The 9th Japan-Korea Joint Meeting for Vascular Surgery

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President: Kiyotaka Imoto

Symposium: Present Status of Vascular Surgery in Japan and Korea

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Hybrid Revascularization for Complex Multilevel Leg Arterial Disease

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Introduction
Peripheral arterial occlusive disease is commonly presented as a fashion of multilevel occlusive disease, especially in patients with critical limb ischemia. In these patients with multilevel arterial disease usually requires complex arterial reconstructions, in order to provide patients with adequate clinical improvement. The term “hybrid” means the use of combined open surgical and endovascular procedures simultaneously and the number of procedures are now increasing with the percentage of 5 to 21% of current limb revascularization procedures.

Conventional open surgical procedures is the gold standard for treatment of extensive occlusive disease. However open surgical procedures of such lesions consisted of extensive and time-consuming procedures. Also, patients with multilevel arterial disease are usually aged patients and frequently associated with significant comorbidities and critical limb ischemia, categorizing these patients as high risk for major operative procedures. So, hybrid repair has obvious appeal in these patients with less surgical morbidity, decreased hospital stay, and patient preference dictating a minimally invasive approach. In regarding to endovascular surgery, iliac artery angioplasty with or without stenting is well recognized and increasing procedures for the patient with localized iliac or femoropopliteal disease even in TASC C/D lesions, however, such endovascular procedures have some limitations when the disease is extended to common femoral artery or long segment femoropopliteal occlusive disease. In hybrid procedures, endarterectomy of common femoral artery (CFA) with extension to distal external iliac artery (EIA) or superficial femoral artery (SFA) is a key component of procedures and it can be an ideal place for the introduction of endovascular procedure or distal bypass surgery. So, treatment of CFA with a surgical component of hybrid repair may enhance the technical success or late results in comparison to sole endovascular treatment. In this article, we introduce the current use of common hybrid revascularization in our hospital.

Iliac Artery Stenting and Common Femoral Endarterectomy
The most common procedures of hybrid surgery in the literatures are iliac artery stenting and common femoral endarterectomy, and many investigators think the hybrid procedure is ideal for these patient. After exposure of the common, superficial, and deep femoral artery, the CFA is opened via a longitudinal arteriotomy, and endarterectomy is performed to remove the obstructing plaque. The arteriotomy can be extended proximally to distal EIA or distally to proximal SFA according to the extent of disease. Reconstruction of the CFA is typically completed using a patch (autogenous saphenous vein, synthetic or biologic material). Before completion of patch angioplasty, the guidewire is introduced to iliac segment via the gap of patch and endarterectomized CFA, and then sheath is inserted to upward direction before final tie. It can control the bleeding without new puncture of patch or remote artery. After sheath insertion, endovascular reconstruction of iliac artery is performed as a usual manner. In addition, hybrid surgery has some benefits in dealing CFA disease compared with sole endovascular treatment. First, it can avoid stenting below the inguinal ligament. When the iliac disease is extended to CFA, the distal EIA can be approached by division or mobilization of inguinal ligament with cephalad traction. The endarterectomy can start from distal EIA and stent may be extended down to the proximal end-point of the endarterectomy and patch if necessary. Second, in some patients with thrombosis associated pre-existing atherosclerotic disease in proximal iliac artery, distal EIA and CFA is filled with only thrombus without severe atherosomatous plaque. In this case, simple Fogarty thromboembolectomy or over-the-wire Fogarty thromboembolctomy can reveal the preserved lumen of distal EIA or CFA, thereafter short segment stenting of proximal iliac segment is necessary for flow restoration. Third, profundaplasty can be applied in patients with severe stenosis or occlusive disease in proximal DFA. The value of the profunda in supplying sufficient distal perfusion in the setting of SFA occlusion has been known since the early 1960s. So, additional profundaplasty during hybrid procedure may improve the runoff, especially in patients with SFA disease, and improve the results of hybrid procedures.

Femoral Artery Stenting with Infrainguinal or Crossover Femoro-Femoral Bypass
In past, iliac artery stenting and bypass surgery was performed as a staged manner. However, widespread adoption of endovascular techniques by vascular surgeons have made the combination of
endovascular and open bypass as a simultaneous manner. Simultaneous hybrid surgery have some advantages over the staged procedures: no delay in complete revascularization of the ischemic limb; puncture complications related to angioplasty are eliminated; potential infectious complications of two separate interventions are minimized; hospital stay is shortened and possibly cheaper; open surgery can immediately repair inadequate endovascular results. After exposure of the CFA and preparation for bypass (exposure of outflow artery, dissection of saphenous vein if necessary and tunneling of graft in cases with prosthetic graft bypass), a sheath is placed in the CFA in a retrograde fashion and iliac artery stenting is carried out as a usual manner. During the iliac artery stenting, proximal SFA and DFA can be closed by vessel loops for the prevention of distal embolization associated with procedures. After satisfactory stent placement, longitudinal arteriotomy including previous puncture site is made and flush the blood for the removal of possible debris after stent placement. And then, proximal and distal anastomosis is carried out as a usual manner.

Femoral Endarterectomy and Distal Catheter-Based Intervention

For patients with critical ischemia and infrainguinal multilevel arterial disease, open femoral endarterectomy and distal intervention can be done simultaneously as a hybrid procedure. First, open femoral endarterectomy is performed as described above. The sheath is then placed in an antegrade fashion to treat femoropopliteal or tibial lesions. This antegrade approach typically allows more “pushability” and “trackability” to treat distal lesions compared to the percutaneous crossover approach for infrainguinal catheter-based interventions impossible in patients with severe ipsilateral disease in common femoral or proximal superficial femoral artery. However, reported long-term patency rates for infrainguinal and, particularly, infrapopliteal endovascular interventions are much lower than for iliac interventions, and the follow-up results of reintervention, open surgical conversion (bypass surgery) and limb salvage rates, especially in patients with critical limb ischemia or acute limb ischemia after hybrid surgery are not well studied currently. Therefore, more careful application to selected high risk patients is required.

Summary

Hybrid operation can be a less invasive therapy for revascularization in multilevel peripheral arterial occlusive disease in selected patients. Hybrid revascularization offers the efficiency and convenience of a single stage therapy without added risks for those with lower extremity ischemia.

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The Current Situation of the Treatment for Peripheral Arterial Disease in Japan

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Background

Traditionally, peripheral Arterial Disease (PAD) has been considered as a primary indication for bypass surgery. In these decades, however, there have been notable continuing advances in imaging techniques, catheter-based devices, and endovascular techniques that allow for the increasing use of angioplasty with or without stenting as a primary revascularization procedure for PAD. Many reports have also supported the effectiveness of endovascular treatment (EVT) in patients with PAD, and the lower morbidity and cost, and results comparable to those of surgical bypass, support the increasingly significant role of EVT in the management of patients with PAD.

Methods and Results

We reviewed the annual reports of Japanese Society of Vascular Surgery and the current situation of treatment strategy of endovascular and open surgery for PAD in Japan. The proportion of EVT is increasing. In the presidential address in 1996, Dr. Frank Veith predicted that 40% to 70% of peripheral vascular cases would be done as endovascular procedures. In Japan, open bypass surgery is being replaced over the years by EVT as the primary and subsequent procedure for treatment of PAD. The situation in Japan is exceeding his prediction on the basis of...
procedures. In addition, patients with CLI may be more likely to accept an endovascular procedure because of its less invasiveness rather than an open bypass procedure.

**Conclusion**

EVT is a feasible, safe, and effective procedure and can be the primary choice for revascularization of PAD. Open bypass surgery can be reserved for lesions technically unsuitable for endovascular procedures and patients who do not demonstrate clinical improvement after EVT. We suggest the importance of teaching and learning endovascular skills as well as open surgical skills so that all treatment options will be available to patients with PAD.

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**2015 Update of Radiofrequency Ablation for the Varicose Vein in Korea**

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**Introduction**

Endovenous radiofrequency ablation (RFA) is a safe and effective treatment for varicose veins caused by saphenous reflux. Since 2007, a ClosureFast catheter has been used to treat the truncal vein reflux. Here, we describe the update of the RFA for the varicose vein in Korea in terms of devices, updated guideline or consensus, and technical issues.

**Subject**

**Devices:** Devices are an important issue to perform the successful procedure. For the proper use of these devices, it may be critical to adopt the instruction for use of each device. Recently a ClosureFast 3 cm catheter is available in Korea. It may be useful to ablate the short segment of the small saphenous vein. Another new device, Stylet catheter, is used to ablate the pathologic perforators.

**Guideline:** A guideline or consensus can be a useful guide to manage the patients. Since 2011, the Society for Vascular Surgery (SVS)/American Venous Forum (AVF) guideline was used for the proper management of the patients with varicose vein. Pavlovic MD et al. published “the Guidelines of the First International Consensus Conference on Endovenous Thermal Ablation for Varicose Vein Disease after the ETAV Consensus Meeting 2012. Phlebology. 2014. Epub 2014/02/19.”

**Technical Issues:** Currently, most of endovenous procedure can be performed safely. Therefore, the main issues for endovenous ablation was focused on the method of avoid the nerve injury or endovenous heat-induced thrombosis (EHIT). One of Korean study was revealed the clinical results in these issues. RFA was done in total 720 limbs in 524 patients (male 226, female 298). The mean age was 52.8 ± 0.5 years (range 8–84). EHIT occurred in 5 of the limbs ablated for an incidence of 0.7%. The EHIT resolved completely in all patients.

**Conclusion**

In Korea on 2015, new devices (ClosureFast 3 cm catheter and Stylet catheter) have been available. Radiofrequency ablation-specific consensus was published on 2015 in Korea. And current radiofrequency ablation was toward to avoid the nerve injury and EHIT.

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**Present Status of Vascular Surgery in Japan: The Survey of Varicose Veins Treatment: Japanese Vein Study XVII**

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**Purpose**

The Japanese Society of Phlebology had been performing survey of venous diseases in Japan. Endovenous laser ablation was accepted with Japanese health insurance system in 2011, and radiofrequency ablation was permitted also in 2014. Therefore treatment of varicose veins in Japan has been changed rapidly.
This study was made to clarify the changes of treatments for primary varicose veins by periodical investigation in Japan.

Methods
A questionnaire survey was mailed to the members of the Japanese Society of Phlebology. The contents of the survey dealt with the treatment of new varicose veins cases in the year 2013 and the treatment strategy. The results were examined and compared to the result of our former survey.

Results
1) 43,958 limbs of 36,078 patients were reported from 193 institutions. The saphenous type is the most numbers and the age with most frequency was 70'. Patients were treated by compression therapy (25.7%), by surgery (73.6%) and by sclerotherapy (7.5%). Surgical treatments included stripping (11.6%), high ligation (6.3%), endovenous laser ablation (EVLA) (73.3%), perforating vein ligation (5.2%) and endoscopic perforating vein surgery (0.7%).

2) For these five years 107 institutes (56%) newly applied EVLA. Most doctors performed EVLA without high ligation and the half experienced the cases with endovenous heat-induced thrombus.

Conclusion
Number of patients with varicose veins increased especially in elderly patients. The surgical treatment was selected in large numbers and EVLA increased explosively.

Keywords: varicose veins, high ligation and stripping, endovenous laser ablation

Open Conversion after Complicated EVAR: Total or Partial Stent-Graft Explantation

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In the era of minimal invasive surgery, endovascular aneurysm repair is the most popular procedure for the treatment of abdominal aortic aneurysms. In spite of the early favorable outcome of EVAR, early and late failure of EVAR is not infrequent and open conversion is necessary in more and more cases during follow-up. Open conversion rate was reported as 2.1% in EUROSTAR registry, but the reported rate is as high as 9%, and the rate is increasing as the time goes by.

The reasons of early conversion (≤30 days) includes; Stent-graft infection, aneurysm rupture, and stent-graft thrombosis.

The open conversion has many technical challenges: 1) cumbersome vessel dissection due to periaortic inflammation 2) difficult to achieve proximal and distal control due to endograft 3) possible endograft injury of stent fracture 4) risk of denudation & laceration of juxtarenal aorta in case of suprarenal fixation with dense incorporation to the aortic wall 5) high mortality & morbidity than primary open repair (10–23% vs. <5%).

In case of infection after EVAR, total explantation of the stent-graft is required. In cases of growing sac due to endoleak or rupture, partial preservation of stent-graft at the sealing zone is recommended, if well incorporated and sealed adequately. The risk of vessel injury during total explantation is present due to bulky endograft and atrophy of the aortic wall after EVAR. The reported morbidity & mortality after SG explantation is higher in total removal (67%) than in partial removal (13%).

In summary, for the explantation of stent-graft, every vascular surgeon should consider several important issues.
1) Prepare for the difficulty in achieving proximal and distal control due to endograft. (e.g. endoluminal occlusion balloon).
2) In case of total explantation of suprarenal fixation with dense incorporation to the aortic wall, be cautious about the risk of denudation & laceration of juxtarenal aorta.
3) When standard graft is anastomosed to the endograft, incorporate the aortic/iliac wall & SG remnant into the suture line.
4) Explantation of EVAR carries high risk of mortality and morbidity.
5) In case of aneurysm growth after primary EVAR or a subsequent failed endovascular reintervention, aggressive attitude to open conversion in patients fit for surgery is needed.

Current Status of Surgical Treatment for Abdominal Aortic Aneurysm in Japan

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Endovascular repair of abdominal aortic aneurysms (EVAR) has become a popular alternative treatment along with open surgical repair (OSR) for abdominal aortic aneurysms (AAA) and more than half patients with AAA are treated with EVAR in Japan. Although OSR in Japan has proven relatively acceptable results, EVAR offers the benefit of lower perioperative mortality and morbidity with shorter hospital stay, and is extended to high risk old patients, who probably would be unperformed without EVAR. The early clinical advantage has also translated into a trend that
EVAR is extensively applied to younger patients with low risk, patients with unsuitable anatomy and patients with ruptured AAA. In consequence, EVAR requires close surveillance after surgery because complications such as endoleaks arise in 20–40% of patients. Additional endovascular or open surgery for migration, sac expansion and even rupture after initial EVAR causes long-term serious troubles for EVAR. As a result, EVAR costs both in the short- and long-term in Japanese medical care system. Because Japan faces problems of ‘Super Aged Society’ and high cost of medical care, we must address indication and management of patients with AAA.

Keywords: AAA, EVAR, open aortic surgery

Oral Presentation A

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Investigation for Radio-Cephalic “Reverse” Arteriovenous Fistula – Computational Fluid Dynamics and Preliminary Clinical Results

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Introduction and Objectives
Radio-cephalic arteriovenous fistula (AVF) is the best choice for achieving vascular access (VA) for haemodialysis (HD), but even this type of AVF has relatively high rates of early failure. Failure of radio-cephalic AVF means impossible to use of the VA for dialysis and usually due to a juxta-anastomotic stenosis. Low haemodynamic shear stress contributes to the pathophysiology of VA failure due to thrombosis secondary to stenosis formation as well as VA reocclusion after percutaneous interventions.

Methods
We have used the approach of computational fluid dynamics (CFD) to evaluate the shear stress distribution and minimization to investigate various possible conditions including the anastomosis angle. The 3D computational domain has been designed for arterio-venous end to side anastomosis according the various angles (45°, 90°) including 135° of “reverse anastomosis” using CAD software (SolidWorks, Solidworks Corp.). Furthermore using COMSOL Multiphysics (COMSOL Inc.) for multiphysics simulation software, various hemodynamic factors influencing on wall shear stress on anastomosis site were simulated including non-Newtonian characteristics of blood, complete cardiac pulse cycles and blood vessel deformation. And clinical analysis of two groups (classical vs. reverse) of all radio-cephalic wrists AVF who were underwent radio-cephalic wrist AVF from Jan. 2009 and Feb. 2014 were performed in totally 200 patients.

Results
The CFD results show that the larger anastomosis angle (135°) has the smaller shear stress that gives the advantage for reducing AVF failures. Among the differ anastomosis angle, we considered in this study, the larger (135°) angle ("reverse anastomosis") would be the preferred choice that minimizes the development of anastomotic stenosis. The clinical preliminary results also shows that the "reverse" AVF has more excellent favorable primary and assisted primary patency without statistic difference.

Conclusion
The “reverse” radio-cephalic wrist AVF shows more favorable patency compares with previous “classical” radio-cephalic wrist AVF in CFD simulation and preliminary clinical trial. The Vascular Access Surgeons when perform the radio-cephalic wrist AVF should consider the AV anastomosis with "reverse pattern".

Preoperative Disseminated Intravascular Coagulation Associated with Acute Type A Aortic Dissection

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Purpose
Acute type A aortic dissection (AAAD) is a life-threatening disease in cardio thoracic surgery. Thrombosis of the false lumen enhances fibrinolysis and it causes disseminated intravascular coagulation (DIC). We examined the incidence, the pathophysiology, and the surgical results of the cases of AAAD with or without preoperative DIC.

Methods
The study enrolled 151 patients with AAAD who were admitted to our hospital and underwent emergency surgery from 2009...
to 2013. For the diagnosis of DIC, we used the diagnostic criteria according to the Japanese Association of Acute Medicine which have scoring from 0 to 8 points. We divided them into two groups; the patients with more than 4 points diagnosed as DIC (the DIC group) and those with under 3 points (the non-DIC group). We compared two groups about age, gender, type of false lumen, periarterial tamponade, multiorgan malperfusion, operation time, blood transfusion, and prognosis.

**Results**

27 patients (18%) were diagnosed as DIC (the DIC group), and 124 patients belonged to the non-DIC group. Comparing the degree of coagulation factor provided by laboratory tests, platelet count was significantly reduced in the DIC group. Prothrombin time (PT) was prolonged, and fibrin degradation products (FDPs) were also elevated significantly. The two groups showed no significant differences in age (65 ± 14 years vs 62 ± 11 years, \( P = 0.21 \)), gender (17 males and 10 females vs 62 males and 62 females, \( P = 0.22 \)), periarterial tamponade (9 cases, 33% vs 27 cases, 22%, \( P = 0.16 \)), and multiorgan malperfusion (12 cases, 44% vs 43 cases, 35%, \( P = 0.96 \)). Types of false lumen showed significant difference in partially thrombosed (11 cases, 41% vs 19 cases, 16%, \( P = 0.004 \)), and showed no difference in completely patent (12 cases, 44% vs 69 cases, 58%, \( P = 0.21 \)), and completely thrombosed (4 cases, 15% vs 32 cases, 27%, \( P = 0.19 \)) (Table 1). We performed replacement of ascending aorta for 19 patients of DIC group and 83 patients of non-DIC group. The two groups showed no significant differences in operating time (457 ± 172 min vs 462 ± 132 min, \( P = 0.87 \)), red blood cell transfusion (15 ± 10 units vs 13 ± 10 units), fresh frozen plasma (16 ± 10 units, 14 ± 10 vs 16 units, \( P = 0.35 \)), and platelet transfusion (34 ± 19 units, 29 ± 17 units, \( P = 0.17 \)). About the prognosis, the mortality in the hospital (6 cases, 22%, 4 cases, 3%, \( P = 0.00 \)) was significantly higher in the DIC group (Table 2). Among 6 death cases in the DIC group, 5 cases had a complication of multiorgan malperfusion.

**Conclusion**

The ratio of the patient whose aortic false lumen were partially thrombosed was significantly higher in the DIC group. Partially thrombosis of the false lumen seemed to enhance fibrinolysis and causes DIC. Moreover, DIC with complication of multiorgan malperfusion seemed to increase the mortality.

Keywords: acute type A aortic dissection, disseminated intravascular coagulation, thrombosis

**Table 1** The relationship between types of false lumen and DIC incidence

| Types of false lumen | DIC     | non-DIC | \( P \) value |
|----------------------|---------|---------|--------------|
| completely patent     | 12 (44%)| 69 (58%)| 0.21         |
| partially thrombosed  | 11 (41%)| 19 (16%)| <0.01        |
| completely thrombosed | 4 (15%) | 32 (27%)| 0.19         |

**Table 2** The relationship between DIC morbidity and the hospital mortality

| Hospital Mortality | DIC     | non-DIC | \( P \) value |
|--------------------|---------|---------|--------------|
|                    | 6/27 (22%)| 4/124 (3%)| <0.01        |

EVAR in Non-IFU in Korean Multicenter Registry

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Endovascular aneurysm repair (EVAR) for abdominal aortic aneurysm (AAA) now becomes widely accepted as primary choice in elective operation. According to Korean health national data, around 500 cases/year has been done recently and it keeps increasing. Most obstacles for this less invasive procedure lies for the hostile neck anatomy which leads to aneurismal exclusion failure by causing type-I endoleak. To overcome this anatomical limitation, new design stent-graft has been developed such as fenestrated or branched stent-graft. However these new devices still could not offer standard solution world widely because of limited experiences confined to specific centers or countries. Also there are another option has been proposed such as snorkel/chimney technique or sandwich-technique which use parallel covered stent to preserve perfusion for branch arteries. Although it could be done commercially available covered stent, still there are many controversies in terms of constant results especially for long-term results. In Korea, still not all these newly developed stent-grafts are available. The Korean health related national regulation for medical devices recommend many strict and complicated approval steps, so it looks like there will be long way to go before these devices are available. Also the additive devices for chimney or sandwich technique such as variable covered stents are just becomes available recently, so it could be considered that there had been obstacles and disadvantages in terms of complicated EVAR procedure in Korea. We have reviewed “Korean EVAR multicenter registry” which has been done from year 2008 to 2010 by 14 centers in nation. This registry was retrospectively done through review of medical records and CT data. However this is the only collective data so far regarding EVAR procedure for abdominal aortic aneurysm. Total registered number was 403 patients and we got consent to analyze the data from 13 centers which is 97.6% (394/403). The sex ratio was 86.8% (342/394) in men. The mean age was 74.6 ± 2.1. Based on IFU (Instruction for use), we reviewed the anatomy especially infrarenal neck and common iliac artery. Non-IFU which means the EVAR procedure was done out of recommend anatomical characteristics, was 69.5% (274/394). Among them, 85.8% was done...
in men. More specifically, EVAR in short neck (<15 mm) was done in 13.5%, severe angle (>60) degree was 76.3%. Non-IFU related common iliac artery anatomy (<7 mm or >20 mm) was 46%. For the endoleak incidence, any type of endoleak was found in 30.8% and type-I endoleak was 13.3% in early postoperative check. 

Conclusion
Even with disadvantages in terms of availability of advanced design stent-graft for hostile anatomy, the application of EVAR in non-IFU patients have been similar as western countries in Korea. This trends will be expands over the time in the future.

OP-A-4
Long-Term Results of Hybrid Repairs for Aortic Arch Pathology in High-Risk Patients
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Objective
Open aortic arch repairs in high-risk patients still remain challenging. Such patients might benefit from less invasive approach. We investigate long-term results of arch debranching and thoracic endovascular aneurysm repair (TEVAR) in high-risk patients with aortic arch diseases.

Methods
From May 2008 to December 2014, 108 patients underwent arch debranching and TEVAR (mean age 74 ± 10 years; 78% men; Japan SCORE 15% ± 15%). The mean aneurysm size was 56 ± 12 mm. The etiology was non-dissection in 98 patients. Arch debranching techniques consisted of isolated left subclavian artery revascularization (60 patients), total debranching (27 patients), two debranching (17 patients), extrathoracic total debranching (2 patients), and surgeon-modified fenestration and two debranching (2 patients). Of all patients undergoing total debranching, 12 patients had mini-sternotomy. Emergency procedures were performed in 8 patients due to rupture.

Results
Three patients died after the procedures. Persistent neurologic deficits occurred in 4 patients and spinal cord injury in 2. Respiratory complications included prolonged ventilation longer than 3 days in 3 patients and tracheal reintubation in 1. Median hospital stay was 22 ± 27 days. Follow-up averaged 22 ± 17 months. At 1 year, the rate of endoleaks was 11% (9/80), including type II endoleak in 2 patients. Five patients required re-TEVAR because of progressive dilatation (n = 4) or rupture (n = 1). There were no surgical conversions. Clinical success rate at 1 year was 75% (69/92). Twenty-three patients died during follow-up, 4 of aortic cause. Kaplan Meier 1-year, 3-year, and 5-year survival rates were 85% ± 4%, 69% ± 6%, and 50% ± 11%, respectively.

Conclusions
Arch debranching and TEVAR provides a safe alternative for the treatment of aortic arch aneurysms, particularly in patients at high risk of traditional surgery.

OP-A-5

Peripheral Nerve Crushing to Treat Chronic Pain of Diabetic and Ischemic Foot Ulcers
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Purpose
We retrospectively assessed the effectiveness of peripheral nerve crushing (Smithwick operation) in relieving intractable chronic pain associated with foot ulcers caused by diabetes mellitus (DM) or atherosclerosis.

Methods
From April 2009 to April 2012, 36 patients (25 men; mean age, 72 years) underwent peripheral nerve crushing in the leg affected by foot ulceration. The cause of ulceration was either
DM alone (6 patients), atherosclerosis alone (10 patients), or both DM and atherosclerosis (20 patients). Because sensation in the foot is associated with five nerves: the tibial, deep peroneal, superficial peroneal, sural, and saphenous, one or more of these nerves were crushed over a length of 1.5 cm by using a “pean” in distal third of leg where there are no major motor nerves.

Results

All ulcers were grade 3, 4, or 5 according to the Wagner ulcer classification system and affected the toes, dorsum pedis, any part of the plantar surface or the heel. The mean duration of foot ulcerations before the nerve crushing was 22.3 ± 9.7 weeks. In all 36 patients, the nerve crushing was performed successfully without any perioperative surgical complication. Thirty four of 36 patients (94.4%) had substantial pain relief immediately after the nerve crushing. While the mean pain level before the procedure was 86.6 ± 0.51 mm on VAS, pain level dropped significantly after the operation to 18.6 ± 5.4 mm at one week, 14.8 ± 4.8 cm at one month, 13.7 ± 4.1 cm at two months, 9.8 ± 4.1 at three months, 11.8 ± 5.7 at four months, 10.1 ± 4.7 at five months and 8.8 ± 3.3 at six months. The time to regeneration of the sensory nerves was 121 ± 6.5 days (range, 80–181 days). The surgical complications were wound infection (6 patients) and temporary toe paralysis (3 patients). The foot ulcers in 20 of the 36 patients (55.6%) were resolved by debridement or minor amputation. In seven patients (19.4%), a major amputation (five below and two above the knee) was required because of ischemia or infection. No patient died within 30 days after the operation, while nine patients died during the observation period because of comorbid conditions.

Conclusion

Peripheral nerve crushing could be the alternative procedure for achieving analgesia in patients with intractable chronic pain from foot ulcers caused by diabetes mellitus or atherosclerosis.

Keywords: peripheral nerve crushing, chronic pain, foot ulcer

Oral Presentation B

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OP-B-1

Outcomes of Simultaneous Hybrid Endovascular and Open Repair in Patients with Chronic Arterial Occlusive Disease

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Purpose

To evaluate clinical outcomes after simultaneous hybrid endovascular and open reconstructions in patients with chronic limb ischemia.

Methods

Hospital records of 84 consecutive patients (average age, 71 years; males, 83%) received 90 hybrid procedures for the chronic limb ischemia including disabling claudication (CD group, 34 limbs) and critical limb ischemia (CLI group, 56 limbs) between June, 2010 and July, 2014 were retrospectively reviewed. Patients suffering acute limb ischemia were excluded. We evaluated patients characteristics, technical failures and follow-up results including target limb revascularization (TLR) and major adverse event (MAE; defined as major amputation and TLR) in limb depending on the type of ischemia.

Results

The most common surgical procedure was femoral endarterectomy with patch angioplasty (n = 48, 53%) and most common endovascular procedure was iliac angioplasty (n = 74, 82%). However, iliac angioplasty was more common in CD group (p < 0.01) and infrainguinal angioplasty was more common in CLI group (p < 0.01). Technical success rate according to intention to treat basis was 95.6% and all of the failure were endovascular revascularization procedures (4 in CLI group). Overall in-hospital mortality was 3% (3 in CLI group). Three (6.8%) major amputations occurred in CLI group. Mean follow-up duration was 17 ± 1.3 months. During the follow-up, TLR was performed in 2 patients with CD group and 8 patients with CLI group. Respective MAE-free survival rates at one year and 2 year differed significantly by
group: 95.5% and 90.2% for CD group; 79.7% and 71.3% for CLI group (p <0.05).

Conclusion
In this study, hybrid reconstruction for CD group was largely successful and demonstrated high durability. Limb salvage and MAE-free survival of CLI group were low in comparison to patients with CD group and it may be related to the localization of disease and endovascular procedures.

Keywords: hybrid procedure, angioplasty, bypass, peripheral arterial disease, limb ischemia

OP-B-2
How to Do It; Self-Expanding Ring to Facilitate the Distal Anastomosis in Total Arch Replacement
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Background
When we perform total arch replacement (TAR) through median sternotomy, distal anastomosis site is deep in the surgical field and it is difficult to keep good exposure. The distal anastomosis in TAR can be the site of difficult bleeding. It is also mandatory to do the distal anastomosis without injury to the surrounding organs, such as esophagus or lung. We described a method of simple exposure for the distal anastomosis in TAR using a self-expanding ring.

Technique
The is a cylindrical stainless ring (1.5 cm in width). We have thus far three ring size, which, when fully expanded are 4.0 cm, 4.5 cm, and 5.0 cm in diameter (T-T Ring, Matsuda Ika Kogyo Co.,Ltd. Tokyo, Japan & Senko Medical Instrument mfg. co. Ltd. Tokyo, Japan). Each of the rings can be reduced approximately 1.0 cm in diameter, when contracted. This ring is contracted in diameter by catching two holes in the ring with a long curved-clamp (Fig. 1A). The ring has narrow part (one-fourth of circumference) for easy contraction with clamp. This compression creates the tension needed for the ring to expand once delivered to the site of the distal anastomosis when the clamp is removed (Fig. 1B). This self-expanding ring can be placed more easily, even in a deep surgical field than an equivalently sized malleable retractor. With the ring expanded to its original size, we can maintain free space around distal stump of the aorta, which facilitates the procedure (Fig. 2). After completion of the distal anastomosis, it is easy to remove the ring along the graft.

OP-B-3
Risk Factors for Development of Colonic Ischemia Following Open Surgical Repair of Abdominal Aortic Aneurysm
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Clinical Outcome of Elective Total Arch Replacement Stratified by Estimated Glomerular Filtration Rate

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Purpose
To investigate the outcome of elective total arch replacement (TAR) in patients with renal insufficiency, early and long-term mortality and morbidities were compared among groups stratified by estimated glomerular filtration rate (eGFR).

Methods
From September 2001 to January 2015, 271 patients (216 male, 36–87 [72.2 ± 8.3] year-old), who underwent elective TAR and were not suffered from end-stage renal disease treated with hemodialysis, were grouped into three categories according to eGFR (ml/min/1.73m²); normal-mild (eGFR ≥60; n = 132), moderate (30 ≤eGFR <60; n = 121), severe (eGFR <30; n=18) renal dysfunction group. Severe and moderate group were associated with a higher prevalence rate of hypertension (severe group 77.8%; moderate group 76.9%; normal-mild group 28.0%; p < .01), diabetes mellitus (16.7%, 28.9%, 3.0%; p < .01), and dyslipidemia (33.3%, 34.7%, 3.0%; p < .01). Higher EuroSCORE II was observed in severe and moderate groups (6.90, 5.70, 3.31; p < .01). More frequently concomitant operations, especially coronary artery bypass grafting, were performed in severe group (61.1%, 46.2%, 34.8%; p = .04), and longer operation time (441, 406, 376 minutes; p < .01) and cardiopulmonary bypass time (233, 222, 205 minutes; p < .01) were necessary. However, cerebral perfusion time (108, 109, 100 minutes; p = .60) and circulatory arrest time were not statistically different (51, 55, 51 minutes; p = .06). Prospectively collected patients’ database were retrospectively reviewed and last status of each patient were collected by outpatient clinical chart. Mean follow-up time was 4.7 years.

Results
The operative mortality within 30 days after TAR and overall hospital mortality were 2 (0.74%) and 7 patients (2.58%) respectively. No mortality was encountered in severe group during hospital stay. In moderate group, 4 hospital mortalities were due to ruptured descending aortic aneurysm in one patient, sepsis in two and mediastinitis in one. In normal-mild group, 3 hospital mortalities were due to stroke in one, and mediastinitis in two. During hospitalization, 4 patients (1 in severe, 2 in moderate, 1 in mild renal dysfunction group) required continuous hemodialfiltration (CHDF) temporarily after TAR, but no patient required de novo hemodialysis (HD). However, in long-term follow up after TAR, renal dysfunction of 8 patients (3, 5, 0 patient) were worsened as required HD. Other complications, such as, sepsis in 6 patients (0, 3, 3 patients), mediastinitis in 4 patients (0, 2, 2 patients), stroke in 10 (0, 7, 3 patients), paraplegia or paraparesis in 3 (0, 3, 0 patient), long intubation (>72 hours after operation) in 13 (0, 12, 1 patient), were observed. Average in-hospital stay after TAR was 26.0 ± 27.7 and was longer in groups with severe and moderate renal dysfunction (32.8 ± 25.0, 37.1 ± 73.0, 28.2 ± 34.9 days; p = .04).

Survival rate in severe group at 5 years was worse than other groups significantly (62%, 77%, 76%; p < .01). The causes of death were cardiac in 2 patients, cerebral in 7, infection in 21, cancer in 10, aortic in 6, others in 8 and unknown in 25. Aortic events at 5 years, such as ruptured aneurysm in 8 (1, 4, 3), surgery for residual AAA in 11 (0, 6, 5), TAA in 11 (0, 1, 1), TAAA in 9 (0, 3, 6) were observed and rate of free from aortic events showed no difference between each groups (94%, 81%, 84%; p = .69).

Conclusion
Despite patients with severe renal dysfunction (eGFR <30) who underwent TAR had more comorbidities and needs longer operation time for concomitant procedure, the early outcome was not worse than the patients with normal-mild or moderate renal dysfunction. In a long-term follow up, patients with severe renal dysfunction revealed lower survival, however, rate of aortic events were not statistically different.

Keywords: total arch replacement, estimated glomerular filtration rate

The Prevalence and Risk Factors for Atherosclerotic Carotid Stenosis and Carotid Plaque: A Community-Based Screening Study

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Purpose
Atherosclerotic carotid stenosis is a major cause of ischemic stroke. Although little was known about the direct effect of the screening for carotid artery stenosis (CAS) or plaque on preventing stroke, there were several studies relevant to the relationship between CAS screening and stroke reduction. However, in Korea, there have been a few studies for CAS screening. The aim of this study was to assess the prevalence and risk factors for CAS with community-based screening.

Methods
The inclusion criteria for screening were all men and women more than 50 years old. Study was processed with visiting the
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Community welfare centers of 5 cities in Korea. The sequence of screening was history taking for demographic information and ultrasound examination. CAS was defined as the presence of plaque with ≥50% diameter reduction and increased Peak Systolic Velocity (PSV) ≥125 cm/sec or increased PSV ratio ≥2.0. The carotid plaque was defined as localized echo structures that encroached into arterial lumen and for which the distance between the media-adventitia interface and the lesion surface facing the lumen was ≥1 mm. For statistical analysis, Mann-Whitney test, Chi-square test, Fisher’s exact test, and logistic regression were used. All statistical analysis was conducted with SPSS software version 21 (SPSS PC version 21.0, SPSS, Chicago, IL, USA).

Results
Between January 2008 and December 2012, total 3030 participants were included with man 1,323 (43.7%) and women 1,707 (56.3%). The carotid plaque was detected in 172/3,030 (5.7%). The prevalence of CAS was 34/3,030 (1.1%). In the multivariate analysis, the significant risk factors for carotid plaque were people aged ≥70 years (OR, 4.68; 95% CI, 2.12-10.31), men (OR, 2.16; 95% CI, 1.29-3.61), hypertension (OR, 1.72; 95% CI, 1.21-2.45), hyperlipidemia (OR, 1.84; 95% CI, 1.30-2.62). And significant risk factors for CAS were old age (OR, 1.07; 95% CI, 1.03-1.12), hypertension (OR, 3.16; 95% CI, 1.34-7.46), ex-smoker (OR, 6.81; 95% CI, 1.66-27.93) and current smoker (OR, 6.97; 95% CI, 1.78-27.31) after adjusting for confounding factors.

Conclusion
The prevalence of CAS in Korean general population was 1.1%. Old age, hypertension, and smoking were significant risk factors for CAS. Further study is needed to evaluate the benefit effect of CAS screening on stroke reduction.

Keywords: atherosclerotic carotid stenosis, carotid plaque, prevalence, risk factors, carotid ultrasound

OP-B-6
Clinical Outcomes of Isolated Dissection of Superior Mesenteric Artery
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Purpose
Isolated dissection of superior mesenteric artery (IDSMA) is rare disease, defined as the dissection of SMA without involvement of aortic dissection. Although it has the potential risk for mesenteric ischemia, necrosis and aneurysmal formation, the clinical outcomes are not elucidated. The aim of this study is to identify the characteristics and the clinical outcomes of IDSMA.

Methods
Retrospective multicenter study was performed from Nov. 2007 to Apr. 2014, including 50 patients with IDSMA, diagnosed by radiological findings. All patients were treated with either conservative management or surgical intervention. Conservative management included antiplatelet therapy, anticoagulation therapy or observation only. All clinical records including medical history, therapeutic regimens, radiological findings, and others were collected retrospectively. Statistical analysis was performed to identify the risk factors for the progressive dilatation of SMA, with the formation of a dissecting aneurysm.

Results
The mean age of the patients was 57.4 ± 10.6 years (range, 40–78 years), 48 males and 2 females. Smoking was the most common risk factor involved with 26 cases (52%), followed by hypertension with 23 cases (46%). Among 50 patients, 48 patients underwent conservative management and 2 patients had surgical intervention. Conservative managements included antiplatelet therapy in 19 patients, anticoagulation therapy in 2 patients, combined therapy in 15 patients, and observation only in 12 patients. None of the conservatively managed patients needed additional surgical intervention and showed aggravation of symptoms. Communicating IDSMA, defined as the dissection with patent false lumen, was involved in 26 patients (52%). The aneurysmal
formation, defined as the diameter of dissected SMA larger than 10 mm were found in 14 patients. Communicating IDSMA was significantly associated with the aneurysmal formation (HR, 9.43; \( p = 0.003 \)). Hypertension, smoking or the use of heparin were not significantly associated with the aneurysmal formation.

**Conclusion**

Conservative management for IDSMA was feasible in most cases. Communicating IDSMA could be the predictable risk factor for progressive dilatation of SMA, with the aneurysmal formation.

**Keywords:** SMA dissection, aneurysmal formation, mesenteric ischemia

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**Poster Presentation A**

**Moderators:**
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**PP-A-1**

**Comparison Endovascular between Open Surgical Treatments Using Distal Origin Bypass Graft (DOBG) in Patients with Diabetes Mellitus (DM)**

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**Purpose**

In several recent studies, peripheral arterial occlusive disease (PAOD) was present in up to 50% of the patients with a diabetic foot ulcer and was an independent risk factor for amputation. The treatment of PAOD of below the knee with DM is on debate. The purpose of this study was to compare with endovascular and open surgical treatments using Distal Origin Bypass Graft (DOBG) in patients with PAOD on below the knee caused by Diabetes mellitus (DM).

**Method**

This study included 68 patients treated for PAOD in below the knee with DM between 2012 and 2014. The main outcome were sustained technical success and overall 1 year patency, defined as improvement of ankle-brachial index (ABI) or wound healing according to TASC classification.

**Result**

Endovascular treatment (ET) was performed in 41 (60.2%) patients and Open surgical treatment (OST) in 27 (39.8%). Technical success was 65.8% for the endovascular group and 100% for the Open surgical group. The overall 1 year patency rate was 50% after ET and 65% after OST.

**Conclusion**

The appropriated choice of treatment for PAOD patients with DM is required. This study showed Open surgical treatments have been a proper patency & technical success than endovascular treatment. PAOD patients with DM benefit from revascularization. To achieve this benefit, multiple revascularization procedures may be required.

**Keywords:** endovascular, open surgical treatments, diabetes mellitus

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**PP-A-2**

**Endovascular Treatment for Critical Limb Ischemia Patients with Connective Tissue Disease**

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**Purpose**

Only few studies have addressed the surgical revascularization in patients with both connective tissue disease (CTD) and critical limb ischemia (CLI), and long-term patency of surgical bypass grafts is likely to be poor in CTD patients. On the other hand, the evidence for the endovascular treatment (EVT) is lacking in such patients. The purpose of this study is to assess our outcome of EVT in patients with CTD and ischemic leg ulcers.

**Methods**

10 Patients (11 limbs) with coexistent CTD and CLI-related leg ulcers were treated with EVT between 2009 and 2013. Medical records were reviewed retrospectively. All patients had Rutherford category 5 lesions, with pain at rest and tissue loss (nonhealing leg ulcers, toe gangrene, or both).

**Results**

All patients were female. The mean age was 69.6 years old. The patients had rheumatoid arthritis (n = 5), systemic lupus erythematosus (n = 1), progressive systemic sclerosis (n = 3), or polyarteritis nodosa (n = 1). EVT was technically successful in all cases. All limbs had an infrainguinal lesion without aortoiliac lesion. No procedure-related morbidity or mortality occurred.
During the mean follow-up period of 26.7 months, there were no major amputations, and sustained clinical improvement (ulcer healing and reduction in Rutherford category) was observed in 8 limbs. The overall 1-year rates of amputation-free survival and freedom from reintervention were 89% and 81%, respectively.

Conclusion

In our series of patients with CTD and ischemic leg ulcers, EVT had acceptable outcomes and may be recommended as a safe and reasonably effective initial treatment option for such patients.

Keywords: endovascular treatment, critical limb ischemia, connective tissue disease

PP-A-3

End Stage Vascular Disease (ESVD): Bypass with below Popliteal Endovascular Treatment in Critical Limb Ischemia (CLI)

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Introduction

Multilevel atherosclerotic occlusion in critical limb ischemia (CLI) patient with limited vascular reconstruction options can be a challenge for vascular specialist. The primary aim of this study is to evaluate the efficacy and feasibility of hybrid open popliteal approach for below the knee (BTK) intervention and femoropopliteal bypass where improved distal runoff patency is necessary to ensure long term patency of femoropopliteal bypass graft to target vessel that would otherwise impossible.

Methods

Between November 2013 and August 2014, 9 cases of CLI were treated with hybrid surgery combined femoropopliteal bypass and BTK true lumen angioplasty through open popliteal approach, by single surgeon at our institute. Primary endpoint was major amputation and perioperative mortality.

Results

We have treated 9 cases of CLI in 8 patients in whom BTK angioplasty through open popliteal approach was combined with 9 cases of femoropopliteal bypass, 1 femorofemoral bypass, 1 iliac angioplasty, 1 iliac thrombectomy, 3 CFA stent explantation and 1 endarterectomy. There was no perioperative mortality and major amputation. The preoperative ABI was 0.336, and postoperative ABI was 0.69. One patient who had undergone sequential femoropopliteal and autogenous popliteo tibioperoneal trunk bypass required reoperation during index admission for graft thrombosis, and it was successfully treated with graft thrombectomy and infrapopliteal angioplasty through popliteal approach. Failed treatment occurred in that one of 9 cases.

Conclusions

In selected patients with limited available reconstruction options, hybrid treatment including infrapopliteal intervention through open popliteal approach and femoropopliteal bypass is an acceptable alternative reconstruction for multilevel occlusion.

PP-A-4

In Patients with Critical Limb Ischemia Due to Palla-malleor Disease, a Balloon-Angioplasty-First Strategy Worsens the Result of Bypass Surgery

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Objective

EVT-first or open-first is just going to have an argument under the medical treatment to critical limb ischemia (CLI). However, when EVT-first is performed to the case in which open surgery is possible, a possibility of affecting the results of bypass surgery according to the vascular damage which EVT does can be considered. This time, the results of the EVT-first group (distal bypass was needed after EVT) and the open-first group were compared.

Methods

95 cases which enforced the distal bypass way to the case which caused critical limb ischemia (CLI) from July, 2012 to May, 2014 were examined retrospectively.

Results

27 cases of 95 underwent EVT-first and 68 open first. There was no significant difference with a patient background in both groups. The primary patency rate for observation period 21 months of EVT group was 65%, and the open group was 77%. The low tendency was shown by the EVT group, although the p-value was 0.08. The case of major amputation was five limbs (18%) in EVT group, one limb (1.4%) in open group.

Conclusion

The primary patency rate and limb salvage rate of the EVT-first group were clearly poor among distal bypass received and enforced with the CLI case as compared with the open-first group. It was suggested with the case in which open-first is possible that bypass surgery should be chosen as the first treatment of the revascularization.
Early Results of Clinical Application of Autologous Whole Bone Marrow Stem Cell Transplantation in Patients with Critical Limb Ischemia

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Objective
To evaluate the early results of the clinical application of autologous whole bone marrow stem cell transplantation (AWBMSCT) in patients with critical limb ischemia (CLI).

Methods
We retrospectively analyzed the data of 49 limbs of 32 patients (mean age, 42.3 years; range, 20–58 years; male, 93.8%) with CLI after AWBMSCT from March 2013 to December 2013. The patients received multiple injection of whole bone marrow stem cell into the calf muscles in the vicinity of native anterior and posterior tibial and peroneal arteries. To assess clinical status, patients underwent physical examination, laboratory test, segmental limb pressure with treadmill and recorded the pain score. We analyze the change of Rutherford category, pain score, pain-free walking time (PFWT), total walking time (TWT), ankle brachial pressure index (ABPI), toe brachial pressure index (TBPI), and investigate the wound healing and occurrence of unplanned amputation.

Results
The mean follow-up duration was 5.7 ± 3.6 months (range, 0.9–7.8 months) and 100%, 75.5%, and 65.3% of patients were available to follow up after 1, 3 and 6 month from AWBMSCT respectively. There was no procedure related or systemic complication. At 6 months, patients demonstrated a significant improvement in Rutherford category (P < 0.0001), pain score (P < 0.0001), PFWT (P < 0.0001), ABPI, toe brachial pressure index (TBPI), and investigate the wound healing and occurrence of unplanned amputation.

Conclusions
AWBMSCT could be a safe and effective alternative or adjunctive treatment modality to achieve clinical improvement in patients with CLI refractory to other treatment modalities.

Crossing of Infrapopliteal Arterial Chronic Total Occlusions with the Crosser™ System

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Objective
Endovascular treatment (EVT) for chronic total occlusion (CTO) is a technically challenging problem in peripheral arterial disease (PAD), especially infrapopliteal lesions. If bypass surgery was not indicated for some reasons, the technical failure of EVT led to limb amputation. The Crosser™ system is a CTO device with high frequency vibrational energy to cross the CTO, which has been adopted for coronary CTO.

Methods
EVT procedure using this device for PAD with CTO was reviewed to evaluate the efficacy and safety of the Crosser™ system. From April 2014 to November 2014, 10 patients with 13 CTO lesions of infrapopliteal arteries underwent EVT with the Crosser™ system. Technical success was defined as the device’s ability to facilitate the successful intraluminal delivery of the guidewire into the distal vessel. In addition, we evaluated the post-operative complications, including device-related complications.

Results
10 patients (8 males; median age, 70 years) were treated with a median lesion length of 13 CTO lesions of 100 mm (range, 35–270 mm). CTO was detected in below the knee popliteal artery artery in one patient, the anterior tibial artery in three patients, the posterior tibial artery in three patients and the peroneal artery in six patients. A technical success rate was 77%, and no device-related complications were observed, including dissection and perforation. In three Technical failure cases, all patients suffered from chronic kidney diseases with hemodialysis, and their CTO lesion length were 50, 250, and 250 mm, respectively. The uncrossing CTO vessels had severe calcifications with continuous calcium on both sides of the vessel wall on radiographics. Even though three patients were categorized by Rutherford’s classification as category 5–6, but other revascularization procedures were successfully accomplished resulting in limb salvage.

Conclusions
The Crosser™ system is an effective, safe and alternative option for treating CTO, especially infrapopliteal arterial lesions.
Meso-Rex Bypass with Transposition of the Coronary or Inferior Mesenteric Vein for the Management of Idiopathic Extrahepatic Portal Vein Obstruction

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Purpose
This study aimed to evaluate whether meso-Rex bypass with transposition of the coronary or inferior mesenteric vein can be used as an alternative treatment modality for selected patients with symptomatic extrahepatic portal vein obstruction.

Methods
This was a retrospective review of six consecutive patients who received this alternative procedure for the treatment of symptomatic portal hypertension secondary to idiopathic extrahepatic portal vein obstruction. Their clinical characteristics, operative procedures and outcomes were analyzed retrospectively.

Results
The procedure was attempted in six patients, and all had a patent shunt established by intraoperative portography at the end of the procedure; the coronary vein was used in four patients and the inferior mesenteric vein was used in two. During the mean period of 17.2 months (range 6–26 months), follow-up was uneventful; reduced portal hypertension and no new episodes of gastrointestinal bleeding were observed in all patients, with the exception of one patient with shunt stenosis and recurrent varix bleeding who had to undergo endovascular treatment to restore portal vein blood flow. Technical and clinical success was achieved in all patients.

Conclusion
This procedure could be used safely and effectively to treat selected patients with portal hypertension secondary to extrahepatic portal vein obstruction.

Keywords: portal vein, obstruction, meso-Rex shunt, coronary vein, inferior mesenteric vein, technique

Intraoperative Surveillance Method with Indocyanine Green Fluorescence Imaging to Predict Ulcer Healing after Revascularization for Critical Limb Ischemia

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Background
Ulcer healing is one of most important goals of revascularization for patients with ulcer or gangrene due to critical limb ischemia (CLI). Although completion angiography after bypass surgery is important to suspect arterial circulation toward the territory of tissue loss, but it is difficult to get detailed visualization of arterial-arterial connection between angiosomes when angiosome not-oriented revascularization is performed. There are few established methods evaluating tissue circulation intraoperatively to predict ulcer healing.

Purpose
Aim of this study was to establish evaluation method with indocyanine green (ICG) fluorescence imaging of irrigation territory to predict ulcer healing. We investigated circulation toward ulcer lesion after revascularization to observe fluorescent appearance on foot.

Technique
After revascularization was completed, ICG was injected and fluorescent contrast on foot was continuously recorded bidirectionally by use of two near infrared fluorescence imagers. In the cases of complete ulcer healing, intraoperative fluorescent contrast in ulcer lesion was found just after revascularization. Intraoperative ICG fluorescence imaging on the foot of CLI so called “living angiosome staining” is useful to estimate reliability for ulcer healing especially in cases underwent angiosome not-oriented revascularization.

Keywords: critical limb ischemia, ulcer healing, revascularization, indocyanine green, angiosome

Follow Up Results of Lower Extremity Arterial Bypass with Autogenous Arm Vein Grafts

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Purpose
The superiority of autogenous vein conduits is well known in lower extremity arterial bypass (LEAB). Among various alternative conduits for LEAB, we would like to present long-term results of arm vein grafts.

Methods
We retrospectively reviewed database of patients who underwent infrainguinal LEAB with autogenous arm vein grafts at a single institute from 2003 through 2014. All procedures were performed in an absence of adequate saphenous vein. Graft patency was determined by periodic examinations of duplex ultrasonography. Graft patency and limb salvage rates were calculated using Kaplan Meier method.

Results
Autologous arm vein grafts were implanted for 25 patients (mean age, 60.4 ± 19.7 years; range, 20–85 years; male, 92%; atherosclerosis 17(68%) and non-atherosclerotic disease 8(32%) including 4 patients with Buerger’s disease. Source of arm vein were basilic 13(52%), cephalic 4(16%) and composition graft with other vein in 8(32%). Level of distal anastomosis distributed popliteal in 5(20%), tibio-peroneal in 18(72%) and inframalleolar artery in 2(8%). Mean duration of follow up was 42.6 ± 46.3 month (range, 1–132 months). Twenty patients (80%) were available to follow up and 12% of patients were dead due to underlying disease. Cumulative primary patency rates at 1, 3, and 5 years are 68%, 62%, 62% and secondary patency rates at 1, 3, 5 years are 75%, 69% 69%, respectively. There was no limb amputation during the follow-up period.

Conclusions
Arm vein is an useful alternative conduit when great or short saphenous vein is not available during LEAB.

Cardio Ankle Vascular Index as an Indicator of Dynamic Changes in Vascular Stiffness During Abdominal Aortic Maneuver

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Objective
Cardio Ankle Vascular Index (CAVI) is a relatively new, blood pressure-independent indicator for atherosclerotic vascular stiffness status. Its capacity, however, of reflecting hemodynamic changes is still unclear. This study is to evaluate the extent of CAVI as an immediate indicator of vascular stiffness following infrarenal abdominal clamping, in comparison to conventional indicator Pulse Wave Velocity (PWV) using New Zealand White rabbit.

Methods
An abdominal aortic clamping/declamping maneuvers were performed under general anesthesia through laparotomy. Pressure of right axillar artery and right renal artery with known distance were monitored, and PWV and CAVI were measured during the course. CAVI was calculated based on stiffness parameter method using VaSera VS-1500 (Fukuda Denshi Co., Ltd. Tokyo, Japan). After systemic heparinization, infrarenal abdominal aorta was clamped for twice, 15 minutes each with enough interval. PWV and CAVI values were indexed against control (valves of preclamp) and were observed during the course along with axillary arterial pressure (sBP(ax), mmHg).

Fig. 1 Changes in PWV and CAVI during abdominal aortic clamp/declamp maneuver.
Results
After aortic clamping, sBP(ax) showed 10% increase compared to control following drastic depression after declamping with gradual recovery to baseline pressure. There was a slight decrease in CAVI during clamping, with immediate and remarkable increase after declamping. PWV was stable during the course. The results of second time clamping maneuver showed the same patterns as those of the 1st challenge (Fig. 1).

Conclusion
CAVI showed a prompt response to blood pressure fluctuations following abdominal aortic clamping/declamping maneuvers, and may be considered as a highly sensitive hemodynamic parameter in the aspect of vascular resistance.

Can Preretrieval CT Predict the Difficult Removal of IVC Filter?

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Purpose
Inferior vena cava (IVC) filter is relatively safe procedure, but the potential negative long-term effects of IVC filters is reported. During IVC filter insertion, there have been complicated filter retrieval. We examine filter characteristics at preretrieval computed tomography (CT) that are associated with complicated IVC filter retrieval.

Methods
Institutional review board–approved retrospective review of IVC filter retrievals between January 2008 and June 2014 was performed to identify patients with preretrieval CT for a IVC filter retrieval. Complicated retrieval was defined by use of nonstandard techniques, procedural time over 30 mins, filter fracture, filter tip incorporation into the IVC wall, and retrieval failure. Preretrieval CT images were evaluated for tilt angle in mediolateral and anteroposterior directions, CT appearance of tip embedding, degree of filter strut perforation, and distance of filter tip from the nearest renal vein and dwelling time.

Results
Of Seventy-Six patients, twenty-four patients (32%) with complicated retrievals and 52 control patients (68%) with uncomplicated retrievals were evaluable for preretrieval CT characteristics. Complicated retrieval was defined by use of nonstandard techniques, procedural time over 30 mins, filter fracture, filter tip incorporation into the IVC wall, and retrieval failure. Preretrieval CT images were evaluated for tilt angle in mediolateral and anteroposterior directions, CT appearance of tip embedding, degree of filter strut perforation, and distance of filter tip from the nearest renal vein and dwelling time.

Conclusion
CT appearance of tip embedding, increased tilt with complicated IVC filter retrieval. Therefore, preretrieval CT may helpful in select patients for retrieval approach if necessary.

Keywords: IVC filter, DVT, retrieval

Lower Extremity Venous Lesions in Chronic Thromboembolic Pulmonary Hypertension Patients

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Purpose
Chronic thromboembolic pulmonary hypertension (CTEPH) is serious and life-threatening disease. CTEPH is generally considered to be caused by unresolved acute and/or repeated asymptomatic pulmonary embolism (PE) arising from deep vein thrombosis (DVT). However, its pathophysiology is still unclear. Because significant number of patients with CTEPH do not have history of DVT, we investigated the lower extremity venous system of CTEPH patients who were performed pulmonary endarterectomy (PEA).

Methods
We retrospectively analyzed History, physical findings, duplex ultrasonography of lower extremities, and air plethysmography (APG) findings of 17 consecutive patients who underwent PEA in our department from April 1995 to February 2015. Surgical specimens were also classified according to Jamieson classification.

Results
History of acute PE was found only two patients (12%). Eight (47%) patients had objectively confirmed history of symptomatic or asymptomatic DVT. Duplex scan found DVT in 9 patients (proximal DVT: 6 patients, distal DVT: 3 patients, no history of DVT: 4 patients). Three patients found no Duplex proved DVT at the time of PEA, although those patients had confirmed clinical history of DVT. Twelve patients (71%) had objectively confirmed history of DVT or duplex proved DVT at the time of PEA. Two patients (12%) had saphenous varicose veins. APG was performed in 9 patients. Eight patients (89%) showed high (>2.0 mL/second) venous filling index (VFI). All of them had DVT and/or varicose veins. One patient with right femoral and left soleal DVT showed normal VFI. Surgical findings of PEA and
site of DVT was as following; Jamieson 1 (proximal thrombi in pulmonary artery):11 cases (no DVT 4 cases, iliac DVT 1 cases, femoral DVT 2 case, popliteal DVT 1 case, distal DVT 2 case), Jamieson type 2 (intermediate type):5 cases (no DVT 4 cases, distal DVT 1 case), Jamieson type 3 (distal type) 1 case (IVC DVT 1 case). There is no clear relationship between site of DVT and pulmonary artery thrombus.

Conclusion

Most of CTEPH patients have objectively confirmed history of DVT, duplex proved DVT or varicose veins. Given low detection rate of chronic phase DVT by duplex scan, most CTEPH patients seemed to have leg venous pathology in CTEPH.

Keywords: chronic thromboembolic pulmonary hypertension, pulmonary endarterectomy, deep vein thrombosis, varicose vein, air plethysmography, Duplex ultrasonography

**Can't Snuffbox AVF Be the First Choice of Vascular Access Formation?**

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**Purpose**

As the survival of hemodialysis patients have prolonged, importance of long-use of AVF as a vascular access is more and more increasing. Snuff-box AVF is known as the superior method among shunt method in the point of the lengthening of in-use vessel. However, normally snuff-box AVF is regarded as only being applied in limited circumstances where the condition of artery and vein is ‘strong’. So usually snuff-box AVF is not accepted as the first choice of AVF and the number of doing also minimal.

**Methods**

From 2011 to 2014, snuff-box AVF was done as the first choice of vascular access by one vascular surgeon. If the possibilities of snuff-box AVF formation is existed, snuff-box AVF was done without exception.

**Results**

Total 156 cases of vascular access was done. Among them, number of snuff-box AVF is 50(31.4%) and excepting number of artificial graft (45 patients, 28.3%), the proportion of snuff-box AVF is increasing to 43.9%. The average follow-up period of snuff-box AVF was 17.4 months and survival rate of 30 months is 92.7%. Among 50 cases, 2 cases showed primary failure and should be changed to other vascular access methods.

**Conclusion**

The possible number of snuff-box AVF as the first choice is one third of total patients. And survival rate is not bad comparing with other vascular access method. So I insist that snuff-box AVF should be considered primarily when the vascular access method is considered and it will make more snuff-box AVF and the prolongation of vascular access.

Keywords: snuff-box AVF, vascular access

**A Case of Successful Inflow Reduction of a High-Inflow Vascular Access by RUDI (Revision Using Distal Inflow) Using Autologous Vein Graft**

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**Background**

High-inflow vascular accesses can be a substantial hemodynamic burden due to its major arterio-venous shunt. Vascular access closure and banding are often applied for treatment of high-inflow vascular access, but the loss of vascular accesses is the critical problem for the patients treated with access closure, and result of banding is often unpredictable and has high ratio of recurrence. Recently, inflow reduction by Revision Using Distal Inflow (RUDI) has been reported with good outcomes.

**Case Report**

We report a case of high-inflow vascular access successfully treated by Revision Using Distal Inflow. The patient was 48 year-old male, who complained dyspnea on mild exertion. He has been on hemodialysis for 4 years for end stage renal disease due to renal sclerosis. A year ago, his vascular access was revised to left brachio-cephalic shunt, which resulted in dyspnea on mild exertion, that he could not go up and down stairs. Banding using ePTFE graft was performed in a clinic. After 2 weeks, a pseudoaneurysm was developed at the site where the banding was performed and the patient was referred to our department. The pseudoaneurysm was ruptured at our emergency room and subsequently the brachio-cephalic shunt was re-anastomosed with a 5 mm arteriotomy with intention to reduce inflow. After the re-anastomosis, dyspnea on mild exertion persisted and the access inflow rate was over 3400 ml/min. The inflow reduction was indicated and RUDI was performed. The graft was the left forearm basilic vein and new inflow was the left radial artery. Immediately after the procedure, his symptom was resolved, and the inflow rate was decreased to 812 ml/min. RUDI is an excellent procedure that can provide
inflow reduction while preserving the vascular access. The patency of RUDI using the autologous vein graft versus RUDI using prosthetic graft was not clarified yet, but we believe the use of autologous vein graft may improve the patency of the vascular access after inflow reduction surgery.

**PP-A-15**

**The Role of Routine Duplex Surveillance in AVF Maturation; A Prospective, Randomized Trial**

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**Purpose**
To increase the usage of the autogenous arteriovenous fistula (AVF), close postoperative surveillance by an experienced physician is recommended, but currently there is no agreed protocol. This prospective, randomized, controlled study aims to test whether aggressive surveillance with routine duplex ultrasound and active intervention can enhance maturation rate of autogenous AVF.

**Methods**
150 patients undergoing autogenous AVF creation were enrolled. Immediately after the operation, patients were randomly assigned to a group of postoperative visit at 2 and 4 weeks with physical exam only (Control group, n = 76) or to a group of postoperative visit at 2 and 4 weeks with routine duplex ultrasound and physical exam (Duplex group, n = 74). Patients of the control group had selective duplex exam, only when there was abnormality detected during physical examination. Physical exam was done by an experienced vascular surgeon, and duplex exam was conducted by a certified registered vascular technologist. Both group had duplex examination at postoperative visit at week 8 and maturation rates were compared. Maturation was defined as successful first use before postoperative 8th week or venous rim flow over 500 ml/min at the final duplex exam. In addition we also sought to determine the patient and anatomic variables predictive of fistula maturation.

**Results**
Among 150 patients, 118 patients (Control group, n = 59; Duplex group, n = 59) were included in the final analysis. 11 patients from the control group and 10 patients from the duplex group had undergone surgical or percutaneous intervention for abnormalities detected during the postoperative visits. Overall maturation rate was 80.6% at postoperative 8th week and there was no significant difference between the duplex group and the control group (44/59 (74.6%) vs. 51/59 (86.4%), p = 0.104). Factors positively associated with maturation were presence of coronary artery disease (p = 0.008), diabetes as the etiology of the renal failure (p = 0.004), usage of antiplatelet or anticoagulant (p = 0.030), and preoperative cephalic vein diameter (p = 0.008).

**Conclusion**
Postoperative surveillance with routine DU has no significant advantage over surveillance with physical examination by experienced vascular surgeon in terms of autogenous AVF maturation.

**Keywords:** vascular access, maturation, surveillance

**PP-A-16**

**Cryopreserved Arterial Allograft Used as a Vascular Conduit for Hemodialysis**

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**Purpose**
This study examined whether an upper arm vascular access using a cryopreserved arterial allograft could permit immediate hemodialysis, if need be, without a central venous catheter in patients with vascular access dysfunction. Furthermore, the patency of this technique was compared with that of vascular access using a prosthetic graft.

**Methods**
Between April 2012 and March 2013, 20 patients underwent an upper arm vascular access using a cryopreserved arterial allograft and 53 using a prosthetic graft were included in this study.

**Results**
The mean duration of catheter dependence until successful cannulation of the vascular access was significantly longer for accesses using a prosthetic graft than a cryopreserved arterial allograft (34.4 ± 11.39 days vs. 4.9 ± 8.5 days, P = 0.000). In the allograft group, use of vascular access started within 7 days in 16 patients (80%), as soon as from the day of surgery in 10 patients. Primary (unassisted; P = 0.314) and cumulative (assisted; P = 0.673) access survivals were similar in the two groups.

**Conclusion**
Upper arm vascular access using a cryopreserved arterial allograft may permit immediate hemodialysis without a central venous catheter, resulting in access survival comparable to that of an accessing using a prosthetic graft.

**Keywords:** vascular access, dysfunction, cryopreservation, allograft, prosthetic graft
Comparative Results of EVAR in AAA with Conical Neck and Non-Conical Neck

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Purpose
Baseline aortic anatomy is a key determinant of endovascular aneurysm repair (EVAR) appropriateness and long-term clinical success. EVAR in abdominal aortic aneurysm (AAA) patients with conical neck is known to have a high risk for complication such as proximal endoleak and stent graft migration. Some researchers consider the presence of conical neck to be the contraindication of EVAR. In this study, we investigated the comparative results in AAA patients with conical neck who underwent EVAR.

Methods
Conical neck was defined if the neck coefficient was greater or equal to 10. From January 2010 to December 2013, 105 patients with AAA underwent EVAR in our institution. Among them, 38 patients (36.2%) had AAA with conical neck. We investigated the clinical characteristics of patients and the details of conical neck. We also analyzed the results of type Ia endoleak, stent migration, admission duration, and mortality.

Results
Mean age of the patients was 73.97 ± 7.70 in conical neck group and 72.70 ± 7.75 years in non-conical neck group (P = 0.419). The percentage of male was 78.9% in conical neck group and 85.1% in non-conical neck group (P = 0.423). There were no statistical differences in clinical characteristics of patients between two groups. The frequency of type Ia endoleak was higher in the conical neck group compared with non-conical neck group (23.7% vs 6.0%, P = 0.013). Although there was no statistical significance, mortality was higher and admission duration was longer in the conical neck (15.8% versus 6.0%, 16.62 ± 13.12 days versus 13.03 ± 13.13 days). Mean follow-up duration was 319.2 ± 366.45 days.

Conclusion
The presence of conical neck may not be a contraindication for EVAR. However, it seems to negative influence the outcomes.

Keywords: endovascular aneurysm repair, conical neck, comparative results

Our Experience of Total Debranching TEVAR in the Treatment of Aortic Arch Aneurysms

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Purpose
The total arch replacement is the best method to treat arch aneurysms, but in elderly and high risk patients with multiple comorbidities can be treat more safely with hybrid repair. We reviewed our experience of total debranching TEVAR in the treatment of aortic arch aneurysms to evaluate its feasibility, safety, and effectiveness.

Methods
Between October 2008 and July 2014, 35 consecutive patients (30 men; mean age 78.5 ± 5.1 years) underwent elective treatment for aortic arch aneurysms with total debranching TEVAR. Preoperative, perioperative, and follow-up data were collected retrospectively in the database.

Results
The technical success rate was 100%. The paraplegia and stroke rates were 2.9% and 11.4%, respectively. The overall 30-day mortality and in-hospital mortality rates for all 61 patients were 0% and 5.7% (n = 2), respectively. There were no perioperative type 1 or 3 endoleaks that required secondary intervention. The mean hospital stay was 37.8 days. The median follow-up was 309 ± 303 days. No aneurysm-related deaths occurred during follow up.

Conclusions
The total debranching TEVAR can be safely performed with good technical success and good midterm results in high risk patients. Because of high stroke rate, improvement to prevent stroke is required.

Keywords: aortic arch aneurysm, TEVAR, hybrid repair
Changes in Suprarenal and Infrarenal Aortic Angles after Endovascular Aneurysm Repair

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Purpose
We investigated whether suprarenal and infrarenal aortic angles change after the endovascular aneurysm repair (EVAR) procedure and during follow up, and investigated the correlation between infrarenal aortic angle after EVAR and type Ia endoleaks.

Methods
Data collected on 70 EVAR procedures for a fusiform infrarenal aortic aneurysm performed between May 2006 and December 2012 were supplemented with a retrospective review of charts and radiographs.

Results
The greater the preoperative infrarenal aortic angle, the greater the suprarenal aortic angle (r = 0.72, P <0.001). The infrarenal aortic angle decreased after the EVAR procedure and continued to decrease slowly thereafter (all p <0.01). Suprarenal aortic angle decreased immediately after the EVAR procedure and continued to decrease during the first month (p <0.01) No differences in angulation were observed based on stent graft type. Type Ia endoleaks occurred with significantly greater incidence in patients with a larger post EVAR infrarenal angle (p = 0.037) and all endoleaks showed significant results in both pre-EVAR (p = 0.037) and post EVAR infrarenal angles (p = 0.007).

Conclusion
The infrarenal aortic angle decreased significantly immediately after the EVAR procedure and continued to decrease slowly thereafter. Suprarenal aortic angle decreased immediately after the EVAR procedure and continued to decrease during the first month. We found a correlation between infrarenal and suprarenal aortic angle. Type Ia endoleaks occurred with greater incidence in patients with a larger infrarenal angle immediately after EVAR.

Keywords: aortic angle, EVAR, endoleak

Our Optimal Medical Treatment for Stanford Type A Acute Aortic Dissection with Thrombosed False Lumen Suggests a New Indication for Surgery

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Purpose
Regarding to the guidelines for aortic disease from The Japanese Circulation Society, The treatment of Stanford Type A Acute Aortic Dissection with Thrombosed False Lumen (Thrombosed AAD) should be determined by its hemodynamic condition and aortic imaging. The hemodynamically stable patients with less than 50 mm in diameter of the ascending aorta or less than 12 mm of its false lumen are usually treated by optimal medical treatment (OMT). However, the patients with OMT are sometimes suffered from aortic events. We retrospectively analyzed our experience of OMT for Thrombosed AAD.

Method
From February 2009 to May 2014, there were 30 cases of Thrombosed AAD. According to Japanese guideline, emergent operation was carried out for patients with >50 mm in diameter of the ascending aorta and >11 mm of the thrombosed false lumen. Patients with cardiac tamponade, severe aortic insufficiency, and hemodynamic instability also underwent emergent surgery. Then, 21 patients (13 males) were determined to have OMT by enhanced-computed tomography on arrival. The mean age was 71 ± 10.6 years old.

Results
We divided 21 patients into 3 groups according to their clinical course. In G1, 7 patients (33%) had surgical intervention during OMT in acute and subacute phase. In G2, 1 patient (5%) died due to aortic rupture during OMT in subacute phase. In G3, 13 patients (62%) discharged without complications after OMT. This group was divided into two subgroups. In G3A, 6 patients (29% of all patients) had late aortic events (e.g. surgery, significant dilatation, recanalization, enlargement of ulcer like projection) during follow-up (mean 8.7 months). In G3B (19% of all patients) showed disappearance of false lumen during follow-up (mean 3 years).

Conclusion
We divided 21 patients into 3 groups according to their clinical course. In G1, 7 patients (33%) had surgical intervention during OMT in acute and subacute phase. In G2, 1 patient (5%) died due to aortic rupture during OMT in subacute phase. In G3, 13 patients (62%) discharged without complications after OMT. This group was divided into two subgroups. In G3A, 6 patients (29% of all patients) had late aortic events (e.g. surgery, significant dilatation, recanalization, enlargement of ulcer like projection) during follow-up (mean 8.7 months). In G3B (19% of all patients) showed disappearance of false lumen during follow-up (mean 3 years).

There were no operative death in G1 and G3A. In G1, there were significantly more patients who had larger ascending aorta (>45 mm in diameter) than the patients in the other groups (p <0.01). In G1+2, the Ascending/Descending aortic diameter ratio (ADR) was higher (1.69 ± 0.2 vs 1.44 ± 0.2, p <0.011) than G3. The ADR more than 1.65 was predictive factor of acute and subacute aortic event (p <0.05). The presence of ulcer like projection on the aortic arch was the predictive factor of late aortic events (p <0.01).
The size of the false lumen was not definitive factor for aortic events.

Conclusion

Thrombosed AAD with >45mm of the ascending aorta and/or >1.65 of the ADR may be applicable for operative indication during OMT.

**PP-B-5**

Success Rate of Reentry During the Endovascular Recanalization in Long Iliac and Femoral Chronic Total Occlusion (CTO) and Alternative Options after Reentry Failure

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**Purposes**

The reentry failure is one of major causes influencing technical success of endovascular treatment of long chronic total occlusions (CTOs) in iliac arteries and femoral arteries. This study was conducted to evaluate the success rate of reentry during endovascular recanalization of long iliac and femoral CTOs and alternative options after reentry failure.

**Methods**

This is a retrospective study from prospectively registered database of patients underwent endovascular treatment for long iliac artery and femoral artery CTO from October 2008 to September 2014 in Seoul St. Mary hospital and Inha university hospital. The patients treated with hybrid technique were excluded. We analyzed the baseline characteristics of patients, success rate of reentry, and alternative options after reentry failure. Primary success rate was defined as a success of recanalization with initial strategy, overall success rate as success of recanalization with initial vascular access and/or alternative endovascular treatment (e.g. using CTO device such as Outback™, Truepath™, Offroad™ etc., or distal vessel puncture (Rendezvous or SAFARI technique) after failure of initial attempt.

**Results**

Fifty nine iliac CTOs (52 patients) and 17 femoral CTOs (16 patients) were enrolled. Overall success of recanalization was 52(88.1%) in iliac CTO group and 14(82.4%) in femoral CTO group (p = .684). Primary success rate was 49(83.1%) and 10(58.8%) (p = .049), secondary success rate was 51(86.4%) and 13 (76.5%) (p = .449), respectively.

**Conclusions**

In this study, overall success rate was 88.1% in iliac CTO group and 82.4% in femoral CTO group. The primary success rate was much higher in iliac CTO group (83.1%) than in femoral CTO group (58.8%) which was statistically significant. However, secondary success rate was markedly increased in femoral CTO group (76.5 %) than in iliac CTO group (86.4%). The alternative strategies after the initial reentry failure is very important and can improve overall success rate of endovascular recanalization of long iliac and femoral CTOs. In this study the primary success rate was much higher in iliac CTO group (84.2%) than in femoral CTO group (57.9%) which was statistically significant. However, overall success rate has increased to 87.7% in iliac CTO group and to 84.2% in femoral CTO group. The alternative strategies after the initial reentry failure is very important and can improve overall success rate of endovascular recanalization of the iliac and femoral CTOs. The alternative strategies after the initial reentry failure is very important and can improve overall success rate of endovascular recanalization of the iliac and femoral CTOs. In this study the primary success rate was much higher in iliac CTO group (84.2%) than in femoral CTO group (57.9%) which was statistically significant (p <0.05). However, overall success rate has increased to 87.7% in iliac CTO group and to 84.2% in femoral CTO group. The alternative strategies after the initial reentry failure is very important and can improve overall success rate of endovascular recanalization of the iliac and femoral CTOs.

Keywords: chronic total occlusion, recanalization, reentry

**PP-B-6**

Immediate Endovascular Repair for Acute Retrograde Type A Aortic Dissection with Branch Vessel Malperfusion

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**Objective**

Acute aortic dissection, Stanford type A, still remains a life-threatening disease that can lead to aortic rupture, cardiac tamponade and neurological disorders. Recently, favorable results of endovascular repair for retrograde type A dissection were reported. We describe successful endovascular repair of a retrograde type A acute aortic dissection with neck vessel malperfusion.

**Case Report**

An 81-year-old man became semiconscious and suddenly noticed back pain in the morning. On the next day, he had chest pain and neck pain on the right side, and was admitted to a hospital.
on the 3rd day after the onset of back pain. Enhanced CT revealed retrograde Stanford type A aortic dissection, extending from just above the sino-tubular junction to the abdominal aortic bifurcation, and thrombosis of the proximal ascending aorta. There were two major intimal tears opening at 2 cm distal from the origin of the left subclavian artery and at the Th6 level of the descending aorta. The true lumens of brachiocephalic and right carotid arteries were occluded by the thrombosed false lumen. We considered complete surgical repair was too invasive for an octogenarian; thus, endovascular aortic repair was planned.

Under general anesthesia, a 22-Fr guiding sheath was inserted in the right femoral artery, and a pigtail catheter was inserted in the left femoral artery. Aortography showed brachiocephalic artery occlusion and false lumen enhancement starting from the distal arch and flowing towards the ascending and distal descending aorta. The left common carotid and left subclavian arteries were intact. A stent graft of $31 \times 100$ mm (Gore TAG, W. L. Gore, Flagstaff, AZ, USA) was placed at the distal side of the left subclavian artery without touchup. Immediately after deployment of the stent grafts, blood flow into the brachiocephalic artery was restored, and right brachial artery pressure normalized. Subsequent aortography showed a closed intimal tear in the distal aorta, restoration of brachiocephalic and right common carotid arteries and no intimal tear in the descending thoracic aorta. Blood flow was detected in the true lumen of the right carotid artery by percutaneous ultrasonography. CT 5 days later showed a diminishing false lumen in the ascending aorta. He had no neurological deficit and was uneventfully discharged on the 14th day after admission.

One and five months after the procedure, CT showed obliteration of the false lumen of the thrombosed ascending aorta and intact branching arteries in the neck. The diameters of the ascending and middle descending aorta had decreased.

**Conclusion**

Endovascular repair for retrograde acute type A aortic dissection was successfully performed and preferable result. Malperfusion caused narrowing of the brachiocephalic artery; however, immediate entry closure resulted in the total recovery of brachiocephalic artery flow due to decompression of the false lumen.

Keywords: acute aortic dissection, endovascular repair

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**PP-B-7**

**Primary Patency of Long Segment Femoropopliteal Interventions for TASC C and D Lesions with Full Metal Jacket Stenting, Balloon Angioplasty with Spot Stenting and Primary Balloon Angioplasty**

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**Purpose**

The purpose of this study is to evaluate outcome of percutaneous femoropopliteal intervention for TASC C and D lesions with full metal jacket (FMJ) stenting, balloon angioplasty with adjunctive spot stenting (BASS) and primary balloon angioplasty (PBA).

**Methods**

From April 2006 to March 2014, Femoropopliteal interventions for long segment occlusion or stenosis with follow-up data of 111 chronic ischemic limbs (60 of long segment stenosis and 51 of occlusion) in 101 patients was analyzed retrospectively. Study endpoints were primary patency. Patency rate was analyzed by the Kaplan-Meier analysis.

**Results**

FMJ stenting was performed in 38 limbs, BASS in 22 and PBA in 57. Technical success was achieved in all cases. As major complication, acute distal embolism occurred in one patient. Primary patency rates of FMJ, BASS and PBA at 6 months were 74.5%, 39.6% and 57.4% respectively ($P = .241$). Primary patency rates of FMJ, BASS and PBA at 12 months were 37.2%, 23.8% and 16.8% respectively ($P = .228$). Patency rate of FMJ stenting was longer than other methods but there were no statistical differences. Subgroup analysis was performed in 60 limbs of long segment stenoses and 51 limbs of long segment occlusions. No significant difference was found in long segment stenosis group in terms of primary patency among treatment modalities. However, in occlusion group, primary patency rates of FMJ, BASS and PBA at 6 months were 57.9%, 0% and 36.0% respectively ($P = .047$). Primary patency rates of FMJ, BASS and PBA at 12 months were 26.3%, 0% and 8.0% respectively ($P = .039$).

**Conclusion**

Patency of FMJ stenting is superior to BASS and PBA in the treatment of infrainguinal long segment occlusion lesions.
Moderate (25°C) versus Deep (20°C) Hypothermia during Hypothermic Circulatory Arrest in Operation for Stanford Type A Aortic Dissection: Analysis of Cerebral Oxygen Saturation and Clinical Outcome

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Purpose
The aim of the present study was to assess the effect of different temperature for hypothermic circulatory arrest (HCA) in the operation of acute type A dissection. We investigated regional cerebral oxygen saturation (rSO2) and clinical outcome in patients undergoing moderate (25°C of rectal temperature) versus deep (20°C of rectal temperature) hypothermic circulatory arrest.

Methods
Between October 2013 and January 2015, 30 patients underwent replacement of the ascending aorta or aortic arch. Of these, 21 patients (12 female; mean age 68 years) undergoing replacement of the ascending aorta, and performing continuous measurement of rSO2 were reviewed. Replacement was performed with an open distal anastomosis using selective antegrade cerebral perfusion (ACP) with HCA. Nine patients underwent deep hypothermia (mean lowest temperature, 19.8 ± 1.3°C) and 12 patients underwent moderate hypothermia (mean, 24.4 ± 1.4°C).

Results
Compared with moderate hypothermia, deep hypothermia was associated with longer cardiopulmonary bypass time (235 ± 66 vs 206 ± 21 min; P = 0.16) and operative time (396 ± 75 vs 354 ± 48 min; P = 0.13), although not statistically significant. Change of rSO2 during operation were similar in two groups (Fig. 1). The rSO2 decreased gradually during HCA without ACP. However it didn’t fall below 55%. Overall, the early mortality rate was 4.8% (n = 1). New postoperative stroke occurred in a patient with preoperative acute type A dissection. No significant difference was seen in early mortality (0% vs 8.3%; P = 0.57), and postoperative neurological morbidity (1.0% vs 0%; P = 0.43) between two groups.

Conclusions
Although both of moderate and deep hypothermia can be safely applied for operation in acute type A dissection, moderate hypothermia may be advantageous in that it reduces cardiopulmonary bypass time and operative time.

Keywords: acute aortic dissection, regional cerebral oxygen saturation, hypothermic circulatory arrest

Technical Considerations for Optimal Outcomes after Treatment of Isolated Iliac Artery Aneurysms

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Purpose
Isolated iliac artery aneurysms without co-existence of abdominal aortic aneurysms is a very rare disease but can still be fatal when ruptured due to its anatomical location. These lesions may be bilateral and may involve any of the common (CIA), external (EIA) or internal iliac (IIA) arteries or a combination of these. An important technical consideration during treatment of these lesions is the preservation of IIA flow to prevent the possibility of pelvic organ ischemia, buttock claudication and erectile dysfunction.

Fig. 1 Change of rSO2 during operation.
CPB: cardiopulmonary bypass; CA: circulatory arrest; ACP: antegrade cerebral perfusion
Herein we present our experience at a single institution with emphasis on the methods used to preserve IIA flow and the related outcomes.

Methods

A total of 17 patients underwent treatment for isolated iliac artery aneurysms between March 2005 and February 2015. Both open and endovascular repair were performed in the operating theater by a single vascular surgeon. Our indication for treatment was aneurysm size of more than 4 cm, the presence of pain or compression of surrounding vital structures, and a rapid increase in size during follow-up. Preservation of both IIAs was attempted in all cases, but when not feasible, at least 1 IIA was always preserved. Open repair was performed mainly by a transperitoneal approach while endovascular treatment was performed by either cutdown of the femoral arteries or by percutaneous puncture. The outcomes of the cases were evaluated and the presence of pelvic ischemic symptoms was monitored in cases in which an IIA was sacrificed.

Results

From a total of 17 patients, 4 underwent open repair and 13 underwent endovascular repair. The 4 patients that underwent open repair were due to hydronephrosis from ureter obstruction in 3 cases and intractable pain in 1 case, all of which would benefit from a rapid decompression. The IIA was preserved in 3 cases, while 1 case required simple IIA excision and ligation due to inaccessibility issues. Standard EVAR with/without single IIA embolization was performed in 4 cases in which the CIA aneurysm had a very short proximal neck or the aneurysms were present bilaterally, and EVAR with sandwich technique was performed in 3 cases with combined bilateral IIA aneurysms for preservation of at least one IIA flow. In 4 cases with good CIA neck for landing, a reversed stent graft was inserted with IIA embolization, and in 1 case where the proximal neck was more than 24 mm, a main body stent graft was inserted. In 1 case of isolated unilateral IIA aneurysm, simple proximal and distal embolization was performed. Technical success was achieved in all patients except for one case of minor type Ib endoleak in a case of reversed stent graft insertion which was decided to be observed. During the follow-up, there was only 1 case of limb occlusion in a case of EVAR with sandwich in which the IIA limb was occluded, which was observed since flow to the lower extremities was preserved. Otherwise, all grafts were patent without complications. None of the patients presented with symptoms related to IIA flow interruption, including the patient with eventual, yet non-simultaneous bilateral IIA occlusion from limb occlusion. There was one case of mortality during the follow-up which was unrelated to the procedure.

Conclusion

Isolated iliac artery aneurysms are rare but require special anatomical considerations regarding IIA flow when intending to treat them. Measures to preserve at least one IIA flow, including use of iliac branch devices or sandwich techniques, are needed to optimize outcomes and improve patient satisfaction.

PP-B-10

Possible Association between Non-Invasive Parameter of Flow-Mediated Dilatation in Brachial Artery and Atherosclerosis of Internal Thoracic Artery with Coronary Artery Disease

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Purpose

Despite being a relatively widely-used non-invasive parameter of endothelial dysfunction, little is known regarding the relationship between flow-mediated dilatation (FMD) and atherosclerosis of internal thoracic artery in patients with coronary artery disease (CAD).

Methods

36 CAD patients (age: 67.7 ± 12.0, Female 8) who underwent both coronary artery bypass graft and FMD were enrolled. Pathological analyses of left internal thoracic artery stump were performed.

Results

Averaged %FMD was 3.67 ± 3.03% (median 2.77%, 25th 1.60%, 75th 4.90%). Intima thickness was shown in 9 patients. The %FMD in intima thickness patients (5.4 ± 3.7%) was significantly higher than no intima thickness patients (2.9 ± 2.1%, P = 0.018). Intima thickness of internal thoracic artery were positively correlated with %FMD (P = 0.002, r = 0.31).

Conclusion

Impaired endothelial function in brachial arteries may be negatively correlated with intima thickness of internal thoracic artery in patients with CAD. That might be a reason why internal thoracic artery has shown the best long-term results in CABG.

Keywords: flow-mediated dilatation (FMD), atherosclerosis

PP-B-II

Management Strategy of Persistent Sciatic Artery

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**Objective**
Persistent sciatic artery (PSA) is a relatively rare congenital variant of the lower limb vasculature and can have highly variable clinical presentation. The purpose of this study is to review our experience with PSA management with literature review and to suggest an optimal management strategy.

**Methods**
Between 2001 and 2014, a total of 19 patients (24 limbs) were diagnosed with PSA in three hospitals. All literature from 1964 to 2014 were reviewed using PubMed database and Google Scholar. Patient demographics, PSA and femoral artery type, aneurysmal change, symptoms and treatment method were also assessed.

**Results**
PSA was diagnosed in 10 men (52.6%) and 9 women (47.4%). The PSA was bilateral in 26.3% of the patients. Type 2a was the most common variant (62.5%) with unclassified types in two limbs. Comparing with literature cases, the occlusion rate was higher in our cases (41.7% vs 6.5%), but aneurysm rate was higher in the literature cases (63.3% vs 20.8%). Sixteen limbs (66.6%) were treated conservatively. Six limbs were treated by open surgery, including 4 bypasses, 1 amputation and 1 embolectomy. Endovascular coil embolization was done in 1 limb and a hybrid procedure with stent graft was done for a PSA aneurysm. We propose a new classification system according to the perfusion status and the presence of aneurysm.

**Conclusions**
Limb perfusion by femoral artery system and the presence of PSA aneurysm should be considered to select optimal therapy. For a huge aneurysm with mural thrombus, surgical treatment is needed. The role of endovascular therapy in PSA needs to be evaluated with long term follow-up.

**PP-B-12**
Endovascular Repair of Aortoiliac Aneurysmal Disease with the Iliac Branch Devices
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**Purpose**
During endovascular treatment of abdominal aortic aneurysm (EVAR, AAA) with bilateral common iliac artery aneurysms (CIAAs), an interruption of the bilateral internal iliac arteries (IIAs) is often needed and may cause postoperative ischemic complications. An iliac branch device has been introduced as a valid endovascular technique to preserve IIA flow. This study aims to present our initial experience with the Zenith iliac branch device (IBD; Zenith Branch Endovascular Graft-Iliac Bifurcation, Cook Medical Inc., Bloomington, IN, USA) that preserves internal iliac artery flow in patients with complex aortoiliac aneurysmal diseases.

**Methods**
Between 2011 and 2015, 10 patients (9 men, 1 woman) with a mean age of 76.8 years (range, 67–93 y) were treated with IBDs. Indications were AAA with concomitant bilateral CIAAs. Eight of the 10 patients had concomitant unilateral IIA aneurysms. The devices were chosen on the basis of multiplanar reconstruction images and centerline flow imaging using 3-dimensional (3D) workstation. After hemilateral internal iliac artery (IIA) embolization with coils, all patients were treated with the Zenith bifurcated stent graft, in which an IBD and an Advanta V12 stent graft (Atrium Medical, Hudson, NH, USA) as a bridging stent graft were used to preserve antegrade flow of the unilateral IIA. Data were prospectively collected from the IBD-treated patients. Follow-up computed tomography scans at 1, 3 (optional), 6, 12 months, and annually thereafter were performed.

**Results**
Technical success rate, as defined by successful implantation of IBD together with the bifurcated stent graft with no intra-procedural type I or type III endoleak, was 100%. The mean fluoroscopy time was 63 minutes and the mean operative time was 262 minutes. The postoperative courses of all the patients were uneventful. The mean postoperative hospital stay was 12.9 days. The branch patency was also 100% during the follow-up period (mean 19 months). One patient died of cancer and the rest of patients were alive. One type II endoleak was detected during the follow-up. No patients complained of buttock claudication or ischemic colitis during the period.

**Conclusion**
IBD placement is a feasible technique with excellent short-term results in the treatment of complex aortoiliac aneurysmal diseases without pelvic ischemic complications. Long-term patency and the durability data needed to be studied to fully elucidate the efficacy of the use of IBDs.

**Keywords:** Iliac branch device, hypogastric artery, common iliac artery aneurysm, stent graft

**PP-B-13**
Usefulness of Intraoperative Ultrasonography (USG) During Directional Atherectomy: SilverHawk/TurboHawk Plaque Excisional Systems
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**Purpose**
During endovascular treatment of abdominal aortic aneurysm (EVAR, AAA) with bilateral common iliac artery aneurysms (CIAAs), an interruption of the bilateral internal iliac arteries (IIAs) is often needed and may cause postoperative ischemic complications. An iliac branch device has been introduced as a valid endovascular technique to preserve IIA flow. This study aims to present our initial experience with the Zenith iliac branch device (IBD; Zenith Branch Endovascular Graft-Iliac Bifurcation, Cook Medical Inc., Bloomington, IN, USA) that preserves internal iliac artery flow in patients with complex aortoiliac aneurysmal diseases.
Objectives
Directional Atherectomy (DA) was introduced for control the infrainguinal arterial stenosis or occlusive lesions. The percentage of stenosis in DEFINITIVE LE study was evaluated under the radiologic image. The aim of this study was revealing of technical feasibility and usefulness of intraoperative ultrasonography (USG) during DA.

Methods
A prospective database was maintained of DA procedure using SilverHawk/TurboHawk system from February 2014 to February 2015. A total 23 lesions of femoral artery stenosis (>60% stenosis) of short segment occlusive lesion (<2 cm length) were treated. 18 lesions were treated with SilverHawk system and 5 lesions were treated with TurboHawk system due to the calcified lesion. When we used a TurboHawk system, protection device for distal embolism also be used. The percentage of stenosis after DA was check with USG and angiography.

Results
Median age was 70 years (range 56–86). All patients were male. Lesion characteristics were 23 superficial femoral arteries and popliteal arteries. Median follow up was 6 months (range 2–13). Device success rate by angiography (<30% stenosis after DA) was 100% and median residual stenosis by USG was 40%. There is no complication such as perforation, embolism and dissection. The 30 day major adverse event rate was 0%. Primary patency reported at 6 months was 100%. (PSVR ≤2.4 and no reintervention for target lesions) Median stenosis of target lesion by USG is 40%. Secondary 6 months patency was 100% and all patients had free of symptoms about claudication at 6 months.

Conclusion
This is the pilot study of using intraoperative USG during DA. This study showed usefulness of using intraoperative USG during DA.

PP-B-I4
Three Cases of Saddle Embolus of Abdominal Aorta
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Background
Acute saddle embolus of abdominal aorta requires rapid diagnosis and intervention to prevent loss of life or limb. The overall mortality due to embolic occlusion is reported to be over 30%. The mechanisms of acute aortic occlusion were mainly divided into embolisms and thrombosis related to aortoiliac occlusive disease. The most common source of emboli is the heart, secondary to atrial fibrillation or myocardial infarction.

Patients
During the interval from 2006 to 2014, we experienced 3 case of acute saddle embolus of abdominal aorta by different mechanisms and reviewed the literature concerning surgical management. The patient’s ages ranged from 66 to 74 years old. One of the 3 patients had a history of atrial fibrillation. Clinical presentations included acute limb ischemia and neurological deficit in all 3 cases. All patients underwent transfemoral thrombectomy under local anesthesia. The perioperative mortality rate was 33%, related to myonephropathic metabolic syndrome, (MNMS). 2 cases of the 3 patients, the lower extremities were successfully salvaged. The outcomes of these patients depend on prompt diagnosis, systemic heparinization and early revascularization by appropriate operation; initial attempt of transfemoral thrombectomy, and axillofemoral bypass in high risk patients. After revascularization, patients must be carefully monitored for reperfusion syndrome, myonephropathic metabolic syndrome, (MNMS) acute renal failure and compartment syndrome.

Keywords: Acute saddle embolus of abdominal aorta, myonephropathic metabolic syndrome

PP-B-I5
Risk Factors for Stroke During Surgery for Carotid Body Tumors
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Purpose
Removing carotid body tumors (CBTs) carry the risk of operative morbidity including stroke. We evaluated the risk factors for stroke related to resection of CBTs.

Methods
We retrospectively reviewed the records of 17 procedures performed on 16 patients with CBT between March 1998 and September 2008. The study population consisted of 5 men and 11 women, of mean age 41.7 years (range: 23–62 years).

Results
At surgery, 8 cases (47%) were localized and classified as Shamblin class I, 4 cases (23.5%) as class II, and 5 cases (29.4%) as class III. Four patients had postoperative stroke (23.5%), with Shamblin classification related to the incidence of stroke (P = 0.041). In contrast, neither tumor size (P = 0.412) nor heparin injection before internal carotid artery (ICA) manipulation (P = 0.538) was associated with stroke. Although preoperative embolization of the tumor feeder did not significantly reduce the stroke rate (P = 0.579), early external carotid artery (ECA) division in patients with class II and III tumors was effective (P = 0.008). Internal carotid artery (ICA) manipulation, including
reconstruction, ligation, and repair of injury, significantly increased the incidence of stroke ($P = 0.029$), as did ICA ligation without reconstruction ($P = 0.044$). Internal carotid artery manipulation, including reconstruction, ligation, and repair of injury, significantly increased the incidence of stroke.

**Conclusion**

For uncomplicated CBT resection, careful preoperative planning, especially for patients with class II and III tumors, is mandatory to avoid inadvertent ICA manipulation necessitated by bleeding. Early ECA division during the operation rather than preoperative percutaneous embolization in patients with class II and III tumors was significantly effective in reducing the stroke rate.

Keywords: carotid body tumor, postoperative stroke

**PP-B-16**

Prevention of Postoperative Spinal Cord Ischemia in Surgical Treatment of Thoracoabdominal Aortic Aneurysm

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**Background**

Preventing postoperative spinal cord ischemia in surgical treatment of thoracoabdominal aortic aneurysm is still controversial, due to the difficulty of identifying the artery of Adamkiewicz (AKA) and associated collateral circulation. However, separating the operation into two periods using cardiopulmonary bypass (CPB) and circulation arrest technique could offer a solution to this problem by developing the collateral circulation and its reliable reconstruction of AKA.

**Case Report**

We encountered a 55-year-old man, who underwent replacement of the ascending aorta to the aortic arch in 2002, followed by the descending aorta in 2003, due to dissection of the aorta (DeBakey type I). He then underwent an m-Bentall operation in 2012 due to aortic regurgitation. The patient was left with thoracoabdominal aortic aneurysm below the Th7 level, and aneurysm of both common iliac arteries.

Since aneurysms involved an extensive area, we separated the operation into two periods. We operated on the lower abdominal and common iliac artery aneurysms first, followed by the thoracoabdominal aortic aneurysm. Since computed tomography (CT) showed wide lumbar arteries at the L2 and L4 level, the decision was made to preserve and reconstruct these lumbar arteries by using CPB to prevent spinal cord ischemia. Preoperatively, we constructed a replacement Y-graft containing several branches feeding to the CPB, lumbar arteries, and internal and external iliac arteries. During the reconstruction, we monitored activity of the spinal cord using motor evoked potentials. The patient’s postoperative course was well. Using the CPB can minimize the ischemic time of the spinal cord.

A year after the prior operation, we decided to operate the remaining part of the thoracoabdominal aortic aneurysm, because he underwent re-dissection of the aneurysm. For this operation, we made the decision of using the circulation arrest technique, in order to prevent damage of the adhesion lung from the previous operation, and also for the reliable reconstruction of the AKA which was thought to be Th11. We cooled the temperature down to 19°C. This protected the lung from unnecessary injury from ablation of its adhesion, and also gave enough time to reconstruct the AKA. The patient’s postoperative course was well and he was free from the spinal cord ischemia.

Prevention of postoperative spinal cord ischemia in surgical treatment of thoracoabdominal aortic aneurysm has remained controversial because of the anatomical complexity of the region. In cases where the AKA remains undetermined or poor development of collateral circulation is expected, separating the operation into two periods of time could allow development of the collateral circulation, and use of CPB may help to prevent spinal cord ischemia by minimizing intraoperative blood loss. Moreover, using the circulation arrest technique will prevent lung from the injury and also provides the operator of enough time for reliable reconstruction of the AKA.

**Poster Exhibition**

**PE-I**

Cumulative Incidence and Risk Factors of Asymptomatic Carotid Artery Stenosis Based on Health Screening Population in Korea

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**Purpose**

The goals of this study were to investigate the cumulative incidence and risk factors of asymptomatic carotid artery stenosis and to determine the natural course of stenosis with asymptomatic carotid artery stenosis in health screening population.

**Methods**

Prospectively maintained database of the patients who underwent carotid artery duplex ultrasonography for health screening
from January 2005 to December 2014 were retrospectively evaluated. Patients were included in this study who had at least three times of duplex ultrasonography and had at least 5-year follow up period. The carotid artery status was defined as normal, 0–50%; moderate carotid stenosis, 50–70%; severe stenosis, 70–99% in relation to the bulb diameter. Progression or regression was considered present if there was a change of at least one grade higher or lower, respectively.

We investigated cumulative incidence of carotid artery stenosis according to the age and sex. And risk factors analysis was conducted with Cox proportional hazard regression model.

**Results**

Total 11469 patients (mean age 58.7 ± 8.0 years, range 23–85 years, 87.5 % male) was included in this study. 68 patients (0.6% of total patients) had diagnosed carotid artery stenosis at initial duplex ultrasonography. Cumulative incidence rate was 2.04% during mean follow up period 6.6 ± 1.3 years. According to age and sex, the incidence rate was 0.30%, 0.83%, 2.18%, 4.20% at age of under 50 years, 50–59 years, 60–69 years, over 70 years, respectively. And we could find higher incidence rate carotid artery stenosis in male patients comparing female patients (2.23% vs.0.77%). On a Cox proportional hazard regression model, carotid artery stenosis was significantly associated with a male (hazard ratio 5.6; confidence interval [CI], 3.1-10.3; P < 0.001), smoking (HR, 1.8; CI, 1.3-2.6; P = 0.000), hypercholesterolemia (HR, 1.6; CI,1.2-2.0; P = 0.001), coronary artery disease (HR, 2.2; CI, 1.2-4.2; P = 0.013), LDL cholesterol ≥130 µg/dl (HR, 1.4; CI, 1.1-1.8; P = 0.009). Among 301 patients who was diagnosed with moderate carotid artery stenosis at the initial or follow up examination, progression to severe stenosis was only 4 patients (1.3%), no change was 262 patients (87.1%) and remission was 35 patients (11.6%).

**Conclusion**

Cumulative incidence of asymptomatic carotid artery was very low and there were only a few patients with disease progression during the follow up periods. So it is necessary to select appropriate patients for the screening ultrasonography examination considering risk factors of carotid artery stenosis.

**PE-2**

Validation of the Korean Version of the Walking Impairment Questionnaire in Patients with Peripheral Arterial Disease

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**Purpose**

Intermittent claudication is the most common early symptom of peripheral arterial occlusive disease. Walking Impairment Questionnaire (WIQ) is a short, inexpensive, easy to complete questionnaire to assess intermittent claudication and can provide data of usual walking. WIQ has validated in many countries, but it needs to be validated for Korean people.

**Methods**

The English version of WIQ was translated into Korean and was retranslated into English version, then the back translated version was reconciled by the original author. Total 51 patients were enrolled and 4 patients were dropped out. The subjects were consisted of who got surgery (n = 13), intervention (n = 20) and medication (n = 14). They were checked ankle-brachial index (ABI) and treadmill test as a baseline and were tested at 4 week after the baseline test for identification of reproducibility. Final follow up test was performed at 12 weeks after the baseline test.

**Results**

Reproducibility was identified in all three groups (p < 0.05). Coefficient of correlation (r) of WIQ with ABI was 0.3651 (p = 0.0667), 0.3872 (p = 0.0136) and 0.3460 (p = 0.0713) in surgery, intervention and Medication, respectively. The r for early claudication distance was 0.4700 (p = 0.0154), 0.5843 (p <0.0001) and 0.5413 (p = 0.0029), and the r for maximum walking distance was 0.4656 (p = 0.0190), 0.2468 (p = 0.1353) and 0.4419 (p = 0.0210) in surgery, intervention and Medication, respectively. When surgery and intervention group were account together in aggressive treatment, r of WIQ with ABI, early claudication distance and maximum walking distance was 0.3946 (p = 0.0010), 0.5499 (p <0.0001) and 0.2884 (p = 0.0219), respectively.

**Conclusion**

This version of the WIQ for Korean patients was valid and reproducible. These results suggest that our Korean version of the WIQ could be effective in assessing Korean patients with peripheral arterial disease.

Keywords: Korea, walking, questionnaires, peripheral arterial disease, intermittent claudication

**PE-3**

Directional Atherectomy for Infrainguinal Peripheral Artery Disease

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**Background**

Although the endovascular therapies shows the favorable results for the lesion of femoropopliteal artery, the elastic recoiling and
intimal hyperplasia may be an important barrier to expand these procedures.

**Purpose**

The aim of this study was to identify the safety and effectiveness of directional atherectomy (DA) for endovascular treatment of peripheral arterial disease (PAD) in infrainguinal arteries in patients with claudication or critical limb ischemia.

**Methods**

Data on all patients treated with DA using Silverhawk/Turbohawk atherectomy device (Covidien, Plymouth, MN, USA) at a single center from September 2013 to March 2015 were collected from a prospectively maintained database for retrospective analysis. Patient demographics and clinical outcomes were evaluated. The technical success of atherectomy was defined as the excision of calcified plaque with residual stenosis <30%. Primary patency was defined as a PSVR ≤2.4.

**Results**

During the study period, 42 limbs in 38 patients (male; 28) were treated. The mean age was 72.4 ± 12.2 years. Among this cohort, 27 patients had critical limb ischemia. As a risk factor, 20 patients had diabetes. Technical success rate was achieved in all patients. At the mean follow up of 5.5 months, primary patency rate was 95.2%.

**Conclusion**

In this subgroup of patients with peripheral arterial occlusive disease, atherectomy was successfully applied to decrease the plaque burden. Atherectomy may yield acceptable primary patency.

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**PE-5**

"Heel Patch Technique" for the Small Size Vein Conduit

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**Purpose**

Even though the majority of vascular diseases are treated through endovascular approaches these days, vein bypass is still the standard procedure for long segment occlusion of extremity arteries. However, size mismatch is one of the shortcomings of the reversed vein bypass. For a successful bypass, good quality of the vein is essential. But for patients with small body habitus, who are common in Asian population, vein size is often problematic. And thick inflow artery results in waisting of anastomosis, thereby endangering the graft patency. Here, we developed a new approach, the “heel patch technique,” to overcome these problems related with the small vein and/or thick inflow artery.

**Methods**

The size and quality of the saphenous vein for leg or coronary bypasses were analyzed. Medical records of the patient who underwent the “heel patch technique” were analyzed retrospectively.

**Technique**

A small piece of the saphenous vein or a branch of saphenous vein was taken and opened longitudinally. Then it was anastomosed to the heel side of the vein graft, in a similar configuration as that of a branch patch.

**Results**

Fifty nine saphenous vein mappings of 32 patients were analyzed. Mean caliber was 2.82 ± 1.89 mm, (ranges 1.2–5.1 mm) and more than one third of the veins were less than 2.5 mm in caliber. Among them, five veins were used for the bypass in the heel patch technique. Indications of bypasses were critical limb ischemia in four and life-limiting claudication in one. Four bypasses were femoro-popliteal bypass and one popliteo-pedal bypass. No initial failure developed and as of now the bypasses have been patent for 11 months of mean follow up (2–29 months).

**Conclusion**

In our experience, inadequacy of vein conduit was very common. We introduce the brand new method of “heal patch technique” which can overcome small caliber vein and thick walled inflow. Initial experience of heel patch technique has been acceptable.
PE-6

In Situ Popliteo-Dorsalis Pedis Bypass Using Small Saphenous Vein with LeMaitre Valvulotome and CT Volume Rendering Technique

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Case Report
A 72-year-old man was transferred to our department due to graft failing after skin grafting on his hill. He had been diagnosed a DM before 20 years and Gout before 5 years. A contrast enhanced CT scan with three-dimensional reconstructions revealed a critical stenosis of the right popliteal artery and occlusion of all tibial arteries. At first, popliteal artery was treated by balloon angioplasty. But, guidewire did not pass into anterior tibial artery due to severe calcification. After then he was treated by popliteo-dorsalis pedis bypass using small saphenous vein with in-situ technique by mapping using CT volume rendering technique. In operation time, two main branches were ligated. But 1 week later, Angiogram through side branch revealed 4 branches. Those branches were ligated under ultrasound guide. His skin graft was revived.

Keywords: in situ bypass, volume rendering technique, popliteo-dorsalis pedis bypass

PE-7

In-Situ Reconstruction of the External Iliac Artery and Vein with Autogenous Vessels in a Patient with Rectosigmoid Colon Cancer Invading the External Iliac Artery and Vein

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Case Report
We report the case of a 53-year-old man who underwent curative surgery for rectosigmoid colon cancer invading the left external iliac artery and vein. En-bloc resection of the tumor including external iliac vessels and ureter was performed, and the resected external iliac artery and vein were reconstructed using own vessels. The internal iliac artery was mobilized and transposed to the distal external iliac artery and external iliac vein was interposed with the harvested internal iliac vein graft. This procedure is more physiologic than extra-anatomic bypass and eliminates the need of artificial graft. Consequently, its use can improve patency and decrease the risk of graft infection.

Keywords: Fogarty balloon, thrombosis, vascular access, thrombectomy

PE-8

Clinical Experience of Hybrid Procedure with Adherent Clot Catheter for Salvage of Thrombosed Hemodialysis Access: Comparison with Standard Fogarty Balloon Catheter

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Purpose
This study aimed to compare the efficacy of two different catheters in hybrid surgery for salvage of thrombosed hemodialysis accesses and to determine post-procedure clinical outcomes.

Methods
The hybrid salvage procedure, which consists of surgical thrombectomy followed by endovascular angioplasty of the thrombosed hemodialysis access, was performed using the adherent clot (AC) catheter in 140 cases and the Fogarty balloon catheter in 68 cases. Procedure-related outcomes such as the clot removal status, clinical success, complications, and primary patency rates were analyzed retrospectively.

Results
The proportion of cases with good clot removal scores in the AC catheter and Fogarty balloon catheter groups was 77.9% and 91.2%, respectively (P = 0.018). Clinical success was achieved in 90.7% of the cases in the AC catheter group and in 98.5% of the cases in the balloon catheter group (P = 0.035). The mean patency rates of the two groups were 50.7% and 63.2% at 3 months, 40.7% and 47.1% at 6 months, and 17.9% and 19.1% at 12 months. The complication rates (12.1% and 5.9%) and primary patency rates between the two catheters were not statistically different (P = 0.328). On the analysis of the patency rate on access type of autologous (P = 0.169) and prothetic graft (P = 0.423), there was also no significant difference between the two catheter groups.

Conclusions
In terms of clot removal and clinical success, the adherent clot catheter did not demonstrate better outcomes than the Fogarty balloon catheter. However, primary patency was not related to the type of catheter. The AC catheter can be a useful alternative to the standard Fogarty balloon catheter for thrombosed hemodialysis access.

Keywords: Fogarty balloon, thrombosis, vascular access, thrombectomy
An Exophytic Tumor of Inferior Vena Cava: Suggestive of Leiomyosarcoma

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Background
Tumors of inferior vena cava (IVC) are rare diseases. Most IVC tumors are diagnosed at advanced stages due to their nonspecific clinical signs.

Case Report
Herein we report a case of IVC tumor which was diagnosed as suggestive of leiomyosarcoma. The patient was an 86-year-old woman presented with growing retroperitoneal tumor. She underwent transurethral resection of bladder cancer 7 years ago. During follow-up period, a retroperitoneal tumor had been detected adjacent to infrarenal IVC and it had been growing on serial computed tomography (CT). About 6.5 cm sized tumor invaded her IVC lumen on the last follow-up CT and she was referred to our department. A well-demarcated and exophytic mass originated from IVC wall was found during operation. We performed mass excision and primary repair of IVC wall. The pathologic findings were compatible with suggestive of leiomyosarcoma. At present, she was well and regularly followed-up.

Keywords: inferior vena cava, leiomyosarcoma

Intravenous Leiomyomatosis and Leiomyosarcoma Involving Vena Cava or Iliac Vein

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Introduction
Intravenous benign leiomyomatosis (LM) and leiomyosarcoma (LS) is very rare tumors originating from the uterine myoma, but they can develop without uterine myoma.

Methods
Seoul national university hospital database from 1997 to 2014 were reviewed retrospectively. LM and LS cases were collected from medical records as intraoperative surgical findings and postoperative pathologic findings.

Results
Total 9 cases (5 LM, 4 LS) were identified as intravenous LM or LS. Two cases (1 LM, 1 LS) involved common iliac vein. All the patients were female except one. Mean age was 51.0 ± 17.1. All LM patients had history of hysterectomy due to uterine myoma. None of LS patients was associated with uterine myoma. Mean operation time was 517.4 ± 330.2 (360.4 ± 97.1 in LM, 713.8 ± 431.1 in LS) min, and mean blood loss during the operation was 11431.2 ± 18879.0 (3462.5 ± 2626.6 in LM, 19400 ± 25600.9 in LS) ml. Two LM and 1 LS had mass extension into right atrium. Four LM and 1 LS were removed as R0 resection, but 1 LM and 3 LS were not resected completely. One LM and 3 LS were reoccurred, and reoperations were done in 1 LM and 1 LS. All patients except 1 LS were survived with a mean follow-up duration of 37.9 ± 38.8 months. One mortality was due to multiple organ metastasis and azotemia after palliative unilateral nephrectomy.

Conclusion
LM and LS are rare tumor of smooth muscle cell origin involving large veins, but they can lead different clinical courses. During the removal of this tumor causing vein occlusion and massive collaterals, the surgeons may encounter massive bleeding, intensive preparation before the operation is needed.

Keywords: vena cava inferior, leiomyomatosis, leiomyosarcoma, iliac vein

Long-Term Deep Vein Thrombus Recanalization, Edoxaban vs Warfarin in Acute Deep Vein Thrombosis Patients-Prospective Randomized Single Center Experience in HOKUSAI Clinical Trial

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Introduction
Newly developed factor Xa blocker anticoagulant clinical trials have shown non-inferior results in terms of venous thromboembolism (VTE) recurrence and superiority regarding bleeding complications. Recently published HOKUSAI trial result also showed similar result. However, the long-term clinical effects of new anticoagulants to thrombosed venous segments have not been reported in anywhere which is significantly important for chronic venous hypertension progression. We have studied prospectively for randomized enrolled VTE patients for HOKUSAI study regarding recanalization of VTE segments.

Methods
During HOKUSAI study period, we have enrolled 57 VTE patients by randomized, double-blind way. Randomly assigned
patients with acute VTE, after initial heparin therapy, received either oral edoxaban at a dose of 60 mg once daily or warfarin. The TTR (time in therapeutic range) was over 60% as following study protocol. At medication was taken 3–12 months. To review VTE segments recanalization, we have performed duplex scan before start medication and also have done after finishing last medication. All imaging study was done by one RVT (registered vascular technician).

Results

The proximal level of VTE in Edoxaban group (n = 38) were IVC 2, iliac 15, femoral 16, popliteal 5 and in Warfarin group (n = 19), iliac 8, femoral 9, popliteal 2. Concurrent pulmonary embolism was diagnosed in 20(52%) patients with chest CT scan and 10(50%) patients in warfarin group. The recanalization rate for most proximal segment after complete anticoagulation were 47.3%(18/37) for complete, 51%(19/37) for partial recanalization in Edoxaban group and 57%(11/19) for complete, partial 57%(11/19) in warfarin group. There was no significant difference (conclusion) New factor Xa anticoagulant, Edoxaban administration once daily have been published that non-inferior to standard warfarin therapy in terms VTE recurrence. On top of that, according our single center's limited experience, the recanalization rate of VTE segment after long-term medication was not inferior to conventional warfarin therapy. We expect our result would be evaluated with other HOKUSAI participated centers by cooperative further investigation.

Introduction

The PICC is a frequent and safe method for central catheterization and can be placed through fluoroscopy guide or at bedside. The Bedside PICC with ultrasound guided vein puncture is becoming popular because reasonable result, patient preference and cost effectiveness. This study was conducted to evaluate success rate of bedside PICC and analyze the characteristics of tip position.

Methods

This is a retrospective study from prospectively registered data base of bedside PICC from Jan 2013 to Sep 2014 in Seoul ST.

Mary’s Catholic Hospital. Two nurses performed bedside PICC placement with or without ultrasound guided vein puncture. Tip malposition was defined as the Tip to be positioned outside superior vena cava, which was evaluated with chest X ray. We reviewed clinical characteristics of patients and procedures of bedside PICC.

Results

During 21 months, 1327 bedside PICC were enrolled. Male was in 58.2% and mean age was 63.3 ± 6.7 year old. PICC from right side 74.6%, 880 ultrasound guided PICC and 447 blind methods PICC. Primary success rate of bedside PICC was 92.76% (n = 1231). Among them, The tip was malpositioned in 5.35% (n = 71). Vein puncture failed in 1.88% (n = 25). Malpositioned tip was repositioned in bed side according to chest X-ray. The malpositioned tips were categorized into easy repositioning group and difficult repositioning group. Easy repositioning group(27/71) included tip in coiled in brachiocephalic vein(4), coiled in subclavian and SVC(3) and tributary in SVC(20). The tips were easily repositioned to SVC. Difficult repositioning group(44/71) included kinking in subclavian vein(18), ipsilateral subclavian(4), ipsilateral axillary vein(2), ipsilateral in arm vein(6), ipsilateral jugular vein(11) and contralateral subclavian vein(3). 13 PICCs was removed and 25 PICCs was used in sub-optimal position. Secondary success rate of bedside PICC was 96% (n = 1274) after PICC repositioning.

Conclusion

Primary success rate and secondary success rate of bedside PICC was 92.76% (n = 1231) and 96% (n = 1274). Bedside PICC is very effective and safe methods of for central catheterization.

Thrombolytic Therapy Using Urokinase for Management of Central Venous Catheter Thrombosis

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Purpose

The management of central venous catheter (CVC) thrombosis vary among centers, and the efficacy of the methods of management of catheter thrombosis in CVCs is rarely reported. We investigated the efficacy of bedside thrombolysis with urokinase for the management of catheter thrombosis.

Methods

We retrospectively reviewed data from patients who had undergone CVC insertion by a single surgeon in a single center between April 2012 and June 2014. We used a protocol for the management of CVCs, and when catheter thrombosis was confirmed, 5,000 U urokinase was infused into the catheter.
Results

A total of 137 CVCs were inserted in 126 patients. The most common catheter-related complication was thrombosis (12, 8.8%) followed by infection (8, 5.8%). Nine of the 12 patients (75%) with catheter thrombosis were recanalized successfully with urokinase. The rate of CVC recanalization was higher in the peripherally inserted central catheter (PICC) group (87.5%) than the chemoport group (50%). Reintervention for catheter-related thrombosis was needed in only 2.2% of patients when thrombolytic therapy using urokinase was applied. Age < 60 years (P = 0.035), PICC group (P = 0.037) and location of the catheter tip above the superior vena cava (P = 0.044) were confirmed as independent risk factors for catheter thrombosis.

Conclusion

Thrombolysis therapy using urokinase could successfully manage CVC thrombosis. Reintervention was rarely needed when a protocol using urokinase was applied for the management of CVC thromboses.

Keywords: central venous catheters, thrombosis, urokinase-type plasminogen activator

PE-14

Cephalic to Internal Jugular Vein Bypass for Salvage of Brachiocephalic Fistula with Combined Cephalic Arch and Subclavian Vein Stenosis in Hemodialysis Patients

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Background

Cephalic arch stenosis is the main culprit which leads to loss of functioning brachio-cephalic vein fistula. Ballooning of stenotic cephalic arch has high risk of recurrence. Furthermore, angioplasty of cephalic arch, especially if it is combined with stent insertion, often breeds subclavian vein stenosis or obstruction because of its close proximity and confluence angle. When subclavian vein stenosis is combined with cephalic arch stenosis, it’s hard to rescue the access with conventional cephalic vein transposition or bypass surgery to axilla brachial vein. In this case, cephalic to internal jugular vein bypass can be the solution to maintain functioning brachiocephalic fistula.

Case Report

We recently experienced three cases of cephalic to internal jugular vein bypass surgery for brachiocephalic fistula with combined cephalic arch and subclavian vein stenosis. In all three patients, they had elbow brachiocephalic fistula with cephalic arch stenosis. After several attempt of angioplasty, stenosis was involved at subclavian vein at thoracic outlet or confluence with cephalic arch. Because angioplasty became more frequent, cephalic to internal jugular vein bypass was planned and the outflow was reconstructed successfully under local anesthesia. In all three cases, 8 or 10 mm-sized PTFE graft was used for bypass, the graft is patent in short term (2–3 months) and brachiocephalic fistula is well-functioning. The patients are under regular surveillance until now. We like to mention clinical issue of cephalic arch stenosis and usefulness of cephalic-internal jugular vein bypass.

Keywords: cephalic arch, internal jugular vein, brachiocephalic fistula, bypass surgery

PE-15

A Case of Popliteal Vein Entrapment Relieved by Partial Myomectomy

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Case Report

Although popliteal artery entrapment syndrome is well-known, popliteal vein entrapment alone is rare and unrecognized condition. Venous entrapment has been reported to occur in 10% of popliteal entrapment syndrome (PES) and to show female predominance. Herein we report a case of popliteal vein entrapment syndrome treated by partial myomectomy. A 15-year-old boy presented with his left calf swelling after exercise. The circumference of his proximal calf was increased 3 cm after 3-minute running. On the computed tomography, his popliteal vein was compressed by abnormally inserted medial head of gastrocnemius muscle. His popliteal artery was not involved. We performed partial resection of the medial head of gastrocnemius muscle. Although his popliteal vein was adhered and compressed, that was fully recovered after adhesiolysis and resection of overlying muscle. At present, he was well with normal activity.

Keywords: Popliteal Entrapment, Popliteal Vein, Myomectomy
Prevalence of the Ischemic Heart Disease (IHD) and Its Impact on Early Postoperative Results Following Elective Abdominal Aortic Aneurysm (AAA) Repair

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Purpose
The prevalence of ischemic heart disease (IHD) in the general population varies according to races or countries. We attempted to determine prevalence of the IHD and its impacts on early postoperative results of the elective abdominal aortic aneurysm (AAA) repair in Korean patients.

Method
We retrospectively reviewed database of AAA patients who underwent elective open surgical (OSR) of AAA or endovascular aortic aneurysm repair (EVAR) in a single institute during the past 11 years. Ruptured AAAs, thoraco-abdominal or suprarenal AAAs, AAAs caused by specific etiology other than degenerative cause, and redo aneurysm surgery after prior OSR or EVAR were excluded from the study. Preoperative cardiac evaluation before an elective AAA repair was performed according to planned protocols. A 12-lead EKG and screening transthoracic echocardiography were routinely undertaken while TI-201 adenosine SPECT, dobutamine-stress echocardiography and/or coronary CT angiography was selectively performed. Enrolled patients were classified into 3 groups based on the previous history of IHD treatment: Group control, patients with no cardiac symptom or evidence of IHD on preoperative examinations; Group I, patients with evidence of IHD on preoperative examinations and past history of IHD treatment with medical therapy; and Group II, patients with evidence of IHD on preoperative examinations and past history of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). We investigated frequencies of early (<30 days) postoperative acute myocardial infarction (AMI), cardiac mortality and all cause operative mortality in each groups and according to the treatment (OSR vs EVAR). Postoperative AMI was defined when serum troponin (cTnI) >5 times of upper normal limit (>3.9 ng/ml) or cTnI >0.78 ng/ml in conjunction with one of the following conditions; cardiac ischemic symptom, new significant ST change or new left bundle branch block (LBBB), development of pathologic Q wave, imaging evidence of new regional wall motion abnormality or identification of an coronary lesion on coronary angiography.

Results
Among 765 AAA repairs during the study period, 602 patients (mean age, 70 ± 8, male 87%, 373(62%) OSRs and 229(38%) EVAR) were enrolled for the study. On preoperative cardiac evaluations, IHD was detected in 204 (34%) patients: Group I (n = 73, 12.1%) and Group II (n = 131, 21.8%). Postoperative AMI

Table 1  Patient characteristics and early postoperative results

| Number (%) | Control group (n=398, 60%) | Group I (n=73, 12%) | Group II (n=131, 22%) |
|------------|-----------------------------|---------------------|-----------------------|
| Age (mean, year) | 67.5 71.1 70.7 72.2 70.5 70.3 0.002a | | |
| Male (%) | 201(85) 145(90) 45(87) 18(78) 74(87) 45(98) 0.072a | | |
| Risk factors | | | |
| Age >75y | 52(22) 50(31) 18(36) 7(36) 23(27) 10(22) 0.291c | | |
| Hypertension | 166(70) 121(75) 32(64) 18(78) 64(75) 35(76) 0.5355 | | |
| Smoker * | 114(48) 64(40) 25(50) 12(25) 37(46) 16(35) 0.3404 | | |
| CRI | 15(6) 6(4) 0 0 6(7) 2(4) 0.3177 | | |
| Diabetes mellitus | 35(15) 26(16) 10(20) 4(17) 19(22) 11(24) 0.4605 | | |
| Hyperlipidemia | 89(38) 79(49) 20(40) 10(43) 40(47) 27(59) 0.0666 | | |
| Early postop. results (<30days) | | | |
| Postop. AMI | 5(2.1) 1(0.6) 9(18.0) 1(4.3) 1(7.1) 1(2.2) <0.001b | | |
| PCI required | 1(0.4) 0 0 0 0 0 1.000b | | |
| CABG required | 0 0 0(2.0) 0 0 0 0.198b | | |
| Cardiac death | 1(0.4) 0 1(2.0) 0 0 0 0.376b | | |
| All cause death | 1(0.4) 1(0.6) 1(2.0) 0 0 0 0.575b | | |

Control group, no evidence of IHD; Group I, history of IHD on medical treatment without; Group II, history of IHD with past history of PCI or CABG; bKruskal-Wallis test ; cFisher’s exact test; Categorical variables were compared using Chi-square test

Abbreviation: IHD, Ischemic heart disease; CRI, defined as diastolic dependent or Scr>2.0mg/dl; DM, diabetes mellitus; AAA, abdominal aortic aneurysm; EVAR, endovascular aortic aneurysm repair; AMI, acute myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting
developed in 23(3.8%) patients: 20(5.4%) after OSR vs. 3(1.3%) after EVAR (p = 0.012) and 6 (1.5%), 10(13.7%), and 7(5.3%) in control, Group I, and Group II, respectively (p <0.001). When patient group and AAA repair type were considered together, Group I or II patients after OSR showed significantly higher frequency of postoperative AMI compared to control group after EVAR group. However, there was no significance difference in surgical mortality between groups (Table 1).

Conclusion
We observed that 34% of Korean AAA patients undergoing elective AAA repair had concomitant IHD on preoperative cardiac screening tests. Postoperative AMI developed more frequently in Group I and II compared to control group after OSR. But there was no difference between groups in EVAR patients. And impact of the concomitant IHD was not significant on the surgical mortality after elective EVAR or OSR of infrarenal AAAs.

PE-17
Effect of Aneurysm Neck Angle and Postoperative Change of Neck Angle in EVAR
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Purpose
The overall outcomes of EVAR might be influenced by various factors in which angle of aneurysmal neck is one of the most concerns. The purpose of this study was to examine effects of neck angle in initial CT angiogram to postoperative complication and change of neck angle after EVAR.

Methods
Data have been collected and analyzed retrospectively from 72 elective EVARs for AAA among total 109 cases of conventional EVAR performed from December 2005 to April 2014. Patients were divided into 2 groups as severely angulated neck (SAN) and without severely angulated neck (WSAN) based on initial virtual CT angiogram. Severely angulated neck (SAN) was defined as neck angulation >60°. Neck angle was evaluated preand post EVAR during short (within 1 month), mid (from 3–6 months) and long-term (over 1 year) follow up. Post procedural complications were also obtained.

Results
Seventy-two patients underwent EVAR, 34 out of those had SAN. There were no statistical differences between two groups in age, sex, follow-up duration and aneurysm profile such as aneurysm diameter, neck diameter, neck length (p >0.05). Mean preEVAR angle of SAN and WSAN were 81.27 ± 19.81 and 37.97 ± 12.19, respectively. There were statistically significant differences in angulation change before and after EVAR over-time, as 52.85 ± 14.30, 49.79 ± 15.29, 48.01 ± 18.20 for SAN compared to 28.24 ± 14.30, 25.42 ± 12.31, 27.61 ± 18.77 for WSAN during short, mid and long-term follow, respectively (p <0.01). Neck angle showed significant decrease and consistency during follow-up after EVAR regardless preEVAR neck angle. PreEVAR angle was the only predictor for post procedural angle change (p <0.001). The endoleak was not associated with neck angle (p = 0.461). Secondary intervention rate was not different between two groups (p >0.05).

Conclusion
EVAR is applicable for SAN group with tolerate and consistent neck straightening ability over long-term follow-up, however further data should be obtained to monitor subsequent configuration as well as late complications.

Keywords: EVAR, neck angle

PE-18
Endovascular Treatment of Extensive Aortoiliac Occlusive Lesions: Single-Center Experience
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Purpose
Endovascular treatment of aortoiliac occlusive disease is challenging and still on the debate. Authors reviewed our experience of endovascular management for aortoiliac occlusive disease (AIOD), focusing on short-term outcomes.

Methods
Retrospective study was done from prospectively registered data for the patient with aortoiliac occlusive disease (AIOD) treated by endovascular means in vascular and transplantation surgery in Seoul St. Mary’s hospital from May 2012 to Feb 2015. Patient’s clinical characteristics, procedure in details and post operative record were summarized.

Results
Seven patients was enrolled. The mean age was 56.4 years (range, 43–64 years). The indication of the treatment was 5 acute attack on chronic AIODS, 1 chronic limb threatening Ischemia and 1 chronic short distance claudication. Thrombectomy was done in 6 cases: 5 open thrombectomy and 1 AngioJet thrombectomy.
Stents was used in all cases including 1 covered stent. The median procedure time was 278 minutes (range, 190–395 minutes). The 30-day post procedural mortality and morbidity rate was 0%. Three patients had compartment syndrome and fasciotomy. Two of 3 patients had a skin graft. With a mean follow-up of 300 days (standard deviation, 358 days), 100% of reperfusion is valid.

Conclusion

Endovascular treatment for AIOD showed the feasibility as alternative procedure for open surgical treatment. Long-term results and further graft improvements will define their role in the treatment of patients with aortoiliac occlusive disease.

Keywords: aortoiliac occlusive disease, endovascular treatment, TASC, aortobifemoral bypass

PE-19

Late Open Conversion of Ruptured Abdominal Aortic Aneurysm after Endovascular Aneurysm Repair

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Purpose

Endovascular abdominal aortic aneurysm repair (EVAR) has been widely and increasingly performed alternative to open repair. However, type I endoleak is a potential disaster caused by inadequate proximal sealing zone. In addition, huge aneurysm may rupture during follow up period after EVAR. Here, we have an experience for treatment of ruptured abdominal aortic aneurysm (rAAA) after EVAR.

Case Report

An 86-year-old female patient underwent an EVAR of abdominal aortic aneurysm (AAA) with 8 cm sized diameter and hostile neck anatomy. After the conventional EVAR, final angiography showed small amount of type I endoleak. After 2 year follow-up, further expansion of the endoleak sac was observed on follow-up CT and additional therapy had to be considered. Using brachial approach, 5F Ansel catheter was placed into the endoleak channel that existed at the top of the stent graft, and a microcatheter was advanced and placed in the endoleak sac. Six coils (6 mm and 8 mm) were deployed just after the right renal artery. At the final angiography, the type I endoleak had completely disappeared. Unfortunately, 9 months later after repair of type I endoleak, aneurysm sac was ruptured during follow up period. After partial stent-graft elimination (from body to both limb of stent-graft), aortic reconstruction was completed with interposition of Dacron® bifurcated graft.

Conclusion

In the era of EVAR, vascular surgeons have to prepare next procedures after EVAR failure. The open conversion should be considered as one of options for treatment of failed stent graft.

PE-20

Sac Regression after Endovascular Relining of Perigraft Seroma after Open Repair of AAA with PTFE Graft in 1 Year Follow Up

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Purpose

Perigraft seroma after open repair of AAA with PTFE graft rarely occurs. There have been various treatment options for symptomatic perigraft seroma: percutaneous drainage of aneurysm sac, open surgical drainage with omental patch, open surgical replacement of PTFE graft by Dacron graft. Authors experienced successful treatment of perigraft seroma with endovascular relining.

Case Report

64 year old man presented with enlargement of aneurysm sac (11 cm) 3 years after open repair of AAA with PTFE graft. AAA was 5.5 cm in diameter at initial presentation. He had hypertension, chronic renal failure (s-creatinine 1.5 mg/dl) but no history of ischemic heart disease. He was current smoker with 30 pack-year. PET CT scan showed there was no active inflammation or infection around graft. Endovascular relining of graft was done under general anesthesia. Stent grafts were used: tow aortic cuff of Excluder AAA devices and 10 mm*10 cm Viabahn for each limb. Vascular access were created with percutaneous technique. There was no morbidity postoperatively. In 1 year follow up CT scan sac was shrunken from 11cm in diameter to 7 cm in diameter.

Conclusion

Endovascular relining can be considered to be the treatment of perigraft seroma after open repair of AAA.

PE-21

Combined Surgical and Endovascular Repair for Mycotic Abdominal Aortic Aneurysm

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Case Report

The author reports a case of a combined endovascular and open repair (hybrid procedure) for a mycotic abdominal aneurysm. A 76-year-old man with diabetes mellitus and unhealed foot ulcer was transferred to the hospital because of obstinate fever and back pain. The initial computed tomography (CT) scan revealed pseudoaneurysm with small size neck at celiac trunk level and from the laboratory findings, the white blood cell and C-reactive protein (CRP) were significantly elevated 18,400/mm³ and 243.27 mg/dL respectively. Based on the CT and laboratory findings, a mycotic aneurysm was highly suspected. After the partial remission of inflammation during 5 days, the pseudoaneurysm was treated with coil embolization. After one week, follow up CT showed good embolization status. And he was treated with Vancomycin for 1 month and he was not complaining with fever and pain and from the laboratory findings, the white blood cell and C-reactive protein (CRP) were normal scale. But, follow up CT after one month showed enlarged pseudoaneurysm. After the remission of inflammation, a hybrid procedure was deemed to be the most appropriate for this patient who needs a second operation. First right iliosuperior mesenteric artery bypass was done using the Ringed goretex graft. Simultaneously, endovascular aneurysm repair was performed with tube stent-graft. The postoperative course was uneventful, and follow-up CT showed the aneurysm to have shrunk with no endoleaks. At two weeks after hybrid procedure, the shrinkage of the aneurysm sac and the patency of the graft were confirmed by a CT scan. A hybrid procedure is considered to be useful and feasible for the poor surgical candidate with severe comorbidities, hostile abdomen and a complex anatomy. The long-term result of this hybrid procedure is considered to be promising.

Keywords: mycotic abdominal aortic aneurysm, iliomesenteric bypass, stent graft

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