# LOW PROBABILITY OF SURVIVAL IN CHRONIC HEMODIALYSIS PATIENTS WITH FOOT LESIONS

Takashi Ohta, Ikuo Sugimoto, Hiroyuki Ishibashi, Hirohide Iwata, Tetsuya Yamada, Masao Tadakoshi, Noriyuki Hida,

Department of Surgery, Division of Vascular Surgery, Aichi Medical University

Two hundred and thirty-four hemodialysis patients with ulcers or gangrene of the lower limbs were enrolled in this study. Seventy-two percent were male. The mean age of the patients was 65.3 years (range: 34-96 years) on admission. The mean+-standard error of the follow-up periods was 3.4+- 0.3 years. The mean duration of hemodialysis was 6.8 years (range: 0.2-33 years). Eighty-four percent of them were diabetics. One hundred and seventy-seven of the 234 patients (77%) had either one or two critical ischemic limbs. Only 74 of the 234 patients (32%) underwent arterial reconstruction. Eighty-nine of the 234 patients (38%) underwent below the knee or thigh amputation.

One hundred and seventy-three patients (74%) died during the follow-up period. The primary cause of death was cardiovascular (n=105). Survival rates of hemodialysis patients with foot lesions were extremely poor, being 65% at 1 year, 36% at 3 years, and 23% at 5 years, with a mean survival period of only 3.4 years. Multivariate analysis demonstrated that age at admission and ischemic abnormality on ECG independently increased the risk of death (hazard ratios: 1.024 and 1.478, respectively). Conversely, hyperlipidemia and total protein independently decreased the risk of death (hazard ratios: 0.559 and 0.661, respectively).

Arterial reconstruction did not lead to a better survival than in patients without arterial reconstruction (p=0.085). Survival rates were poorer in patients with than in those without major amputation (P<0.001).

Limb preservation should not be the goal of treating hemodialysis patients with foot lesions. Careful patient selection or treatments might result in acceptable outcomes for those who are already in the terminal stage of life.

# SURGICAL TREATMENT FOR VENOUS DISORDERS OF THE SUPERIOR VENA CAVA

Masayoshi Okada<sup>1</sup>, Takaki Sugimoto<sup>2</sup>, Masato Yoshida<sup>3</sup>

<sup>1</sup>International Institute for Advanced General Medicine <sup>2</sup>Hyogo Prefectural Awaji Hospital <sup>3</sup>Himeji Cardiovascular Center

### PURPOSE

In recent years, the number of the patients with venous disorders of the superior vena cava is now increasing in Japan.For those patients we have surgically treated them for saving and getting a longevity of their lives.

### **METHODS**

During past 20 years we have performed surgical treatments for 25 patients with stenosis and occlusion of the superior vena cava (SVC) due to invasive thymoma, pulmonary cancer, Hodgkin's disease, thyroid cancer and so on. To make a diagnosis these patients we have carried out venography through both sides of the cubital veins as well as CT, MRI. We have decided to do operations for the patients who can get radical operation with resection of the tumor and reconstruction of the SVC.

### RESULTS

Patch grafting and replacements of prosthetic vascular graft have undertaken after resection of the tumor in 20 patients and in the remining 5 patients with severe SVC syndrome,only bypass with e-PTFE graft with was done to prevent facial edema and syncope due to increase of the intracranial pressure. We have applied e-PTFE graft with external ring for graft replacement. Anticoagulation therapy was carried out in all postoperatively. However, long-term results depended on the kinds of original tumor and reccurence to the lymphnode.

# CONCLUSION

SVC reconstruction using e-PTFE with ring was available for curability and longevity of the patient's life. Double bypass was useful method to increase patency rate of e-PTFE graft. On the other hand, bypass grafting was also effective for patients with high intracranial pressure as well as syncope.

# FLOW ANALYSIS OF AORTIC PERFUSION: EXPERIMENTAL MODELING, COMPUTATIONAL FLUID SIMULATION AND CLINICAL RELEVANCE

Ikuo Fukuda<sup>1</sup>, Wakako Fukuda<sup>1</sup>, Masahito Minakawa<sup>1</sup>, Takeshi Goto<sup>2</sup>, Minori Shirota<sup>3</sup>, Takao Inamura<sup>3</sup>

<sup>1</sup>Department of Cardiovascular Surgery, Hirosaki University Graduate School of Medicine <sup>2</sup>Medical Engineering Center, Hirosaki University Hospital <sup>3</sup>Department of Intelligent Machine, Hirosaki University Graduate School of Technology

### BACKGROUND

Human aorta has a three-dimensional configuration with hairpin curve at the exertion of head and arm vessels. Aged aortas tend to elongate, dilate and have cholesterol deposition at flow-separation-sites. Atheroembolism due to jet from small caliber aortic perfusion cannula is an emerging problem in cardiovascular surgery using cardiopulmonary bypass.

#### **OBJECTIVES**

To clarify shear stress distribution in the aortic arch and to elucidate mechanism of atheroembolism due to sandblast effect, we analyzed flow in the glass aortic model, computed simulation model and clinical case.

### MATERIALS AND METHODS

Glass aortic arch models were made from CT of a healthy adult and of a patient having transverse aortic arch aneurysm (AAA).Extracorporeal circulation model was established using centrifugal pump. Non-pulsatile simulated arterial perfusion was performed thorough cannulas in the ascending aorta. Flow velocity, shear stress and flow vector were measured using particle image velocimetry. Simultaneously, computer simulation of jet flow from the cannula was performed. To investigate clinical implication of these model experiments, flow analysis of patients undergoing operation using extracorporeal circulation was performed.

#### RESULTS

Curved end-hole perfusion cannula made steep jet flow hitting the major curvature of the aortic arch where atherosclerotic cholesterin deposit is dense. Maximal velocity of the jet flow from the cannula tip was as 10 times fast as normal flow velocity. Shear stress was high along the major curvature. Computed simulation model of AAA demonstrated similar result to experimental model in proximal aortic arch area.

### CONCLUSION

Computational flow simulation may be useful tool to determine perfusion strategy.

# **RESULTS OF SURGICAL RECONSTRUCTION OF THE CAROTID ARTERY — GERMAN NATIONAL DATABASE**

M. Storck<sup>1</sup>, H Niedermeier, T. Noppeney, HH Eckstein, W. Lang

<sup>1</sup>Dept. Vascular and Thoracic Surgery, Klinikum Karlsruhe, Germany, for the AQUA Expert Group

### BACKGROUND

Since 2002 operative reconstructions of the extracranial carotid artery (CEA) have to be documented by a legally defined quality assessment. Between 2002 and 2010 a total of 217.782 procedures were documented. The analysis of the data was begun in 2002 -2007 by the BQS – Institute, and is continued by the AQUA Institute according to German legislation.

#### MATERIAL AND METHODS

In 2010, a total of 27.170 surgical carotid endarterectomies were performed in 544 hospitals. Age and gender distribution showed the largest group in the range of 70-79 years (43%), 67,9% male and 32,1% female patients. 14 206 patients were asymptomatic (52%).

Analysis of the data was performed defining three categories (A: asymptomatic, B: symptomatic, C: other: stroke simultaenous cardiac sugery, aneurysm etc.) A group of 8 quality indicators was defined and used throughout the whole period. Two of these indicators are defined with regard to indication (degree of stenosis), the other indicators are outcome related.(periprocedureal stroke and death). When analysing the data, a risk adjustment was calculated with report of a rate O/E (observed to expected).

### RESULTS

The range of results was higher in low-volume hospital with less than 20 cases per year (n=172, arbitrary border) when compared to hospitals with more than 20 cases (n=372).

The adjusted O/E rate of stroke/death in all patients was 1,1 in 2008, 1,0 in 2009 and 0,8 in 2010. (The data for 2011 were not published at the time of abstract submission).

The mean time between the neurological event and the operative procedure was reduced from 28 to 10 days (p<0.001) over observed time period.

### CONCLUSION

There is a high level of care for carotid endarterectomy in Germany. Hospitals with less than 20 cases are observed for high variance of the results.

Analysis of Carotid Stenting (CAS) will be included beginning in the year 2013.

# VENOUS ANEURYSMS – DANGEROUS CONDITON OR NOT

Thomas Noppeney

Center for Vascular Diseases, Nuernberg, Germany

# ENDOVASCULAR THERAPY OF VASCULAR MALFORMATIONS -NEW THERAPY APPROACHES

Walter Wohlgemuth

Universitätsklinikum Regensburg

# DISTAL VENOUS ARTERIALIZATION FOR LIMB SALVAGE IN PATIENTS WITHOUT GRAFTABLE DISTAL ARTERIES

Tadahiro Sasajima, Shinsuke Kikuchi, Hisashi Uchida, Taku Kokubo Nobuyoshi Azuma, Atsuhiro Koya

Department of Surgery, Asahikawa Medical University, Japan

### **OBJECTIVES**

Distal venous arterialization (DVA) is a last resort of limb salvage surgery for patients without graftable distal arteries due to progression of occlusive lesions. We present indications, techniques, and results of DVA for patients with critical limb ischemia (CLI).

### PATIENTS

Since 2003, we have performed DVA for 18 patients (4.3% of CLI). Our primary indication was limited to progressive or extensive tissue loss without graftable distal arteries in patients with CLI. There were 13 diabetes (including 9 dialysis), and 5 vasculitis syndrome (4 Buerger's disease, 1 collagen disease). Procedures included combined DVA and free flap in 7, primary solitary DVA in 4, and DVA for hemodynamically failing distal arterial bypass in 5. Adjuvant DVA for arterial access of free flap was performed in 3.

### **TECHNIQUES**

Vein valves are destructed using a surgical probe for proximal valves, and a 2Fr. Fogarty balloon catheter for distal fine valves. Successful valve destruction is confirmed by visualization of plantar metatarsal veins in intraoperative descending venography. Use of autogenous vein graft is essential, and DVA bypass from popliteal or tibial artery to the common plantar vein or dorsalis pedis vein is performed with a continuous suture of 8-0 polypropylene. To facilitate earlier spontaneous valve incompetence, systemic arterial pressure in the DVA system should be maintained, and adequate ligation for arteriovenous fistulae (AVF) under monitoring DVA graft flow is performed, and intraoperative DVA graft flow is controlled around 20- 40 ml/min by AVF ligation. Two stage operation strategy is employed in 5 patients underwent combined DVA and free flap.

### RESULTS

Foot ischemia and pain were commonly relieved within about a week. There were 4 major amputations (too late of limb salvage DVA in 3; tibia osteomyelitis after successful DVA in 1), and 3 early deaths in dialysis patients (myocardial infarction). Limb salvage was achieved in 14 patients (78%), with follow-up period of 1-94 months (Me: 3 years). All 14 patients with successful DVA had no difficulties in a short walk or inside a house without the prosthesis. Arteriography in selected patients after 1-3years demonstrated a functioning DVA graft, the feeding artery to the free flap, and ample peripheral microvasculature via plantar veins in the sole.

# CONCLUSION

This limb salvage surgery is required rather complicated techniques, longer hospital stay, and higher costs of care, but the present favorable results convinced us to be a novel last resort for limb salvage in advanced CLI patients without graftable distal arteries.

# PAOD

#### Werner Lang

Department of Vascular Surgery, University Hospital Erlangen, Krankenhausstrasse 12 Erlangen, ZIP 91054, Germany

Patients with peripheral artery occlusive disease (PAOD) need an ideal cardiovascular risk management. International guidelines demonstrate clearly, that patients are threatened by myocardial infarction and stroke more than by amputation of the limb. However, many patients suffer from claudication with a limited quality of life. In cases of Fontaine stage IV of PAOD there is much evidence that only revascularization is effective for limb salvage.

In contrast, patients with intermittend claudication (IC) can be treated by supervised exercise, angioplasty and bypass surgery. There are some papers that emphasize the need for a supervised exercise program, however, many patients are looking forward for a rapid and more comfortable improvement of walking distance. As a result of this request, recanalization of stenosed or occluded segments of the infrainguinal arteries is indicated to improve quality of life in selected cases.

Endovascular procedures are prefered in many cases and there is a call for an endovascular first-line treatment. Due to newer devices the primary technical success rate is above 90% in almost every situation. But dissections, embolization and early occlusion and restenosis lead to severe setbacks. As the intendent purpose of treatment is improvement of walking distance more than limb salvage, everybody should select patients carefully to avoid severe complications. Many devices, e.g. stents, did not demostrate their superiority. Standard surgical procedures, e.g. a femoropopliteal bypass with the great saphenous vein play still a decisive role in the treatment of long occluded segments because of an outstanding long-term patency.

This lecture will demonstrate current concepts of treatment of patients with PAOD with a special focus on intermittend claudication.

# EARLY RESULTS AFTER PERIPHERAL VASCULAR REPLACEMENT WITH BIOSYNTHETIC COLLAGEN PROSTHESIS IN CASES OF GRAFT INFECTION

Peter Fellmer<sup>1</sup>, Georg Wiltberger<sup>2</sup>, Ivan Matia1<sup>1</sup>, Hans-Michael Tautenhahn<sup>2</sup>, Sven Jonas<sup>2</sup>

<sup>1</sup>University of Leipzig, Department of Surgery, Division of Vascular Surgery <sup>2</sup>University of Leipzig, Department of Surgery

### **INTRODUCTION**

Vascular graft infection in peripheral bypass surgery represents a highly significant risk with regard to limb loss and morbidity. In the absence of autologous superficial veins, finding a suitable replacement material can be difficult. Silver-coated polyester grafts, homografts, or use of deep veins are additional risks. Use of a biosynthetic collagen prosthesis on a PTFE matrix (Omniflow II) was investigated as an alternative method, and the situation regarding revenues evaluated.

#### MATERIALS AND METHODS

From December 2010 to December 2011, eight patients with clinical and imaging signs of vascular graft infection were treated. Infected material was removed, microbiological specimens taken and, in the absence of superficial veins, Omniflow II implanted. Patients were followed up, outcome evaluated, and the revenue implications analyzed.

### RESULTS

The technical feasibility of the procedure was given in all cases. Microbiological detection of pathogens was achieved in 5 of 8 cases. With a mean follow-up of 8 months, 7 of 8 patients showed clinical cure of the infection. Primary patency was 63%, secondary patency was 75%, and prevalence of limb salvage was 88%. One patient had to undergo limb amputation to avoid sepsis, and another unsuccessfully underwent thrombectomy after 12 months. Four PET-CT follow-up studies showed a reduction of uptake in the affected area. To generate adequate revenues, specialized knowledge of the DRG system is necessary.

# DISCUSSION

Treatment of vascular graft infection in peripheral bypass surgery in the absence of endogenous material necessitates infection-resistant materials. The present study showed promising results in the use of a collagenbiosynthetic prosthesis. Due to a lack of long-term results, the graft should be used only after detailed informed consent from the patient. The expenses caused by the biosynthetic graft are covered by adequate revenues for these patients.

# REDISCOVERY OF THE ARM VEIN AS A PROBATE BYPASS MATERIAL

### Thomas Grube

Department of General, Vascular and Visceral Surgery, Hospital Greiz, Thuringia, Germany

### **OBJECTIVE**

The increasing need of autologous vein material in distal bypass revascularization and the absence of the ipsilateral saphenous vein led to the (re-)discovery of the arm vein as a probate venous material. In this study we compared the effectiveness of all autogenous arm vein bypass grafts with the composite bypass graft and saphenous vein bypass graft revascularisation, ipsi- and contralateral.

### **METHODS**

Between January 2010 and May 2012 we performed 127 distal revascularization procedures. (35 over the knee, 56 below the knee, 36 crural) A total of 27 Arm vein grafts were studied retrospectively in 25 patients. (16 male, 9 female, 18 diabetic)

### RESULTS

The patency rate and limb salvage rate between arm vein and saphenous vein were excellent and comparable with other international studies. In spite of the worse patency rate, prosthetic grafts provide a reasonable alternative to primary amputation.

### CONCLUSIONS

Arm veins are an easily accessible autologous conduit of sufficient length. Excellent patency rates allow durable limb salvage in otherwise difficult circumstances. Vein configuration and splicing do not affect patency rates. We have found arm veins to be a durable source of accessible autogenous grafts for lower limb revascularization in the absence of suitable saphenous veins.

# SURGICAL MANAGEMENT OF ATHEROSCLEROSIS OBLITERANS (ASO) A COMPARABLE STUDY BETWEEN DIABETIC PATIENTS ON DIALYSIS VERSUS NON — DIABETIC PATIENTS ON DIALYSIS —

Wakako Fukuda, Kenichi Wtanabe, Satoshi Taniguchi Kozo Fukui, Yasuyuki Suzuki, Ikuo Fukuda

Department of Thoracic and Cardiovascular Surgery Hirosaki University School of Medicine

### BACKGROUND

The number of patients on dialysis is increasing worldwide and it is known that dialysis patients with diabetic nephropathy have a poor prognosis. Patients on dialysis are often complicated with ASO. The purpose of this study was to identify the influence of diabetes mellitus on dialysis patients with ASO.

### PATIENTS AND METHODS

A retrospective study was conducted to compare differences between ASO patients on dialysis with and without diabetes in regard to clinical characteristics and outcomes of surgical management. Between 1998 and 2007, a total of 111 ASO patients were treated.

### RESULTS

Among 111 patients with ASO, 12 patients (10.8%) on dialysis were included in this study. Six patients (7 legs treated) were diabetic and 6 patients (8 legs treated) were non-diabetic. Comorbidity, such as ischemic heart disease and stroke, was comparable between the two groups. Major amputation was required in 4 diabetic patients because of infection and limb-threatening ischemia. The mortality rate after revascularization was poor in both groups.

### CONCLUSION

Preoperative screening for ischemic heart disease in ASO patients on dialysis is very important since cardiac events happen often in these patients. An aggressive multidisciplinary approach including early infection control and revascularization appear to save the lower extremity of patients.

# EFFICACY OF LOW DOSE PGE1 INFUSION AFTER PARAMALEOLLAR BYPASS - TRIAL OF POOR RUN-OFF CASES -

Taku Kokubo<sup>1</sup>, Shinsuke Kikuchi<sup>2</sup>, Nobuyoshi Azuma<sup>2</sup>, Daiki Uchida<sup>2</sup> Atsuhiro Koya<sup>2</sup>, Hisashi Uchida<sup>2</sup>, Tadahiro Sasajima<sup>2</sup>

> <sup>1</sup>Vascular Surgery, Edogawa Hospital <sup>2</sup>Vascular Surgery, Asahikawa Medical University Hospital

### **OBJECTIVE**

To investigate the effect of short-term intra-bypass graft infusion therapy of prostanglandin E1, our results were summarized in patients with CLI showing poor blood flow cases after pallarmaleolar bypass grafting.

#### DESIGN

Retrospective study.

#### METHODS

From September 2006 to August 2011, 177 limbs from 159 patients performed pallamaleolar bypass grafting were studied. 40 limbs were admired the low dose PGE1 infusion after bypass surgery due to the low blood flow of grafts (PG group). The results of cases required the low dose PGE1 infusions were summarized, and compared to the results of cases without PGE1 infusion (nonPG group).

### RESULTS

Compared with the nonPG group, the rate of patients with hemodialysis (HD) in PG group and were 30% (37 limbs) (versus 5% (3 limbs; P<0.01). The number of graft failure within 7 days after bypass surgery were 6 cases (13%) in PG group (versus 8 cases (5%) in nonPG group; P>0.09). The PG group patients exhibited lower the 2-year cumulative primary patency rates (75% versus 49%; P<0.01). The 2-year cumulative secondary patency rates and limb salvage rates were 89% and 97% in PG group, respectively (versus 83% and 94% in nonPG group; P>0.05). There were no significant difference between nonPG group and PG group.

#### CONCLUSIONS

The short-term intra-bypass graft infusion therapy of prostanglandin E1 might be effect the prevention of the graft failure in early post bypass surgery.

# PERSISTENT SCIATIC ARTERIES ACCOMPANY ANATOMIC VARIATIONS OF LOWER EXTREMITY VENOUS SYSTEM

Masao Tadakoshi, Yuki Orimoto, Noriyuki Hida, Tetsuya Yamada, Hirohide Iwata, Ikuo Sugimoto, Hiroyuki Ishibashi, Takashi Ohta

Department of Vascular Surgery, Aichi Medical University

### **OBJECTIVE**

A persistent sciatic artery (PSA) is a rare anomaly occurring in approximately 0.025-0.6% of the population based on angiographic studies. According to case reports, its coexistence with a persistent sciatic vein (PSV) is extremely rare and only 5 cases have been reported.

We investigated the anatomic variations of lower extremity venous system accompanied with PSA.

# **METHODS**

Ichushi web (presented by Japan Medical Abstract Society) was searched for PSA from January 2003 to September 2011. We requested the authors to furnish the computed tomography (CT), magnetic resonance imaging (MRI), and angiography. These date were examined to elucidate anatomic variations of lower extremity venous system.

#### RESULTS

Sixty-three cases were extracted in Ichushi web and radiographic images of 33 cases with PSA were obtained. Two cases of PSA in our institute were added. The total of 35 cases (42 limbs) were included (12 men, 23 women).

A PSV is observed in 20-48% of patients with Klippel-Trenaunay syndrome. However, only 5 cases of its coexistence with a PSA have been reported. In 2002, Parry reported that the sciatic artery and vein were paired in utero, and that their synchronous persistence was extremely rare. Recently, multi-detector CT has developed and accompanying anatomic variations can be examined.

PSV was classified into three types. Complete PSV arises from the popliteal vein, traverses the sciatic notch, and terminates in the internal iliac venous system. Upper PSV involves the buttock and upper thigh. Lower PSV is limited to the distal and middle thigh, terminating in the deep femoral vein system or an embryonic subcutaneous venous network. In this series, complete PSV was found in 7 cases (7 limbs) and inferior PSV was found in 18 cases (20 limbs).

Although popliteal vein usually runs dorsally and popliteal artery runs ventrally, reversed arrangement of popliteal artery and vein were found in 23 limbs.

# CONCLUSIONS

In this series, 25 cases (71%) with coexistence of PSV have been found. This percentage of coexistence was much higher than the percentage before mentioned. This is the largest series of PSV.

Reversed arrangement of popliteal artery and vein were found in 23 limbs (70%). This was a distinctive anatomic variation of PSA.

# EARLY RESULTS FROM SUBFASCIAL ENDOSCOPIC PERFORATOR SURGERY (SEPS) FOR SEVERE STASIS DERMATITIS AND ULCER

Koji Shinozak, Tomohiro Katayama, Tomohiko Machida, Hideo Ota, Takaaki Ishii Kunihiko Hiraoka, Yasuhito Kawasaki, Minoru Otsuru, Seiji Yasuda

Kobe Ekisaikai Hospital Dept. of surgery

### **OBJECTIVE**

Severe stasis dermatitis and ulcer may be due to incompetent perforating veins, which are located under the dermatitis. This study shows the importance of the perforating vein surgery to heal and prevent the recurrence of stasis dermatitis and ulcer.

### **METHODS**

Thirty-five patients of venous insufficiency (CEAP classes C4-C6) were treated by Sebfascial Endoscopic Perforator Surgery (SEPS) from November 2010. Each patients are tested with Duplex ultrasonography and incompetent perforating veins (IPV) more than 3mm in diameters are marked. Dual port system together with CO2 insufflation enabled the perforating viens to be dissected by an ultrasonic surgical system. SEPS and great saphenous vein stripping were performed in 22 cases, SEPS and high ligation in 4 cases, SEPS and varicotomy in 1 case, and SEPS alone in 5 cases.

### RESULTS

In most cases with dermatitis, serious complication was diminished. Ulcers in 3 cases out of 6 cases were healed and no recurrent was seen. In 3 cases the size of ulcer was decreased. Minimal surgical site infection at the port-site incision was seen in 3 cases. One patient suffered from prolonged pain and numbness in the foot.

### CONCLUSIONS

SEPS is preferable procedure to treat severe dermatitis and ulcer with incompetent perforating veins.

# ARTERIO-ARTERIAL INTERPOSITION GRAFTS AS ACCESS FOR HEMODIALYSIS

Zidane, D<sup>1</sup>, Wunsch, M<sup>1</sup>, Lorenz, U<sup>1</sup>, Petzold, K<sup>1</sup>, Elling, J<sup>1</sup>, Petrov, H<sup>2</sup>, Scholz, H<sup>1</sup>

<sup>1</sup>Evangelisches Krankenhaus Königin Elisabeth Herzberge, Vascular Surgery, Berlin, Germany <sup>2</sup>Evangelisches Krankenhaus Königin Elisabeth Herzberge, Nephrology, Berlin, Germany

# **OBJECTIVE**

Under rare circumstances the creation of an AV vascular access is not feasible or even contraindicated in hemodialysis patients. Then the interposition of an arterio-arterial graft is a viable procedure. Basically this method consists in severing the subclavian artery or the common femoral artery and interposing a looped prothesis that is implanted subcutaneously for puncture. The main indications are as follows:

- 1. None of the following six major central veins are patent (V. subclavia, V. jugularis interna, V. femoralis communis)
- 2. Only one of these six veins is patent and is reserved as an emergency access
- 3. Cardiac decompensation resistant to treatment
- 4. Severe peripheral ischemia of the extremity designated for a potential av access
- 5. Several different rare indications

### **METHOD**

From February 1994 through May 2012 we placed 74 arterio-arterial interposition grafts in 69 patients. There were 41 female and 28 male patients aged from 28 to 88 years (mean age 64 years). 62 loops were in the subclavian position and 12 in the femoral position.

### RESULTS

The most frequent complications were aneurysms at frequent puncture sites, stenoses of the proximal anastomoses (n=11), stenoses of the distal anastomoses (n=4), and thromboses. Until 2007 (n=49) the secondary patency rate was 87 % after 36 months.

The distinctive features of arterio-arterial interposition grafts are the need for anticoagulants, a mostly longer time required for dialysis, and a longer time for post-dialysis compression.

### CONCLUSION

The lacking influence on cardiac output and peripheral perfusion is a pathophysiologic advantage of arterio-arterial loops. Our 18-year experience proves the efficacy of arterio-arterial interposition grafts as vascular access for hemodialysis in problematic patients.

# PREOPERATIVE SERUM ALBUMIN VALUE TOGETHER WITH PREVENT III RISK SCORE IS NEW RISK STRATIFICATION FOR CRITICAL LIMB ISCHEMIA PATIENTS WITH END STAGE RENAL FAILURE

Juno Deguchi, Tadashi Kitaoka, Jun Suzuki, Osamu Sato

Department of Vascular Surgery, Saitama Medical Center, Saitama Medical School

### BACKGROUND

Prevent III risk score is useful for estimating 1 year-amputation free survival (AFS) for critical limb ischemia (CLI) (J Vasc Surg 2009; 59: 769). However, Prevent III scores automatically categorize CLI in patients with end stage renal failure (ESRF) as median or high risk. Given that those patients have limited life prognosis, the current study sought to validate a new risk stratification based on Prevent III risk score.

# MATERIALS AND METHODS

Ninety patients with 103 limbs undergoing infrainguinal bypass surgery with autogenous vein at Saitama Medical Center between 2001 and 2011, were reviewed retrograde.

### RESULTS

Among ninety patients (63 male with 73 limbs, average of 69 years old), 96% had diabetic nephropathy. Eighty nine percent of the patients (92 limbs) had Fontaine 4 CLI (ulcer 19%, gangrene 70%). Targeted artery was popliteal (16 limbs, 15%) or below crural arteries (87 limbs, 85%). Twenty two percent (23 limbs) resulted in major amputation, although 9.7% (10 limbs) had patent bypass grafts at major amputation. Secondary graft patency was 89% in 1 year and 75% in 3 year. Survival rate was 66% in 1 year, 43% in 3 year. There were 16 limbs that did not heal before death, and only 58% (60 limbs) achieved complete wound healing. Under Prevent III score 7, 96% had complete wound healing, while 46% had complete wound healing over score 8. Serum albumin value was associated with wound healing. Therefore, we evaluated complete wound healing by albumin value. Over score 8, 11% achieved wound healing in albumin value below 2.5mg/dL, 56% in 2.5~3.5 mg/dL, 73% over 3.5 mg/dL.

### CONCLUSION

Preoperative serum albumin value together with Prevent III risk score is useful risk stratification for CLI patients with ESRF.

# SAPHENOUS VEIN ABLATION WITH RADIOFREQUENCY – 4 YEAR RESULTS OF THE EUROPEAN CLOSURE FAST STUDY

Thomas Noppeney, Thomas Proebstle, Jens Alm, Olivier Pichot, Ian Franklin

Center for Vascular Diseases, Nuernberg, Germany

Since the first introduction of radiofrequency ablation (RFA) 1998 in Europe, the system was further developed to Closure Fast (CLF). CLF has a 7cm segment at the tip of the catheter, which is heated to 120 C. With the segmental ablation the procedure became much faster.

The purpose of this European prospective, multicenter study was to prove the efficacy and safety of CLF. The primary endpoint of this study was the occlusion rate of the treated vein, Secondary endpoint was the incidence of perioperative complications.

# **METHODS**

225 patients with 290 treated great saphenous veins were included in the study. The mean age was 47.1+/-12.1 years. 8 European centers in Germany and France participated in the study, the thermal ablation was restricted to the level below the knee and the use of tumescent anesthesia was obligatory. The follow up rate was 95.1& after 2, 86.8% after 3 and 82.4% after 4 years respectively.

#### RESULTS

Severe perioperative complications, like skin burn, deep venous thrombosis or pulmonary embolism, could not be seen. Hypesthesias were noticed in 3.2%, pigmentations in 2.4% and indurations in 2.7%. After one year the rate of pigmentation droped to 1.0% and the rate of pigmentation droped to 0.4%. The other side effects were not noticed any more after one year.

During the follow up period we found a total occlusion rate 1 month postoperatively of 99.3%, 3 months of 98.6%, 12 months of 96.6%, after 24 months of 94.1%, after 3 years 94.0% and after 4 years 93.8%. We did not see any reflux in the GSV in 95.9% after 4 years.

The diameter of the GSV was 2.01 mm at the 4 year follow up, measures 3 cm from the sapheno-femoral junction.

The VCSS was around 1 6 months after operation and remained below 1 after 4 years (0.96).

### CONCLUSIONS

CLF is a very safe and efficient method to exclude superficial venous reflux of the great saphenous vein. In comparison to the initial RFA procedure, Closure Plus, the occlusion rate is higher and the complication rate is lower.

# STRAIN MEASUREMENT OF ABDOMINAL AORTIC ANEURYSM WITH 3D ULTRASOUND SPECKLE TRACKING

### Thomas Schmitz-Rixen, Peter Bihari

Dep.of Vascular and Endovascular Surgery, Goethe-University Frankfurt am Main, Germany

### **INTRODUCTION**

The main risk associated with abdominal aortic aneurysm is rupture caused by mechanical failure of the vascular tissue. To predict individual rupture risk it is necessary to determine biomechanical properties of the aneurysm in vivo, which until the present, has been limited to 2-dimensional analysis of the aorta using conventional sonography, CT or MRI [Vorp, 2005]. Recently, 3-dimensional time-resolved speckle tracking ultrasound has been introduced to measure biomechanical strain parameters of the heart in vivo [Kapetanakis, 2005]. The aim of this investigation was to establish and validate this 3D ultrasound method, applied to the abdominal aortic aneurysm.

### MATERIALS AND METHODS

To validate displacement data measured by 3D ultrasound, silicone aorta aneurysm models were perfused in an artificial circulatory system with different intraluminar pressures. Wall displacement was measured simultaneously with a commercial real time 3D-echocardiography system (Artida, Toshiba Medical Systems) and by a laser-scan-micrometer, and the results of the two methods were compared. In addition, in vivo 3D wall displacement data were collected from the abdominal aorta of 6 healthy volunteers and 6 patients with abdominal aortic aneurysm. Mean and peak strain values were calculated and strain distribution was visualised with MatLab Software.

Volunteers		Patients
pulse pressure	$60.6 \pm 11.3$	$57.5 \pm 10.4$
mean radial strain	$3.3 \pm 1.3$	$2.4 \pm 1.3$
mean circ. strain	$4.0 \pm 1.3$	2.3 ± 1.2 (*)
mean long. strain	$2.4 \pm 1.0$	$1.6 \pm 0.4 (*)$

Table 1: Pulse pressure, mean radial, circumferential and longitudinal strain in abdominal aorta from healthy volunteers and in patients with abdominal aortic aneurysm. \*p<0.05.

#### RESULTS

There was good correlation between displacement parameters measured by 3D ultrasound and laser scanmicrometer (a highly accurate reference method).

Although there was no significant difference in blood pressure, mean circumferential and longitudinal aortic strains were significantly lower in patients compared to healthy volunteers (Table 1). Local differences in strain were apparent in abdominal aortic aneurysm as well as in healthy aorta Discussion The 3D ultrasound data correlated well with the laser scan-micrometer measurements of the silicone model. The in vivo data showed local differences in biomechanical properties of healthy aorta as well as of abdominal aortic aneurysms. The established 3D ultrasound speckle tracking method is suitable for the detection of local differences of strain in the whole geometry of abdominal aorta in vivo. This method might contribute to rupture risk estimation of abdominal aortic aneurysm.

# FLUID SHEAR STRESS RESPONSIVE mRNAs ARE INVOLVED IN ARTERIOGENESIS

Thomas Schmitz-Rixen<sup>1</sup>, Kerstin Troidl<sup>2</sup>

<sup>1</sup>Dep.of Vascular and Endovascular Surgery, Goethe-University Frankfurt am Main, Germany <sup>2</sup>Dep.of Vascular and Endovascular Surgery, Goethe-University Frankfurt am Main, Germany and Max-Planck-Institute for Heart and Lung Research, Bad Nauheim, Germany Arteriogenesis Study Group

### **OBJECTIVE**

MicroRNAs (miRNA) are implicated in post-transcriptional regulation of gene expression. Arteriogenesis? the growth of pre-existing collateral arterioles to functional arteries ? is triggered by increased fluid shear stress (FSS). The growth process is associated with a switch of vascular smooth muscle cells (VSMC) from the contractile to the synthetic phenotype and a re-expression of fetal or cardiac genes. We investigated the involvement of miRNAs in arteriogenesis in a rat model of chronically elevated FSS in collateral arteries after femoral artery ligature (FAL).

### **METHODS**

6 sprague dawley rats were subjected to FAL. An additional side-to-side anastomosis distal to the ligature was created between the femoral artery and the accompanying vein in order to create a pressure gradient and to establish chronically elevated FSS inside the collaterals. Following dissection of collateral tissue 7d after surgery, miRNA was isolated and an expression profile was generated by microarray analysis. Differential expression was confirmed by qRT-PCR. Cellular localization of selected miRNAs was assessed by in situ hybridisation.

#### RESULTS

Surgical FSS-stimulation of collateral arteries provoked an extreme arteriogenic response and the growing collateral arteries showed increased levels of 29 miRNAs when compared to sham operated controls. A subset of 6 miRNAs turned out to be significantly up-regulated (p<0.05) as determined by qRT-PCR. miR-143, miR-195, and miR-24 were localized in the media of growing collateral arteries.

### CONCLUSIONS

These data indicate that miRNAs are involved in arteriogenesis. miR-143 belongs to a cluster which is involved in the phenotypic switch of VSMCs. miR-195 and mir-24 are also up-regulated in human heart failure and hypertrophic mouse heart. A potential functional association of the identified miRNAs with arteriogenesis has to be confirmed.

# SILVER PROTECTED GRAFTS: LEGEND OR TRUTH? DETERMINATION OF STATUS QUO

Max Zegelman<sup>1</sup>, Gisela Guenther1, Ojan Assadian<sup>2</sup> for the committee "infections in vascular surgery" of the German Society of Vascular Surgery

<sup>1</sup>Department of Vascular and Thoracic Surgery, Krankenhaus Nordwest, 60488 Frankfurt, Germany <sup>2</sup>Clinical Institute of Hospital Hygiene, Medizinische Universität Wien, Austria

Thirteen years ago we performed the first implantation of a silver acetate coated vascular graft in our vascular center. From the beginning we cooperated with industry on a critical and scientific platform. Based on this cutting edge research we were involved in a dedicated committee named 'Infections in Vascular Surgery' as part of the German Society of Vascular Surgery.

We also initiated European multicenter registries for the silver acetate coated vascular graft in patients with graft infections and for the metallic silver coated vascular grafts in high risk patients including cases with graft infections. In 2009 under the guidance of our vascular center, the national guidelines on the treatment of vascular graft infections were first published. In February 2012, a consensus group assembled with experts from Austria and Germany published our comments based on currently available literature and expert opinions.

It remains to be shown if silver coated grafts can provide a preventive value in patients in need of vascular reconstructions. A firm treatment recommendation with the current clinical evidence cannot be given. However, the recently available long-term data from the European multicenter registry in high risk patients receiving the metallic silver coated vascular grafts are very encouraging. Clinical proof based on differences in treatment groups were, however, not within the nature of this clinical assessment. Of importance is that there is no evidence that silver coated graft have compromised healing characteristics or reduced patency as compared with uncoated polyester grafts. Randomized trials, nevertheless, are very unlikely to show the ultimate proof due to the very high patient numbers and the plethora of bias introducing factors.

Based on our own clinical results and available literature, silver coated vascular grafts are effective to treat patients with vascular graft infections using in-situ reconstructions. The associated rates for re-infection and mortality were acceptably low. A new development is the combination of silver and triclosane. The first implantation worldwide was performed at our hospital in Frankfurt.

The aforementioned committee comments that up to now proof to prevent vascular graft infections by using silver coated grafts has not been given yet. In the 2009 consensus group treatment recommendations, however, the use of silver coated grafts was established as one important treatment option in patients with vascular graft infections. Recently published comments by the consensus group (Zegelman et al., Gefässchirurgie 2012; ·17:29–36) provide strong additional support. The use of silver protected grafts in patients with graft infections is based on reliable data published by various authors – thereby providing much more "truth" than "legend".

# EFFICACY OF MOTOR EVOKED POTENTIAL DURING THORACIC AND THORACOABDOMINAL REPAIR IN TEVAR ERA

Shinya Takahashi, Keijiro Katayama, Naomichi Uchida, Katsuhiko Imai, Taijiro Sueda

Department of cardiovascular surgery, Hiroshima University, Hiroshima, Japan

### **OBJECTIVE**

This study aims to evaluate the efficacy of motor evoked potential (MEP) monitoring during thoracic endovascular aortic repair (TEVAR) compared with open surgery.

# **METHODS**

From 2005 to 2012, there were 41 cases of thoracic and thoracoabdominal aortic surgery performed both preoperative multi-slice computed tomography to visualize the Adamkiewicz artery (AKA) and intraoperative MEP monitoring. Open surgery and TEVAR were performed in 23 cases (Group O) and 18 cases (Group T). Cerebraospinal drainage was inserted in all the cases of group O and in the high risk cases of group T including AKA occlusion, long therapeutic segment more than 25cm and post replacement of abdominal aortic aneurysm. Neurologic MEP was measured in group O and myogenic MEP was measured in group T. In the early cases, if MEP amplitude decreased 50% of the baseline, we defined MEP change significant. However, we experienced the case resulting in transient paraparesis showed MEP decreasing reaching not below 50% and in the later cases we considered any MEP decreasing should be significant. MEP change and neurological results were compared.

#### RESULTS

Preoperative CT depicted AKA in all cases. One case in group O died postoperatively due to thromboembolism with paraplegia. In group T, paraplegia did not occur but 2 cases suffered from paraparesis, which appeared at 2 and 7 days after the operation and both of them recovered. Paraparesis may be related to hypotension.

In group O, MEP decreased in 6 of 13 cases in which AKA was occluded and 2 cases showed spinal cord damage. MEP did not change in 10 cases in which AKA was not occluded and all these cases did not show neurological deficit. In group T, MEP decreased in 3 of 6 cases in which AKA was occluded and 2 cases showed transient and delayed paraparesis. MEP decreased in 7 of 12cases in which AKA was not occluded and all these cases did not show any neurological deficit.

### CONCLUSION

MEP monitoring is effective to detect spinal cord injury in both of open surgery and TEVAR. In TEVAR, Myogenic MEP change may result from hypotension during and the evaluation of MEP change needed careful observation especially during touch-up ballooning. Blood pressure should be controlled restrictively in AKA occluded cases.

# SIMULATOR TRAINING ON PULSATILE VASCULAR MODELS SIGNIFICANTLY IMPROVES SURGICAL SKILLS AND THE QUALITY OF CAROTID PATCH PLASTY

Senekowitsch Christian<sup>1</sup>, Duschek N<sup>1</sup>, Assadian A<sup>1</sup>, Lamont PM<sup>2</sup>, Klemm K<sup>3</sup>, Schmidli J<sup>4</sup>, Mendel H<sup>5</sup>, Eckstein HH<sup>6</sup>

<sup>1</sup>Wilhelminenspital, Vienna, Austria <sup>2</sup>Bristol Royal Infirmary, Bristol, United Kingdom <sup>3</sup>Marienhospital, Stuttgart, Germany <sup>4</sup>University Hospital Berne, Berne, Switzerland <sup>5</sup>EKH, Vienna, Austria <sup>6</sup>Klinikum rechts der Isar der Technischen Universität München, Munich, Germany

### **OBJECTIVE**

Vascular surgeons have to perform numerous highly sophisticated and delicate procedures. Due to restrictions in training time and the advent of endovascular techniques, new concepts including alternative environments for the training and assessment of surgical skills are required. Over the past decade, training on simulators and synthetic models has become more sophisticated and life-like. This study was designed to evaluate the impact of a 3-day intense training course in open vascular surgery on both specific and global vascular surgical skills.

### **METHODS**

Prospective observational cohort analysis with various parameter measurements of both surgical skills and the technical quality of the finished product, performed before and after 3 days of simulator training of 10 participants (7 male, 3 women) within a vascular surgery-training course. The simulator model used was a conventional carotid endarterectomy (CEA) with a Dacron patch plasty on a life-like carotid bench model under pulsatile pressure. The primary endpoints were to assess any changes in the participants' surgical skills and in the technical quality of their completed carotid patches documented by means of procedure-based assessment forms (PBAs). Scores ranging from 1(excellent) to 5 (inadequate) were compared by a related-sample Wilcoxon-signed test. The inter-observer reliability was estimated by Cronbach's alpha (CA).

### RESULTS

A significant improvement in the surgical skills tasks was observed (P < 0.001). The mean score increased significantly by 21.5% from fair  $(3.43 \pm 0.93)$  to satisfactory  $(4.17 \pm 0.69)$  (P < 0.001). The mean score for the quality of the carotid patch increased significantly by 0.96 (27%,) from fair  $(3.55 \pm 0.87)$  to satisfactory  $(4.51 \pm 0.76)$  (P < 0.01). The median inter-assessor reliability for the quality of the carotid patch was acceptable (CA = 0.713) and low for surgical skills (CA = 0.424).

### **CONCLUSIONS**

This study shows that life-like simulation featuring pulsatile-flow is able to increase surgical skills and technical quality in a highly sophisticated multi-step vascular intervention. This training provides comparatively inexpensive and life-like training possibilities for the adoption and assessment of surgical skills required to perform delicate vascular surgical procedures.

# THE STRATEGY FOR EXTRACRANIAL CAROTID ARTERY ANEURYSMS

Masato Nishizawa, Katsui Soutarou, Kimihiro Igari, Hidetoshi Uchiyama, Shinya Koizumi Takahiro Toyofuku, Toshifumi Kudo, Masatoshi Jibiki, Yoshinori Inoue

Department of Surgery, Division of Vascular Surgery, Tokyo Medical and Dental University, Tokyo, Japan

### **OBJECTIVE**

Extracranial carotid artery (ECA) aneurysms are rare, but either transient or permanent ischemic episode occurs due to aneurysmal thrombus. Therefore, it should be treated aneurysms promptly. The aim of this study was to assess the treatment for ECA aneurysm in our series.

### PATIENTS AND METHODS

We retrospectively reviewed 7 patients with 8 ECA aneurysms between 1997 and 2010, which were composed of 2 men and 5 women with a mean age of 60.9 years, (range: 32-77). There were 6 internal carotid artery aneurysms and 2 external carotid artery aneurysms. The causes were infection in 3, degeneration in 3 and giant cell in one patient. Brain infarction was ipsilaterally found in 2 cases by magnetic resonance imaging. Operative indications were aneurysm with symptoms, more than 2cm in diameter or aneurysmal thrombus. Electroencephalography, carotid arterial stump pressure and near-infrared spectroscopy were used to evaluate the intraoperative cerebral blood flow.

### RESULTS

The carotid artery reconstruction using autogenous vein with aneurysmectomy, ligation of the common carotid artery (CCA) with patch angioplasty of distal CCA stump, ligation of internal carotid artery (ICA), and coil embolization of ICA were performed in 5 cases, 1, 1 and 1, respectively. An internal shunt was used in one case. Moreover, aneurysmectomy was performed after mandible was divided in one case with ECA aneurysm located above the line from angle of mandible to mastoid bone. There was no postoperative death. A brain infarction occurred postoperatively. Ipsilateral transient recurrent nerve paralysis occurred in two patients.

### CONCLUSIONS

Surgical treatment for ECA aneurysm was safely accomplished using intraoperative monitoring and stump pressure measurement.