# The 8th Korea-Japan Joint Meeting for Vascular Surgery

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## Professor Nakajima Memorial Symposium: Current Management of CLI and VTE

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## Free Paper Session - I

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## Free Paper Session - II

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Panelists from Japan

01
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The University of Tokyo

02
Kazuo Shimamura
Okuma Central Hospital

03
CLI Patient with Idiopathic Hypotension
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Kansai Medical University Takii Hospital

Case Summary
Patient was 40 year-old man with end-stage renal disease. He had suffered from systemic lupus erythematosus. He was referred to our hospital for surgical treatment of toe ulcer. Although he had no cardiac problems, his blood pressure was always below 80 mmHg. After careful discussion, we decided to perform below-knee popliteal-peroneal bypass for leg salvage. Postoperative course was uneventful and leg ulcer healed in two months. We are not sure which treatment option could be the best choice.

Panelists from Korea

01
Case from SNUBH
TaeSeung Lee
Seoul National University

56-year-old man presented with right flank pain visited emergency center. The pain was developed 9 hours ago. He had no previous medical history. On physical examination, there was tenderness on his right costo-vertebral angle. The CT scan of his abdomen showed mural thrombus at the suprarenal abdominal aorta as well as descending thoracic aorta which may be caused right renal artery obstruction and subsequent renal infarction. Also, floating thrombus was located at just near the superior mesenteric artery (SMA) orifice. Additionally, the celiac artery (CA) had a 80% stenosis at its ostium with poststenotic dilatation. Transaortic thrombectomy and right nephrectomy were performed. The postoperative CT scan showed dissecting aneurysm at proximal SMA stenosis at orifice level and diffuse wall thickening of proximal to mid SMA. Follow up CT scan after 1 month showed even more progression. SMA&CA stenting were performed successfully, however branch artery of pancreaticoduodenal arcade was injured by guidewire inadvertently and the bleeding was embolized with microcoil. After the procedure, the patient complained severe abdominal pain at ward, repeated embolizations were performed. The patient was discharged after 4 day without further problem.

02
My Tummy Suddenly Hurts and I Have Heart Problems
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Case Summary
The 84-year-old male was referred to my hospital because of sudden periumbilical pain for 6 hours. He had visited to a general hospital, where abdominal CT revealed abdominal aortic aneurysm with contained rupture. In his past medical history, he has had hypertension, dilated cardiomyopathy, congestive heart failure (EF:28%) with severe aortic stenosis and diffuse LV hypokinesia. The CT, one year ago, showed aneurysms on aortic arch, descending thoracic, and abdominal aorta, which were planned to observe due to his heart problem at that time. His
vital signs were stable except elevated blood pressure. Hemoglobin level was decreased to 8.5g/dL. Other laboratory tests were normal including serum creatinine. Initial abdomen CT showed contained rupture of infrarenal AAA (maximal diameter: 80 mm, neck length: 18 mm, neck diameter: 34 mm with angulation of 127.5°), Rt common iliac artery aneurysm with thromboed occlusion, and multiple Lt CIA, EIA stenosis. Emergency EVAR was performed under general anesthesia with uni-iliac aortic stent-graft without femoro-femoral bypass. Type Ia endoleak occurred because of diatal migration when deploying device. Aortic extension cuff was applied with decreased endoleak and procedure was finished with no heparin. On next day, followup CT still noted type Ia endoleak, thrombotic occlusion of distal portion of stent-graft, and previously obstructed Lt SFA due to PAOD. Emergency EVAR was performed under general anesthesia with uni-iliac aortic stent-graft without femoro-femoral bypass. Type Ia endoleak occurred because of diatal migration when deploying device. Aortic extension cuff was applied with decreased endoleak and procedure was finished with no heparin. On next day, followup CT still noted type Ia endoleak, thrombotic occlusion of distal portion of stent-graft, and previously obstructed Lt SFA due to PAOD. Second procedure was given through cut-down of Lt CFA under the general anesthesia. Thrombectomy with Fogarty catheter, balloon angioplasty with stenting on multiple iliac stenosis, recanalization of Lt SFA with stenting were done. CT angiography on 5th HD still showed endoleak. On 8th HD, aortic neck banding was performed through laparotomy using folded Teflon graft with a result of significantly decreased endoleak. The patient was cared at ICU for 2 weeks with temporary azotemia and pulmonary edema. Patent arterial flow down to distal leg was seen on last imaging but Rt renal artery occlusion was found with preserved urine output. He was discharged from hospital on 41st HD and alive for 8 months.

Discussion Point
1. Initial procedure, open or endovascular?
2. Second procedure for thrombosed stent-graft
3. Management of type Ia endoleak

Atriocaval Shunt and Intermittent Pringle for Complicated Retrohepatic Vena Cava and Hepatic Vein Disruption
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Case Summary
Twenty four year old male was transferred to our emergency department with distended abdomen after traffic accident. While he was driving his car crashed to the tree and got the injury. Initially his condition was just assessed as liver laceration as written in the referral note but we noticed contrast leak beneath the diaphragm. Repeated CT scan revealed definite contrast leakage below the right hemidiaphragm and filling defect in the retrohepatic IVC. Assessed as hepatic vein and/or retrohepatic caval injury. Atriocaval shunt was planned and simultaneous sternotomy and laparotomy were carried out. When open the peritoneum, blood pressure dropped to 40mmHg. Supraceliac clamp was applied and pressure was restored. The clamp was released after applying Pringle maneuver. Atriocaval shunt was placed with No 8. endotracheal tube. ET tube was straightened in the warm saline to avoid misplacement because of its’ curvature. Then exposed hepatic vein and retrohepatic IVC. All three hepatic veins were avulsed at the confluence to the IVC. Since reconstruction of avulsed hepatic veins required long time, intermittent Pringle maneuver was applied to minimize ischemic liver injury. Right and middle hepatic veins were reconstructed and left hepatic vein was removed with avulsed lateral segment by finger fracture method. Entire procedure time was min., units of PRC were transfused. His recovery was uneventful and he returned to the work 3 months after the operation.

Discussion Point
1. Utility of atriocaval shunt in hepatic vein injury
2. Best way of atriocaval shunt
3. Intermittent Pringle maneuver to prevent ischemic injury
Current Management for Critical Limb Ischemia: Korean Experiences

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Critical limb ischemia (CLI) is a serious condition jeopardizing the survival of the limb or the patient. Therapeutic goals for CLI includes reducing cardiovascular risk factors, relieving ischemic pain, healing ulcer, preventing major amputation, improving quality of life and increasing survival.

Owing to the recent advances in devices and techniques for intervention, endovascular surgery is widely applied for the treatment of CLI. In many scientific meetings, interesting debates on open versus endovascular therapy are popular. However, this binary decision is not the case for daily practice for vascular surgery. Objective assessment of the patient status and combination of optimal treatments available are very important to achieve the therapeutic goals for CLI.

Lots of treatment options should be tailored for each patient according to the severity of CLI and the patient status. Contemporary armamentaria for CLI treatment include open surgery, endovascular surgery, hybrid surgery, amputation and aggressive medical therapy. Medical therapy includes administration of analgesics, local wound care and pressure relief, infection control and modification of atherosclerotic risk factors. In this talk, the treatment goals and options for patients with CLI and some cases currently treated in SNUH, a tertiary referral center in Korea, will be discussed.

Current Management for Critical Limb Ischemia

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Current Management of VTE in Korea

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Current Management for VTE

Hirono Satokawa
Fukushima Medical University, Japan
Clinical Characteristics of Abdominal Aortic Aneurysm in Younger Patients

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Purpose
To determine clinical characteristics of abdominal aortic aneurysm (AAA) in younger patients.

Method
We conducted a retrospective analysis using a database of AAA patients in a single institute. We compared patient characteristics between younger patient group (<60 years) and older patients group (≥60 years). Variables tested in this comparative study included demographic, clinical features (symptomatic vs asymptomatic; ruptured vs non-ruptured), etiology (degenerative vs other etiology), features of aneurysm (infrarenal vs non-infrarenal; fusiform vs saccular or eccentric; presence of other concurrent aneurysm), coexisting morbidities, family history and blood test results of AAA. Numerical variable were analyzed using the T-test or Mann-Whitney test and categorical variables were using the Chi-square or Fisher’s exact test.

Results
Fourteen percent of patients with AAAs were in age below 60 years. Mean age was 51.9 ± 7.2 years (27-59 years) in younger patient group (n=107, 14%) and 71.5 ± 6.1 years (60-91 years) in older patient group (n=676 patients, 86%). In comparison of patient characteristics, there was no differences in sex ratio, frequencies of symptomatic or ruptured AAAs, or aneurysm diameter. Patients with uncommon etiologies such as inflammatory AAA, Marfan syndrome, infective AAA or aortitis-related AAA and AAAs at uncommon locations (such as juxtarenal, suprarenal and type IV thoracoabdominal aneurysm), and uncommon morphology (saccular or eccentric shaped AAAs) are more common in younger patients group. Regarding to coexisting disease or risks, hypertension, diabetes mellitus, ischemic heart disease, cerebrovascular disease and chronic renal failure were less common in younger patients group.

Conclusion
We interpreted above described results as AAAs in younger patients may have different clinical courses from those of the older patients group due to more common AAAs with uncommon location or etiology.

Keywords: Aortic Aneurysm/Abdominal, age factor
Follow-Up Results of Small Abdominal Aortic Aneurysm

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**Purposes**
To determine natural courses of small abdominal aortic aneurysm (SAAA).

**Methods**
SAAA was defined as AAA with maximal diameter of 3.0-5.0 cm. To measure SAAA diameter, we measured a short diameter of aneurysm perpendicular to the longest diameter on axial image of abdominal CT scan using electronic caliper. To follow-up AAA diameter, CT scan was undertaken every year in patients with 3.0-4.0 cm AAA and every 6 months in patients with 4.0-5.0 cm AAA.

**Results**
Among 295 patients with SAAA, it was available to measure AAA diameter 2 or more times in 212 patients (mean age 69.1 ± 8.2 years, 37-90 years, male 87%). Mean duration of follow-up was 42.0 ± 35.6 months (1-163.7 months). AAA expansion rates were 0.24 ± 0.22 cm/yr in 3.0-4.0 cm AAA (n=127) and 0.39 ± 0.33 cm/yr in 4.0-5.0 cm AAA (n=84). There showed no significant difference in AAA expansion rate between genders. And 63 (30%) patients required AAA treatment due to AAA diameter ≥ 5 cm (n=47), expansion rate ≥ 1 cm/yr (n=6), associated iliac aneurysm ≥3.5 cm (n=4), saccular-shaped AAA (n=3), concealed AAA rupture (n=2) and abdominal pain (n=2). During the follow-up period, we found that 2 (0.9%) patients died of AAA ruptures before treatment. On multivariate cox regression, larger initial diameter of AAA and higher LDL-cholesterol are independent risk factors for more rapid expansion of SAAA.

**Conclusions**
Though expansion rate was slow in SAAAs, we found that 30% of SAAA patients required treatment due to various causes and 3 (2%) AAAs are ruptured. Based on our observation, patients with high LDL-cholesterol and larger SAAA need closer attention.

Keywords: Small abdominal aortic aneurysm, Expansion rate, Follow up results

Root Reconstruction with Hemi-arch Replacement for Dilated Ascending Aorta

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**Purpose**
We have occasionally encountered a moderately dilated distal ascending aorta while reconstructing an aortic root. We describe reconstruction of an extended root and ascending aorta using our current strategy.

**Methods**
Between March 2011 and May 2012, 15 (11 men; mean age, 70.1 ± 7.3 years) patients underwent root reconstruction with hemi-arch replacement under hypothermic circulatory arrest with antegrade selective cerebral perfusion. All patients were diagnosed annulo aortic ectasia with aortic regurgitation preoperatively by computed tomography, angiography and ultrasound cardiography. The maximum diameter of the aortic root was 52.5 ± 4.4 mm. The distal ascending aorta just below innominate artery was moderately dilated to 41.7 ± 1.4 mm in diameter.

**Results**
Operative outcomes excluding the diameter of the distal ascending aorta did not significantly differ from those of patients who had undergone root reconstruction under distal ascending aortic clamping during the same period. Postoperative computed tomography confirmed complete resection of the dilated ascending aorta in the patients, and did not develop neurological dysfunction or stroke. All patients remained in hospital after surgery for 26.2 ± 5.9 days.

**Conclusion**
We considered that complete resection under hypothermic circulatory arrest and selective cerebral perfusion might help to avoid repeated surgery to treat dilation of the distal ascending aorta over the long-term.

Keywords: Root reconstruction, Annulo aortic ectasia, Hypothermic circulatory arrest
Evaluation of False Lumen at Chronic Phase in Stanford Type B Non-communicating Aortic Dissection

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Purpose
It remains unclear what types of patients are most likely to have the late disappearance of the thrombosed false lumen in non-communicating type B aortic dissection (BAD). We studied the late-phase characteristics of the false lumen in BAD and attempted to clarify the acute-phase characteristics of patients who had disappearance of the thrombosed false lumen in the late phase.

Method
The study group comprised a total of 117 patients with BAD. All patients presented at our hospital from January 2000 through January 2012 and received conservative therapy. We retrospectively compared the characteristics of aortic dissection in the acute phase between disappearance group and residual group.

Results
The false lumen disappeared in the late phase in 37 patients with type B aortic dissection. Univariate analysis revealed significant differences between the disappearance group and residual group in maximal aortic diameter (p=0.04), true lumen diameter (p=0.04), and transition to ULP-type aortic dissection in the late phase. On multivariate analysis, only maximal aortic diameter differed significantly between the groups. The Kaplan-Meier method disclosed that a maximal aortic diameter of less than 30 mm in the acute phase was significantly associated with disappearance of the false lumen in the late phase (p=0.02).

Conclusion
In patients with BAD, a maximal aortic diameter of less than 30 mm were significantly associated with disappearance of the false lumen in the late phase.

Keywords: Non-communicating aortic dissection, False lumen diameter

Histologic and Immunohistochemical Examinations for IgG4 Aortitis in Patients with Inflammatory Abdominal Aortic Aneurysm

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Purpose
Inflammatory abdominal aortic aneurysm (IAAA) is an uncommon variant of degenerative AAA. Some of those patients are known to be related with IgG4 related disease (IgG4 aortitis). Suggested comprehensive diagnostic criteria for IgG4-related disease include clinical characteristic findings of single or multiple organs, elevated serum IgG4 concentrations, and pathological findings such as marked lymphocyte and plasma-cell infiltration, fibrosis, IgG4+/IgG+ cells ratio>40% and >10 IgG4+ plasma cells/HPF. We attempted to see relations between IAAA and histologic and immunohistochemical findings of IgG4 aortitis.

Method
Among IAAA patients who were diagnosed on the characteristic surgical and CT finding, histological examinations by H&E and MOVAT staining and immunohistochemical staining of the serial sections for CD138, IgG, and IgG4 was available in 18 patients. We counted IgG4+ plasma cells per high power field (HPF) and calculated IgG4+/IgG+ cells ratio. We conducted correlation analysis between number of IgG4+ cells infiltration and IgG4+/IgG+ cell ratio using Spearman’s correlation.

Results
Among 983 AAAs who underwent open AAA repairs in 2 hospitals, 31 (3.2%) were diagnosed as IAAA (mean age, 63.7 years (range, 32-85 years; male, 87%). Histologically, mean thickness of fibrosis in aneurysmal wall was 5.4 mm (range 3-8 mm, median 5 mm). IgG4+ plasma cell infiltration was found in all patients (mean 4 cells/HPF, range, 2-100 cells/HPF). Mean IgG4+/IgG+ cell ratio was 16% (median 17.5%, range, 1%-35%). On a correlation analysis, we found a positive correlation (Rho=0.798, p<0.001) between number of IgG4+ cells and IgG4+/IgG+ cell ratio.

Conclusion
We have experienced IAAA patients in 3.2% of AAA repair patients. Though we found positive correlation between num-
ber of IgG4+ cells infiltrations and IgG4+/IgG+ cell ratio, those findings did not suffice for the previously suggested comprehensive diagnostic criteria of IgG4-RD. We think more specific diagnostic criteria are required for the diagnosis of IgG4 aortitis.

Keywords: Aortic Aneurysm/abdominal, Aortitis, Immunoglobulin G

Periostin Links Mechanical Stress with Inflammatory Signal in Abdominal Aortic Aneurysm

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Purpose
The aim of this study was to elucidate the role of periostin, a matricellular protein, in mechanical strain-induced inflammatory signaling in the pathogenesis of abdominal aortic aneurysm (AAA).

Methods and Results
First, we observed significant increases in periostin expression in human AAA walls, associated with inflammatory cell infiltration and destruction of elastic fibers. We next examined whether mechanical stress upregulates periostin and activates inflammatory signaling responses in cultured vascular smooth muscle cells. As a result, 20% cyclic strain significantly increased periostin expression as well as monocyte chemoattractant protein-1 (MCP-1) and active form of matrix metalloproteinase (MMP)-2. Interestingly, this enhancement of MCP-1 and active MMP-2 was largely abolished by periostin neutralizing antibody. In addition, we also found that exogenous recombinant periostin caused increases in MCP-1 and active MMP-2 through the activation of inflammatory signaling molecules, such as focal adhesion kinase, extracellular signal-regulated kinase and c-Jun N-terminal kinase. Finally, peri-aortic application of recombinant periostin caused MCP-1 upregulation, and also facilitated cellular infiltration into the aortic walls in mice.

Conclusion
Our findings indicate that periostin has an important role in linking mechanical stress with inflammatory signaling in the pathogenesis of AAA.

Keywords: AAA, Periostin, Mechanical stress

Radiation Risk to a Vascular Surgeon During Endovascular Surgery Performed on a Mobile C-Arm

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Purpose
To identify radiation exposure dose of a vascular surgeon caused by fluoroscopy for C-arm assisted endovascular surgery and to estimate carcinogenic risk due to such exposure dose.

Methods
The study was conducted in 71 patients (53 men and 18 women) who had undergone endovascular or hybrid surgery at a tertiary hospital from November 2011 to April 2012. All procedures were performed in the operating room, using a mobile C-arm (OEC 9900 Elite, GE healthcare, UT, USA). The fluoroscopy time and radiation exposure dose of patient (dose-area product, DAP) was measured. Exposure dose during the procedure was measured by attaching optically stimulated luminescent dosimeters (OSL, InLight/OSL NanoDotTM dosimeters, Landauer, Glenwood, IL, USA) on the radiation protectors. The OSL was attached on each inner and outer side of lead goggle, thyroid protector, apron (breast level) and apron at the position of gonad. Effective dose (ED) was calculated in accordance to the equation that was proposed by Niklason. The lifetime attributable risk of cancer was estimated using ED and BEIR (Biological Effects of Ionizing Radiation Committee) VII report.

Results
Mean DAP value of patients was 30.9 Gycm2 (0.2 surgeon for 6 months was 3.85 mSv. Therefore, its annual exposure dose was estimated as 7.70 mSv. When assumed a vascular surgeon was continually exposed to radiation working from 18 years old to 65 years old, all cancer incidence of an operator is corresponding to 2,355 persons per 100,000 persons.

Conclusions
Although the ED of a vascular surgeon did not exceed the safety limits (20 mSv/y) recommended by International Commission on Radiological Protection (ICRP), the risk of cancer incidence can increase inevitably due to radiation exposure. Adequate use of radiation protectors and effort to reduce fluoroscopy time is necessary to prevent invisible danger during the procedure.

In addition, the scattered ray by distance and direction was measured as setting each point at a distance of 20 cm, 50 cm and 100 cm from focal point and in horizontal direction, 45˚ in the direction of image intensifier, and 45˚ in the direction of tube respectively.

From the measurement of scattered ray by distance and direction, it presented that 10 minutes cumulative dose of the point at
a distance of 20 cm in horizontal direction from the beam field was 0.162 mSv, 10 minutes cumulative dose of the point at a distance of 20 cm and 45° in the direction of tube was 0.698 mSv, while 10 minutes cumulative dose of the point at a distance of 20 cm and 45° in the direction of image intensifier was 0.073 mSv.

Keywords: Endovascular surgery, Radiation, Fluoroscopy

Disease Progression in Contralateral Carotid Artery after Carotid Endarterectomy

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Purpose
We've experienced some patients with progression of stenosis of contralateral carotid artery after carotid endarterectomy (CEA). The purpose of this study was to evaluate the progression of atherosclerotic lesions in contralateral carotid artery after CEA.

Method
From March 1996 to May 2012, 76 CEA procedures were performed in 71 patients at our hospital. Among them, 67 patients, who were followed-up with duplex scan after surgery, were the targets of this study. We classified the stenosis of internal carotid artery (ICA) into four categories; none (0-49%), moderate (50-69%), severe (70-99%), and occlusion using duplex scan. Progression of the lesion was defined as a deterioration of the stenosis into more severe category of stenosis. Multivariate analysis was used to detect the independent risk factor for the progression of the carotid lesions.

Results
Average age of the patients at CEA was $71 \pm 7.6$ (51 to 81) yrs. During the follow-up, progression of the contralateral carotid arteries was observed in 10 patients (14.9%). Their risk factors consisted of hypertension, smoking history, hyperlipidemia, diabetes, ischemic heart disease and peripheral arterial disease. However, multivariate analysis could not detect the independent risk factors for progression of contralateral carotid arterial stenosis.

Conclusion
After CEA, although all patients were receiving antiplatelet treatment, we identified an annual rate progression of contralateral carotid artery stenosis.

Keywords: Carotid endarterectomy, Contralateral carotid artery, Disease progression
Impact of Contralateral Carotid Occlusion in Patients Undergoing Carotid Endarterectomy or Carotid Artery Stenting

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Purpose
To determine impacts of contralateral carotid occlusion (CCO) or vertebral artery occlusion (VAO) in treatment of carotid artery stenosis.

Methods
A retrospective analysis was conducted using a database of 1153 patients (male 87%; mean age, 67.9 ± 7.8 (range 38-92) years; symptomatic, 42.2%) who underwent carotid endarterectomy (CEA, n = 698) or carotid artery stenting (CAS, n = 455) in a single institute. We reviewed patient demographics, preoperative symptomatic status, carotid images and early (<30 days) symptomatic neurologic complication (ESNC). Patients were classified into 3 groups according to the status of contralateral carotid or vertebral arteries: Group I (no CCO and VAO); Group II (presence of CCO with or without VAO); Group III (presence of VAO without CCO). All CEA was performed under the general anesthesia using routine carotid shunt and all CAS was performed using embolic protection device. The frequencies of ESNC were calculated after adjusting for age, sex and preoperative symptom status and compared them between groups using univariate (χ2 or Fisher's exact test) and multivariate analysis (binary logistic regression analysis).

Results
ESNC developed in 2.6% vs. 7.9% (p<0.001) following CEA vs. CAS. Frequencies of ESNC after CEA vs CAS were 1.8% vs. 7.7% (p<0.001) in group I, 6.8% vs. 8.0% (p=0.999) in group II, and 4.6% vs. 8.7% (p=0.341) in group III. On a multivariate analysis, group II showed statistically higher frequency (OR 5.817, 95% CI 1.439-25.513, p=0.013) of ESNC following CEA but not in CAS group.

Conclusion
Presence of CCO was an independent risk factor for ESNC in patients undergoing CEA.

Keywords: Carotid stenosis, Carotid endarterectomy, Carotid artery stenting

Comparative Results of Conventional and Eversion Carotid Endarterectomy

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Purpose
Comparative results of conventional carotid endarterectomy (cCEA) and eversion carotid endarterectomy (eCEA) have been reported in many studies. But in Korea, there was no report to compare the outcome of two techniques. So we investigated the results of the eCEA compared to cCEA in our hospital.

Methods
A total of 120 subjects were included in this study. Of them, cCEAs were performed in 63 patients and eCEAs were performed in 57 patients. We analyzed the results divided into the early (within 30 days after surgery), mid-term (from 30 days up to 1 year after surgery) and late (over 1 year after surgery).

Results
Mean age of the patients was 65.9 ± 7.1 in cCEA group and 66.8 ± 7.7 years in eCEA group (P=0.523). Carotid shunt frequency was higher in the cCEA group (39.7% versus 19.3%, P=0.015). There were no statistical differences in the early complications with the exception of a significantly higher risk for new brain lesions in the cCEA group (34.9% versus 14.0%, P=0.008). The frequency of complication was same between cCEA group and eCEA group in the mid-term. Although there was no statistical significance, the frequency of late complications was higher in the cCEA group compared to eCEA group. Mean follow-up duration was 29.4 ± 23.5 months.

Conclusion
These data showed that eCEA was acceptable procedure and had some advantage compared to eCEA in aspect of the early and late complication. But further large study and long-term follow-up is mandatory.

Keywords: Conventional carotid endarterectomy, Eversion carotid endarterectomy, Carotid stenosis
Management of Spontaneous Isolated Superior Mesenteric Artery Dissection

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Purpose
Spontaneous isolated superior mesenteric artery dissection (SISMAD) is a rare condition, and the cause is unclear. There is no consensus on the medical treatment strategy for this disease, but some treatment options have been reported currently, including conservative management and surgical repair. We present our experience in the treatment of SISMAD.

Method
Between April 1997 and January 2013, 8 patients underwent treatment for SISMAD in our hospital. There were 7 men and 1 woman with a median age of 64.5 years. Four patients presented with acute onset of persistent abdominal pain and 4 patients diagnosed incidentally during investigations of another illness. The diagnosis was established with computed tomographic (CT) angiography in all patients. On CT angiography, the false lumen of the SMA was patent in 2 patients, and thrombosed in 6 patients including 3 patients with ulcer-like projection (ULP). The dissecting aneurysm was detected in 2 patients. The true lumen was patent in all patients. Six patients received conservative management including anticoagulation therapy and 2 patients performed surgical therapy.

Results
The median follow-up period was 26.1 months. All patients remained asymptomatic after conservative management or surgical therapy. No patients had progression of the dissection on the follow-up CT angiography.

Conclusion
We obtained successful outcomes following SISMAD with conservative management or surgical therapy.

Keywords: Superior mesenteric artery dissection, Spontaneous, management

The Influence of Pedal Arch Patency on Arterial Flow Distribution in the Foot with CLI after Distal Bypass Surgery

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Purpose
In patients with critical limb ischemia (CLI), the target artery for the distal anastomosis in the foot is sometimes restricted and does not always perfuse the ischemic area directly because of the occlusion of pedal arch. The purpose of this study is to reveal the influence of pedal arch patency on arterial flow distribution in the foot with CLI after distal bypass surgery.

Method
We retrospectively compared skin perfusion pressure (SPP) before and after surgery. For the feet with distal anastomosis at anterior tibial or dorsalis pedis artery, SPP at planta of the foot was evaluated. For those at posterior tibial or plantar artery, SPP at dorsum was evaluated. We assigned the ischemic feet into 3 groups by the patency of pedal arch: good, poor, or absent. The improvement of the SPP after surgery was defined as that SPP exceeds 40mmHg, or increase with 15mmHg.

Results
Among patients undergone distal bypass surgery in our department from 2010 to 2012, SPP at the evaluating site in this study was obtained in 32 feet in 30 patients. After surgery, SPP was improved in 4 (80%) in good group, 9 (82%) in poor group, and 13 (81%) in absent group. One in poor group and one in absent group had to undergo major amputation due to uncontrollable infection.

Conclusion
Irrespective of the patency of the pedal arch, improvement of SPP and limb salvage could be obtained, as far as the distal bypass surgery could be performed to the artery in the foot with CLI.

Keywords: CLI, SPP, Distal bypass
Postoperative Delirium after Major Vascular Surgery: Prevalence and Risk Factors

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Purpose
Postoperative delirium (PD) has increased recently along with aging population. Vascular surgery has been reported to be associated with high incidence of PD. We evaluated the prevalence and the risk factors of PD after major vascular surgery.

Method
From Jan. 2009 to Dec., 2012, 217 patients who underwent major vascular surgery in DSMC were retrospectively analyzed. Prevalence, onset, duration, and risk factors of PD were analyzed.

Results
Mean age was 67.1 (SD±10.5) and male were 84.3%. PD was developed in 59 (27.2%) and mostly postoperative 1 to 2 day (1.58 ± 1.62). Mean duration of PD was 2.25 ± 1.42 days. The highest incidence (43.5%) of PD was found after surgery for critical limb ischemia (P=0.010). Logistic regression analysis identified the following risk factors: old age (OR; 1.139 95% CI; 1.061 to 1.224; P<0.001), low BMI (OR; 0.796, CI; 0.666 to 0.952; P=0.012), loss of hearing function (OR; 20.479; CI; 1.616-259.537; P=0.010), alcohol consumption (OR; 3.706; CI; 1.094-12.557; P=0.035), duration of ICU stay (OR; 2.043; CI; 1.156-3.611; P=0.014), reduced activity (OR; 4.078, CI; 1.121-14.843; P=0.033), albumin (OR; 0.020, CI; 0.001-0.392, P=0.010), cholesterol (OR; 0.973; CI; 0.954-0.993; P=0.007).

Conclusion
The prevalence of PD was high after major vascular surgery. Current study identified eight risk factors for PD. Patients having these risk factors need to monitor closely to prevent or mitigate PD after major vascular surgery.

Keywords: Postoperative, Delirium, Vascular, Surgery

Patterns and Distribution of Isolated Calf Deep Vein Thrombosis

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Purpose
As the public and medical concern for the risk associated with deep vein thrombosis (DVT) has increased, the number of examinations with duplex scanning for seeking DVT has soared dramatically in the current clinical practice. The purpose of this study was to determine the patterns and distribution of isolated calf DVT.

Method
From January 2007 to December 2011, 647 limbs of 506 patients (165 men and 341 women with a mean age of 72 years) were diagnosed as having isolated calf DVT by means of duplex scanning. Of the deep veins in the calf, the peroneal, the posterior tibial, the gastrocnemial, and the soleal veins were routinely examined.

Results
No significant difference was noted for the limb preference (334 left vs 313 right). The soleal veins were most frequently involved, with 555 limbs (86%) affected. The peroneal veins were involved in 133 limbs (21%), followed by the posterior tibial in 87 limbs (13%) and the gastrocnemial in 52 limbs (8%). Thrombus confined to a single vein was found in 510 limbs (79%). Thrombus involving two different veins (15%) was the second most frequent pattern, and thrombus in three (5%) or four (1%) different veins was less prevalent.

Conclusion
Our data revealed that the majority of calf vein thrombi were located in the soleal veins and tended to be confined to a single venous segment. Therefore, much attention should be paid to the soleal area when screening calf DVT.

Keywords: Thrombus distribution, Soleal veins, Calf vein thrombus
The Clinical Outcomes of Endovenous Radiofrequency Ablation of Varicose Veins: Results from the Korean RFA Registry

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Purpose
Radiofrequency ablation (RFA) is commonly used modality for the treatment of varicose veins. A multinational, multicenter “Closure Study Group” reported the excellent outcomes after RFA. Until now, however, there was no registry of RFA using ClosureFast catheter. The Korean RFA Registry is the first study group to evaluate the result of RFA using ClosureFast catheter. The purpose of our study is to report the result of The Korean RFA Registry.

Method
We retrospectively collected data of the patients demographics, risk factors, and clinical outcome after RFA from March 2009 to March 2013. We investigated CEAP score, venous clinical severity score (VCSS), and quality of life (QoL)score. The paired t-test and bivariate correlation analysis using SPSS Ver. 19.0 (Armonk, NY) were used for statistical analysis.

Results
RFA was done in total 607 limbs in 453 patients. The treated truncal veins were 660 veins. The female patients were 60.4%. The mean age was 52.3 ± 11.6 years (range 19-84). Clinical outcomes of clinical class, VCSS, QoL score were improved significantly, 2.33 ± 0.78 to 1.29 ± 0.96, 3.48 ± 0.98 to 0.63 ± 1.16, 6.91 ± 6.69 to 3.38 ± 4.74, respectively. Occlusion rate after 2 years was 94.5%.

Conclusion
RFA showed the good clinical outcomes in terms of clinical class, VCSS, and QoL score. There was no correlation between the diameter of saphenous vein and the occlusion length.

Keywords: Varicose vein, Radiofrequency ablation, Outcomes

Anatomical Characteristics of an Infra-renal Abdominal Aortic Aneurysm: Can an Aneurysm That Is Prone to Enlargement after Endovascular Aneurysmal Repair Be Predicted?

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Purpose
Late AAA rupture and continued AAA sac expansion after EVAR are the significant risk factors after EVAR and the major limiting factors in the long-term result of EVAR. This study was conducted to identify the anatomical characteristics of an infra-renal abdominal aortic aneurysm (AAA) that may cause a poor result of endovascular aneurysmal repair.

Method
We retrospectively analyzed the baseline anatomical parameters of an infra-renal AAA, which were obtained during pre-EVAR evaluation. By comparing such anatomical parameters of patients who showed various EVAR results, an attempt was made to identify the morphological determinants of an infra-renal AAA, which could result in aneurysmal sac expansion after EVAR. A retrospective review of 60 AAA patients who have follow up more than a year, was performed.

Results
The proximal neck length was significantly shorter in patients with AAA sac expansion after EVAR. Longitudinal aneurysmal length, maximal aneurysmal diameter and cross-sectional area were significantly larger in patients with AAA sac expansion after EVAR than the other patients.

Conclusion
An AAA with a shorter proximal aortic neck and a larger lumen diameter/area could result in AAA sac expansion after EVAR.

Keywords: Abdominal aortic aneurysm, Aneurysm shrinkage, Aneurysm expansion abdominal aortic aneurysm, Aneurysm shrinkage, Aneurysm expansion
Endoleak after Endovascular Repair of Abdominal Aortic Aneurysm

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Purpose
The criteria for endovascular repair (EVAR) of abdominal aortic aneurysm (AAA) at our hospital requires that patients are within close range of the instruction for use of EVAR, as well as either more than seventy years old or at high-risk. Patients who do not meet these criteria undergo open repair.

Method
After EVAR was introduced to our hospital in October 2009, the surgical treatment of AAA was divided into cases for EVAR and cases for open repair.

Results
Between October 2009 to December 2011, 34 patients with AAA underwent EVAR, while 23 patients underwent open repair. The average patient age in the EVAR group and open repair group was 79.1 (ranging from 64 ranging from 56 significant differences in the patient backgrounds of each group other than age and gender. Compared with open repair, EVAR resulted with shorter operation and hospitalization times. Although there were 11 cases of minor residual endoleak from the surgery, there was not remarkable postoperative increase in diameter. However, there were 6 cases of endoleak occurring for the first time in the postoperative stage. Three of these cases show an increase in diameter, while the other three cases show no remarkable change.

Conclusion
While the preliminary results of EVAR proved favorable, increased diameters resulting from postoperative endoleak requires additional treatment and careful follow up.

Keywords: EVAR, AAA, Endoleak

Comparison of the Property of Type II Endoleak between the Zenith and the Excluder and Its Effect on the Changes of Aneurysmal Diameter

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Purpose
We examined the difference of incidence of type II endoleak between the Zenith and the Excluder. We compared the anatomical pattern of sources of blood flow and the changes of aneurysmal diameter.

Method
We performed this study on 121 (Zenith/Excluder, 70/51) patients who underwent a contrast enhanced CT one year after EVAR. We examined the incidence of type II endoleak, the sources of blood flow, the number of source vessels, and measured the maximum diameter. We measured the number of all source vessels contributing to type II endoleak.

Results
The incidence of type II endoleak was 31.4% for the Zenith and 54.9% for the Excluder (P<0.05). The rate of the source vessels was 8/97 (8.2%) at L3, and 15/93 (16.1%) at L4 in the Zenith, and in the Excluder 17/71 (23.9%) at L3, and 27/67 (40.3%) at L4. There was a significant difference between the Zenith and the Excluder (P=0.05) in terms of L3 and L4. There was also a significant difference between L3 and L4 in the Excluder (P=0.05).

The rate of patients with shrinking greater than 10mm using the Zenith with no endoleak was 48%. The rate of patients with shrinking greater than 10mm using the Zenith with type II endoleak was down to 18%. The rate of patients with shrinking greater than 10mm using the Excluder without endoleak was 35%, which was a slightly less than that for the Zenith.

Conclusion
The present study demonstrated the difference between the Zenith and the Excluder influenced the pattern of type II endoleak.

Keywords: AAA type II endoleak
Relationship between TypeII Endoleak and Anti-platelet Therapy after EVAR

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Purpose
Patients with abdominal aortic aneurysm are said to have concomitant ATIS and these patients need to continue to take anti-platelet drugs even after EVAR. However, there are few studies on the relationship between persistent endoleak and anti-platelet therapy after EVAR. This study investigated the relationship between the frequency of type II endoleak after EVAR and anti-platelet therapy retrospectively.

Method
We enrolled consecutive 34 patients who underwent EVAR in our hospital and divided them into two groups by the presence of anti-platelet therapy. Then, we evaluated the presence of endoleak and the change of aneurysm size by contrast CT during follow up periods.

Results
The mean age of patients was 75.7 years. 10 patients were on anti-platelet therapy due to ATIS after EVAR. Among the 34 patients enrolled in this study, 6 patients revealed typeII endoleak and all of them belonged to the anti-platelet therapy group. These cases showed significantly lesser shrinkage of aneurysmal diameter after EVAR. After 2 years after EVAR, the frequency of persistent type II endoleak in the anti-platelet therapy group was significantly higher than that in the non-anti-platelet therapy group (p<0.01, OR 33.2).

Conclusion
The patients with anti-platelet therapy after EVAR should be monitored carefully about persistent typeII endoleak.

Keywords: EVAR, TypeII endoleak, Antiplatelet therapy

Usefulness of Abdominal Echo Examination for Detection of Endoleaks after EVAR

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Purpose
Contrast-enhanced CT (CECT) is the gold standard for detecting endoleaks after endovascular aortic repair (EVAR). However, CECT is not safe for patients with renal dysfunction or allergies to contrast media. The purpose of this study was to evaluate the usefulness of follow-up abdominal echo examination after EVAR.

Method
From September 2007 to July 2012, 90 patients underwent both abdominal echo examination and CECT after EVAR. We measured the flow velocity (cm/s) and the width (mm) of the endoleak by abdominal echo examination. Results: Endoleaks were detected in 26 of the 90 patients (29%), of whom 22 (24%) had type II endoleaks. Four of the patients with type II endoleaks had aneurysmal dilation (>5 mm), which was detected on both CECT and abdominal echo examination. In the 18 patients with type II endoleaks but no aneurysmal dilation, the endoleaks were detected by CECT in 83% of cases and by abdominal echo examination in 78% of cases. There was a significant difference in flow velocity between cases with dilation and those without dilation (46.4 ± 31.0 vs 21.9 ± 6.1 cm/s, p<0.05). The width of the endoleak was also larger in cases with dilation than those without dilation (4.2 ± 1.2 vs 2.7 ± 0.5 mm, p<0.05).

Conclusion
In conclusion, abdominal echo examination was as useful as CECT for detecting endoleaks. The flow velocity and width of the endoleak may be predictive factors for aneurysmal dilation in patients with type II endoleaks.

Keywords: EVAR, Echo, Endoleak

Reversing a Zenith Stent Graft Extension Limb for Iliac Aneurysm Repair

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Background
Endovascular aneurysm repair (EVAR) has been established as one of treatments for abdominal aortic aneurysm (AAA). And its indication is expanding to iliac artery aneurysm (IAA). However, current commercially available stent grafts are designed for AAA, not for IAA. Therefore, they can be applied for IAA in limited cases. To overcome this limitation, extracorporeal stent graft reversal technique was reported. We introduce our experience and technical tips of reversing a Zenith stent graft extension limb.

Case
An 82-year-old male patient was transferred to our depart-
ment after incidental diagnosis of bilateral internal iliac artery (IIA) aneurysm. Since the right IIA aneurysm size was over indication of repair, we decided to repair it. Because of his peri-operative risk, we approached by endovascular way. Simple coil embolization would not work, because there was a big neck in the right IIA. Additive covering of orifice was necessary with another stent-graft. Because there was ectatic change of common iliac artery (CIA), regular device would not work. So custom made design was necessary. Another solution for this was surgeon custom made reversal reloading of stent graft.

Keywords: Aneurysm, Stent graft, Endovascular aneurysm repair

07

Graft Infection after Endovascular Abdominal Aortic Aneurysm Repair (EVAR)

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Objective
To report our experiences of in-situ repair for graft infection after EVAR.

Background
5 patients who have been treated their graft infection after EVAR by one surgeon between May 2005 and May 2011 at Asan Medical Center, Seoul, Korea.

Methods
Diagnosis was based on preoperative abdominopelvic CT scans and operative findings, and confirmed by tissue and/or blood culture of the infected organism. Operative principle constituted with complete removal of the infected tissue and/or material followed by in-situ repair of the aorta including omental transposition. Sensitive antibiotic therapy was conducted in every patient perioperatively. We retrospectively analyzed patients’ records, CT scans, results of tissue or blood culture, and clinical outcome.

Results
There were 5 male patients with median age of 65.6 years old. There were 5 infected stent grafts (STG) including one stent graft complicated with aortoduodenal fistula. As for aortic reconstruction, we performed in-situ graft (3 PTFE and 2 Dacron) interposition. The median follow-up period was 21 (range, 1-61) months. In the present series, we observed no cases of residual infection. And there were one operative death.

Conclusion
In-situ bypass for graft infection after EVAR would be a safe procedure. When the treatment is based on the principles which comprise complete removal of infected tissue, use of long-term sensitive antibiotics and omental wrapping of the graft following in situ bypass.

Keywords: In-situ bypass, Aorta, Stent graft

08

Usefulness of Rectal Electrodes in Motor-evoked Potential (MEP) Monitoring During Aortic Surgery

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Purpose
Myogenic MEP monitoring by transcranial stimulation, which has widely been used to detect spinal cord ischemia during aortic surgery, is vulnerable to leg ischemia. This study aimed to evaluate the efficacy of rectal electrodes to exclude the effects of leg ischemia.

Method
Twenty four patients (mean age 65 years old, 22 men) underwent descending (n=8) or thoracoabdominal (n=16) aortic replacement under MEP monitoring since 2010. Aneurysm pathology included 12 dissections, 10 degenerative and 2 infected aneurysms.

Results
There was no hospital death. One patient with infected thoracoabdominal aortic aneurysm developed paraplegia. Sixteen cases showed decrease (<50% of baseline) in lower limb amplitude. Six of them were considered due to leg ischemia because of the lack of corresponding change in rectal amplitude. In these six patients, change in lower limb amplitude was gradual and it took 28 to 85 minutes to decrease and 3 to 42 minutes to recover. In the remaining 10 patients, both rectal and lower limb amplitude decreased simultaneously. In six of them changes were considered resulting from spinal cord ischemia, because they occurred immediately after responsive surgical procedures (ex. blood steal on opening the aneurysms). In the remaining four patients, changes seem due to technical problems including anesthetic depth control.

Conclusion
Addition of rectal electrodes is useful in MEP monitoring because it was not influenced by leg ischemia.

Keywords: Motor-evoked potential, Thoracoabdominal aortic aneurysm, Rectal electrodes
Is the Abdominal Aortic Aneurysm Uncommon in Asian Population?

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Purpose
The prevalence of abdominal aortic aneurysm (AAA) is 4-8% of older men and 0.5-1.5% of older women in Western countries. Screening ultrasonography can decrease the aneurysm-related mortality. The purpose of this study is to report the results of screening for the AAA in Korea.

Method
The abdominal aorta was scanned in the anterioposterior (AP) and lateral planes using 2.5 to 5 MHz convex probe. AAA was defined if the mean diameter of AP and lateral aortic diameters was more than 3 cm. For statistical analysis, Student t-test and ANOVA were used to evaluate the difference of diameter between men versus women and the difference of diameter with age, respectively. Logistic regression analysis was used for the evaluation of risk ratio.

Results
A total of 3,030 people were screened in this study. Diagnoses of AAA were made in 22 (0.7%) patients during the study period. All male patients who had AAA were smokers. Among the male population of high risk, the prevalence of AAA was 3.7%. The diameter of the infrarenal aorta was increased with age: 1.75 cm in 50s, 1.8 cm in 60s, 1.94 cm in 70s and 80s. The male gender, increased age, smoking, and alcohol use were significant risk factor for AAA with univariate analysis. With multivariate analysis, smoking (P < 0.0001, Odd ratio 7.4, 95% CI 2.6-21.5) was significant risk factor for AAA.

Conclusion
AAA is not uncommon in Asian population and smoking is the most significant risk factor for development of AAA.

Keywords: Aneurysm, Abdominal aorta, Screening, Ultrasonography

Persistent Sciatic Arteries Accompany Anatomic Variations of Lower Extremity Venous System

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Purpose
A persistent sciatic artery (PSA) is a rare anomaly. According to case reports, its coexistence with a persistent sciatic vein (PSV) is extremely rare and only 5 cases have been reported. In 2002, Parry reported that the sciatic artery and vein were paired in utero, and that their synchronous persistence was extremely rare. We investigated the anatomic variations of lower extremity venous system accompanied with PSA.

Method
Ichushi web (presented by Japan Medical Abstract Society) was searched for PSA from January 2003 to September 2011. We requested the authors to furnish the radiographic images. These data were examined.

Results
Sixty-three cases were extracted in Ichushi web and of 37 cases with PSA were obtained. Four cases of PSA in our institute were added. The total of 41 cases (49 limbs) were included. PSV was classified into three types, complete PSV, upper PSV and lower PSV. In this series, complete PSV was found in 7 limbs and inferior PSV was found in 34 limbs. Although popliteal vein usually runs dorsally and popliteal artery runs ventrally, reversed arrangement of popliteal artery and vein were found in 27 limbs.

Conclusion
In this series, 41 limbs (83%) with coexistence of PSV have been found. This percentage of coexistence was much higher than the percentage before mentioned. Reversed arrangement of popliteal artery and vein were found in 27 limbs (55%). This was a distinctive anatomic variation of PSA.

Keyword: Persistent sciatic artery

Huge Superior Mesenteric Artery Aneurysm: Mimicking Abdominal Aortic Aneurysm Presented with Pulsating Mass: A Case Report

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62-year-old male presented with one year history of periumbilical pulsating mass, who had smoking history of 30 Pack year. He had medical history of hypertension 2 years ago. Physical examination revealed huge pulsating mass on periumbilical abdomen. Femoral and popliteal arterial pulse was palpable. The laboratory values were normal. Computerized tomography showed arterial dissection in proximal segment of superior mesenteric artery, one huge aneurysm with mural thrombus, two small aneurysms in right ileocolic and ileal branches. On operation, one 52 x 50 and two 20 x 20 mm-sized saccular true aneurysms containing mural thrombosis along superior mesenteric
artery with proximal dissection and atherosclerotic change. Interposition by using great saphenous vein was performed after aneurysmal isolation and ligation of jejuna branches in sac. Distal flow could be reestablished by using end-to-end and end to side anastomosis in right ileocolic branch and ileal branch, respectively. The patency was identified in CT angiography. No complication was observed at 1 year follow-up.

Keywords: Superior mesenteric artery, Aneurysm

Experiences of Treatment in Nutcracker Syndrome

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Introduction
Nutcracker syndrome (NCS), caused by compression of the left renal vein (LRV) between the superior mesenteric artery and the aorta, results in left renal and gonadal venous hypertension. Several treatment options have been described to relieve associated symptoms. The purpose of this study was to evaluate late results of LRV transposition and conservative treatment in our hospital.

Methods
Clinical data from 3 consecutive patients diagnosed and treated with NCS. NCS was diagnosed by CT scan, cystoscopy and left renal venogram.

Results
There were 3 males (Mean ages: 20.7 range: 16-24) with diagnosed nutcracker syndrome. Three patients had gross hematuria without anemia. On venography, the mean renovascular pressure gradient was 7.3 cm H2O (range, 3-15 cm H2O). Two patients underwent LRV transposition through a transperitoneal exposure. There were no early postoperative complications. The hematuria and other symptoms disappeared postoperatively for the mean follow-up (42 months). The conservatively managed patient remained improved at CT scan over follow-up period of 24 months.

Conclusion
NCS should be considered in the differential diagnosis of hematuria. Evaluation of the clinical significance of hematuria with LRV compression remains challenging, as does selection of patients for intervention. LRV transposition is a safe, effective procedure in selected patients with persistent, severe symptoms. Conservative treatment is also considered in patients with mild symptoms.

Keywords: Nutcracker syndrome, Left renal vein

Poster Presentation - II

01

Longitudinal Incision of the Dilated Ascending Aorta for Aortic Valve Replacement

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Purpose
Dilated ascending aorta has been considered to be a factor for late adverse aortic event after aortic valve replacement (AVR). Currently, concomitant replacement for the dilated aorta is recommended, especially in Marfan and bicuspid disease. However, there is insufficient evidence. Our current strategy consists of AVR and aortorrhaphy via a longitudinal aortic incision.

Method
Consecutive 20 AVRs via a longitudinal incision from October 2009 to January 2013 were analyzed. Approximately 50mm length longitudinal aortic incision to 15mm distal to the right coronary ostium was placed and extended to the distal to left-non commissure. At the closure, the aortic wall was resected about 10mm in width and sutured continuously with long felt strip.

Results
Among 20 patients (10 male, mean age was 71.2 ± 5.7 years), calculated Japan SCORE mortality and Euro SCORE II was 4.95 ± 6.8 and 3.3 ± 5.6, respectively. There were no in-hospital mortality and morbidity. There was significant reduction of the aortic diameter (postoperative; 45.6 ± 1.8, at discharge; 40.8 ± 3.2. \(P<0.01\)). During follow-up (median 508 days, range 10 to 1184 day), no adverse aortic events including aortic enlargement was disclosed.

Conclusion
Our experience might imply following merits; fine view of the valve, easiness in hemostasis, and the closure resulted in aortorrhaphy. The short term follow-up data showed no adverse aortic events including enlargement.

Keywords: AVR, Dilated ascending aorta, Longitudinal incision
Zone 0 TEVAR with Chimney Graft Technique

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**Purpose**
To extend the application of TEVAR to the arch aneurysm, debranching with Chimney graft technique (CGT) was adopted. Zone 0 TEVAR was indicated whenever the aneurysm was located less than 2 cm distal to the brachiocephalic artery. We reviewed our experiences in six patients.

**Method**
Aneurysms were fusiform in 1 case, and saccular in 5 cases. The combination of Gore TAG and the leg of the Excluder were used in all cases. For the reconstruction of the left common carotid artery (LCCA), carotid-carotid bypass was performed in five cases, and double chimney graft method in another case. The embolization of the gutter between the main and chimney graft was performed via the exposed LCCA in three cases. Selective cerebral perfusion was adopted for the embolic protection for the brain in 5 cases with aortic wall thrombus located close to the neck vessels.

**Results**
Retroperitoneal hemorrhage resulted in the only operative death. Flow through the gutter was a relatively common phenomenon but it leaded to the endoleak in one case of fusiform aneurysm arising from the origin of the brachiocephalic artery. Shrinkage of the aneurysm was recognized in 1 case.

**Conclusion**
The distance between the brachiocephalic artery and aneurysm seems to be an important factor to avoid endoleak through the gutter. Cerebral complication was avoided. TEVAR with CGT for saccular arch aneurysms seems to be promising, while the role of this procedure for fusiform aneurysm is yet to be determined.

Keywords: TEVAR, Arch aortic aneurysm, Chimney graft technique

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Tips and Trouble Shooting in TEVAR

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We performed 43 TEVAR cases between 2010 and 2012. Intraoperative complications were observed in 3 patients (7.0%). Bilateral carotid artery occlusion occurred in one patient due to type A aortic dissection. The stent was placed urgently over both the left common carotid artery and the left internal carotid artery. After left to right carotid-carotid bypass grafting, total arch replacement was performed and the patient survived. Second patient had pull-out injury of the external iliac artery (EIA). Stent grafts were placed in the common iliac artery (CIA) and EIA. Replacing the common femoral artery controlled the bleeding. Third patient had disruption in the anastomosis of the left subclavian artery debranching bypass graft. Vertebral artery was exposed and ligated directly to stop the bleeding. In order to resolve TEVAR related complications, TEVAR procedure should be able to switch to an open surgery, surgeons should be familiar with anatomy of the carotid arteries and be always ready to treat ruptured abdominal aorta.

Keywords: TEVAR complication Tips

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Reconstruction Using Retrograde Cerebral Perfusion with Deep Hypothermic Circulatory Arrest for Extended Large Right Carotid Aneurysm Due to Behcets Disease

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**Purpose**
Extracranial carotid aneurysms due to Behcet’s disease are extremely rare and often difficult to treat. We describe the successful surgical repair of this vascular anomaly using retrograde cerebral perfusion with deep hypothermic circulatory arrest.

**Case Presentation**
A 58-year-old man was referred with rapidly expanding pulsatile mass in the right side of his neck and hoarseness. Computed tomography revealed a 56mm aneurysm containing a
thrombus in the carotid artery. Digital subtraction angiography showed that the aneurysm originated from bifurcation of the common carotid artery and extended to the just bifurcation of internal and external carotid arteries. Preoperative MRA and brain scintigraphy suggested that anatomically and functionally incomplete circle of Wills, it’s means decreased reservation ability of brain circulation. Therefore, we decided to surgical intervention by autogenous superficial femoral vein graft using retrograde cerebral perfusion with deep hypothermic circulatory arrest. Retrograde cerebral perfusion time was 25 minutes and cerebral oxygen saturation decreased 16% during procedure. The postoperative course was uneventful. Postoperative CT revealed no abnormalities and he was discharged 30 days after this procedure.

Conclusion
We considered that retrograde cerebral perfusion is useful management when simple clamp or direct shunt could not be perform because of aneurysm location and patient’s brain circulation.

Keywords: Carotid aneurysm, Behcet’s disease, Retrograde cerebral perfusion

Acute Upper Extremity Thromboembolism Due to Occluded Axillary Graft Stump

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Upper extremity embolic complications of occluded axillofemoral bypass graft (AxFG) or occluded axillo-axillary bypass graft (AxAG) are infrequent. We report two surgical cases of these rare complications. The first patient, a 65-year old male, presented with acute right upper extremity thromboembolism 3 years after an AxFG occlusion. Thrombectomy was performed, but the decreased radial artery pulse remained. Multi detector-row computed tomography (MDCT) revealed the Y elongation and occlusion of the axillary artery at the anastomosis. So, we resected the occluded axillary artery, and reconstructed it by end-to-end anastomosis. The second patient, a 63-year old male, presented with acute left upper extremity thromboembolism 2 years after an AxAG occlusion. Thrombectomy was performed, but 4 years later, he was suffered from acute left upper extremity thromboembolism again. MDCT detected a thrombus occupying from the occluded graft to the axillary artery. So, we detached the previous graft, removed the thrombus and repaired the axillary artery by saphenous vein patch. Reviewing the literature, upper extremity thromboembolism after an AxFG occlusion has been reported as axillofemoral bypass graft stomp syndrome (AxSS). We think that similar complication could happen after an AxAG occlusion. Anticoagulation therapy, surgical repair, and endovascular repair has been reported to treat AxSS, but we conclude that surgical repair is the most effective treatment.

Keywords: Acute upper extremity thromboembolism, Axillofemoral bypass graft, Axillo-axillary bypass graft

Comparison of Follow-Up Results of Above-the-knee Femoro-Popliteal Bypass Graftings: Reversed Saphenous Vein Grafts vs. Polytetrafluoroethylene Grafts
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Purpose
To compare results of bypass surgery between autogenous reversed saphenous vein grafts (RSVGs) and polytetrafluoroethylene (PTFE) grafts after above-the-knee femoro-popliteal bypass (ATKFPB) graftings.

Methods
ATKFPBs on 233 limbs (101 RSVGs vs. 132 PTFE grafts; critical limb ischemia: 32%) in 203 patients with chronic atherosclerotic occlusive disease were retrospectively analyzed. After comparison of the demographic, clinical and distal runoff status between 2 groups of patients, we compared primary, assisted primary, secondary patency rates of the grafts and clinical outcomes of the occluded grafts. Graft surveillance was performed using periodic examinations of duplex ultrasonography. Graft patency was calculated using Kaplan Meier method and compared using log rank tests.

Results
Preoperative demographic characteristics, clinical features, and distal runoff scores were similar between 2 groups. During the follow-up period of mean 39 ± 31 months (range, 1-109 months), 8 vein graft revisions (3 surgical repairs, 5 endovascular repairs) were performed due to failing graft. Though the primary patency rates were not statistically different between RSVGs and PTFE grafts (72% vs 55%, P=0.466) at 8 years after bypass surgery, assisted primary (86% vs. 61%, P=0.009) and secondary patency rate (90% vs. 63%, P=0.019) were significantly higher in RSVGs compared to PTFE grafts at 8 years of follow up. When graft occlusion occurred, acute limb ischemia
was more likely to occur in the PTFE group than in the RSVG group (0% vs. 54%, $P=0.043$).

**Conclusions**

As a conduit for ATKFPB, RSVGs showed significantly better treatment results on follow-up examinations compared to PTFE grafts.

**Keywords:** Graft patency, Leg bypass, Arterial occlusive disease

**The Outcomes of Thromboendarterectomy Atherosclerotic Lesion at the Common Femoral Artery**

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**Purpose**

Endovascular treatment (EVT) is the preferred choice of treatment for peripheral arterial disease. However, the treatment for common femoral arterial (CFA) lesions are not suitable for EVT, due to severe calcification and anatomical location. Therefore, thromboendarterectomy (TEA) is suitable for CFA lesions.

**Method**

From March 2004 to December 2011, we treated with 44 lesions in 40 patients by TEA. We include simultaneous EVT cases and exclude simultaneous bypass procedure cases. In 44 limbs of 44 lesions, 31 limbs are classified into Rutherford Category 1 into Category 5 and 2 limbs into Category 6.

**Results**

We treated 29 male and 11 female patients, and the mean age was 70.7 years old. Preoperative ankle brachial pressure index (ABI) was $0.57 \pm 0.19$, and postoperative ABI was $0.90 \pm 0.33$. The primary and assisted primary patency rate were 72.2%, 100% in 5 years. Redo procedures needed in 9 limbs. EVT after TEA performed in 4 limbs, for other atherosclerotic lesion in 1 limb, and adjunctive bypass procedures in 4 limbs. The limb salvage rate and survival rate were 88% and 64.4% in 5 years; however the limb salvage rate of Rutherford Category 4, 5 and 6 was 78.6% in 1 year, 47.1% in 2 years.

**Conclusion**

TEA is effective and feasible treatment for atherosclerotic lesion at the CFA. In the critical limb ischemia, categorized to Rutherford Category 4, 5 and 6, additional treatment such as EVT might lead to the improvement of surgical outcomes.

**Keywords:** PAD, CFA, TEA

**Comparison of Results of Open versus Endovascular Revascularizations of Infra-popliteal Artery Occlusive Disease**

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**Purpose**

To compare results of the surgical bypass and endovascular treatment of the atherosclerotic infrapopliteal occlusive disease.

**Method**

We retrospectively reviewed a database of patients who underwent infrapopliteal bypass using vein graft or endovascular treatment. After comparison of demographic, clinical features, comorbidities and concomitant arterial procedures, we compared operative mortality, patency rates of the treated artery or grafts and limb salvage rate in CLI group between the bypass group and endovascular group.

**Results**

Three hundreds and five limbs in 280 patients were included for this retrospective study. In bypass group ($n=124$ limbs in 113 patients), distal anastomosis distributed at 63 posterior tibial, 23 peroneal, 18 pedal, 16 anterior tibial arteries and 4 tibioperoneal trunk. Endovascular treatment ($n=181$ limbs; 269 arteries in 167 patients) were 164 PTAs, 102 subintimal angioplasty and 3 stenting at 183 multiple and 86 single arteries (35 anterior tibial, 24 posterior tibial, 15 peroneal and 12 tibioperoneal trunk). CLI comprised of 66% in bypass group and 73% in endovascular group ($p=0.276$). Diabetes mellitus were more common in endovascular group 56% vs 79% ($p<0.001$). In treatment results, there was no significant difference in operative mortality rate (bypass 1.8% vs endovascular 0.6%). Major postoperative complications developed more common after bypass surgery (5.3% vs 0%, $p=0.01$). During 34.7 months (mean, 1-112) of postoperative follow-up, 222 limbs (77% of bypass group vs 70% of endovascular group) were available to follow up. At 5 years after treatment, we found that higher assisted primary (57.9% vs 25.2%) and secondary patencies (74.7% vs. 25.1%) in bypass group and limb salvage rate in CLI groups ($n=209$ limbs) showed significantly higher in bypass group (90.2% vs 70.7%, $p=0.011$) at 5 years.

**Conclusion**

Though endovascular treatment was performed more frequently for patients with infrapopliteal occlusive disease, bypass with vein graft showed better results than endovascular treatment.

**Keywords:** Leg bypass, Endovascular Revascularizations, Artery occlusive disease
Roundabout Crossover Bypass Passing Through Ungraftable Inguinal Area Is Useful as an Inflow Source of the Distal Bypass: Report of Two Patients with Buerger’s Disease

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Buerger’s disease sometime involves extensive area of arteries by spread of the thromboangitis. We experienced two cases of CLI with extensive occlusion from iliac to infrapopliteal arteries, which necessitated crural bypass regardless the devastating inflow arterial system.

Case 1
32 year old man with bilateral cyanotic feet. CT angiography revealed extensive arterial occlusion from infrarenal aorta to infrapopliteal arteries. We performed aorto-left DFA bypass passing though right inguinal area by use of Dacron graft, concomitant with distal bypass to right ATA bypass using autogenous vein graft. The vein graft took off from roundabout Dacron graft. Severe rest pain had disappeared immediate after operation, and his both foot were salvaged.

Case 2
53 year old man with bilateral cyanotic toes and necrotic left toe. There was no graftable artery on his left leg except distal PTA. We performed extra-anatomic bypass from left axillary artery to right DFA using ePTFE graft which was running through left inguinal area without anastomosis to left femoral artery. Simultaneously, distal bypass from the ePTFE graft to left PTA was performed. Blood supply of both foot were markedly improved postoperatively, and he is now waiting for ulcer healing.

Conclusions
The roundabout crossover bypass concomitant with crural bypass is one of useful option revascularizing ischemic limb with extensive arterial occlusion including inguinal, femoral, and popliteal regions.

Keywords: TAO, CLI, Extensive occlusion

Femoro-anterior Tibial Bypass (extra-anatomical route) for the Recurrent Prosthetic Infection of a Femoro-popliteal Bypass

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In a man of 70s, who had previously undergone bilateral femoro-popliteal bypass surgery (above the knee) in an another hospital, prosthetic graft removal followed by FP (AK) bypass surgery was performed for prosthetic vascular infection in March 2008. The cause of infection was diagnosed as pyogenic spondylitis. In April 2010, the patient suffered from local redness and pain at the mid-part of the right upper leg. Antibiotic therapy and local external cooling were temporarily effective, but the symptoms relapsed after the discontinuation of treatment. Therefore, graft extraction was performed in July 2010 for treatment of the graft infection. Because of the progression of the limb ischaemic symptoms, the patient underwent right femoro-anterior tibial bypass with an extra-anatomic route from outside the upper leg to anterior and below the knee on the second postoperative day.

In October 2010, an anastomotic aneurysm was detected. Because it was suspected to be an infectious aneurysm, it was removed and arterial reconstruction was successfully performed employing a right ilio-graft bypass with a new prosthetic graft. Two years have passed since the last surgery and the patient is doing well, with favourable graft patency and no sign of relapse of infection. The antibiotic therapy has been continued for the treatment of the pyogenic spondylitis. In conclusion, this procedure is effective for the treatment of prosthetic graft infection after femoro-popliteal bypass surgery.

Keywords: Recurrent prosthetic infection, Extra-anatomical route, Femoro-anterior tibial bypass

Limb Salvage Achieved by Free Tissue Transfer and Revascularization for Critical Limb Ischemia

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Objectives
The purpose of the treatment for critical limb ischemia (CLI) is to avoid major amputation. This study was to evaluate our experience of the management for CLI with free tissue transfer and revascularization.

Patients and Methods
From January 2010 to December 2012, 7 lower extremities in 7 patients who were treated by revascularization and free tissue transfer for CLI with tissue loss. On the same period, we treated 27 limbs in 20 patients with tissue loss by revascularization without free tissue transfer. In the free tissue transfer treatment group, all 7 patients had tissue loss with Rutherford class 5 and
6. Six patients underwent bypass surgery, and 1 patient underwent percutaneous transluminal angioplasty for revascularization. All patients also underwent free flap transfer using latissimus dorsi muscle simultaneously and separately in 3 and 4 patients, respectively.

Results
Five of 7 patients had flap patency and flap survival without any complications. One patient gained flap survival and limb salvage, even though, flap graft was occluded, resulting in flap survival. One patient had partial flap necrosis requiring skin graft, who acquired limb salvage. The flap survival rate was 85%, and limb salvage rate was 100%.

Conclusions
Free tissue transfer with revascularization for CLI achieves successful wound healing and limb salvage. For vascular supply to free flap, it is useful not only bypass surgery and endovascular treatment.

Keywords: CLI, Free tissue transfer, Bypass surgery

Pursuit of the Effective Vascularization Therapy: Importance of Choosing an Appropriate Intramuscular Injection Part

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Introduction
The basic concept in most therapeutic strategies for chronic arterial occlusive diseases is local delivery of bioactive factors or cells. Previous animal model studies of chronic ischemia that tested delivery of these materials reported favorable therapeutic effects in some growth factors and cells. However, very little is known about the most appropriate region for delivery. It might be possible to increase therapeutic efficiency by specific delivery to the target region. We aimed to identify therapeutic targets for effective development of collateral vessels.

Material&Method
First, we performed angiography on a chronic ischemic rabbit limb. Post angiography, the collateral vessel developed in the coccygeo-femoral muscle (CFM) in all individuals. Thus, we effectively administered 100-FGF, in 3 regions, in the CFM of the ischemic rabbit limb. The control group was injected in the adductor magnus muscle. Evaluation was carried out 28 days after intramuscular injection.

Results
Injections to the CFM and associated blood pressure, angiographic score, and leg blood-flow volume showed significant improvement than that in the control group. Moreover, similar improvements were seen in the functional blood-vessel density measured with the tissue specimen.

Conclusions
Vascularization was effectively promoted by choosing an appropriate treatment target and administering therapeutic factors that possibly had a curative effect.

Keywords: Therapeutic angiogenesis, Arteriogenesis, bFGF