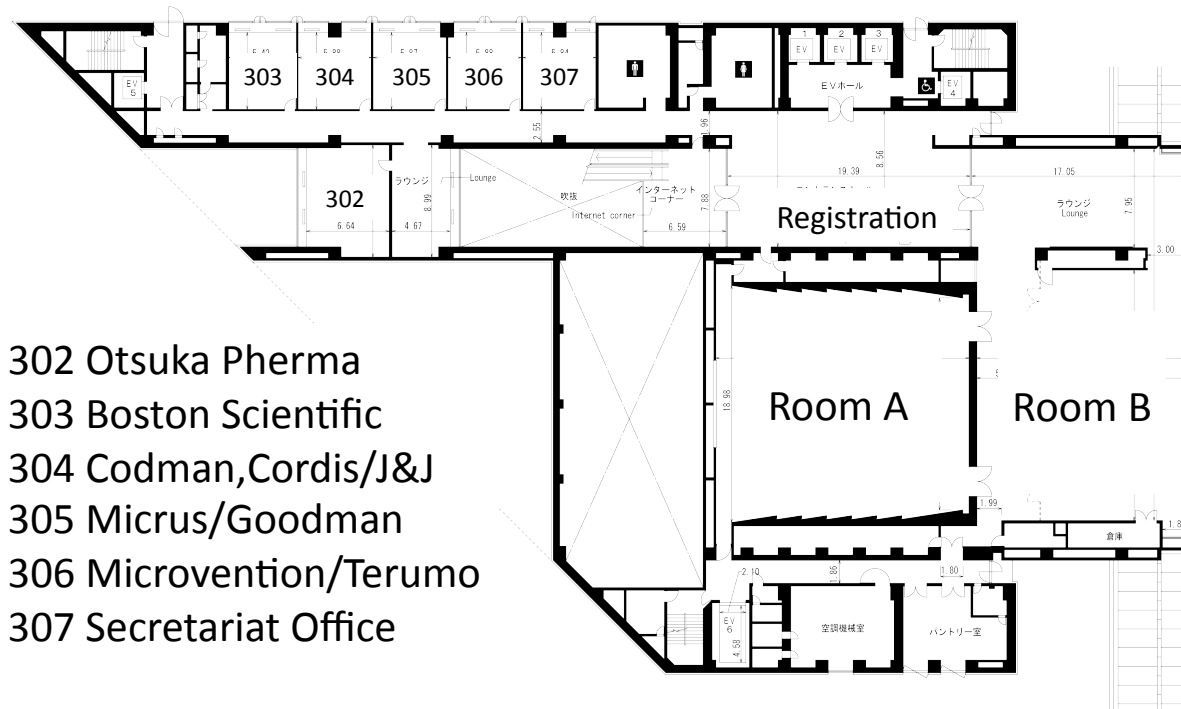
**Welcome Party** June 12 (Sat) 19:00  
 Grand Banquet Room "Ohwada"  
 at Kobe Portopia Hotel South Wing 1F

**Language** English

## Map



## Kobe International Conference Center 3F



### Instruction for speaker

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**Director:** Moon Hee Han, Jianmin Liu, Nobuyuki SAKAI,

**Co-Director:** Toshio Hyogo, Shigeru Miyachi

**Faculty:**

〈China〉

Qinghai Huang  
Zhongrong Miao  
Jieqing Wan  
Bin Xu  
Yong Zhang

Chuhan Jiang  
Donglei Song  
Zhongxue Wu  
Pengfei Yang

〈Korea〉

Hong Sik Byun  
Kil-sung Chae  
See-Sung Choi  
Sung-Kyun Hwang  
Myongjin Kang  
Byung Moon Kim  
Eui Jong Kim  
Jae Kyun Kim  
Tae Hyung Kim  
O-Ki Kwon  
Nam Joon Lee  
Byeong Cheol Rim  
Seung Hun Sheen  
Je Young Yeon

Sang-Hoon Cha  
Suk Ki Chang  
Seok Keun Choi  
Pyoung Jeon  
Bum-soo Kim  
Dae-Won Kim  
Hyun Jeong Kim  
Mun-Chul Kim  
Yong Sun Kim  
Jong Sea Lee  
Soo Mee Lim  
Chang Woo Ryu  
Sang Hyun Suh  
Pyeong Ho Yoon

〈Japan〉

Hideki Endo  
Toshiyuki Fujinaka  
Masaru Hirohata  
Akio Hyodo  
Toshihiro Ishibashi  
Yasushi Ito  
Taketo Kataoka  
Eiichi Kobayashi  
Masaki Komiyama  
Naoya Kuwayama  
Yasuhiko Matsumori  
Kenichi Murao  
Hisashi Nagashima  
Ichiro Nakahara  
Shigeru Nemoto  
Hidenori Ohishi  
Tetsu Sato  
Kenji Sugiu  
Yasuyuki Takeuchi  
Tomoaki Terada  
Kazunori Toyoda  
Wataro Tsuruta  
Shinichi Yoshimura

Masayuki Ezura  
Mikito Hayakawa  
Nobutaka Horie  
Koji Iihara  
Akira Ishii  
Takashi Izumi  
Naoto Kimura  
Shigeki Kobayashi  
Ryuji Kondo  
Yuji Matsumaru  
Yasushi Matsumoto  
Yuichi Murayama  
Izumi Nagata  
Makoto Negoro  
Yasunari Niimi  
Koichi Sato  
Norihito Shimamura  
Waro Taki  
Satoshi Tateshima  
Kouji Tokunaga  
Tomoyuki Tsumoto  
Hiroshi Yamagami

## Time Table

	<b>Room A</b>	<b>Room B</b>
<b>0810</b>	<b>opening</b>	-
<b>0815-0945</b>	<b>Session 1A AN1</b> chairperson: Nam Joon LEE (Korea University Hospital) Zhongxue Wu (Beijing Neurosurgical Institute) Akio HYODO (Dokkyo Univ. Koshigaya Hospital)	<b>Session 1B ICAD</b> chairperson: Pyeong Ho YOON (NHIC Ilsan Hospital) Zhongrong MIAO (Xuanwu Hospital) Masayuki EZURA (Sendai Medical Center)
<b>0945-1000</b>	Break	
<b>1000-1200</b>	<b>Session 2</b> chairperson: Moon Hee HAN (Seoul National University) Jianmin LIU (Changhai Hospital) Nobuyuki SAKAI (Kobe City General Hospital)	-
<b>1205-1255</b>	<b>Luncheon Seminar</b> chairperson: Jianmin LIU (Changhai Hospital)	-
<b>1300-1430</b>	<b>Session 3A AN2,dAVF</b> chairperson: Hong Sik BYUN (Sungkyunkwan University Samsung Medical Center) Chuhan JIANG (Beijing Neurosurgical Institute) Waro Taki (Mie University)	<b>Session 3B Stroke, Carotid</b> chairperson: Yong Sun KIM (Kyung Buk National University Hospital) Jieqing WAN (Renji Hospital, Shanghai) Tomoaki Terada (Wakayama Rosai Hospital)
<b>1430-1445</b>	Break	
<b>1445-1615</b>	<b>Session 4A AN3</b> chairperson: Eui Jong KIM (Kyung Hee University Medical Center) Qinghai HUANG (Changhai Hospital) Shigeru MIYACHI (Nagoya University)	<b>Session 4B CAS</b> chairperson: Pyoung JEON (Sungkyunkwan University Samsung Medical Center) Bin Xu (Huashan Hospital) Toshio HYOGO (Nakamura Memorial Hospital)
<b>1615</b>	<b>closing</b>	-

**Program**

Nr	Time	Authors	Institute	Country	Title
<b>Session 1A:AN1 (Room A)</b> Chairperson: Nam Joon LEE (Korea University Hospital) Zhongxue Wu (Beijing Neurosurgical Institute) Akio HYODO (Dokkyo Univ. Koshigaya Hospital)					
1A-1	8:15	Bum-Soo KIM	The Catholic University of Korea	Korea	Endovascular Treatment of Intracranial Aneurysms in the Elderly
1A-2	8:30	Norihito SHIMAMURA	Hirosaki Univ	Japan	Clinical features of ruptured cerebral aneurysms embolization in elderly patients
1A-3	8:45	Yasuhiko MATSUMORI	Konan Hospital	Japan	Coil Embolization of an Unruptured Intracranial Aneurysm Associated With Behcet's Disease
1A-4	9:00	Sung-Kyun HWANG	College of Medicine, Ewha Womans University	Korea	Effect on Shunt-dependent Hydrocephalus after Coil Embolization for Aneurysmal Subarachnoid Hemorrhage
1A-5	9:15	Je Young YEON	Samsung Medical Center, Sungkyunkwan University	Korea	Endovascular Treatment of Unruptured Paraclinoid Aneurysms
1A-6	9:30	Yasuyuki TAKEUCHI	Kurume University	Japan	Endovascular treatment of posterior cerebral artery aneurysms
<b>Session 1B: Intracranial Disease (Room B)</b> Chairperson: Pyeong Ho YOON (NHIC Ilsan Hospital) Zhongrong MIAO (Xuanwu Hospital) Masayuki EZURA (Sendai Medical Center)					
1B-1	8:15	Mikito HAYAKAWA	Toranomon Hospital	Japan	Endovascular recanalization for acute and subacute total occlusion of the intracranial internal carotid artery: -The efficacy of proximal balloon protection with retrograde control angiography
1B-2	8:30	Hyun Jeong KIM	Daejeon St. Mary's Hospital, The Catholic University of Korea	Korea	Acetazolamide-challenged Perfusion MRI for Assessment of Cerebrovascular Reserve Capacity in Patients with Symptomatic Middle Cerebral Artery Stenosis: Comparison with 99mTc-HMPAO SPECT
1B-3	8:45	Hong Sik BYUN	Samsung Medical Center, Sungkyunkwan University	Korea	Hyperperfusion Syndrome after Stenting for Intracranial Vertebral Artery Stenosis
1B-4	9:00	Zhongrong MIAO	Xuanwu Hospital, Beijing	China	Stenting or not for symptomatic arteriosclerosis intracranial stenosis
1B-5	9:15	Soo Mee LIM	Ewha Womans University Hospital	Korea	Comparison of 3D-TOF MRA with Contrast-enhanced MRA in Detection of Intracranial Steno-occlusive Diseases
<b>Session 2: Sponsored Seminar (Room A)</b> chairperson: Moon Hee HAN (Seoul National University) Jianmin LIU (Changhai Hospital) Nobuyuki SAKAI (Kobe City General Hospital)					
2-1	10:00	Shinichi YOSHIMURA	Gifu University	Japan	Gateway angioplasty balloon in Neuro Intervention (Boston Scientific)
2-2	10:30	Jianmin LIU	Changhai Hospital	China	Enterprise VRD experience in China (Codman, J&J)
2-3	11:00	Moon Hee HAN	Seoul National University	Korea	Hydrogel-modified coils in aneurysm intervention (Terumo/Micovention)
2-4	11:30	Yasunari NIIMI	Rosevelt Hospital	USA	DeltaPaq / DeltaPlush, new concept of coiling technology for cerebral aneurysms (Micrus)

**Luncheon Seminar (Room A)**

chairperson: Jianmin LIU (Changhai Hospital)

sponsored by Otsuka Pherma

L-1	12:05	Koji Iihara	National Cardiovascular Center	Japan	Current treatment strategy for carotid diseases
L-2	12:35	Yuji Matsumaru	Toranomon Hospital	Japan	RESISTER CAS

**Session 3A AN2,dAVF**

chairperson: Hong Sik BYUN (Sungkyunkwan University Samsung Medical Center)

Chuhan JIANG (Beijing Neurosurgical Institute)

Waro TAKI (Mie University)

3A-1	13:00	Sang Hyun SUH	Kangnam Severance Hospital	Korea	Management of Anterior Inferior Cerebellar Artery Aneurysms: Endovascular Treatment and Clinical Outcome
3A-2	13:15	Suk Ki CHANG	Hallym University Gangdong Sacred Heart Hospital	Korea	Endovascular Treatment for Isolated Dissecting Aneurysm of the Pericallosal Artery Presenting with Spontaneous Subarachnoid Hemorrhage: A Case Report
3A-3	13:30	Chang Woo RYU	East-West Neo Medical Center	Korea	Endovascular Treatment for Dissecting Aneurysms of the Bilateral Vertebral Arteries: Report of Three Cases and Review for Management Strategy
3A-4	13:45	Chuhan JIANG	Beijing Neurosurgical Institute, Beijing	China	Venous Sinus or Draining Veins packing with ONYX to treat Dural Arteriovenous fistulae
3A-5	14:00	Kil-Sung CHAE	Bongseng Memorial Hospital	Korea	Embolization for Dural Arteriovenous Fistula Using Onyx
3A-6	14:15	Ichiro NAKAHARA	Kokura Memorial Hospital	Japan	Dural sinus reconstruction for dural AVFs with sinus stenosis / occlusion using bare / covered stents

**Session 3B Stroke, Carotid Disease**

chairperson: Yong Sun KIM (Kyung Buk National University Hospital)

Jieqing WAN (Renji Hospital, Shanghai)

Tomoaki Terada (Wakayama Rosai Hospital)

3B-1	13:00	Shinichi YOSHIMURA	Gifu University	Japan	Retrospective survey of acute stroke in Japan
3B-2	13:15	Kouji TOKUNAGA	Okayama University	Japan	Percutaneous balloon angioplasty for acute intracranial occlusion
3B-3	13:30	Dae Won KIM	Wonkwang University Hospital	Korea	Intra-arterial Thrombolysis of Central Retinal Artery Occlusion
3B-4	13:45	Tomoyuki TSUMOTO	Japanese Red Cross Society Wakayama medical center	Japan	Carotid artery stenting in patients with progressing stroke
3B-5	14:00	Hiroshi YAMAGAMI	Kobe City Medical Center General Hospital	Japan	CAS: Diagnostic and medical approach to prevent complications
3B-6	14:15	Jieqing WAN	Renji Hospital, Shanghai	China	Symptomatic carotid artery stenosis: the new reliable evidence for a selection of CAS or CEA

<b>Session 4A AN3</b>					
chairperson: Eui Jong KIM (Kyung Hee University Medical Center) Qinghai HUANG (Changhai Hospital, Shanghai) Shigeru MIYACHI (Nagoya University)					
4A-1	14:45	Pengfei YANG	Changhai Hospital, Shanghai	China	Stent placement for the treatment of ruptured wide-necked intracranial aneurysms: Changhai experience
4A-2	15:00	Yanlong TIAN	Huashan Hospital, Shanghai	China	Endovascular treatment for intracranial aneurysms: a multi-center study using Willis covered stent
4A-3	15:15	Qinghai HUANG	Changhai Hospital, Shanghai	China	Endovascular stenting for intracranial aneurysms: vascular morphological and hemodynamic change
4A-4	15:30	Takashi IZUMI	Nagoya University	Japan	Tips and pitfall of double catheter technique for wide neck aneurysm
4A-5	15:45	Sang-Hoon CHA	Chungbuk National University Hospital	Korea	Matrix2 Coils in Embolization of Intracranial Aneurysms: One-year Outcome and Comparison with Bare Coil Group in Single Institution
4A-6	16:00	Wataro TSURUTA	Toranomon Hospital	Japan	Endovascular treatment for unruptured asymptomatic cerebral aneurysms with one-year angiographical follow-up
<b>Session 4B CAS</b>					
chairperson: Pyoung JEON (Sungkyunkwan University Samsung Medical Center) Bin Xu (Huashan Hospital) Toshio HYOGO (Nakamura Memorial Hospital)					
4B-1	14:45	Kenji SUGIU	Okayama University	Japan	Comparison of balloon vs filter protection in CAS
4B-2	15:00	O-Ki KWON	Seoul National University Bundang Hospital	Korea	A Technical Strategy for Carotid Artery Stenting: Suboptimal Pre-stent Balloon Angioplasty without Post-stenting Balloon Dilatation
4B-3	15:15	Yong ZHANG	Affiliated Hospital of Qingdao University	China	CTO recanalization in carotid and brain vasculature
4B-4	15:30	Naoto KIMURA	Sendai Medical Center	Japan	Carotid artery stenting with intra-aortic balloon pump pulsation: two case reports
4B-5	15:45	Nobutaka HORIE	Nagasaki University School of Medicine	Japan	Careful follow up is mandatory after endovascular PTA/Stenting for Takayasu arteritis: report of three cases and review of the literature
4B-6	16:00	Hideki ENDO	Nakamura Memorial Hospital	Japan	Carotid Artery Stenting for Restenosis Following Endarterectomy



# East Asian Conference of Neurointervention 2010

## Abstract

### 1A-1

#### Endovascular Treatment of Intracranial Aneurysms in the Elderly

Bum-soo KIM<sup>1</sup>, Tae-Hyung KIM<sup>1</sup>, Joonho CHUNG<sup>2</sup>, Kwang-Sung LEE<sup>3</sup>, Yong-Sam SHIN<sup>3</sup>, Pyeong Ho YOON<sup>4</sup>

Department of Radiology<sup>1</sup> and Neurosurgery<sup>3</sup>, The Catholic University of Korea,  
Department of Neurosurgery<sup>2</sup>, Inha University School of Medicine,  
Department of Radiology<sup>4</sup>, Ilsan Hospital, National Health Insurance Corporation,  
Seoul, Korea

**Purpose:** With growing of elderly population, more elderly patients are presenting with intracranial aneurysms, and treatment risks are thought to be higher in this group. We present our experience with endovascular treatment of aneurysm in elderly patients.

**Materials and Methods:** We performed retrospective review of a prospective database of elderly patients treated for intracranial aneurysms. Among a total of 235 patients with 250 intracranial aneurysms treated between January and December 2009, 32 patients (13.6%) were 70 years of age or older, and 13 patients (4 men, 9 women) were managed endovascularly. 6 patients presented after subarachnoid hemorrhage, and 7 patients presented with unruptured aneurysm. Aneurysm characteristics, endovascular procedures, angiographic outcomes, complications, and duration of admission were reviewed

**Results:** 14 aneurysms were treated in 13 patients. Median patient age was 73 years (range, 70-85 years), and average aneurysm size was  $6.9 \pm 4.3$ mm (range, 2-19mm) Endovascular procedures included coiling alone (12/14, 85.7%), stent assisted coiling (1/14, 7.1%), and stent only (1/14, 7.1%). Complete occlusion was achieved in 9 aneurysms (64.3%), neck remnant observed in 3 aneurysms (21.4%), and residual aneurysmal filling was observed in 2 aneurysms (14.3%). There was no procedure-related mortality, yet two patients (14.2%) had new deficit after the embolization. Duration of admission was  $42 \pm 44.5$  days (range 13-130 days) for the patients with SAH, and  $6.4 \pm 2.8$  days (range 3-10 days) for the patients with unruptured aneurysm.

**Conclusion:** Embolization of the intracranial aneurysms in elderly patients is safe and effective. However, in elderly patients, morbidity rates remain relatively high, and duration of admission is often prolonged.

### 1A-2

#### Clinical features of ruptured cerebral aneurysms embolization in elderly patients.

Norihito Shimamura, Masato Naraoka, Tomoshige Kikkawa, Hiroki Ohkuma  
Department of Neurosurgery, Hirosaki University School of Medicine, Hirosaki, Japan

**Object:** In recent advanced aging society, the number of elderly subarachnoid hemorrhage (SAH) patients is increasing. We retrospectively analyzed our consecutive SAH patients who were treated by endovascular methods for distinguish the feature of high elderly cases.

**Methods:** From February 2005 to January 2010, we embolized 58 ruptured cerebral aneurysm patients in our institute. We divided patients in two groups; young group who were aged under 69 years (36 patients) and elderly group who were aged over 70 years (22 patients). We focused about prehospital, surgical and postoperative features. Outcome of patients were measured at 3 months after the embolization. Statistical analysis was done with chi-square test or ANNOVA analysis (JMP 8.01).

**Results:** Genders, Hunt-Kosnik grade and localization of aneurysms were the similar. Balloon assist technique was used in 9% of elderly group and in 17% of young group. Celurean that was microcatheter compatible supporting small caliber catheter was used in 9% of elderly group and 3% of young group. Mean volume embolization ratios in elderly groups and young groups were 24.7% and 23.4 %. Intraoperative troubles (perforation, embolism and branch occlusion) were occurring in 23% of elderly group and in 27% of young group. Application of heparin before coiling in elderly groups and young groups were 69% and 51%. Medication of antiplatelet drugs before coiling in elderly groups and young groups were 50% and 53%. Sixty seven percent of elderly group and 75% of young group achieved favorable outcome. The GR of Glasgow outcome scale in elderly group was 32% but that of young group was 61%.

**Discussion:** In treatment of elderly patients we need to prepare supporting materials (Cerlean catheter, balloon and so on) for surmounting the difficulty of approach and stabilization of microcatheter. Even if we embolize ruptured aneurysm perfectly, elderly patients will have other organ complications and dementia. We should take care of elderly patients to improve their prognosis.

### 1A-3

#### Coil Embolization of an Unruptured Intracranial Aneurysm Associated With Behcet's Disease

Yasuhiko Matsumori, Yasushi Matsumoto  
Department of Neuroendovascular Therapy, Kohnan Hospital, Sendai, Japan

Behcet's disease is a chronic disorder characterized by recurrent inflammatory attacks and may involve multiple organs. The clinical triad consists of aphthous stomatitis, genital ulceration, and uveitis. Though the vascular lesions occur in 7-29% of cases of Behcet's disease, arterial involvement is extremely rare. Furthermore few such intracranial aneurysms associated with Behcet's disease have been treated by endovascular treatment. We report a case of unruptured intracranial aneurysm in a patient with Behcet's disease treated by endovascular embolization. A 36-year-old male patient with Behcet's disease consulted our hospital for treatment of an unruptured intracranial aneurysm. He was neurologically intact. He had undergone surgery for an aneurysm of the superior mesenteric artery 2 years ago and had been followed up because of the aneurysm of the left radial artery for 1 year. He had been receiving steroid treatment for 4 years. Three-dimensional computed tomography angiography identified an aneurysm of the left intracranial internal carotid artery. The lesion was treated by coil embolization. He was discharged without complications. Intracranial aneurysm formation is extremely rare in patients with Behcet's disease. The presence of extracranial aneurysms indicates screening for intracranial aneurysms. The present case shows that coil embolization can be used to treat unruptured intracranial aneurysm in patients with Behcet's disease.

#### 1A-4

##### **Effect on Shunt-dependent Hydrocephalus after Coil Embolization for Aneurysmal Subarachnoid Hemorrhage**

Sung-Kyun HWANG, Sung-Hak KIM

Department of Neurosurgery, College of Medicine, Ewha Womans University, Seoul, Korea

**Objectives:** To evaluate the effect on shunt-dependent hydrocephalus after treatment of ruptured intracranial aneurysms by coil embolization.

**Methods:** One hundred twelve consecutive patients with aneurysmal subarachnoid hemorrhage, who were treated by coil embolization between August 2004 and February 2009 were retrospectively evaluated. We assessed the factors concerning the risk of shunt-dependent hydrocephalus related to coil embolization in ruptured intracranial aneurysms.

**Results:** One hundred nine patients (97.3%) did not develop shunt dependent hydrocephalus. Even if 4 patients developed the acute hydrocephalus treated with temporary external ventricular drainage, they never needed permanent shunt diversion. Overall three (2.6%) patients required permanent shunt diversion. Among them, temporary external ventricular drainage was placed in two (1.7%) patients.

**Conclusion:** Coil embolization of ruptured intracranial aneurysms may be associated with lower risk for developing shunt-dependent hydrocephalus, possibly by lesser damage for cisternal anatomy. This might effect on long-term outcome and decision making of ruptured intracranial aneurysms.

#### 1A-5

##### **Endovascular Treatment of Unruptured Paraclinoid Aneurysms**

Je Young YEON<sup>1</sup>, Geon-Ha KIM<sup>2</sup>, Pyeong JEON<sup>2</sup>, Jong-Soo KIM<sup>1</sup>, Seung-Chyul HONG<sup>1</sup>

Department of Neurosurgery<sup>1</sup> and Radiology<sup>2</sup>, Samsung Medical Center, Sungkyunkwan University Seoul, Korea

**Objectives:** The purpose of this study was to evaluate the risk and efficacy of endovascular treatment in the management of unruptured paraclinoid aneurysms.

**Methods:** From January 2008 to December 2009, 75 patients with a mean age of 52.5 years underwent endovascular treatment for 77 unruptured paraclinoid aneurysms. All of them were treated by coil embolization and there were 8 large and 1 giant aneurysms. The mean size of the dome was 5.6 mm and the neck was 3.9 mm. Excluding aneurysms arising from the cavernous segment of the internal carotid artery (ICA), the paraclinoid aneurysms were categorized as dorsal (n=19), ophthalmic (n=5), ventral (n=39), and carotid cave (n=14).

**Results:** The stent-assisted, balloon-assisted, catheter-assisted, or a combination of these techniques were required in 68% of dorsal ICA, 60% of ophthalmic artery, 49% of ventral ICA, and 36% of carotid cave aneurysms. Coil embolization was not possible in one patient (1.3%) with a small dorsal ICA aneurysm. Immediate post-procedure angiography demonstrated residual aneurysm or neck in 42%, 40%, 28%, and 29%,

respectively. Although most of them remained asymptomatic, one patient with a large ventral ICA aneurysm suffered from sensory aphasia. Of the 43 patients who have MR angiographic follow-up of 6 months or more, 3 patients (dorsal ICA: 2, carotid cave: 1) were found to have a recanalized aneurysm. One of them underwent the second procedure.

Conclusions: Endovascular treatment could lead to good outcomes, with an acceptable risk, in the management of unruptured paraclinoid aneurysms. Although a long-term angiographic follow-up would be mandatory, dorsal ICA and ophthalmic artery aneurysms seem to be associated with higher morbidity and lower success rates than those of other paraclinoid aneurysms.

## 1A-6

### **Endovascular treatment of posterior cerebral artery aneurysms**

Takeuchi Y <sup>1)</sup>, Hirohata M <sup>1)</sup>, Orito K <sup>1)</sup>, Yamashita S <sup>1)</sup>, Morimitsu H <sup>2)</sup>, Fujimura N <sup>3)</sup>, Shigemori M <sup>1)</sup>

Department of Neurosurgery, Kurume University school of Medicine.<sup>1)</sup>

Ichinomiya Neurosurgery.<sup>2)</sup>

Department of Neurosurgery, Saiseikai Yahata General Hospital.<sup>3)</sup>

Purpose: Posterior cerebral artery (PCA) aneurysms are rare, and there are many cases that it is difficult to perform a direct surgery anatomically. Recently, We tend to choose a treatment by endovascular surgery for an aneurysm of PCA.

We retrospectively reviewed our cases of PCA aneurysms that received endovascular treatment and evaluated the efficacy of treatment and outcome

Subject: From 1998 to 2010, we treated 14 patients (ten females and four males, average age 58.1 years old) with 14 aneurysms of PCA performed the endovascular approach.

Of the 14 patients, 9 presented with subarachnoid hemorrhage, and one patient, with symptomatic epilepsy, the aneurysms were asymptomatic in the remaining four patients.

Aneurysmal location involved area of the PCA was classified into four segments according Zeal and Rhoton; P1-2 segment (3 patients, 22%), P2 segment (9 patients, 71%), P2-3 segment (one patient, 7%) and P3 segment (one patient, 7%). The mean size of aneurysms was 9.8 mm diameter and 5 aneurysms (36%) were saccular aneurysm. In addition, nine aneurysms (64%) were present regardless of vessel bifurcation and diagnosed those as dissecting aneurysm.

Results: We performed aneurysmal embolization in 11 cases, 2 cases parent artery occlusion included an aneurysm, and one case parent artery occlusion just proximal to an aneurysm. We used balloon remodeling technique in 4 cases, and double catheter technique in one case of 11 cases that performed aneurysmal embolization

In follow up angiogram, 9 of 11 cases that treated aneurysmal embolization completely disappeared, but 2 cases showed neck remnant.

There was symptomatic complication as hemianopsia by cerebral infarction of PCA territory in one case during 3 cases that performed parent artery occlusion of PCA post operatively.

Outcome at discharge was Good recovery; 11(79%), Severe disability; 1(7%), and dead; 2(14%) (Those patients developed severe subarachnoid hemorrhage.) on Glasgow Outcome Scale.

In addition, we experienced thalamic infarction in one patient by obstruction of PCA for chronic stage.

Conclusion: Aneurysmal embolization by endovascular surgery for cerebral aneurysm of PCA is a useful and safety treatment.

As for the PCA, collateral circulation developed, and it was assumed that there was much it when occlusion of PCA was possible from past literatures, but we considered the risk of cerebral infarction, and it was thought that we should have chosen treatment to perform aneurysmal embolization as possible.

## 1B-1

### **Endovascular recanalization for acute and subacute total occlusion of the intracranial internal carotid artery: -The efficacy of proximal balloon protection with retrograde control angiography**

Mikito Hayakawa, Kentaro Mori, Yuki Kamiya, Wataro Tsuruta, Yuji Matsumaru

The Department of Endovascular Neurosurgery, Toranomon Hospital, Tokyo, Japan

Background and purpose:

Although several case series of endovascular recanalization for total occlusion of the intracranial internal carotid artery (ICA) were reported in recent years, an ideal technique to prevent embolic complication has not yet been established. For safe intervention, we use proximal balloon protection-method with retrograde control

angiography to recanalize acute and subacute total occlusion of the intracranial ICA. We report technical details and clinical outcomes of the cases

Methods:

We retrospectively reviewed our registry for patients of total occlusion of the intracranial ICA treated with endovascular therapy at acute or subacute stage between April 2007 and April 2010. At the first setout of revascularization procedures, an 9-French balloon-tip guiding catheter was advanced into the cervical portion of the affected ICA, and a 4-French diagnostic catheter was placed into the artery supplying collateral blood flow to the region originally-supplied by the affected ICA, majority of which was ipsilateral external carotid artery. Throughout the revascularization procedures, the balloon located at the tip of the guiding catheter was inflated for flow arrest and/or reversal of the affected ICA, as proximal protection. When the target lesion was partially recanalized by using any procedures such as thromboaspiration, angioplasty and/or stent placement, we performed retrograde control angiography through the 4-French diagnostic catheter and investigated the condition of the target lesion. Depending on the opacified condition of the lesion, we often used distal balloon protection device as an appropriate change from proximal protection. We repeated such procedures including retrograde control angiography to achieve an acceptable recanalization.

Results:

There were five patients treated with a mean age of 66 years; four of these five patients were women. Two patients treated within the first 24-hour after symptom onset had apparent clinical-diffusion mismatch, and the others presented with progressing stroke. The causes that occluded the ICA were as follows; cardiogenic embolism in two, atherosclerosis associated with quasi-moyamoya syndrome in two, and spontaneous carotid artery dissection in one. Three patients required placement of any coronary and/or carotid stents. All patients were successfully recanalized and no procedure-related ischemic or hemorrhagic complication occurred. Four of these five patients had good outcomes as modified Rankin scale score of 0 to 2 at the time of discharge.

Conclusions:

This series demonstrates that endovascular recanalization for acute and subacute total occlusion of the intracranial ICA using proximal balloon protection-method with retrograde control angiography is feasible and safe, especially in terms of prevention from ischemic complications due to embolism.

## 1B-2

Acetazolamide-challenged Perfusion MRI for Assessment of Cerebrovascular Reserve Capacity in Patients with Symptomatic Middle Cerebral Artery Stenosis: Comparison with  $^{99m}\text{Tc}$ -HMPAO SPECT

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Purpose: To assess the feasibility of the acetazolamide-challenged perfusion MRI for evaluating the cerebrovascular reactivity (CVR) in patients with severe MCA stenosis ( $\geq 70\%$ ) by comparison with the acetazolamide-challenged  $^{99m}\text{Tc}$ -hexamethylpropyleneamine oxime (HMPAO) SPECT.

Methods: Seventeen patients (10 women, 7 men; age range, 35 to 83 years, mean, 64 years) with symptomatic unilateral MCA stenosis ( $\geq 70\%$ ) from June 2008 to March 2009 were prospectively enrolled in the present study. All patients underwent both  $^{99m}\text{Tc}$ -HMPAO SPECT and perfusion MRI without and with acetazolamide challenge, respectively. Acetazolamide was administered for both  $^{99m}\text{Tc}$ -HMPAO SPECT and perfusion MRI studies as a slow intravenous injection (2 min) of a standard dosage of 1000 mg diluted in 10ml NaCl. Quantitative and Qualitative comparisons between acetazolamide-challenged SPECT and perfusion MRI were done by ROI analysis.

Results: There was no significant percent change (PC) difference between SPECT and perfusion MRI of all ROIs. The PCs of rCBF and rCBV significantly decreased in group of impaired CVR ( $P$  value, 0.016 and 0.029 respectively). The visual assessments of SPECT by baseline-to-acetazolamide study comparison and rCBF and rCBV maps by lesion-to-contralateral comparison on baseline study were corresponded with CVR. The initial symptom ( $P = 0.010$ ) and follow-up mRS ( $P = 0.018$ ) were correlated with the CVR.

Conclusion: PC of CBF and CBV strongly correlated with quantitative CVR. Therefore, acetazolamide-challenged perfusion MRI is feasible for evaluating the CVR in symptomatic patients with severe MCA stenosis ( $\geq 70\%$ ).

**1B-3****Hyperperfusion Syndrome after Stenting for Intracranial Vertebral Artery Stenosis**Hong Sik BYUN, Ji Hyun KOO, Pyoung JEON, Keon Ha KIM

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Introduction: Cerebral hyperperfusion syndrome (CHS) is a rare complication which can occur after carotid endarterectomy or carotid angioplasty with stenting at an incidence of 0.2-12.6%. However, CHS after reconstruction of the posterior circulation is not clearly described. We report a case of hyperperfusion syndrome after stenting of intracranial vertebral artery stenosis.

Case Report: A 78-year-old man presented with transient right side weakness, dysarthria, and right facial palsy which occurred 2 months ago. He was diagnosed with chronic infarction 20 years ago, and received coronary artery bypass graft operation for myocardial infarction 4 months ago. He was treated with medical treatment consisting of Aspirin, cilostazol and clopidogrel, however, the symptoms were refractory to medical therapy. Brain MRI demonstrated chronic infarction in right occipital lobe and right cerebellar hemisphere, but there was no recent acute infarction. On MRA, there was a focal stenosis in the intracranial segment of the left vertebral artery (VA) with occluded right VA at the origin. Transfemoral cerebral angiography showed 90% stenosis in left distal vertebral artery with 5mm inlength.

Endovascular stenting was performed under general anesthesia. The lesion was dilated with a 3 x 15mm balloon expandable stent. Post-stent angiogram showed marked improvement of left vertebral artery flow with no signs of procedural complication. The patient was neurologically intact with normal blood pressure and transferred to the ward for close monitoring of neurological status.

Thirty minutes after the end of procedure, the patient became irritable and the systolic blood pressure was elevated up to 190, which was not controlled by anti-hypertensive medication. His mental status became drowsy, and brain CT demonstrated large amount of subarachnoid hemorrhage and intraventricular hemorrhage. External ventricular drainage was performed along with medical treatment. However, he could not recover from the comatose stage, and died 20 days after the procedure with the complication of sepsis. CHS is a rare complication which can occur after carotid endarterectomy or carotid angioplasty with stenting. Although many patients have mild symptoms and signs, progression to severe life-threatening symptoms can also occur. To the best of our knowledge, our case is the third case of CHS with hemorrhagic presentation after intracranial vertebral artery stenting reported in the English literature.

**1B-4****Stenting or not for symptomatic arteriosclerosis intracranial stenosis**Miao Zhongrong.

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Symptomatic ICAS is associated with a high rate of ischemic stroke. This rate increases dramatically with high-grade stenoses, such that among those patients with greater than 70% stenosis, approximately 23% will experience recurrent.

The recent prospective WASID study showed the the role of medical therapy ineffective for ICAS with high grade stenosis. Despite of publications suggested angioplasty with or with stent were effective instead of conventional medical therapy. But indications remained controversial . how to modify and select scientifically the patients accepted the new technique is changed more and more important. With the cases increased the experience of doctors improved. On the other hand, we have got information from long-term follow-up longer than 10 years. Some of the vessels accepted angioplasty years ago occluded aymptomatically. So now it is time for us to sit up together to discuss which patient is the best indication to accepted angioplasty.

**1B-5****Comparison of 3D-TOF MRA with Contrast-enhanced MRA in Detection of Intracranial Steno-occlusive Diseases**Soo Mee LIM<sup>1</sup>, Nam Joon LEE<sup>2</sup>Ewha Womans University Hospital<sup>1</sup>,Korea University Anam Hospital<sup>2</sup>,

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Purpose: We compared diagnostic performance of 3D Time of flight (TOF) MRA with contrast-enhanced

MRA (CE MRA) to detect and quantify intracranial atherosclerotic steno-occlusive disease.

Material and method: From April 2007 to December 2009, 95 patients with clinically suspected intracranial atherosclerotic steno-occlusive disease who had undergone 3D TOF-MRA and CE MRA at 1.5T or 3T with DSA were included. Two experienced radiologists independently analyzed the postprocessed images using a maximum intensity projection algorithm. Intracranial vessels were divided by distal internal carotid artery, middle cerebral artery and vertebrobasillar artery and we graded degree of stenosis and assorted into three group as a low grade (<50%), high grade (50-99%) and complete occlusion. Then we compared the result of CE MRA with that of 3D TOF-MRA by using DSA as the reference standard.

Result: CE-MRA showed 94.2% sensitivity, 88.1% specificity, 51% positive predictive value, 99.1% negative predictive value and 88.8% diagnostic accuracy for detecting >50% stenosis while 3D TOF-MRA showed 94.2% sensitivity, 91.6.1% specificity, 59.8% positive predictive value, 99.1% negative predictive value and 91.9% diagnostic accuracy

Conclusion: 3D TOF-MRA provides comparable diagnostic performance with CE-MRA for diagnosis more than 50% intracranial steno-occlusive disease.

### 3A-1

#### **Management of Anterior Inferior Cerebellar Artery Aneurysms: Endovascular Treatment and Clinical Outcome**

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Background and purpose: AICA aneurysms are rare and a challenge to treat surgically. We present our experience of the angiographic results and the clinical outcome for 9 AICA aneurysms treated by EVT.

Materials and methods: Between 1997 and 2009, 9 AICA aneurysms were treated by coil embolization or surgical clipping. Six patients were presented with SAH and three aneurysms were found incidentally. Location of the aneurysms was the proximal AICA in seven and the distal AICA in two. Five aneurysms were originated from the AICA-PICA variant. Clinical outcome and procedural complications were evaluated and angiography was performed 6, 12, 24 months after embolization to confirm recanalization of the coiled aneurysm.

Results: EVT was technically successful in 7 patients and surgical trapping was applied in one patient after failure of EVT. One aneurysm had occluded spontaneously, combined with the parent artery during EVT. There was no procedural complication in 7 patients with EVT and one patient with surgical trapping had postoperative complication of cerebellar infarction. Stent-assisted coiling was performed in 3 patients. All the AICAs had good patency on the postoperative angiography. Follow-up angiographies were obtained in 7 patients and showed no example of recanalization or progressive occlusion with further thrombosis except one patient. 8 patients carried out all usual activities without symptoms (mRS 0 to 1).

Conclusion: EVT with detachable coils and stent may provide a feasible and safe treatment option, although microsurgical option is considered for the management of the AICA aneurysms. Further follow-up and more experience are necessary.

### 3A-2

#### **Endovascular Treatment for Isolated Dissecting Aneurysm of the Pericallosal Artery Presenting with Spontaneous Subarachnoid Hemorrhage: A Case Report**

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The cause of subarachnoid hemorrhage due to rupture of pericallosal artery aneurysm is almostly non-penetrating trauma accounted for 62%, but spontaneous rupture is very rare. We report an unusual case of isolated dissecting aneurysm of the pericallosal artery presenting with spontaneous subarachnoid hemorrhage. A 46-year-old hypertensive woman presented with severe headache and intense nuchal rigidity after onset of two days. Computed tomography (CT) brain scan revealed a subarachnoid hemorrhage and an interhemispheric hematoma. This was due to dissecting aneurysm of left pericallosal artery on conventional cerebral angiography. When on the basis of the anatomy, potential lack of sufficient collaterals was suggested,

a balloon occlusion test was performed at the right pericallosal artery to identify the collaterals from the splenic branch of posterior circulation, and to determine the feasibility of an endovascular approach. Total occlusion of the dissecting aneurysm was performed with five Guglielmi detachable coils, with no apparent procedure-related complications. Endovascular treatment by aneurysm and parent artery occlusion is a relatively reliable alternative to surgery for isolated dissecting aneurysm of pericallosal artery.

### 3A-3

#### **Endovascular Treatment for Dissecting Aneurysms of the Bilateral Vertebral Arteries: Report of Three Cases and Review for Management Strategy**

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In cases of dissecting aneurysms of the bilateral vertebral arteries (DABVAs) with SAH, treatment of one affected side may result in dissection or rupture on the opposite side. Occlusion of the affected VA may cause increased blood flow in the contralateral VA, resulting in increased hemodynamic stress, which leads to enlargement of the unruptured dissecting aneurysm, possibly followed by rupture. We present our endovascular experience of 3 patients with DABVAs and review related literatures to establish the appropriate management strategies for DABVAs. Treatment of both sides VAs, when involved, in patients with ruptured DABVAs should be mandatory to achieve better outcomes.

### 3A-4

#### **Venous Sinus or Draining Veins packing with ONYX to treat Dural Arteriovenous fistulae**

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**Objective:** to value the efficacy and safety of venous sinus or draining veins packing with ONYX to treat Dural Arteriovenous fistulae. **Methods:** venous sinus or draining veins were catheterized through venous or arterial route, ONYX was injected to pack the sinus and draining veins. In some cases, coils were placed to slow down the shunt flow before ONYX injection. **Results:** There were totally 32 patients in this group, 26 cavernous sinus DAVFs, 5 lateral sinus DAVFs, and 1 tentorial DAVF. Complete cure was achieved in 27 patients, incomplete in 5 (4 lateral sinus, 1 cavernous sinus). 1 tentorial DAVF patient died of intracranial hemorrhage secondary to draining veins packing. 5 cranial nerve palsy were found associated with ONYX injection in cavernous DAVFs. **Conclusion:** Venous Sinus or Draining Veins packing with ONYX is a convenient and efficient way to treat properly selected DAVFs. Special care should be taken to avoid complications.

### 3A-5

#### **Embolization for Dural Arteriovenous Fistula Using Onyx**

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**Objectives:** The aim of this study is to validate Onyx, a non-adhesive liquid embolic agent, as a primary treatment agent for dural arteriovenous fistula (DAVF).

**Methods:** Between August 2008 and November 2009, 10 patients with symptomatic DAVFs with cortical venous reflux underwent at least one transarterial embolization using Onyx at our institutions. Three cases had additional embolization at the same session with n-butyl-2-cyanoacrylate in 1 and transvenous coil embolization in 2 patients. The demographic characteristics, angiographic features, clinical presentation, treatment, and outcome of the patients were reviewed.

**Results:** The mean age was 53 (range, 32-72) and two patients presented with hemorrhages.

According to the Cognard classification, 2 lesions were grade IV, 4 were grade III,

2 were grade IIa+b, and 2 were grade IIb. Immediately after embolization, complete occlusion was



achieved in 2 out of 6 patients in whom a transvenous approach was not possible (grade IV and III, respectively). The other patients had some residual shunting from other inaccessible or unsafe feeders, however five of them experienced resolution of the symptoms. There was no procedure-related morbidity, and none of the patients had worsening of neurological function.

**Conclusions:** Onyx is an useful alternative agent for primary treatment of DAVF, and especially effective for the management of isolated sinus with cortical venous reflux.

### 3A-6

#### **Dural sinus reconstruction for dural AVFs with sinus stenosis / occlusion using bare / covered stents**

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Dural arterio-venous fistula (DAVF) with sinus stenosis / occlusion may cause leptomeningeal venous reflux, induce venous hypertension, leading to intracranial hemorrhage / venous infarction / mass effect by varix. Pathogenesis of dangerous DAVF is not a shunt itself but a venous disease. In some cases of DAVFs, such as bilateral transverse-sigmoid DAVF, DAVF involving confluence and SSS, sufficient decrease of shunt is not expected by conventional transarterial / transvenous embolization / direct surgery. Dural sinus reconstruction with bare / covered stents might be useful in some cases of these DAVFs, alleviating venous hypertension and closure of shunt. We present an initial experience of dural sinus reconstruction in 5 cases (transverse-sigmoid: 3, confluence: 1, SSS: 1) using bare stent only in 2 and covered stent ± bare stent in 3. DAVF was obliterated completely in 1, subtotally in 2, and partially in 1. Significance of this strategy in the treatment of DAVFs will be discussed, and its tips / pitfall and perioperative antithrombotic therapy will also be presented.

### 3B-1

#### **Retrospective survey of acute stroke in Japan**

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**Introduction:** A nationwide survey of acute stroke was conducted for The Japanese Society of Neuroendovascular Therapy (JSNET) in 2009. The result of this survey is shown and discussed.

**Patients and Methods:** The patients who admitted within 24 hours after stroke onset was registered retrospectively. The below factors related to treatment selection and its result were also investigated; duration to treatment, type of stroke, occluded vessel, NIHSS on admission, outcome (mRS on discharge), and method of IVR and its result, and complications.

**Results:** A total of 1963 patients were registered from 68 medical centers in Japan where JSNET boarded physician was working. Occluded vessels were ICA 29%, MCA 53%, VBA 11%. Cardiogenic stroke was 63% and atherosclerotic was 31%. The patients admitted within 3 hours after onset were in 56%, 3-6 hours 15%, 6-8 hours in 4%, after 8 hours in 16%. The first treatment was IV-tPA was in 21%, IVR in 9%, IV-tPA + IVR in 2%. In the patients within 3 hours after onset (1286cases), clinical outcome on discharge was better in IV-tPA group than in conservative group, and best in IV-tPA + IVR group. However, outcome in IVR alone was worse in IV-tPA group. After 3 hours after onset, no IV-tPA was performed and IVR was limitedly done in 11%.

**Conclusions:** In this survey, IVR was already performed in contraindicated or failed patients for IV-tPA in Japan. A prospective registry would clarify the results of each treatment and their combination in the real clinical situation.

### 3B-2

#### **Balloon angioplasty for acute intracranial artery occlusion**

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**Object.** The benefits of intravenous thrombolysis with tissue plasminogen activator for acute ischemic stroke are still limited. We evaluated the safety and the efficacy of double lumen balloon catheter-based reperfusion therapy with or without intra-arterial thrombolysis for acute occlusion of intracranial arteries.

**Methods.** Fifty-nine patients with acute occlusion of intracranial arteries were enrolled. A double lumen balloon catheter (Gateway™) was used to disrupt clots and/or to dilate atheromatous plaques in every patient. The technical details, technique-related complications, the recanalization rates and the clinical outcomes were analyzed. The occlusion sites were internal carotid arteries in 17, M1 segments in 32, M2 segment in 1, a vertebral artery in 1 and basilar arteries in 8. Twenty-four patients (41%) were treated with thrombolysis first, and 20 (34%) were treated with PTA followed by thrombolysis. PTA only was performed in 15 (25%). The duration of inflation was 30 seconds or less in 84%. The mean dose of urokinase was  $205 \times 10^3$  U. The extent of recanalization was complete in 17 (29%), and partial in 28 (47%). Functional independence at discharge was preserved in 76%, 25% and 7% with complete, partial and no recanalization, respectively. A combination of PTA and thrombolysis resulted in a significantly higher recanalization rate than PTA only. Severe hemorrhagic complications of brain parenchyma were observed in 2 (4%), and vessel rupture was encountered in one atherosclerotic case.

**Conclusions.** Mechanical angioplasty using a double lumen balloon catheter combined with a low-dose thrombolytic agent is a safe and effective treatment for acute intracranial embolic and atherosclerotic occlusion with a low risk of hemorrhagic complications.

### 3B-3

#### **Intra-arterial Thrombolysis of Central Retinal Artery Occlusion**

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**Purpose:** Central retinal artery occlusion (CRAO) is an ophthalmic emergency with a severe and irreversible visual loss. The effective treatment regimen of CRAO has not been proven. Recently, several literatures have reported improved vision after super-selective administration of a thrombolytic agent directly into the ophthalmic artery. The aim of this study was to assess the safety and efficacy of intra-arterial thrombolysis of the ophthalmic artery.

**Material and Methods:** We retrospectively evaluated recent CRAO patients who underwent selective ophthalmic artery thrombolytic treatment (n=11). These patients were divided into two groups. In group I, 4 patients underwent selective intra-arterial thrombolytic treatment within 24 hrs after the onset of symptom. In group II, 7 patients were treated after 24 hrs from symptom onset. All patients underwent pre-procedural and post-procedural ophthalmological examination, funduscopy, and fluorescent angiography. We assessed the improvement in visual acuity and arm to retinal (A-R) time before and after the procedure to evaluate patients' outcome.

**Results:** A visual acuity was completely recovered to the previous state in two patients (2/4, 50%) and the others had partial recovery in group I. There was no change of visual acuity in group II patients. However, the retinal perfusion of all eleven patients was improved and there were no systemic or ophthalmic complications.

**Conclusion:** Although, the efficacy of intra-arterial thrombolysis for treatment of CRAO needs to be further evaluated in a controlled study, we suggest that ophthalmic arterial thrombolytic treatment may improve visual acuity of patient who is treated within 24 hrs after the onset of symptom. Also, it may improve retinal perfusion, which leads to prevent further progressive complications such as retinal detachment and neovascularization glaucoma.

### 3B-4

#### **Emergent carotid artery stenting in patients with progressing stroke**

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**Background and Purpose:** In this presentation, we discuss the feasibility and safety of emergent carotid artery

stenting (CAS) in patients with progressing stroke.

Methods: Our strategy was to treat patients medically first. When their symptoms got worse even with maximum medical treatment, we decided to perform emergent CAS in 10 patients. CAS was performed with distal protection in 5 patients, proximal protection in one, and combined protection in 3.

Results: CAS was performed 7.6 days (2-14days) after stroke onset. In one patient, CAS was attempted, but failed because of difficulty to access the stenosis. In the remaining 9 cases, CAS was successfully performed. In one case, stent was occluded without new symptom. Morbidity/Mortality at 30 days was 80%, although their symptoms were improved in 6 of 10 cases.

Conclusion: Emergent CAS in patients with progressing stroke was technically possible, safe, and feasible in many cases. To overcome some problems we have now, new device and drug may be useful in the future.

### 3B-5

#### **Carotid Artery Stenting: Diagnostic and technical approaches to prevent complications**

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Carotid artery stenting (CAS) is emerging therapy for carotid artery stenosis. At present, indication for CAS is limited to the selected patients in whom stenosis is difficult to access surgically, medical conditions that greatly increase the risk for surgery are present, or other specific circumstances exist such as radiation-induced stenosis or restenosis after CEA. For the patient at average surgical risk, the role of CAS is still unproven, especially for symptomatic patients.

Periprocedural stroke risk still remains a concern in CAS. Particularly, distal embolization of debris is the critical complication. To prevent such complication, peri-procedural diagnostic, medical and technical approaches should be considered.

Evaluation of carotid plaque characteristics can predict "high risk plaque for CAS". Echo-lucent plaque by ultrasound, intra-plaque hemorrhage by black blood MRI, and larger volume plaques are associated with embolic complications. Additionally, vulnerable systemic condition may be important. In our study, higher levels of systemic inflammatory markers are related to higher occurrence of new ischemic lesions in diffusion-weighted MRI after CAS. Aggressive antiplatelet therapy with dual/triple drugs and plaque stabilization by statin/ARB/thiazolidine are the potential medical therapies to prevent distal embolization and stent thrombosis.

Also, angiographical features such as tortuous arteries, intra-luminal thrombi, and pseudo-occlusions may be related with higher risk of embolic complications. Technical approaches with selection of embolic protection devices should be considered for these lesions.

In this session, we present current opinions of diagnostic, medical and technical approaches to prevent thrombo-embolic complications in CAS.

### 3B-6

#### **Symptomatic carotid artery stenosis: the new reliable evidence for a selection of CAS or CEA**

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[Abstract]

Objective : Magnetic resonance imaging (MRI) of the arterial wall has emerged as a viable technology for characterizing atherosclerotic lesions in vivo, especially within carotid arteries and other large vessels. To study the capability of detecting the distribution and classification of carotid atherosclerotic plaque using high resolution multiple sequences imaging with 3.0T M R scanner.

Methods : Thirty-one patients with atherosclerosis which detected by duplex ultrasound underwent bilateral carotid artery MRI with a 3.0T scanner. Phase-array coil of neck and ECG gating were used. The pulse sequences included T1W I, T2 W I, proton density and 3D time of flight. American heart association classification criteria was modified for MRI diagnosis and was used to evaluate lesions quantitatively and qualitatively at 3 key-points (common, internal and bifurcation of carotid artery) for classification.

Results : Of the 25 patients with 150 key-points at axial plane examined, TypeIII (44.7%) occurred most commonly, followed by Types I~II(34%), TypesIV~V (14%), TypeVI (3.3%), and TypeVII(4.0%). Calcified

plaques in TypeVII was all proved by CT images. There was no significant statistical difference in different types of carotid atherosclerosis(Fisher's exact test : P=0.112). All of the type VI patients had ischemia recently in the area supplied by unilateral cerebral artery.

Conclusion : High resolution multi-sequence MRI with 3.0T scanner is an optimal noninvasive approach in the evaluation of arteriosclerosis of carotid artery, and will be the new reliable evidence for a selection of CAS or CEA.

#### 4A-1

##### **Stent placement for the treatment of ruptured wide-necked intracranial aneurysms: Changhai experience**

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Ruptured wide-necked intracranial aneurysms are common and often pose technical challenges to interventionalists. Intracranial stents are widely used in treating unruptured wide-necked aneurysms. To evaluate the effectiveness and safety of stent placement in treating ruptured aneurysms, we performed this retrospective study. Between September 2000 and November 2009, 209 patients with ruptured wide-neck aneurysms were treated with stents at our institution. We retrospectively collected and analyzed the data for these patients, including demographics, morphologic features of the aneurysms, treatment results, and follow-up. Our experience demonstrates that stent placement for the treatment of ruptured wide-neck MCA aneurysms is effective and relatively safe.

#### 4A-2

##### **Endovascular treatment for intracranial aneurysms: a multi-center study using Willis covered stent**

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#### 4A-3

##### **Endovascular stenting for intracranial aneurysms: vascular morphological and hemodynamic change**

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Purpose Anterior communicating artery (A-Com-A) aneurysm is the most common form of intracranial aneurysms. Stent placement has been successfully applied to the treatment of wide-necked and fusiform intracranial aneurysms. The purpose of this study is to quantify the vascular geometry change due to intracranial stent placement and to discuss its effect on hemodynamics.

Methods Between January 2005 and January 2010, imaging data of patients with wide-necked A-Com-A aneurysm, treated with stent-assisted coil, were retrospectively analyzed. The angle between the afferent vessels (A1 segment) and the efferent vessels (ipsilateral or contralateral of A2 segment) was calculated to determine the exact change in the angle after stenting.

Results In all 21 patients, the stent caused a distinct change in the geometry of the parent vessel. Stent-related vascular angle change ranged from 7.60 to 74.88 degrees, with an average of 29.25 degrees. In 9 cases, the angle changed by above 30 degrees. In the 13 patients with the distal segment of the stent placed in ipsilateral A2 segment, the mean postoperative A1-A2 angle increased by  $26.75 \pm 16.23$  degrees (from 7.60 degrees to 57.43 degrees). In the other 8 patients with the distal segment of the stent placed in contralateral A2 segment, the mean postoperative A1-AcomA-A2 angle increased by  $33.29 \pm 21.89$  degrees (from 15.49 degrees to 74.88 degrees).

Conclusion In addition to serving as a scaffold to contain coils, stent placement for A-Com-A aneurysms has a substantial effect on the vascular geometry, resulting in local hemodynamic variations. This may reduce coil compaction and prevent regrowth of aneurysm.

#### 4A-4

##### **Tips and pitfall of double catheter technique for wide neck aneurysm**

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**Background and purpose:** In Japan, neck-plasty technique and double catheter technique (DCT) are often used for wide neck aneurysm because intracranial stent is not available now. DCT is more complicated, but applicable to various shaped aneurysm. We present our result and some illustrative cases using DCT and consider tips and pitfall.

**Material and Methods:** Twenty-one patients for 21 aneurysms underwent embolization with DCT between 2004 and 2008. Eighteen aneurysms were unruptured. The most frequent location was posterior communicating artery (PCoA) (24%), followed by anterior communicating artery, superior cerebellar artery (SCA), basilar artery and so on. The mean size of aneurysms in maximum diameter was 9.3 (4.0-15.7) mm.

**Results:** Among 21 procedures, the purpose of DCT was neck-plastic framing for wide-neck aneurysm in 16, tight packing for large aneurysm in 5. Two aneurysms resulted in complete occlusion, 14 aneurysms were in neck remnant (NR) and 5 aneurysms were in body filling (BF). One patient suffered from cerebellar infarction due to occlusion of posterior inferior cerebellar artery. Coil protrusion to parent artery occurred except for flow impairment, because of unintentional detachment.

**Illustrative case 1:** The unruptured lt.SCA aneurysm which size was 9mm in diameter was found in association with symptomatic unruptured aneurysm in the patient who was 58-year-old male. Because it seemed to be difficult to place balloon catheter to lt.SCA originated from aneurysmal body itself, 2 microcatheter were placed. Fortunately, adequate-sized frame was shaped using only 1 complex coil. Second helical coil was inserted from another microcatheter preventing the break of 1<sup>st</sup> coil. After all procedure, the flow of rt.SCA was preserved completely.

**Illustrative case 2:** The 78-year-old female with unruptured rt PCoA aneurysm which size is 6mm in diameter desired to be treated. First complex coil from the bottom-sided microcatheter shaped smallish frame. Second 3D coil from neck-sided one enlarged the frame beside PCoA successfully. After dense packing, only mild neck remnant was remained.

**Illustrative case 3:** The 71-year-old male had unruptured rt.SCA aneurysm which size was 7mm. One complex coil and one helical coil were inserted from 2 microcatheter one after the other, little by little. Frame consisted of 2 coils did not impair the flow of rt.SCA. While filling coils were inserted from one microcatheter, early detachment of remaining 1<sup>st</sup> coil by detaching process of other coils occurred. As a result, although almost complete occlusion was achieved, the tip of 1<sup>st</sup> coil remained to protrude to basilar artery.

**Conclusion:** Although DCT needed trained catheter manipulation and has the risk that 2 coils got tangled, it makes DCT safer to understand the motion of coils and to insert coils carefully. DCT which made complex-shaped frame is seemed to be particularly useful when balloon-catheter for neck-plasty can not advance to its branch vessel and when balloon catheter is not effective.

#### 4A-5

#### **Matrix<sup>2</sup> Coils in Embolization of Intracranial Aneurysms: One-year Outcome and Comparison with Bare Coil Group in Single Institution**

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**Background and Purpose:** To evaluate durability of Matrix<sup>2</sup> coils after endovascular treatment of intracranial aneurysms, we compared one-year outcome of the intracranial aneurysms treated with Matrix<sup>2</sup> coils to historical controls treated with the bare platinum coils (BPC).

**Methods:** The 121 consecutive aneurysms in 114 patients were embolized in Seoul National University Hospital by using Matrix<sup>2</sup> coils between April 2006 and September 2008. The historical control group consists of 151 aneurysms in 137 patients who underwent coil embolization by using BPCs alone during the period from October 2007 to October 2008. The initial coiling outcomes include volumetric packing attenuations, occlusion grades, and procedure-related complications. Anatomical outcomes were evaluated by MR angiography at one year and were compared between Matrix<sup>2</sup> group and historical BPC control group.

**Results:** The Matrix<sup>2</sup> coil group and BPC group with similar baseline demographic characteristics revealed comparable initial endosaccular coiling outcomes. The rates of overall recurrence, major recanalization, and retreatment rate of the Matrix<sup>2</sup> coil and BPC were 17.4% versus 7.3%, 14.0% versus 5.3%, and 10.7% versus 4.6%, respectively (p=0.066). However, those of the subgroup with aneurysm volume between 50 mm<sup>3</sup> to 200 mm<sup>3</sup> were 23.7% versus 2.2%, 10.5% versus 0%, and 10.5% versus 0%, respectively (p=0.022). Those of

another subgroup with packing density less than 30% were 38.3% versus 13.3%, 31.9% versus 11.7%, and 23.4% versus 10%, respectively ( $p=0.025$ ). There were no significant difference in mean packing density ( $p=0.152$ ), initial occlusion grade ( $p=0.098$ ), one-year follow-up outcomes ( $p=0.209$ ) according to the length of Matrix<sup>2</sup> coils used.

Conclusions: Overall, initial and one-year follow-up coiling outcomes of Matrix<sup>2</sup> coil group were comparable to those of BPC group based on our single center experience. But in certain subgroups of aneurysm volume and packing density, the one-year durability of Matrix<sup>2</sup> coils was inferior to that of BPC group.

#### 4A-6

##### **Endovascular treatment for unruptured asymptomatic cerebral aneurysms with one-year angiographical follow-up**

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**[Objective]** Evaluation of angiographical results after endovascular treatment for cerebral aneurysms is subjective. We evaluated the angiographical results critically with modern angiographical machine. **[Methods]** A retrospective analysis for 185 unruptured asymptomatic aneurysms was undertaken in our department between 2005 and 2009. **[Results]** Aneurysm location included the ICA in 108 (ophthalmic segment in 58), posterior circulation in 39, ACA in 30, MCA in 8. The size of aneurysms were less than 5mm in 17, 5 to 7mm in 103, 8 to 10mm in 47, 11 to 20 in 18mm. Aneurysms treated with Bio-active coils in 48 (26%); 38 with Matrix, 12 with Cerecyte. Balloon neck remodeling was used in 126 (68%). Immediate anatomic results were complete occlusion without any dome filling (CO) in 30 (16%), neck remnant with small filling around the neck (NR) in 87 (47%), body filling (BF) in 62 (34%), treating failure in 6 (3%). As for complication, minor stroke occurred in 5 (2.7%), and intra-operative rupture in 2 (1%). But these all cases were tolerated without lasting neurological deficit. No patients suffered from SAH after embolization. Follow up angiogram at 1-year was available for 113 (61%). Anatomic results were CO in 54 (48%), NR in 33 (29%), BF in 24 (21%), treating failure in 2 (2%). Re-treatment was carried out in 22 of 113 (19%), repeated embolization in 18, surgical treatment in 3. No patients suffered from SAH in follow up period. In follow up angiogram, the percentage of CO increased. On the other hand, the percentage of NR and BF decreased. Favorable course (CO→CO, NR→improved NR /CO, BF→NR/CO) at 1-year revealed in 82 (73%). Unfavorable course (CO/NR/BF→BF, CO→NR, NR→worsened NR) revealed in 31 (27%). Favorable course was dominant in complete occlusion and neck remnant in immediate anatomic result, lateral type aneurysms, and embolization with bioactive coils. **[Conclusion]** Coil embolization is a safe therapy with almost nonexistent morbidity and mortality. Improvement of occlusion rate in follow up angiogram with critical evaluation was seen in many cases, especially of lateral type and treated with bioactive coils.

#### 4B-1

##### **Comparison of balloon versus filter protection in carotid artery stenting**

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Carotid artery stenting (CAS) has emerged as an alternative to carotid endarterectomy (CEA) for patients with high surgical risk. A distal embolic protection device (EPD) is regarded as an essential tool to avoid embolic complications during CAS. Protected CAS using PercuSurge GuardWire, a balloon-type EPD, has been introduced into our hospital since 2002, and Angioguard XP, a filter-type EPD, has been approved in Japan since 2008. The purpose of this study is to compare clinical results of protected CAS with the use of Angioguard XP and that with GuardWire.

Two hundred and nine patients treated by CAS under distal protection from 2002 to present were included. One hundred and ten patients were treated with GuardWire (the GW group). Angioguard XP was used in 99 patients (the AG group) from 2007. A self-expandable open-cell-type stent, SMARTeR or PRECISE stent was successfully deployed in all patients. In the GW group, one patient died of intracerebral hemorrhage that developed five days after CAS, and one patient had persistent hemiparesis due to intracerebral hemorrhage that occurred one week after CAS. Another patient died of multiple organ failure after intraoperative abdominal wall hemorrhage. No patients had perioperative ischemic stroke in the GW group. In the AG group, 2 patients suffered from thromboembolic minor strokes. One patient developed a fatal hematoma in the basal ganglia one hour after the procedure. In conclusion, hemorrhagic complications were causes of disability in

our series in the era of GuardWire. Thromboembolic events were more frequently encountered in patients undergoing CAS with the use of Angioguard XP. Appropriate selection of patients and devices may be necessary to achieve more sufficient results.

#### 4B-2

##### **A Technical Strategy for Carotid Artery Stenting: Suboptimal Pre-stent Balloon Angioplasty without Post-stenting Balloon Dilatation**

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**Objectives:** Traditional carotid artery stenting (CAS) consists of predilatation, optional deployment of embolic protection devices (EPD), stenting, and post-stent angioplasty. Each step has a risk of thromboembolism. The authors have designed a new and simplified procedural protocol; suboptimal balloon angioplasty and no routine post-stenting balloon dilatation. The efficacy of our protocol is described in terms of procedural risks, and angiographic and clinical outcomes.

**Methods:** Over a period of 6 years, 161 carotid artery stenoses in 156 consecutive patients were treated by CAS with EPDs. Among them, 110 lesions in 107 patients (68.3%) were treated by our simplified method (symptomatic > 50% stenosis, asymptomatic > 70% stenosis). Overall, 98 lesions (88.3%) had severe stenosis (>70%).

**Results:** The mean stenosis was reduced from 77% to 10% after CAS. A persistent neurological deficit developed in two patients from thromboembolism. Hemodynamic insufficiency developed in 14 lesions during the CAS (12.7%). The ipsilateral stroke and mortality rate was 4.5% within 1 month after CAS (asymptomatic: 3.6%, symptomatic: 4.8%). On mean 19 months follow-up, additive angioplasty was performed in two patients due to progressive restenosis ( $\geq 50\%$ ). In comparing the balloon size of the pre-stent angioplasty for Group I (balloon  $\leq 4$  mm) and Group II (balloon  $\geq 5$  mm), there was no difference of restenosis between the groups at follow-up 15 months after CAS.

**Conclusions:** Our CAS technique with suboptimal pre-stenting angioplasty, without routine use of post-stenting dilatation, is safe, simple and efficient, with acceptable risks.

#### 4B-3

##### **CTO recanalization in carotid and brain vasculature**

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#### 4B-4

##### **Carotid artery stenting with intra-aortic balloon pump pulsation: two case reports**

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We report two cases of carotid artery stenting (CAS) with intra-aortic balloon pump pulsation (IABP) to prevent coronary artery from flow reduction due to intra- and post-procedural bradycardia and hypotension. Case 1: A 82-year old woman, who had been found to have symptomatic right carotid artery severe stenosis and severe aortic stenosis (AS), suffered congestive heart failure and transient ischemia attack. Because of the possibility that hemodynamic instability during and after CAS for severe AS may be fatal, CAS was performed under using IABP. The stent was placed successfully and no cardiac and cerebrovascular event occurred during and after CAS. 4 weeks after CAS she underwent aortic valve replacement with bloodpump and oxygenator uneventfully and discharged in stable condition. Case 2: 71-year old man with angina pectoris from three-vessel coronary artery disease, for which bypass surgery should be indicated, presented asymptomatic left carotid artery severe stenosis. CAS with IABP was performed before bypass surgery, complicated which might need bloodpump and oxygenator. There was no cardiac and cerebrovascular procedural event. 6 weeks after CAS he underwent bypass surgery successfully and discharged. CAS with IABP is safe and effective

method for AS and coronary artery disease to prevent coronary artery from ischemic event due to bradycardia and hypotension during and post CAS.

#### 4B-5

##### **Careful follow up is mandatory after endovascular PTA/Stenting for Takayasu arteritis: report of three cases and review of the literature**

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**Introduction:** Recently, endovascular management has been reported as a feasible option for Takayasu arteritis. However, restenosis rate is much higher than arterosclerotic stenosis, and it is important to find out high risk cases for restenosis. We herein report three patients with Takayasu arteritis underwent endovascular PTA/Stenting and discuss its clinical implications in terms of restenosis with a review of the literature.

**Case descriptions:** Three patients with Takayasu arteritis (mean age 34 year old, all female) involving 2 common carotid and 2 subclavian arteries underwent PTA/Stenting when inflammation was controlled with corticosteroids. They showed sufficient revascularization of all the treated vessels after the initial treatment and the symptom disappeared immediately. However, they all showed restenosis later and required several PTAs in 2 year follow up. On the other hand, CBF study on SPECT showed no decrease in spite of repeated restenosis assuming that collateral supply in the brain developed in this period.

**Discussion and Conclusions:** We reviewed 6 English literatures reporting PTA/Stenting for Takayasu arteritis, and overall restenosis rate is 24.6%. We guess actual restenosis rate is much higher since these reports include short and mild stenosis and follow up period is short in some of them. We should keep in mind that endovascular PTA/Stenting for Takayasu arteritis does not always keep its patency. Careful follow up under strict control of inflammation is mandatory. Severe stenosis or uncontrollable inflammation is supposed to be a risk factor for restenosis. Overall, this method has an advantageous in terms of available repeated PTA until collateral supply develops.

#### 4B-6

##### **Carotid Artery Stenting for Restenosis Following Endarterectomy**

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**Backgrounds and Purpose:** Recurrent stenosis following carotid endarterectomy (CEA) is an important complication, and second surgery may have increased morbidity. The goal of this study was to evaluate the procedural complication and follow-up results of carotid artery stenting (CAS) for post-CEA restenosis in our institution.

**Methods:** From November 1999 to April 2010, 9 CAS procedures were performed in 8 patients (mean age 68.8 years; 5 men, 3 women). One male patient had bilateral recurrent stenosis following endarterectomy. The mean interval between CEA and restenosis (peak systolic velocity  $\geq 200$  cm/sec.) was 8.8 months (range, 3.5 to 18). The mean interval between CEA and CAS was 12.6 months (range, 8 to 21.5). One patient presented transient ischemic attack, and the others were asymptomatic. CAS was performed under local anesthesia with PercuSurge GuardWire (n=2), Angioguard XP (n=4), no protection (n=3). The implanted stents were SMART (n=3) and Precise (n=6).

**Results:** All CAS procedures were successfully performed. No periprocedural complication was occurred, except one in which hypotension was occurred at 6 hour after CAS. The mean duration of follow-up was 57.2 months (range, 0.5 to 126.5). No in-stent restenosis ( $\geq 50\%$ ) was detected after CAS. One patient was developed ipsilateral minor stroke (lacunar infarction) at 5 year after CAS.

**Conclusions:** In our series, the clinical outcomes of CAS for post-CEA were acceptable. Early restenotic lesions after CEA are mainly consisted of intimal hyperplasia; therefore, CAS can be performed with low risk of complications. The medical management of risk factors is also important in a long term follow-up.