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Holger Reinecke
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Holger Reinecke

Eva Freisinger

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Sehr geehrte Kolleginnen, sehr geehrte Kollegen,

die 47. Jahrestagung der Deutschen Gesellschaft für Angiologie – Gesellschaft für Gefäßmedizin e.V. (DGA) in Münster stand unter dem Motto „Wirklichkeit und Visionen“. Das Konzept des wissenschaftlichen Programms war darauf gerichtet, durch zahlreiche Hauptsitzungen, freie Vorträge, Poster- und Experten Sessions sowie durch Symposien und Workshops möglichst alle Facetten der Gefäßmedizin im Hinblick auf „Wirklichkeit und Visionen“ zu durchleuchten. Dieses wissenschaftliche Programm wäre ohne ein entsprechendes Engagement und Tätigkeit aller wissenschaftlich aktiven Kolleginnen und Kollegen nicht zustande gekommen. Daher gilt unser Dank insbesondere all denjenigen, die sich aktiv an Beiträgen und der Begutachtung der eingereichten Beiträge beteiligt haben.

Das vorliegende Band enthält alle Abstracts der angenommenen freien Vorträge und Posterbeiträge. Alle eingereichten Beiträge sind durch ein Peer-Review-Verfahren durch mindestens 3 Reviewer begutachtet worden. Das Supplement gibt somit einen Überblick über den Status quo der Forschungsaktivitäten in der Gefäßmedizin und zeigt zugleich Zukunftsperspektiven auf.

Wir wünschen Ihnen viel Freude bei der Lektüre.

Mit herzlichen Grüßen,

Mit herzlichen Grüßen

Prof. Dr. med. Holger Reinecke

Dr. med. Eva Freisinger

Dr. med. Nasser Malyar

Münster, im September 2018

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DGA Jahrestagung 2018 – Abstracts

Gefäßmedizinische Versorgung 2018 – Wirklichkeit und Visionen

FV-1

Freie Vorträge

Grundlagen 1

FV-1.1

Treatment of high-risk pregnancies with Tinzaparin

H. Kiesewetter*

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Background

The effectiveness of Tinzaparin (T) in high-risk pregnancies has also been examined in combination with Acetylsalicylic Acid (ASS).

Patients and methods

The data of 786 pregnant women at the age between 19–53 (body height: 145–186 cm and body weight: 45–132 kg) has been analysed. 501 have had early or late abortions or stillbirths in their prehistory. 26 of those 501 women in combination with ASS at a secured APA-Syndrome (11) or Sticky Platelets (15).

In 91 cases of unsuccessful intracytoplasmatic sperm injections (ICSI) in the prehistory, Tinzaparin has been injected once a day 2 days before the transfer was made. 44 with a positive pregnancy test also got ASS.

150 patients have had notches, in detail: 22 growth retardations, 11 placental abruptions; only 7 a pre-eclampsia and 11 a HELPP-Syndrome in pre-pregnancy. 63 had an old leg vein thrombosis or an old pulmonary embolism, 16 have had a new leg vein thrombosis or a new pulmonary embolism (10 of them with an APA-Syndrome, 6 with sinus vein thrombosis, 2 with brain insults, 1 with a heart attack, 1 with an arterial occlusion in their prehistory), 5 have had a thrombophlebitis (24 with a high thrombophilic risk), 10 were smokers.

212 of those 786 patients are taking 3.500 IE, 454 8.000 IE, 80 10.000 IE, 32 14.000 IE and 8 18.000 IE Tinzaparin. Target was the life birth rate.

Results

755 of the 786 pregnant women have given birth to a healthy child, 2 of them had a pre-eclampsia and 2 had a HELLP-Syndrome. These 4 have given birth by a cesarean section.

31 patients have had an abortion so far. 89 patients who have had unsuccessful ICSI became pregnant after the third transfer. All 285 patients with notches, thrombosis, pre-eclampsia or a HELLP-Syndrome have not had any abortions. 15 patients have suffered a local allergic reaction.

Conclusions

Tinzaparin turned out to be very effective, safe, compatible and it can be safely used in pregnancies.

FV-1.2

Iliaca-PTS – a prospective registry analysing Iliofemoral Thrombosis and Postthrombotic Syndrome

J. Nawasrah*, J. Renczes, J. Lucks, B. Zydek, E. Lindhoff-Last

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Background

The incidence of Iliofemoral Thrombosis (IFT), the occurrence and severity of Postthrombotic Syndrome (PTS) in the population is not well examined. We therefore performed a systematic prospective analysis of causes and outcomes of IFT in patients presenting with history of deep venous thrombosis (DVT). One of the aims of this registry was to analyse current epidemiological data such as incidence and prevalence, gender and side allocation of IFT in the general population. In addition, data on the incidence and severity of the resulting PTS were collected and correlated with quality of life (QOL) impairment. Another focus was screening for thrombophilic disorders as possible additional risk factor.

Patients and methods

We searched our database for patients who had presented with the diagnosis of DVT or IFT during 1st January 2014–30th June 2017. The registry was approved by the ethical committee (ClinicalTrials.gov ID: NCT03148548). Patients were included in the prospective registry when they fulfilled the inclusion criteria: 18–80 years, diagnosis of IFT confirmed by duplex sonography, phlebography, CT- or MR-venography after 1996 and giving written informed consent. Vein occlusion plethysmography, vein duplex ultrasound, leg circumference analysis before/after treadmill ergometry, MR phlebography and thrombophilic screening were performed under standardized conditions, in addition the severity of PTS was quantified using Villalta-Score (VS) and QOL was assessed using the VEINES-QOL Questionnaire.

Results

167 out of 847 (19,7%) patients with DVT were identified with an IFT. 85 out of 167 (50,9%) Patients agreed to participate and were included in the registry and analysed in more detail. 53% (45/85) were female. 76,5% (65/85) had left IFT, 15,3% (13/85) had right IFT and 8,2% (7/85) presented with IFT on both sides. 53,8% (35/65) of left sided IFT were diagnosed to have May-Thurner-Syndrome (MTS). 69,4% (59/85) had a descending IFT, 30,6% (26/85) had an ascending DVT. 28,2% (24/85) of the patients with IFT underwent operative, interventional or thrombolytic treatment, 71,8% (61/85) received conservative treatment with anticoagulation and compression stockings alone.

Left sided descending IFT was diagnosed in 69,2% (45/65) and 77,8% (35/45) of these presented with MTS.

In the interventional treatment group 45,8% (11/24) had a mild (VS 5–9), 8,3% (2/24) moderate (VS 10–14), 4,2% (1/24) severe PTS (VS ≥ 15 or ulcer). 37,5% (9/24) described no PTS (VS 0–4). In the conservative treatment group 26,2% (16/61) had mild (VS 5–9), 3,3% (2/61) moderate (VS 10–14), 4,9% (3/61) severe PTS (VS ≥ 15 or ulcer). 65,6% (40/61) described no PTS (VS 0–4).

Conclusions

IFT is seen in nearly 20% of the examined population with DVT. In the interventional group 83,3% of patients presented with no or mild PTS after intervention, in the conservative group 91,8% of patients had no or mild symptoms of PTS. Left sided descending IFT was highly correlated with MTS (77,8%), which suggests that MTS may be one of the major risk factors for this group of patients.

FV-1.3

Safety of VenoTrain® angioflow in patients with chronic venous insufficiency (CVI) and peripheral arterial occlusive disease (PAD)

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Introduction

Compression is a corner stone in the therapy of phlebological diseases. Advanced PAD is known as an absolute contraindication for compression treatment. In patients with a combination of CVI and PAD compression is possible, if the ankle-brachial-index (ABI) is > 0,5 and the absolute arterial pressure is > 60 mmHg. Here, an unelastic compression up to 40 mmHg resting pressure is possible without a reduction of arterial perfusion. Special compression bandage systems have been proven for this indication. Since September 2017, a new specially designed medical compression stocking – VenoTrain® angioflow (MKS) is available. The aim of the study was to examine the safety of this MKS.

Material & methods

Prospective, monocentric, not randomised study with 50 evaluable patients with CVI in stages C3-C5 und PAD (ABI < 0,9 und > 0,5 and absolute arterial pressure > 60mmHg). We had 3 visits in a period of 3 weeks with documentation of clinical findings (skin, edema), venous status (duplex, DPPG), arterial status (ABI, APPG), leg volume (Bodytronic), clinical symptoms (VVSymQ) as well as comfort and handling of the MKS. Patients wore the MKS daily for 8 hours for a period of 14 days (visit 2- to 3). The analysis was pooled and descriptive.

Results

Up to now, 10 patients have passed the complete protocol. By use of the MKS, there was a volume reduction of the lower legs (visit 2 prior MKS: 2,91l vs. visit 3 after 2 weeks MKS: 2,82l), a reduction of subjective (patients – VVSymQ visit 1:2,6 vs. visit 3: 1,6) and objektive symptoms (doctors) of the CVI but no reduction of the arterial perfusion. Actually, results showed an increase of systolic arterial toe pressure from 69,2 mmHg in visit 2 without MKS to 95,4 mmHg in visit 3 with MKS. The handling of the MKS was regarded as easy by both, patients and study nurses. Patients rated the MKS with very good (5), good (2) and satisfactory (3) according to the German grading system. The MKS in the study had an opening for the toes to perform the APPG-measurements what allowed slipping of the foot part of the MKS in some cases and provoked criticism. On the market, the MKS is sold without a toe opening.

In September 2018, we hope to present the data of the complete group.

Conclusion

Up to now, the VenoTrain® angioflow can be recommended as safe for the treatment of patients with CVI and compensated PAD.

Patients and methods

Safety, stent patency and clinical outcome after placement of the Vici Venous Stent® in patients with chronic ilio-femoral venous obstruction were assessed. Stent patency was evaluated by duplex ultrasound scanning, and clinical outcome was determined using the revised Venous Clinical Severity score (rVCSS).

Results

Between 2014 and 2016, 75 patients (49 % female; median age 57 years; 82 limbs) with symptomatic significant VOO had stent placed in the ilio-femoral veins. Lower limb venous skin changes including ulcers (C-class in CEAP 4–6) were found in 31 patients (41%). Non-thrombotic iliac vein lesions (NIVLs) and postthrombotic obstruction (PTO) were found in 40 and 42 limbs, respectively. There were no safety issues. Cumulative primary, assisted-primary, and secondary stent patency in the entire cohort at 12 months were 94 %, 94 % and 96 %, respectively. Five limbs presented with stent occlusion. Two limbs had no intervention, 2/3 remained patent after reintervention. Clinical improvement (a decrease ≥ 2 rVCSS points) was observed in 81 %, 81 %, and 77 % of patients at 1 month, 6 months, and 12 months, respectively. There was a marked drop in the frequency of more marked pain and swelling (VCSS ≥ 2) from 62 % to 5 % and 93 % to 19 %, respectively. Four limbs had venous ulcers, three healed during the follow-up. Cumulative primary stent patency at 12 months was 100 % and 87 % in patients with NIVL and PTO, respectively ($p = 0.032$). There was no statistical difference in clinical outcome between these subgroups.

Conclusions

The Vici Venous Stent® placed in the ilio-femoral vein segment in patients with symptomatic VOO revealed no safety issues, had excellent primary patency and substantial symptom improvement. Long-term studies are needed to evaluate the durability of this stenting procedure.

FV-1.5

Patency and clinical outcome of the Venovo venous stent in the treatment of non-thrombotic or post-thrombotic iliac vein lesions – short-term results from the Arnsberg venous registry

M. Lichtenberg*, R. de Graaf

Klinikum Arnsberg, Arnsberg

Background

Patency and clinical outcome of the Venovo venous stent in the treatment of non-thrombotic or post-thrombotic iliac vein lesions: short-term results from the Arnsberg venous registry.

Patients and methods

A total of 80 patients (45 female, mean age 57 years) treated in 2015 were included in the Arnsberg venous registry. Clinical improvement was determined by the revised venous clinical severity score (rVCSS) as well as the clinical, etiologic, anatomic and pathophysiologic (CEAP) score. Primary and secondary stent patency was evaluated using duplex ultrasound.

Results

Overall 12-months patency rates were 96 % for primary and 97 % for secondary patency. For NIVL primary versus secondary patency was 97 % versus 100 %, whereas for PTS primary versus secondary patency was 96 % versus 95 %, respectively. Clinical improvement with a gain of ≥ 2 rVCSS levels was observed in 51 %. CEAP scores decreased from 4.3 to 2.8.

Conclusions

The Venovo venous stent showed adequate patency rates associated with reasonable clinical improvement and low device-related complications throughout a 12-months-follow-up in both NIVL and PTS.

FV-1.4

First time report for safety and performance of the Vici Venous Stent® in patients with acute and chronic venous outflow obstructions – Results from the Arnsberg Venous Registry

M. Lichtenberg*, R. de Graaf

Klinikum Arnsberg, Arnsberg

Background

To evaluate the performance of the Vici Venous Stent® for the treatment of chronic ilio-femoral venous outflow obstruction (VOO) in the short-term.

FV-2

Arterielle Erkrankungen –
Strategien zu Diagnostik und Therapie

Freie Vorträge

FV-2.2

Prognosis improvement by specialized
vascular medicine in patients with peripheral
artery disease

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Background

Over 4.5 million people in Germany suffer from peripheral artery disease (PAD). The incidence continues to increase, especially in the stages of critical limb ischemia. The compensation amounts for inpatient PAD patients are increasing rapidly. Nevertheless, the care situation is not sufficient, because despite an overall increase in treatment costs, mortality and amputation rates remain very high. The aim of the present study was to determine the influence of specialized vascular departments on the resource consumption and prognosis of PAD patients and to clarify the benefits of vascular centers.

Patients and methods

21.261 patients with a diagnosis of PAD at the time of index hospitalization from 2010 to 2012, who had health insurance with the KNAPPSCHAFT. There are data sets from a observation period of 15 months before and up to 7.5 years in the follow-up.

Results

The mean age was 74 years, 63.5% were men. Among these patients, 43% were categorized in stage 1–3, 14% in stage 4 and 43% in stages 5 and 6 according to Rutherford (RF). The 7.5-year mortality was 48% in RF stage 1–3 versus 80% and 86% in RF stage 5 and 6.

Only 35% of the PAD patients (3% angiology, 32% vascular surgery) were treated in specialized vascular centers. With a share of 54% general surgeons and internal departments took over the main supply. The hospital costs for index hospitalization and the additive costs incurred over the following year were dependent on RF stage and went up from the average of 3.820 and 9.720 Euros per patient in RF 1–3 to 8.510 and 22.320 Euros in RF 6.

There were higher rates of revascularization procedures and angiography in PAD patients, especially in amputee patients, when treatment was performed in vascular centers, see Table 1.

Regarding the outcome of the patients, we found an advantage in amputation-free survival in treatment within a vascular center. A significant reduction in relative risk of death and/or amputation by vascular center treatment was found in multivariate analysis with an hazard ratio (HR) of 0.925 (confidence interval (CI) 0.89–0.96, $p < 0.01$).

Specifically, treatment in angiology (HR 0.671, CI 0.59–0.76, $p < 0.01$), as well as in vascular surgery (HR 0.932, CI 0.88–0.99, $p < 0.01$), showed an survival advantage versus general surgery care (HR 1.124, CI 1.06–1.19).

Conclusions

The present descriptive study demonstrate, that the connection of PAD patients to vascular centers (as an expression of specialized vascular medicine departments) makes sense from a prognostic point of view. The explanation attempt for it are most likely higher revascularization rates as well as the optimized supply of secondary medical prevention (statin prescription). National and international guidelines require specialized treatment but in the current practice, as our analysis shows, this is insufficiently implemented.

FV-2.1

Ankle-Brachial-Index by Doppler Sonography
and oscillometry for PAD diagnosis

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Background

CT/MR-angiography and duplex sonography are the gold standards in non-invasive diagnosis of peripheral arterial occlusive disease (PAD). As a stepwise diagnostic procedure is recommended medical history, physical examination and Ankle Brachial Index (ABI) are carried out first. Automated oscillometric devices are promising alternative options as they are easy to handle. The aim of this study was to compare Doppler-based ABI and oscillometry-based ABI regarding sensitivity, specificity, time saving and patient satisfaction.

Patients and methods

In three centres, 286 patients (568 legs) underwent Doppler-based ABI (dABI) and oscillometry-based ABI (oABI) including pulse wave index (PWI). Mean patients' age was 68.1 years (22 to 96 years), 44.6% were female. Overall 72% of the patients had hypercholesterolemia, 73.8% arterial hypertension, 34.6% Diabetes mellitus, and 7.8% renal dysfunction; 33.9% were smokers and 30.8% ex-smokers. Calculating dABI, the systolic brachial arterial pressure was used as denominator and the lower arterial ankle pressure for each leg as numerator. The PWI was calculated by inclusion of the pulse wave form: higher wrist pulse pressure divided by leg pulse pressure multiplied with each leg's peak time. Hemodynamically relevant stenoses were confirmed by colour-coded duplex sonography, MR-angiography or digital subtraction angiography. Sensitivity and specificity were calculated with respect to the gold standard separately for each leg and then combined with inverse-variance weighting. Clopper-Pearson confidence intervals were computed. The outcomes for dABI and oABI were compared by McNemar tests. Patients' satisfaction was measured by a visual analogue scale (VAS) ranging from 0 (= not inconvenient) to 10 (= very inconvenient). VAS results were compared by Wilcoxon matched pairs test. In addition, patients' preferences were inquired.

Results

Sensitivity and specificity of dABI for detecting PAD were 87.3% (95% CI: 81.9–91.3%) and 65.3% (95% CI: 59.5–70.6%), respectively. For oABI the figures were 66.4% (95% CI 59.8–72.4%) and 79.8% (95% CI 74.8–84.0%) and for PWI 84.2% (95% CI 80.1–87.7%) and 77.2% (95% CI: 71.8–81.8%). Logistic regression analysis revealed non-inferiority of oABI for specificity ($p < 0.001$) but inferiority in sensitivity compared to dABI while PWI was shown to be non-inferior to dABI for both, sensitivity and specificity. The average time for measurement was 9 ± 3.7 min for dABI and 3.7 ± 0.9 min for oABI. This time saving of 5.2 min on average per patient was statistically significant ($p < 0.001$). 11.9% of patients favoured dABI, 25.2% oABI, and 60.9% had no preference ($p < 0.001$). Median VAS score for dABI was 1 (interquartile range – IQR: 0–2) and for oABI 0 (IQR: 0–1) ($p < 0.001$).

Conclusions

Automated oscillometric devices are an alternative method detecting PAD with significant saving of time and higher patient satisfaction.

	no vascular center					vascular center				
Rutherford	1 – 3	4	5	6	all	1 – 3	4	5	6	all
n	6533	2139	2810	3946	15428	2545	914	1008	1366	5833
n amputee patients	51	44	332	1794	2223	5	22	125	596	748
procedures										
Angiography (%)	62	58	46	46	55	59	56	50	52	55
in amputated (%)	18	51	35	41	40	20	46	43	49	48
Surgery (%)	26	43	17	24	26	28	45	25	27	30
in amputated (%)	2	55	17	21	21	20	77	28	28	29
Endovascular (%)	49	33	29	25	37	51	36	34	35	42
in amputated (%)	4	18	16	22	20	0	9	28	34	32
Endovascular Only (%)	45	28	26	21	33	48	29	31	29	38
in amputated (%)	4	12	14	18	17	0	0	24	26	25
Endovascular below knee (%)	7	10	14	14	10	6	9	17	20	12
in amputated (%)	2	5	9	13	12	0	5	16	21	19
Revascularization (%)	71	71	44	45	55	77	74	56	56	68
in amputated (%)	6	67	31	39	38	20	77	52	54	54
medication										
Platelet aggregation inhibitors (%)	57	55	48	48	53	55	59	52	52	54
in amputated (%)	35	57	48	45	45	60	55	51	50	50
Statins (%)	56	49	42	38	48	60	54	46	43	53
in amputated (%)	47	34	43	35	36	40	27	31	41	39
Anticoagulation (%)	15	25	21	19	18	11	23	21	19	16
in amputated (%)	26	32	17	18	18	0	23	22	19	19
ACE inhibitors/sartanes	73	72	75	70	72	72	73	75	72	73
in amputated (%)	77	57	73	68	69	40	55	66	70	69
Beta blocker (%)	56	58	58	57	57	55	57	61	58	57
in amputated (%)	51	52	59	57	57	60	46	58	56	56
Diuretics (%)	59	65	78	76	67	55	66	77	75	65
in amputated (%)	80	52	77	75	75	60	64	71	72	72
Renin inhibitors (%)	37	37	35	33	36	38	39	36	36	35
in amputated (%)	39	25	38	31	32	20	23	37	35	35
Vasoactive substances (%)	10	12	9	7	10	9	12	7	6	9
in amputated (%)	10	0	8	7	7	0	0	6	3	3

FV-2.2. Table. Procedures and medication inside and outside vascular centers in all/ amputee patients while index hospitalization.

FV-2.3

New predictors of neurologic outcomes following carotid endarteriectomy

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Background

The prospective registry study intended to identify risk factors of periinterventional neurologic outcomes after carotid endarteriectomy (CEA) to improve patient selection. Neurologic outcome prediction differs from the endpoint MACCE as previously shown.

Patients and methods

Patient characteristics and procedural factors were prospectively acquired and analysed using Cox regression to determine predictors for stroke and death within 30-days of CEA.

Results

The analysis included 748 operations, 262 (35%) asymptomatic, 208 (28%) with previous strokes, and 278 (37%) with transient ischemic attacks (TIA). The overall 30-day stroke rate was 5.5%, 3.1% in asymptomatic and 6.8% in symptomatic patients. Independent predictors of stroke and

death were contralateral occlusion, symptomatic status, First-degree atrioventricular block, resection and myocardial infarction.

Conclusions

This is the first investigation identifying preprocedural myocardial infarction and first degree AV-block as predictors of perioperative stroke and death.

FV-2.4

Bypass to the ankle and foot – contemporary single center results

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Background

Critical limb ischemia (CLI) still represents a challenge in respect of longterm foot preservation and durable improvement of limb perfusion. Currently the concept of a primary endovascular approach is favoured but surgical bypass still represents an attractive option. Results of a contemporary single center series of distal bypasses to the ankle and foot are presented.

Patients and methods

In case of CLI with or without previous unsuccessful endovascular treatment and suitable distal artery at the level of the distal calf or foot and presence of long arteriosclerotic vessel occlusion at the femoropopliteal and/or crural level surgical bypass was preferred for revascularisation. Grafts were followed with duplex ultrasound at regular intervals and secondary graft or anastomotic stenosis preferentially treated with endovascular techniques.

Results

From 06/10 until 01/18 in 371 patients with CLI (257 men and 114 women; 76+10 years) 430 bypasses to the ankle and below were constructed in 411 limbs. Diabetes mellitus was present in 64% and in 14% of patients were suffering from end stage renal disease. The distal anastomosis was located below the ankle in 81% of cases. „Distal origin“ technique could be used in 53% of operations and sequential bypass was constructed in 20%. 86% of the bypasses were constructed with autologous vein combining two or more vein segments in 37% of cases. The composite technique with a proximal prosthesis and a distal vein was employed in 14%. Arm vein was used in 30% for bypass material. The distal anastomosis was located in 63% at the distal anterior tibial artery, the dorsalis pedis artery or its branches. Early mortality was 5,8%. In 12% of cases during follow up secondary interventions to preserve or restore bypass patency became necessary. After a mean follow-up of 26 ± 23 months primary, primary assisted, secondary patency and limb salvage were 45%, 63%, 66% and 89% for all bypasses after 60 months. Secondary patency and limb salvage was significantly better for autologous vein compared to composite bypass (69% versus 45%, $p = 0,005$ and 91% versus 77%, $p = 0,015$). Amputation free survival and survival was 41% and 41% after 60 months. Results were significantly worse for composite bypass (amputation free survival 29%, $p = 0,009$, survival 29%, $p = 0,02$) and end stage renal disease (amputation free survival 14%, $p = 0,00$, survival 14%, $p = 0,00$)

Conclusions

Bypass to arteries at the level of the ankle and below is an effective and durable method of lower limb revascularisation in CLI with good long term results. Despite inferior limb salvage and increased surgical effort composite bypass is justified. Survival for end stage renal disease is poor. Distal bypass remains an important tool in the treatment of lower limb CLI.

FV-2.5

Antithrombotic treatment upon endovascular revascularization of acute lower limb ischemia

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Background

In the last couple of decades, substantial advances have been made the interventional treatment of thromboembolic acute limb ischemia (ALI), leading to excellent primary revascularization success rates of over 90%. However, patency after interventional treatment of ALI in one-year follow-up is still moderate, calling for a substantial need for optimization of the long-term management of the disease, such as the antithrombotic treatment regime.

The majority of patients today receive upon mechanical thrombectomy of a thromboembolic occlusion a long-term treatment with aspirin 100 mg/daily; in addition, clopidogrel 75 mg/daily is administered for a certain period of time in case of stent implantation. In lesions with a high thrombotic burden, current guideline and inter-consensus paper recommend the use heparin immediately after an ALI intervention, followed by vitamin K antagonist for at least 3 to 6 months; however, there are no standardized antithrombotic regimes for the patients in a long-term follow-up and it still remains to be elucidated which concept and duration time of treatment is both effective and safe to improve the patency rate.

Patients and methods

Based on data from the Heidelberg registry for peripheral artery disease (a total of 202 patients), we evaluated whether short-term vs long-term anticoagulation in addition to standard antiplatelet regime might improve patency rate over an observation period of 24 months. In the current study, all patients presented with acute thromboembolic occlusion of the lower extremity. The patients' collective was further segregated according to the antithrombotic regime received in following groups: 1) dual antiplatelet therapy (aspirin 100mg/d and clopidogrel 75mg/d for 4 weeks), DAPT alone; 2) DAPT plus low-dose anticoagulation for 4 weeks (short term); 3) DAPT plus high-dose molecular weight heparin/oral vitamin K antagonist/NOAC for >4 weeks, long term).

Results

The current study showed that endovascular treatment is not only associated with high immediate revascularization rates (>98%), but those results remain stable over time as measured by ankle-brachial indices (0.84 ± 0.25 , 0.9 ± 0.12 , and 0.82 ± 0.3) and duplex ultrasound despite complex lesions and advanced stage of patients' symptoms. Survival analysis revealed that endovascular treatment is associated with low mortality (<3%) and limb loss (<5%) rates over a long-term follow-up of twenty-four months with no significant difference depending on the chosen anticoagulation regime, $p > 0.05$. Bleeding complications were numerous increased in the long-term anticoagulation group (9.3% vs. 5.6% (short-term group) and 6.5% (DAPT group)).

Conclusions

Our current results demonstrate that dual platelet therapy in combination with additional anticoagulation (either low-dose short-term or high-dose long-term) vs. dual antiplatelet treatment alone did not significantly improve the outcome upon treatment of acute thromboembolic limb ischemia.

FV-2.6

Spot stenting of complex femoropopliteal lesions with the Multi-LOC multiple stent delivery system – 12 month results of the multicentre LOCOMOTIVE registry

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Background

The purpose of this observational study is to report the 12-month clinical outcomes with the Multi-LOC multiple stent delivery system (MSDS) for the treatment of complex femoropopliteal lesions.

Patients and methods

The LOCOMOTIVE all comers registry documents procedural data as well as preliminary safety and efficacy data of the first results of this new device. Femoropopliteal lesions were dilated with uncoated and/or paclitaxel-coated peripheral balloon catheters. When flow-limiting dissections or recoil required provisional stenting, up to six short stents per delivery device, each 13mm in length, were implanted.

This prospective, multicentre study included the first 75 patients with 176 atherosclerotic femoropopliteal lesions who underwent focal implantation of 382 short stents. Duplex ultrasound follow-up and clinical assessments were scheduled at 12 months after the intervention.

Results

A total of 75 patients 72.9 ± 9.2 years of age were enrolled. Critical limb ischemia (CLI) was present in 26.7% (20/75). The total lesion length was 14.5 ± 9.0 cm with reference vessel diameters of 5.6 ± 0.7 mm. 51.1% were TASC II class C and D lesions. Predilatation was performed with POBA in the majority of the cases (75.6%).

The ratio of stent vs. lesion length was significantly lower in CLI patients as compared to the non-CLI subgroup (0.46 ± 0.16 vs. 0.56 ± 0.18 , $p = 0.009$). Overall $47 \pm 18\%$ of lesion lengths could be saved from stenting with a procedural success rate of 100%.

At 12 months all cause target lesion revascularization rate (TLR) was 9.3% for the total cohort, with 5% in CLI and 10.9% in nonCLI patients. Primary unassisted patency for all, CLI and non CLI patients was 85.7%, 93.3% and 83.3%. Primary assisted patency rate was 96% in the overall cohort. Between baseline and 12 months, the target leg ankle-brachial-index (ABI) increased from 0.62 ± 0.24 to 0.91 ± 0.38 ($p < 0.001$) and the mean Rutherford-Becker class decreased from 3.4 to 1.9 ($p < 0.001$). Between 6 and 12 months, neither target leg ABI, nor Rutherford-Becker class changed significantly (p post vs. 12 months = 0.343, p 6 months vs. 12 months = 0.397).

Conclusions

The 12-month data confirmed the initial benefits in terms of TLR, primary patency and overall clinical efficacy. The current data suggest that the MSDS strategy delivers sustainable clinical safety and efficacy at 12 months after treatment of femoro-popliteal lesions with considerable length (14.5 ± 9.0 cm) in unselected all days patients with severe peripheral artery disease.

FV-3

Freie Vorträge

Grundlagenforschung und Innovationen

FV-3.1

Subclavian coverage during TEVAR – complications and mid-term follow-up

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Background

Numerous conditions that affect the boundary between the aortic arch and descending aorta are treated with thoracic endovascular aortic repair (TEVAR). In 40% of cases, coverage of the left subclavian artery (LSA) cannot be prevented. Subsequently, neurological complications such as stroke or ischemia of the left upper extremity may develop. However, the actual risk of these complications is a matter of considerable controversy. The optimal treatment approach, specifically whether primary revascularization of the LSA should be performed in all cases, is unclear.

Patients and methods

The present retrospective study analyzed the short- and mid-term results of patients treated with TEVAR with complete coverage of the LSA. The postoperative protocol consisted of clinical and noninvasive examinations as well as morphological imaging. Survival, complication and reintervention rates were recorded.

Results

A total of 40 patients, undergoing TEVAR with complete coverage of the LSA between January 2010 and December 2014 were analyzed retrospectively. The 30-day survival rate was 95%, the survival one year after performed TEVAR was 67.5%. The average follow-up was 1.5 years. After TEVAR procedure with complete coverage of the LSA, only one patient (2.5%) developed critical ischemia of the left arm immediately after aortic stent implantation, requiring revascularization by transposition of the LSA. Anterior spinal artery syndrome occurred in another patient (2.5%) immediately following TEVAR. During follow-up examinations, all patients showed a compensated arterial arm status. None of the patients developed new neurological deficits during the follow-up period.

Conclusions

The study shows, that performing TEVAR without primary revascularization of the LSA was justifiable in our cohort. An important risk factor of developing cerebral ischemia seems to be insufficient collateralization through the circle of Willis.

FV-3.2

Improvement of carotid stenoses quantification on Novel 4D/3D color-Doppler Ultrasonography

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Background

Accuracy of internal carotid artery stenosis (ICAS) quantification depends on the method of stenosis measurement, impacting therapeutic decisions and outcomes. The NASCET-method references the stenotic to the distal ICAS lumen and the common carotid artery (CC) method to the CC-diameter. Direct morphometric stenosis measurement with four-dimensionally guided three-dimensional ultrasonography (4D/3DC-US) demonstrated good validity for the commonly used NASCET-method. The NASCET-definition has clinically relevant drawbacks. Our purpose was to investigate the validity of the CC-method.

Patients and methods

Screening with 4D/3DC-US was performed in 93 patients (122 ICAS) admitted to our vascular center. Main exclusion criteria were insufficient image quality, previous revascularization and contraindications to CA. Eighty patients were prospectively examined in optimal planes with 4D-US assisted static 3DC-US color-Doppler (10MHz) followed by blinded multiplanar off-line rendering to determine %-NASCET and %-CC stenosis. Multiplane selective CA of the same ICAS were quantified with dedicated software in a blinded fashion.

Results

The 4D/3DC-US versus angiography intermethod standard deviation of differences (SDD, $n = 103$) was lower for the CC (5.7%) compared to the NASCET-method (8.1%, $p \leq 0.001$). Additionally, it was lower than the NASCET angiography interrater SDD of 52 stenoses (SDD 7.2%, $p = 0.047$). Interobserver analysis of equivalent grading methods showed no differences for the SDDs between angiography and 4D/3DC-US observers. Binary comparison to angiography showed equal Kappa values ≥ 0.7 and an accuracy $\geq 85\%$ for the NASCET- and CC-method. Binary accuracy of ICAS grading did not differ from DUS for all methods.

Conclusions

The new 4D/3DC-US method referencing to the conserved diameter of the common carotid artery is an accurate and well reproducible alternative to the NASCET-method and offers perspectives for clinical application.

FV-3.3

Validation of new oszillometric PAD parameters – Puls Wave Index (PWI), Tissue Optical Perfusion Pressure (TOPP) and oszillometric ABI vs cw-Doppler-ABI

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Background

The classic way to determine the severity of PAD is measurement of ABI by cw-Doppler technique. However, foot perfusion is underestimated measuring ABI at the ankle. Toe pressure (TP) varies, documented in numerous publications. The issue of an optimal parameter to control the success after peripheral intervention especially performed in the foot arteries is on going. Using an infrared sensor to determine skin perfusion at the very end of microcirculation of the toes the first signal during automatic deflation was recorded. This technique was added to an automated oszillometric determination (AOD) of the ABI (AOD-ABI). Analysing the pulse wave, PWI was calculated by the maximal amplitude and time-to-peak interval and as ratio similar to the ABI.

Patients and methods

Methods: AngE with AOD between ranges of 200 to 20mmHg was used to determine the ABI. First, in 100 patients ABI by AOD (AOD-ABI) was compared to the standard cw-Doppler ABI (cwD-ABI). In AOD ABI is determined by best signal of mean arterial pressure whereas cw-Dopp-ABI is able to differentiate systolic pressure of the ATP or ADP. Data of AOD-ABI were compared with best or worst cw-Dopp-pressure. In AOD TOPP at the first toe was documented simultaneously in 10mmHg increments while deflating the pressure cuffs and compared to cwD-systolic pressure (cwD-SP) and TP. Secondly, in 100 patients TP was determined and compared to TOPP. Data were expressed as regression analysis and Bland-Altman-plot.

Results

Results: AOD-ABI correlates with best cwD-ABI ($R = 0.68$, $p < 0.001$) and worst cwD-ABI ($R = 0.63$, $p < 0.001$). Bland-Altman-plot analysis presented almost no difference between AOD-ABI vs best cwD-ABI and a difference of 0.16 to worst cwD-ABI. TOPP correlates very well to best cwD-SP ($R = 0.9$, $p < 0.001$) and to worst cwD-SP ($R = 0.74$, $p < 0.001$). Bland-Altman-plot presents almost no difference of TOPP to best cwD-SP and a difference of 26mmHg to worst cwD-SP. Correlations were similar for the PWI data. TOPP correlates to TP ($R = 0.77$, $p < 0.001$). The absolute difference is mean 37mmHg. Circumference to cuff ratio is mean 2.1 for the ankle and mean 3.4 for the first toe.

Conclusions

For determination of the ABI automatic oszillometry can be used as well as cw-Doppler-technique. Automatic detection serves time especially in treadmill stress test and avoids human errors. In addition, tissue optical perfusion pressure (TOPP) and puls wave index (PWI) can be determined in the same measurement. TOPP is a very good parameter to control interventional results and is superior to toe pressure.

FV-3.4

Age-related vascular dysfunction – the role of MIF

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Background

Age-related vascular dysfunction is associated with increased morbidity and mortality. Although vascular aging can cause or aggravate cardiovascular dysfunction and other widespread diseases, the underlying biochemical mechanisms are poorly understood.

Macrophage Migration Inhibitory Factor (MIF) was recently suggested to play an important role in the pathogenesis of aging-induced vascular dysfunction as a potent mediator of endothelial function and vascular stiffness. Since the S-nitrosation of MIF leads to a doubling of the oxidoreductase activity and a daily diet rich in nitrate has been shown to reverse age-related vascular dysfunction, we hypothesized that MIF's S-nitrosation could mediate the beneficial effects of dietary nitrate on vascular function. This study thus aims to characterize the potential role of MIF in age-associated vascular dysfunction.

Patients and methods

Vascular function in 57 probands was determined by pulse wave velocity (PWV) measurement as a parameter for vascular stiffness and correlated to plasma MIF levels.

On a translational approach age-related changes of intracellular MIF expression in vascular tissue were determined in isolated aortas of C57BL/6 mice at the age of six and 18 months. Determination of PWV through transit-time measurements was conducted in aged MIF-deficient mice and compared to WT littermates.

To study the changes in the beneficial response to dietary nitrate in MIF-deficient aged mice, animals were then treated with dietary nitrate via drinking water (2g/L) for eight weeks followed by PWV measurement. Plasma nitrate and nitrite levels were determined to confirm nitrate uptake and bioactivation.

Results

Proband's age was related to increased pulse wave velocity (PWV) and elevated plasma MIF levels ($n = 57$, $p = 0.001$).

Analysis of intracellular MIF expression in murine aortic tissue revealed elevated MIF levels in aged mice compared to young controls on both mRNA and protein level ($n = 3-4$, $p = 0.01$ for both).

PWV measurement showed elevated PWV in aged MIF-deficient mice as compared to aged WT mice indicating increased vascular stiffness ($n = 5-6$, $p = 0.001$). After dietary nitrate administration for 8 weeks, old WT mice showed a reduction in PWV as a sign for improved vascular compliance ($n = 5-6$, $p = 0.002$). PWV levels in MIF-deficient mice could only partially be restored by administration of nitrate to the degree of nitrate-treated aged WT mice ($n = 5-9$, $p = 0.002$).

Conclusions

This study provides evidence that MIF crucially mediates age-associated changes in vascular function. We show an age-dependent increase in MIF plasma levels intracellular MIF expression in vasculature and that MIF deficiency even exacerbates age-associated dysfunction. Increased S-nitrosation of MIF could be the underlying biochemical target to orchestrate a potential therapeutic approach through dietary nitrate to counteract age-related vascular dysfunction.

FV-3.5

PEARL – alirocumab real-world use in German clinical practice

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Background

The ESC recommends low-density lipoprotein cholesterol (LDL-C) <1.81mmol/L (70 mg/dL) for patients (pts) with peripheral arterial disease (PAD). Task Force consensus statements indicate that it may be reasonable to consider PCSK9 inhibitor therapy for pts with atherosclerotic cardiovascular (CV) disease who are not adequately treated with statins and ezetimibe. PEARL (Prospektive Nicht-Interventionelle Studie zur Erfassung der Wirksamkeit und Verträglichkeit) assessed the efficacy and safety of the PCSK9 inhibitor alirocumab (ALI) in pts with hypercholesterolaemia despite maximal tolerated non-ALI lipid-lowering therapies (LLTs) in a real-world setting.

Patients and methods

PEARL was an open, prospective, multicentre, non-interventional study. Enrolled pts (n = 619) had LDL-C >1.81 or 2.59mmol/L (100 mg/dL; depending on CV risk) and subsequently received ≥1 dose of ALI 75 or 150 mg every 2 weeks (Q2W) prior to enrolment (study duration: 24 weeks). Physicians could adjust the ALI dose based on their own clinical judgment throughout the study. Primary efficacy endpoint was LDL-C reduction from baseline (prior to ALI therapy) to Week 24.

Results

In total, 64.4% of pts were male; mean age was 61.6 years. Most pts (90.2%) had a history of CV disease, including coronary heart disease (CHD, 72.4%), acute coronary syndrome (ACS, 33.0%), cerebrovascular disease (9.2%) and PAD (13.2%). In total, 50.8% of pts had familial hypercholesterolaemia and 27.6% had diabetes mellitus; 45.3% were statin intolerant (unable to tolerate ≥2 statins) and 27.6% were partially statin intolerant (unable to tolerate sufficient statin dose to reach treatment target). Before receiving the first ALI dose, 23.5% of pts were on statin therapy only, 47.8% of pts were on LLT therapy (ezetimibe, fibrates and/or bile acid sequestrants) combined with statin, 10.1% were on non-statin LLT combination therapy and 1.9% received other LLTs (no information available: 16.7%). In total, 13.7% of pts with CHD and 16.7% with ACS received >1 statin. Overall, the initial ALI dose was 75 mg Q2W in 72.9% and 150 mg Q2W in 24.5% of pts, with similar percentages observed for pts with CHD (72.2% and 25.3%, respectively) and ACS (74.3% and 23.8%, respectively). Week 24 LDL-C levels are presented in Figure 1.

Least-squares mean % change from baseline to Week 24 in LDL-C was -48.6% for all pts, -50.0% for those with CHD and -50.4% for those with ACS. During PEARL, 20.4% of all pts received ALI dose increase from 75 mg to 150 mg Q2W, and 4.0% had a dose decrease from 150 mg to 75 mg Q2W. In total, 13.4% of pts discontinued treatment. Treatment-emergent adverse events were reported in 10.3% of pts, with myalgia (7.3%) the most common.

Conclusions

In a real-world setting, data from the PEARL study showed that ALI was mostly used in pts with high CV risk and complete/partial statin intolerance, including those with PAD. ALI efficacy and safety results were consistent with those observed in the ODYSSEY Phase III programme.

FV-3.5. Figure. Mean LDL-C at baseline and Week 24 for the overall PEARL study population, patients with CHD and patients with ACS (ITT analysis).

FV-4 Freie Vorträge Arterien – Interventionelle Studien und Devices

FV-4.1

The Lutonix® global drug coated balloon registry real world patients with below the knee disease – interim 12 month outcomes

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Background

The most common clinical presentation of peripheral artery disease (PAD) comprises intermittent claudication but about one third of patients will progress to critical limb ischemia (CLI) characterized by rest pain and/or tissue loss, which is the most severe limb manifestation of PAD. Paclitaxel-coated balloons are safe and effective in treating PAD. This ongoing multicenter registry study is designed to assess the safety and effectiveness of the Lutonix® 014 Drug Coated PTA Dilatation Catheter (DCB) for the treatment of stenosis or occlusion of native below-the-knee (BTK) arteries in a real world clinical practice.

Patients and methods

This registry trial enrolled 317 real world patients presenting with claudication or critical limb ischemia (Rutherford Category (RCC) 3–5). Patients with significant stenosis ($\geq 70\%$) or occlusion of one or more native artery(s) below the tibial plateau and above the tibiotalar joint and the target vessel(s) reconstitute(s) at or above the ankle with inline flow to at least one patent inframalleolar outflow vessel were included. Patient is participating in an investigational drug or device study which has not yet reached its primary endpoint or had a non-controllable allergy to contrast were excluded. All patients were treated per standard of care when using the Lutonix® DCB. The DCB procedure was performed per the IFU. Follow-up visits, through 24 months, were also done per standard of care. Primary endpoints are: Safety: Freedom from BTK MALE+POD at 30-days (Freedom at 30-Days from the composite of all-cause death, above-ankle amputation or major reintervention, i.e. new bypass graft, jump/interposition graft revision, or thrombectomy/thrombolysis of the index limb involving a BTK artery). Efficacy: TLR at 6 months (Defined as clinically-driven target lesion reintervention (TLR)).

Results

Interim results on 317 patients will be presented. Majority of the patients were RCC 5 (65.8%), 64.0% were diabetic, 86.8% were hypertensive and 62.4% had dyslipidemia. Mean lesion length was 121+97.9mm, calcification was present in 68.2% and 24.4% with severe calcification. Lesion locations were 6.9% popliteal, 20.6% TP trunk, 51.1% AT, 22.3% PT, and 22.8% peroneal. Freedom from Primary Safety Events at 30 days was 98.6%. Primary efficacy of Freedom from TLR at 12 months was 76.09%.

Conclusions

These interim 12 month outcomes suggest the Lutonix® DCB 014 is safe with sustained treatment effect for BTK arterial disease.

FV-4.2

Benefits and risks of dual antiplatelet therapy (DAPT) in endovascular treatment of complex peripheral artery disease

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Background

Dual antiplatelet therapy (DAPT) is established in the treatment of CAD, but its value in peripheral artery disease (PAD) is not clear. We assessed the efficacy and safety of DAPT in high-risk patients undergoing complex lower limb endovascular revascularization.

Patients and methods

Patients with complex PAD (n = 71) were treated with endovascular interventions for intermittent claudication (IC, n = 36) and for critical limb ischemia (CLI, n = 35). DAPT was given for 1 month after interventions and aspirin thereafter. Efficacy endpoints were high on-treatment platelet reactivity (HTPR), symptomatic improvement, and major adverse limb events (MALE). Safety endpoints were MACCE and BARC bleeding complications.

Results

The technical success rate was 100% and no procedure related complications occurred. HTPR was detected in 54% of patients. In IC, the pain free walking distance improved from 58 ± 6 m to 297 ± 17 m ($p < 0.0001$). At 6 months, none of the patients had rest pain and only 3 had ulcers. Twelve patients (17%) experienced a MALE in particular those with complex multilevel procedures ($p = 0.03$) and those with HTPR to clopidogrel ($p = 0.0255$). 15 patients (21%) were affected by bleeding with CLI patients at highest risk ($p = 0.0008$). 3 out of 12 patients with MACCE died due to GI-bleeding. Multivariate analysis revealed that anemia, chronic kidney disease, infection, diabetes, and CLI are strongly associated with worse outcome ($p < 0.05$).

Conclusions

Comorbidities and complexity of PAD mitigate efficacy and safety of endovascular treatment. Adjunct therapy with DAPT after endovascular treatment is limited by HTPR and needs to be carefully evaluated due to high bleeding rates in patients with critical limb ischemia and severe comorbidities.

FV-4.3

Two-year results of the CONSEQUENT trial – can femoro-popliteal lesions be treated cost-effective with DCB?

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Background

Previously, the 6-month angiographic and 12-month clinical outcomes of the CONSEQUENT trial were published and demonstrated the safety and efficacy of a novel paclitaxel-resveratrol coated peripheral balloon catheter to treat femoro-popliteal lesions. We now present the two-year clinical results and a cost-benefit analysis for Germany.

FV-4.2. Figure. Odds ratio (OR) and Kaplan Meier.

Patients and methods

A total of 153 patients with symptomatic peripheral artery occlusive disease (PAD) were randomized either to drug coated balloon (DCB, $n = 78$) or plain old balloon angioplasty (POBA, $n = 75$). The two-year clinical results consisting of target lesion revascularization (TLR), patency and increase in walking distance were defined as secondary endpoints. A cost-benefit analysis for Germany was conducted based on the 2-year clinical results.

Results

Between 14 and 24 months there were no additional TLRs in both groups (DCB: 19.1% vs. POBA 40.6%, $p = 0.007$). The patency rate at 2 years was significantly higher in the DCB group (72.3% vs. 48.4%, $p = 0.006$). 2-year cost savings of € 1,111.97 per patient were estimated in case DCBs were used instead of POBAs.

Conclusions

Paclitaxel-Resveratrol coated DCBs are associated with significantly reduced 2-year TLR rates as compared to POBA resulting in significant cost savings.

FV-4.4

Percutaneous deep vein arterialization as a minimally invasive approach to create arterio-venous fistulae for the treatment of critical limb ischemia – results of first clinical experience – six month and one year follow-up

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Background

Percutaneous Deep Vein Arterialization (PDVA), the LimFlow procedure is a novel, minimally invasive, endovascular procedure that attempts to treat Critical Limb Ischemia (CLI) via the creation of arterio-venous (AV) fistulae and placement of a stent graft under non-visual ultrasound guidance. Thus, patients can potentially avert amputation resulting from vascular disease, as well as its associated morbidities. We report here feasibility, safety and preliminary efficacy data regarding PDVA on the first case series available to date.

Patients and methods

11 patients clearly indicated for imminent amputation due to CLI were included in the study with the following conditions: nine chronic non-healing wounds, one severe rest pain, and one severe rest pain and chronic non-healing wound. The primary objective of the investigation was to determine the safety of PDVA at 30 days. Secondary objectives included clinical efficacy at six & 12 months with outcome measures such as limb oxygenation, clinical observation, and wound healing during the six & 12 months follow-up period.

Results

Eight out of the 11 patients reached the six month follow-up while three so far have reached one year. Primary safety at 30 days was measured as freedom from MACE in 82% of the patients (9/11) and freedom from MALE in 100% (11/11). There were no deaths, no above the ankle amputation and no major re-interventions at 30 days. All patients presented remarkable improvements in their condition after the procedure: four patients had full wound healing within six months and the two patients with rest pain experienced a complete resolution in their symptoms in less than 24 hours. All three patients who have reached the one year end point had their wounds fully healed. Limb oxygenation as measured by TcpO₂ measurements increased in all patients and stayed above 40 mmHg passed the six and 12 month time points. At six months two patients had died with one additional death by one year.

Conclusions

PDVA is an innovative approach for treating CLI. The procedure is feasible and safe, with very promising clinical efficacy results to date. Potential impact on the quality of life of patients affected with CLI, notably those originating from diabetic foot ulcers, is dramatic with the ability for patients to walk again just a few weeks after the intervention. Resulting costs savings to the healthcare systems could be considerable. Further clinical investigations are under way in both Europe and the United States.

FV-4.5

Results of different endovascular procedures for the treatment of obstructive popliteal artery lesions

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Background

There is growing evidence concerning the outcome of different endovascular techniques for treatment of the femoral artery. Limited data are available evaluating these techniques in the treatment of obstructive popliteal artery (PA) lesions. Purpose: To evaluate the safety and efficacy of different endovascular procedures (plain-old balloon angioplasty, atherectomy, stenting, and drug-coated balloon angioplasty) for the treatment of atherosclerotic popliteal artery lesions.

Patients and methods

Between January 2010 and December 2016 patients with Rutherford-Baker class (RBC) 2 and 3, and a de-novo lesion of the popliteal artery were selected for this retrospective analysis. The primary study endpoint was 1-year primary patency defined as freedom from target lesion restenosis detected with duplex ultrasound or angiography. Secondary endpoints included target lesion revascularization rate (TLR) and changes in RBC.

Results

From a total of 1,650 patients with an endovascular procedure of the popliteal artery 220 patients met the inclusion- and exclusion criteria. The outcome results will be presented at the congress.

Conclusions

Conclusions will be presented at the congress.

to promote angiogenesis (sprouting of new vessels) and the enhancement of arteriogenesis (transformation of preexisting arteriolar anastomoses into collateral vessels). However, in addition to the desired effect of cell transplantation, the restoration of the blood supply in the underserved tissue (ischemic leg / heart) also causes undesired delivery of the blood supply e.g. could be involved in/to a tumor and this has not been studied worldwide, we have carried out the following study.

Patients and methods

C57BL6 mice were subcutaneously implanted with an artificial tumor (500 µg Matrigel, supplemented with VEGF and bFGF, Becton Dickinson) and then injected with mononuclear cells systemically via the tail vein to the animal. In a time course then the size increase and weight change of the tumor, as well as its vascularization should be investigated (aquaporin staining for vessel imaging at the capillary level and a-actin staining for visualization of strong muscle arteries).

Results

After transplantation of MNC, there was a significant increase in volume and weight of the tumor compared to control without cell challenge. Weight in µg: 190 ± 80 vs. 150 ± 50 after 7 days. Volume in µl: 300 ± 100 vs. Control 250 ± 70 after 7 days.

Immunohistochemical analysis of tumor vascularization revealed an increase in capillary number after cell transplantation within the center of the matrigel. Enhanced capillarisation was detected after Mo transplantation (306 ± 193 vs. control 116 ± 108, $P < 0.05$ and $n = 7$) within the capsule area of the matrigel. But the vascularization differ between capsular and center of the Matrigel. Therefore no significant difference in vessel density between Mo transplantation group (327 ± 177 vs. control 277 ± 153; $n = 5$) was seen in the capsular.

Compared with the control group, an increased vascularization (Mo 197 ± 151 vs. control 83 ± 40 cells / cm²) is shown by transplantation of monocytes ($P < 0.05$ and $n = 7$).

Conclusions

From previous studies, we know that the administration of monocytes, probably through immunological triggering, strongly promotes arteriogenesis. This study shows that the transplantation of monocyte may be associated with an undesirable increase in the blood supply in occult tumors and requires further analysis prior to systemic cell administration.

YIA-1.2

YIA

Preisträgersitzung Young Investigator Sitzung

YIA-1.1

Influence of monocyte therapy to promote collateral growth (arteriogenesis) on the vascularization of a tumor

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Background

Cardiovascular diseases determine morbidity and mortality in the Western world, which is why new therapeutic approaches are of overriding interest. In addition to traditional blood vessel repair strategies such as percutaneous transluminal angioplasty (PTA) and bypass surgery, many have started to promote vascular growth through cell transplantation. For this purpose, e.g. Stem, progenitor or mononuclear cells (MNC), some with promising results, transplanted. These therapeutic approaches aim

The impact of concomitant diabetes mellitus and coronary artery disease on prognosis in patients with subclinical to moderate peripheral artery disease

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Background

Coronary artery disease (CAD) and diabetes mellitus (DM) are frequent co-morbidities in patients with peripheral artery disease (PAD). We sought to determine patient's cardiovascular risk dependent on CAD and DM co-morbidity and its impact on therapy and outcome parameters in mild to moderate PAD.

Patients and methods

Routine-data on 21,197 patients of the BARMER GEK health insurance hospitalized with PAD at Rutherford 1–3 from Jan 1st, 2009–Dec 31st, 2011. Analysis of co-prevalence with CAD and DM, complications and mortality during in-hospital stay and up to 4-year follow-up.

Results

Among the entire PAD cohort, CAD was present in 5,355 (25.3%), DM in 4,976 (23.5%) and both in 1,741 (8.2%) of patients. Concomitant DM was

Long-term amputation-free and overall survival in PAD patients depending on concomitant CAD or DM.

YIA-1.2. Figure. Cox regression analysis shows amputation-free survival to be reduced by concomitant DM irrespective of the presence of CAD. Overall survival was about equally deteriorated by each, DM and CAD alone, and further worsened if DM and CAD combined.

associated with reduced overall revascularization and increased risk of long-term amputation (HR 2.238, 95% CI 1.849-2.710; $p < 0.001$). Mortality during follow up was 11.5% (no CAD, no DM: 9.2%; no CAD, DM: 13.0%; CAD, no DM: 13.9%; CAD and DM 20.9%; $p < 0.001$) with highest risk for both CAD and DM (HR 1.76, 95% CI 1.55-2.00, $P < 0.001$).

Conclusions

Our study revealed a highly adverse impact of concomitant DM and CAD on the outcome in low-stage PAD patients pointing out the need for preventive measures and effective risk factor control. CAD was related with increased risk of short- and long-term mortality, whereas DM highly increased amputation risk.

YIA-1.3

Outcome of endovascular revascularization in octogenarians with peripheral artery disease

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Background

Prevalence of peripheral artery disease (PAD) is strongly increasing with high age. Despite commonly regarded as high-risk population, evidence

for lesser benefit or adverse outcome after endovascular revascularization (EVR) is not sufficiently studied. Objective of the present study is to assess the outcome of EVR in octogenarians with PAD.

Patients and methods

This first research of the running study includes 92 cases. In total 360 unselected cases, retrospectively 228 patients aged >80 years (octogenarians), receiving endovascular revascularization for PAD will be analysed. Data were collected from the University Hospital Münster with index treatment (EVR) between 2010–2016. The assessment further includes comorbidities, parameters of mobility, laboratory parameters as well as outcome parameters during follow-up (until 12 months).

Results

In our data on octogenarians with PAD, average age at index EVR was 83 years (52.2% male, 47.8% female). The preliminary results on 92 cases shows high prevalence of concomitant coronary heart disease (CHD; 51.8%), cerebrovascular disease (CVD; 43.5%) and visceral arterial occlusive disease (VAD; 4.7%). The cardiovascular risk profiles of octogenarian PAD patients mainly comprises arterial hypertension (96.5%), dyslipidemia (48.8%), arterial fibrillation (38.8%), heart failure (22.1%), chronic kidney disease (27.9%). Prevalence of concomitant diabetes (18.8%) or smoking (2.3% active, 29.1% former smokers) is rather low.

Medical therapy was assessed, showing rate of statin intake to increase from 66.3 % at index admission to 80.4% at 6-months and 86.8% at 12-months follow-up. Anticoagulants applied to 80% of octogenarian PAD patients (ASS 27.5%, Clopidogrel 45%, oral anticoagulants 27.5%).

EVR was performed primary successful in 78.7% ($n = 70$), partially successful in 20.2% ($n = 18$) and unsuccessful in 1 case (1.1%). In-hospital complications accumulated to 17.9%, thereof major cardiovascular events (3.6%) and major limb events (6.0%). In-hospital mortality was 0% ($n = 0$). PAD status significantly improved from index hospitalization during follow-up: percentage of patients with critical limb ischemia (CLI) decreased from 62.6% to 27.5% at 6 months and 24.2% at 12 months follow-up:

Conclusions

In summary, data on octogenarian PAD patients indicate EVR procedure to be highly successful and safe. PAD stages significantly improved over 6 and 12 months follow-up. In terms of guideline-recommended medication, prescription rates were insufficient at admission but significantly increased during follow-up.

YIA-1.4

Hemodynamic changes lead to alterations in aortic diameters and may challenge further stent graft sizing in acute aortic syndrome

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Background

Precise stent graft sizing in thoracic endovascular repair (TEVAR) is crucial to receive optimal long-term results. Computed tomography (CT), as the current standard in assessing aortic diameters (AD), is often performed at initial diagnosis. Since several acute aortic diseases are associated with blood loss and/or volume re-distribution, assessed AD might be influenced by impaired hemodynamic conditions. Intravascular ultrasound (IVUS) offers real-time assessment, especially after hemodynamic restoration, and might help for stent graft choice.

This study aimed to determine the effect of changes on the aortic diameter in emergency TEVAR before and after hemodynamic stabilization and the potential benefits of IVUS-guided stent graft sizing after stabilized hemodynamic conditions in acute aortic syndromes. As most import-

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YIA-2.3. Figure. The figure shows two-thirds of octogenarian PAD patients to have CLI at index hospitalisation. CLI rate could effectively be reduced after EVR, illustrated by CLI presence in about one-in-four patients after 6 and 12 months follow-up.

ant benchmark, we focused on the aortic diameter at the level distal to the left subclavian artery (LSA) as a frequent landing zone in TEVAR.

Patients and methods

We investigated the correlation between CT and later IVUS measurements in elective (n = 83) and emergency patients (n = 32) at the level distal to the left subclavian artery (LSA), a frequent proximal landing zone in TEVAR. Patients were grouped depending on their shock index (heart rate/systolic blood pressure): emergency patients with diagnosis of acute aortic syndrome, urgently required treatment after admission and had a shock index >1, otherwise were grouped as elective. Basic hemodynamic data were assessed for both groups at time of admission and at definite IVUS-procedure.

Results

At time of admission the emergency group showed lower blood pressure (99 ± 19.8 vs. 141 ± 24mmHg; p = 0.001) and higher heart rate (98 ± 13 vs. 70 ± 12 bpm; p = 0.001) compared to elective patients. By hemodynamic stabilization comparable blood pressure and heart rate were achieved in both groups at time of IVUS. In the emergency group, we found a significantly increase in AD after hemodynamic stabilization, whereas the diameters did not change in the elective group (IVUSmean-CTmean: 5.1 ± 1.0 vs. 0.4 ± 2.2mm; p = 0.001 and IVUSmin-CTmean: 3.9 ± 1.3 vs. -0.3 ± 2.2mm; p = 0.011).

Conclusions

IVUS for stent graft sizing is a valuable approach during TEVAR, especially in the light of emergency treatment by offering real-time assistance. Impaired hemodynamic conditions might lead to relevant changes in AD and may strongly influence stent graft choice. In these cases, careful stent graft selection might contribute to avoidance of stent graft related complications.

YIA-1.5

Blue light exposure enhances cardiovascular function

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Background

Previous studies have shown that UVA light can lead to release of nitric oxide from the skin and decrease blood pressure. Here, we investigated whether whole body exposure to blue light can decrease blood pressure and increase endothelial function in healthy subjects.

Patients and methods

In a randomized cross-over study 14 healthy subjects were exposed on two days to monochromatic blue light or blue light with a filter foil over 30 min. We measured blood pressure, heart rate, endothelial function, forearm blood flow, forearm peripheral resistance, pulse wave velocity, aortic augmentation index, and central blood pressure during and up to two hours after exposure.

Results

Systolic blood pressure decreased and heart rate increased during blue light exposure. In parallel, it increased forearm blood flow and flow-mediated dilation while it decreased forearm peripheral resistance and pulse wave velocity.

Conclusions

In contrast to UVA, blue-light-induced blood pressure lowering might be therapeutically used in the treatment of arterial hypertension.

P-1 Interventionelle Angiologie

Postersitzung

P-1.1

Intravascular ultrasound visualizes incomplete stent-graft expansion due to distal oversizing as a risk factor for distal stent-graft induced new entry (dSINE) after endovascular treatment of acute and chronic type B dissections

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Background

Distal stent graft-induced new entry (dSINE) after thoracic endovascular aortic repair (TEVAR) is rare but associated with a high re-intervention rate and major complications.

To further understand the mechanisms underlying dSINE development, we analysed the potential predicting risk factors and evaluated the aorta at the distal end of the stent graft end using intravascular ultrasound (IVUS) to determine the possible mechanical stress in extensive distal oversizing (dOS).

Patients and methods

In this single-center retrospective study we evaluated patients after thoracic endovascular aortic repair (TEVAR) and investigated possible predictors of dSINE, focusing on distal oversizing (dOS). Computed tomography scans using contrast agent were performed before and after TEVAR and in further follow-up studies. Available IVUS examinations of the distal end of the stent-graft after implantation were analysed for assessed dOS and distal stent expansion compared to the follow-up computed tomography (CT). To identify factors with possible influence on dSINE, we assessed dOS, the angle between the aorta and the distal end of the stent graft and the taper ratio of the aorta.

Results

We analysed 208 patients in total with a follow-up of 71.8 ± 44.4 months. Within the follow-up period, 13 (6.3%) patients developed dSINE after a median time of 22.1 ± 19.9 months. We identified dOS as a major predicting factor for dSINE development with a significantly increased value of $47 \pm 18\%$ compared to the non-dSINE patients ($24 \pm 12\%$, $p = 0.001$), referring to the maximum preprocedural true lumen diameter of the distal landing zone. The analysis of the distal end of the stent-graft by IVUS showed incomplete stent-graft expansion in the dSINE group with further expansion over the following days seen on the later CT studies.

Conclusions

Several risk factors for dSINE have been identified. DOS is already suspected to be a key player and should be reduced to the minimum. The visualized distal end of the stent in the cases of dOS with incomplete stent-graft expansion gives an impression of the radial forces acting on the fragile aortic wall. Postprocedural IVUS-imaging of the distal stent-graft might help identify patients at risk. Tapered stent grafts may reduce dOS, especially in cases with an elevated taper ratio.

P-1.2

Recovery of radial artery patency following transradial catheterization

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Background

The aim of this study was to investigate the impact of anticoagulation and vasoactive medication on recovery of radial artery patency (RAP) following occlusion after transradial coronary catheterization.

Radial artery access is considered the primary approach for coronary interventions due to higher safety profile in comparison to femoral access with lower bleeding rates. Radial artery occlusion (RAO) is the main complication of transradial catheterization that can lead to permanent occlusion of the radial artery. The incidence of RAO after transradial access ranges from 5-38% and data regarding treatment is scarce. Whether anticoagulation and vasoactive medication has a benefit on recovery of RAP has not been investigated in detail.

Patients and methods

Overall 2635 patients were screened. 2215 (84%) cardiac catheterizations were performed by femoral and 420 (16%) by radial access. In 30 patients RAO was observed after cardiac catheterization. In case of RAO patients were classified in three groups: Controls, anticoagulation and anticoagulation together with alprostadil. Follow up was conducted after 3 months with ultrasound and clinical examination.

Results

Control group consisted of 11 patients. 8 patients received anticoagulation and 11 patients anticoagulation together with alprostadil. Probability of patency recovery after RAO was higher following either treatment (79.5%) than in the control group (0%, $p = 0.006$). Subgroup analysis yielded a higher recovery of RAP in patients treated with anticoagulation (62.5%) as compared to controls (0%, $p = 0.002$). No effect was found with additional alprostadil therapy (33.3%) compared to anticoagulation therapy (62.5%, $p = 0.229$).

Conclusions

RAO can be treated with anticoagulation to recover patency. However addition of vasoactive medication does not confer to an additional benefit. Further research is needed regarding preventive and therapeutic strategies following RAO.

P-1.3

Surgical reconstruction for visceral ischemia with superficial femoral vein

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Background

Chronic visceral ischemia caused by atherosclerotic disease is associated with severely impaired quality of life due to ischemic symptoms and high morbidity and mortality in case of acute visceral ischemia with bowel gangrene. Endovascular and open surgical therapy are performed according to the morphology of the atherosclerotic lesion and the general status of the patient. The role of the superficial femoral vein as autogenous vein graft is unclear.

Patients and methods

In case of chronic or acute visceral ischemia superficial femoral vein was chosen as bypass graft. Whenever possible a complete visceral revascularisation including all available anastomotic sites was achieved. Grafts

and donor limbs were followed with duplex ultrasound at regular intervals and secondary graft or anastomotic stenosis treated with endovascular techniques.

Results

From 01/12 until 04/18 13 patients with chronic (10) or acute (3) visceral ischemia (5 men and 8 women; 62±8 years) were operated with surgical revascularisation with superficial femoral vein. One patient had undergone previous surgical therapy with bypass and four patients had received endovascular treatment with stent angioplasties or balloon angioplasty. The superior mesenteric artery was revascularized in all cases and additional anastomosis to the coeliac trunk or common hepatic artery performed in 7 cases. The inferior mesenteric artery was reimplanted into the bypass vein in 6 cases. All operations were performed with a single segment of superficial femoral vein. Antegrade bypass with a proximal anastomosis at the supraceliac aorta and sequential anastomoses to the coeliac trunk and the superior mesenteric artery was used in 3 cases. Retrograde bypass from the common iliac artery, the distal abdominal aorta or a synthetic aortic prosthesis was performed in 10 cases.

In one patient with antegrade bypass the inferior mesenteric artery was reimplanted into the aorta. Simultaneous replacement of the aneurysmal infrarenal aorta with a tube graft was combined with the visceral reconstruction in one patient. One patient (1/13) died after emergency operation with short bowel resection from sepsis with a patent bypass graft. Another patient died after 21 months from severe pulmonary disease without signs of visceral ischemia. After a mean follow-up of 23 (max. 64) months 11 patients are alive and free of ischemic symptoms. In two cases a stenosis of the proximal anastomosis of an antegrade bypass was treated with stent implantation. Primary assisted and secondary patency was 100% and 100% for all bypasses after 24 months. Significant impairment of the venous circulation of the donor limb was not detected.

Conclusions

The use of the superficial femoral vein as bypass graft for visceral artery reconstruction in chronic or acute atherosclerotic visceral ischemia is associated with an excellent graft patency and freedom from visceral symptoms. Bypass graft or anastomotic stenosis can be successfully treated with endovascular methods.

P-1.4

Transradial access, a promising option for peripheral interventions

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Background

The arterial access pathways in percutaneous angioplasties are becoming increasingly important in view of the potential and complexity of peripheral interventions. Transradial access has already been established in the context of coronary angiography. We investigated the using of a transradial approach in a group of 10 patients with pelvic artery lesions.

Patients and methods

In 10 patients (7 female, 3 male) transdermal access with a 100 cm sheath (6 x 6 French, 4 x 5 French) was successfully used for percutaneous angioplasty of a pelvic artery.

Results

In all cases, the radial artery puncture could be closed without complications using cuffs. The patients could be mobilized immediately after the procedure.

Conclusions

The radial artery may provide alternative access for percutaneous angioplasty of the iliac arteries than the previous "standard puncture routes". Additional data and longer balloon and stent catheters may expand the potential applications of transradial access.

P-1.5

Intravascular lithotripsy shockwave therapy – in a patient with peripheral arterial disease and severe calcified stenosis due to pseudoxanthoma elasticum

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Background

A 67-year-old woman diagnosed with PXE presented with PAD of the lower extremities, category 3 according to Rutherford classification. IC occurred after a few meters and daily life activities were severely compromised. Ankle-brachial-indices (ABI) revealed pathological findings with a value of 0.70 at rest. Ultrasound analysis confirmed severe atherosclerosis with significant stenosis of both superficial femoral arteries (SFA). Acknowledging the challenge of severe calcification due to PXE we considered that endovascular intervention remained a treatment choice with good odds for the left SFA. Angiography did present significant vascular calcification and a subtotal occlusive lesion of the thin SFA. The vessel was prepared with a 4.5 x 60 mm IVL Catheter (Shockwave Medical, Fremont, California) was inflated to 4 atm, followed by 30 pulses in the target lesion. Finally PTA was performed with a drug-coated balloon. Post-PTA angiography showed a good result without any dissection.

P-1.5. Figure.

P-1.6

Treatment of femoropopliteal atherosclerotic lesions using the ranger paclitaxel-coated balloon catheter – 24-month results from an all-comers registry

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Background

To evaluate 24-month effectiveness of the endovascular treatment of femoropopliteal (FP) atherosclerotic lesions with the Ranger drug-coated balloon (DCB) in a real-world setting

Patients and methods

In this prospective, observational, multicenter trial (ClinicalTrials.gov Identifier: NCT02462005) 172 consecutive patients with 226 de novo, restenosed, or reoccluded native superficial femoral and/or popliteal artery lesions were treated with the Ranger paclitaxel-coated balloon angioplasty. Mean lesion length was 129 mm (5–400 mm). Fifty-nine (26%) of 226 lesions were moderately or heavily calcified. Provisional stenting was conducted in 55 (22%) of 226 lesions. Main effectiveness outcomes were procedural success, 6- and 12-month hemodynamic or clinical improvement, and primary patency based and clinically driven target lesion revascularization (TLR) at 6, 12 and 24 months.

Results

Procedural success (<30% residual stenosis and no major adverse event within 30 days) was achieved in 126 (73%) of 172 patients with DCB alone and in all patients if bailout procedures were included. Primary patency was 91.0% at 6 months, 84.1% at 12 months and 70.1% at 24 months. Freedom TLR was 92.4% at 6 months, 89.2% at 12 and 74.8% at 24 months. ABI, pain-free walking distance and Rutherford category improved significantly ($p < 0.001$) after 6, 12 and 24 months.

Conclusions

Results suggest that angioplasty with the Ranger paclitaxel-coated balloon with provisional stenting is efficacious for the treatment of a broad range of femoropopliteal atherosclerotic lesions. No safety concerns arose.

P-1.7

Effectiveness of the Pulsar-18 self-expanding stent with optional drug-coated balloon angioplasty in the treatment of femoropopliteal lesions – the BIOFLEX PEACE all-comers registry

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Background

To evaluate the 2-year effectiveness of the Pulsar-18 self-expanding (SE) nitinol stent with optional drug-coated balloon (DCB) angioplasty in symptomatic femoropopliteal artery disease in a real-world setting.

Patients and methods

In this prospective, observational trial, 160 consecutive patients with 186 de novo femoropopliteal lesions were treated with the Pulsar-18 SE nitinol stent at 8 German sites between May 2014 and December 2015. Mean lesion length was 116 ± 103 mm, and 41.9% of the lesions were moderately or heavily calcified. Eighty lesions were concomitantly treated with DCB. Main effectiveness outcome was primary patency at 12 months, and main safety outcome was freedom from the composite of device or procedure related death, major target limb amputation, and clinically driven target lesion revascularization (TLR) at 30 days and 6 months.

Results

Kaplan-Meier estimate of primary patency was 89.1%, 67.3%, and 57.1% at 6, 12, and 24 months. Freedom from TLR was 95.5%, 91.4%, and 85.2% at 6, 12, and 24 months, respectively. Lesions, which were additionally treated with DCB (plus DCB-group), were longer (150 versus 82 mm on average, $p < 0.0001$), and associated with lower primary patency estimates than those without DCB angioplasty (stent-only-group) (log-rank $p = 0.006$). However, there was no difference in freedom from TLR between groups (log-rank $p = 0.542$). Procedural success was achieved in all lesions and patients. Improvement by ≥ 1 Rutherford category was achieved in 84.8%, 81.0%, and 81.7% of patients at 6, 12, and 24 months, respectively. Walking distance and patient-reported pain improved persistently through 24 months ($p < 0.001$). Hemodynamic improvement was achieved in 68.2%, 73.7%, and 70.7% of the patients at 6, 12, and 24 months, respectively.

Conclusions

The Pulsar-18 self-expandable nitinol stent with optional drug coating balloon angioplasty can be considered an efficient and safe therapy option for endovascular treatment of femoropopliteal artery disease.

P-2

Arterielle Krankheitsbilder

Postersitzung

P-2.1

Therapeutic anticoagulation in acute type A aortic dissection survivors

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Background

Early survivors of acute type A aortic dissection (AAAD) remain at risk for late death and late aortic events. However, the frequency and long-term effects of warfarin anticoagulation on long-term outcome in post-surgical AAAD survivors have not been elucidated.

Patients and methods

Two tertiary care centers performed a retrospective observational cohort study of Warfarin anticoagulation in AAAD in 243 persons with early survival of surgical repair (WATAS). Serial postoperative tomographic imaging was available in 106 persons.

Results

A total of 88 postoperative AAAD survivors (36%) were on long-term warfarin anticoagulation. The indication for anticoagulation was a mechani-

cal aortic prosthesis in 46 (52%), atrial fibrillation in 33 (38%), stroke in 7 (8%), and pulmonary embolism in one (1%). The indication for anticoagulation remained unclear in one person (1%). Survival and aortic event free survival were 98.3 ± 0.01 and 98.7 ± 0.01 at 1 year, and 76.4 ± 0.03 and 91.8 ± 0.02 at 5 years, respectively, with no differences irrespective of Warfarin anticoagulation. Multivariate Cox regression analysis established higher age ($P < 0.001$), and Operation extending into the descending aorta ($P = 0.030$) as independent predictors of late death. Follow-up without tomographic imaging independently predicted increased long-term mortality ($P < 0.001$) and lower rates of documented aortic event ($P = 0.003$). Kaplan-Meier analysis showed a relationship of aortic diameter growth ≥ 0.5 cm per year with late death ($P = 0.041$) and with late aortic events ($P < 0.001$). However, rapid aortic growth did not relate to warfarin anticoagulation.

Conclusions

Warfarin anticoagulation is frequent in postsurgical AAAD and it is administered for vital indications. Warfarin anticoagulation does not relate to late mortality or to late aortic events. Rapid aortic growth predicts late mortality and late aortic events, but warfarin anticoagulation is not associated with aortic growth. Follow-up tomographic imaging is mandatory for long-term survival after surgical repair of AAAD.

P-2.2

Beware of thrombosis in patients with PSA after invasive angiography

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Background

Pseudoaneurysm (PSA) is with a rate up to 4% the most common iatrogenic complication after coronary angiography. The therapeutic management of PSA ranges from physical, ultrasound-guided compression to the use of pressure bandage up to surgical intervention. All techniques suggest an increased risk for deep venous thrombosis (DVT). However, a systematic analysis for DVT and the direct comparison of different strategies has not been realized until now.

Patients and methods

From 2010 until 2017, 450 patients with PSA were examined of which 242 patients had been included into the study. When PSA was detected, compression sonography of superficial, deep and muscle veins of the lower and upper limb were done at both legs for presence of DVT. We only included patients without a DVT at the time of PSA-detection and excluded all patients with a simultaneous occurrence of PSA and DVT.

After initial compression, patients were treated with PPB ($n = 160$) for average 24h or UGT ($n = 78$; Tissuecol, Baxter USA) followed by a PPB for 2h. Four of the patients were transferred to the vascular surgeon. All patients were screened intensively by duplex- and compression-sonography after 24h to control sufficient PSA treatment and incidences of DVT.

Results

39 of the 242 patients presented with new DVT (16.1%). The DVT appearance was in two of three cases ipsilateral (62.5%), in 12.5% contralateral and in 25% within both legs.

The baseline-characteristic showed no significant differences except "coronary heart disease" and "obesity".

The UGT-treatment was successful in 85.9%, arterial embolism was caused in two cases (2.6%) by UGT. In comparison of the two study-arms there were far less DVT-appearances in the UGT-group (6.4%) as compared to the PPB-group (21.3%; $p = 0.02$; chi-square-test with $n = 216$). In the PPB-group, compression was successful in 83 of 160 patients (success-rate of 51.9, which was a significant lower success rate compared to UGT-treatment ($p < 0.0001$, chi-square-test with $n = 216$).

Thus the PPB-group showed 3.3 times more DVT as the UGT-group. There were no lethal events.

Conclusions

Our study clearly demonstrates the safety of therapeutic UGT for treating PSA. UGT is superior to PPB-treatment both in success-rate and the incidence of DVT. The UGT treatment was demonstrated to have nearly twice the success rate of PPB and reduces the rate of DVT more than 50 percent.

P-2.3

Finding the truth – claudication and underdiagnosed iliac stenoses

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Background

Patients suffering from claudication with normal ankle-brachial-indices (ABI) and normal duplex-sonographic results are often underdiagnosed, and the underlying moderate isolated iliac stenosis is not treated. To identify those patients, we use duplex sonography of the common femoral artery (CFA) and ABI measurement after mild exercise. For patients with a basal bi- or triphasic CFA signal and a persistent monophasic signal after 120 sec of knee bending, invasive measurement of peak-to-peak gradients over the stenosis were conducted and varied from 11 to impressive 58 mm Hg in our patient population. Furthermore, the ABI after exercise decreased by at least 19% and a high correlation for percental loss of ABI versus pressure gradient was found in those cases.

If duplex sonographic findings and slightly reduced ABI do not explain the severe extent of claudication, functional duplex sonography and ABI measurement after mild exercise are able to identify underestimated iliac stenoses.

P-2.4

Pseudoxanthoma elasticum – also a microvascular disease

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Background

Pseudoxanthoma elasticum (PXE) is a rare autosomal recessive disease which leads to ectopic mineralization of soft connective tissue. Extensively investigated main features are progressive loss of vision, formation of yellowish, confluating papules in the skin, and mineralization of medium and small sized arterial vessels. Therefore, clinical manifestation of PXE have mainly been assigned to three major organ systems: skin, eye, and cardiovascular system, in particular formation highly calcified arterial plaques. Additionally, there is evidence for restrictive lung disease. Also, case reports have suggested a microvascular manifestation of PXE.

It was the aim of this present study to enlighten patterns of capillary alterations in patients with PXE. It was assumed, that PXE is correlated with presence of atypical capillaries, ramifications and bushy forms in particular, which is a sign of neoangiogenesis. To crosslink capillary alteration and restrictive lung disease, it was further insinuated, that high frequency of atypical capillaries is accompanied by reduced levels of CO-diffusion capacity (DLCO).

Patients and methods

51 consecutive patients with PXE and 17 controls were included. Grouping was performed according to reference values of DLCO (DLCO < 75%, $n = 25$; DLCO $\geq 75\%$, $n = 26$; control, $n = 17$). No significant differences in base line characteristics occurred. All patients underwent capillaroscopy, body plethysmography and blood testing. Blood testing included C-reactive protein and titer of rheumatoid factor, ANA, cANCA, and pANCA.

P-2.4. Figure. Capillary alterations. * $p < .05$; ** $p < .01$; *** $p < .001$.

Results

Intergroup differences of capillaroscopy (Fig. 1) revealed reduced density of capillaries and perivascular edema in patients with PXE ($p < .01$). Frequently, torsions ($p < .01$), dilatations ($p < .001$), and atypical capillaries occurred ($p < .001$). No avascular areas or giant capillaries were found. Comparing the two groups of patients with PXE, patients with reduced DLCO presented with increased numbers of atypical capillaries.

Body plethysmography showed reduced FEV1 and vital capacity in patients with PXE. ANA-titer were elevated insignificantly compared to control, yet still gathering within normal range compared to literature. Linear regression revealed vital capacity as main influencing factor on presence of atypical capillaries ($p < .01$).

Conclusions

PXE is accompanied by highly pathological capillary alterations consisting of atypical, bushy, and ramificated forms in particular. Frequently, contorted and/or dilatated capillaries are present. Capillary denseness is reduced, pericapillary tissue is edematous. Although patients with reduced diffusion parameters presented with more atypical capillaries, a confounding influence of FEV1 cannot be excluded whereas vital capacity holds explanatory power. This can be interpreted as further lead on restrictive lung disease in patients with PXE.

P-2.5

A familial case of primary antiphospholipid syndrome?

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Background

Primary antiphospholipid syndrome (APS) is characterized by recurrent vascular embolism and pregnancy complications in the absence of any underlying disease. There is plentiful evidence that the occurrence of antiphospholipid antibodies (aPL) is causally related to clinical manifestations. Although it has been assumed for years, so far, a genetic basis of APS has not been fully proven.

Patients and methods

In this study we characterized a family with frequently occurring APS. Between 2014 and 2016 seven family members with a primary form of partially catastrophic APS associated to specific accumulation of anti-cardiolipin antibodies (aCL) and three supposedly healthy relatives were evaluated at our outpatient clinic. Diagnosis of APS was done in accordance to the classification criteria for APS which were proposed at the Eleventh International Congress on aPLs in Sydney in 2006. In all these individuals clinical phenotyping, antibody analysis and web-based next-generation sequencing (NGS) from peripheral blood samples were performed after written consent has been obtained.

Results

The index patient is a 64-year-old male with a history of recurring pulmonary embolism (PE) and deep vein thrombosis (DVT) and repeatedly ele-

vated aCL IgG antibodies. In his daughter emerging from first marriage primary APS was diagnosed at the age of 21 years after having recurrent PE, DVT and one episode of embolic myocardial infarction. She died at the age of 25 years with acute fulminate PE. Her brother suffered from splenic infarction and an arterial embolism in the left leg. In the 49-year-old sister of the index patient PE and DVT occurred at the age of 24 years after a surgical intervention and she also had repeatedly measured elevated aCL IgG antibodies. The 30-year-old son emerging from the index patient's second marriage had repeatedly slightly elevated aCL antibodies without having any clinical manifestations. Interestingly, in the index patient's mother at the age of 41 years sudden death occurred, supposedly due to fulminate acute PE, although here no further information is available.

In our genome-wide association study we found 21 single nucleotide polymorphisms (SNPs) in 17 different genes on 9 different chromosomes co-segregating in the APS individuals. Especially alterations in genes found to be involved in cardiolipin synthesis, mitochondrial damage, immune modulatory pathways, DNA repair mechanisms, mechanisms of oxidative stress and lipid metabolism and platelet function may be interesting in this context.

Conclusions

To our knowledge this is the first description of a comparable accumulation of APS in one family. Furthermore, our genome-wide association study revealed candidate gene variants co-segregating with the disease in this family. However, from a genetic view, further studies are needed to examine precise pathomechanisms and relevance of the found candidate genes in the causality of this primary form of APS.

P-2.6

Changes in flow density measured by optical coherence tomography angiography in patients with carotid artery stenosis after carotid endarterectomy

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Background

Aim of this study was to evaluate retinal and optic nerve head (ONH) perfusion in patients with carotid artery stenosis (CAS) compared with healthy controls and to analyze the impact of carotid endarterectomy on flow density using optical coherence tomography angiography (OCT-A).

Patients and methods

18 eyes of 18 patients with CAS (study group) and 18 eyes of 18 healthy controls (control group) were prospectively included in this study. Patients in the study group were evaluated before and after carotid endarterectomy. OCT-A was performed using RTVue XR Avanti with AngioVue (Optovue, Inc, Fremont, California, USA). The flow density data in the superficial and deep retinal OCT-angiogram of the macula and in the radial peripapillary capillary network (RPC) of the optic nerve head (ONH) were extracted and analyzed.

Results

There was no significant difference between the signal strength index (SSI) in the control group and the study group (macula: $p = 0.94$; ONH: $p = 0.83$). The flow density (whole en face) in the superficial retinal OCT angiogram of the macula and in the OCT angiogram of the optic nerve head (RPC) were significantly lower in the study group compared with the control group (superficial OCT-angiogram: study group: 50.21 ± 2.23 ; control group: 53.10 ± 1.97 ; $p < 0.001$) (RPC study group: 53.06 ± 2.69 ; control group: 55.89 ± 2.13 ; $p = 0.001$). The flow density in the RPC improved significantly after carotid endarterectomy (before: 53.06 ± 2.69 ; after: 54.59 ± 2.39 ; $p = 0.004$).

Conclusions

A reduced flow density in the RPC layer and in the superficial retinal OCT angiogram was observed in patients with CAS when compared with healthy controls. The flow density also improved after carotid endarterectomy.

P-2.7

Interim analysis from the KANSHAS 1 study of the novel KANSHAS drug coated balloon for treatment of femoropopliteal occlusive disease; a latest first-in-human study

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Background

Although drug coated balloon is a proven modality for treatment of femoropopliteal disease, the therapeutic effects of the DCBs with various drug coating technologies have been still extensively discussed. This KANSHAS 1 study aims at investigating safety profile and overall performance of the novel KANSHAS DCB in treatment for patients with de novo lesions in femoropopliteal arteries.

Patients and methods

KANSHAS 1 is an on-going prospective, single-arm, multicenter study at seven hospitals in Germany and Belgium. From April 2017 to Jan 2018, 50 patients with symptoms of Rutherford category 2–4 were enrolled in this first-in-human study, treated with KANSHAS DCB with $3.2 \mu\text{g}/\text{mm}^2$ paclitaxel. Follow-up assessments are scheduled at 1, 6, 12, and 24 months. The primary outcome measure is a composite of freedom from device- and procedure-related deaths through 30-day, freedom from target limb amputation, and clinically driven target lesion revascularization through six months. All data are validated by source documents and adverse events are adjudicated by an independent clinical events committee. Angiographic and duplex-ultrasound parameters are assessed by independent core laboratories.

Results

To date, the patient enrollment has been completed. Most of the patients had claudications (Rutherford category 2: 16.7%, category 3: 80.0%, category 4: 3.3%). Baseline mean ankle-brachial index (ABI) was 0.64 ± 0.14 . The mean cumulative lesion length was 84.7 ± 32.2 mm, and mean diameter stenosis (DS) $92.3 \pm 7.8\%$; 30.0% of lesions had moderate to severe calcification. The popliteal segment was involved in 46.6% of patients.

Interim 6 months analysis will finished in the 3rd quarter of year and can be presented for the first time at the conference.

Conclusions

Promising new DCB with available safety and efficacy data within the next months.

Fontaine stages in male and female PAD patients subsequent to EVR

P-3.1. Figure. The figure shows the change of PAD Fontaine stages for male and female patients before and 12 months after EVR. Both, male and female patients showed significantly improved PAD stages. Particularly females showed sustained advancement in CLI ratio.

P-3 Outcomes Research

Postersitzung

P-3.1

Predictors of re-intervention after endovascular revascularization in patients with peripheral artery disease

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Background

Re-Intervention after endovascular revascularization (EVR) is a major predictor of adverse outcome in peripheral artery disease (PAD). Large-scaled data on the impact of specific and potentially modifiable risk

factors are scarce, particularly in view of the recent advantages of EVR procedures. The objective of the present study is to comprehensively analyze detailed risk profiles predicting the need for recurrent EVR in an unselected cohort of PAD patients.

Patients and methods

In this retrospective study, all patients with EVR at University Hospital Münster between 2014-2016 were included. Defined co-morbidity, medical history and laboratory results were determined and the patients were followed-up after intervention at 6 and 12 months.

Results

In the present study 324 cases (203 patients) with PAD were included (mean age 72 ± 10.74 years; male 79.3% vs. female 29.7% $p = 0.005$). Preliminary results show high prevalence of polyvascular disease (PAD alone 31.1%, PAD + CHD 30.4%, PAD + CVD 11.7%, PAD + VAD 1%, PAD + CHD + CVD 19.1%, PAD + CHD + VAD 4.5%, PAD + CVD + VAD 1%, PAD + CHD + CVD + VAD 1.3%; CHD – coronary heart disease; VAD – visceral arterial occlusive disease; CVD – cerebrovascular disease). Whereas male patients had higher prevalence of concomitant arterial fibrillation (30.4% male vs. 26.4% female; $n.s.$), previous stroke (23% vs. 9.8%; $p = 0.007$), diabetes (41.9% vs. 29.7%; $p = 0.04$), females had higher ratio of terminal chronic kidney disease (12.8% vs. 17.6%; $n.s.$) and chronic heart failure (16.5% vs. 23.1%; $n.s.$).

EVR was primary successful in 86.5%. Need for re-intervention was within 6 months after index-EVR was 8.8% and 14.6% within 12 months

follow-up. Embolic complications and bleeding (5,5% and 5,8%) were the major in-hospital complications. In-hospital mortality was 0% (n = 0). The frequency of critical limb ischemia (CLI) decreased from 45.9% to 20.9% after 6 months and remained unchanged after 12 months (19.8%). The rate of PAD patients with asymptomatic or mild intermittent claudication (Fontaine 1 + 2a) increased from 7.9% at admission to 57.2% after 6-months and 37.5% after 12-months. Therefore, improvement of at least 1 Fontaine stage occurred in 56.6% at 6 months and 49.4% at 12 months:

Conclusions

Polyvascular disease was highly prevalent in two out of three PAD patients. Overall, CLI was present in about half of PAD patients. Both, male and female patients showed sustained improvement of PAD stages after 6 and 12 months follow-up.

P-3.2

Impact of secondary prevention on outcome in patients with peripheral artery disease

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Background

Adherence to guidelines recommended therapies (GRT) in patients with manifest atherosclerosis has been reported to be insufficient. We aimed to assess the current status of adherence to GRT in patients with peripheral artery disease (PAD) in Germany.

Patients and methods

All patients covered by the German health insurance KNAPPSCHAFT referred for in-hospital treatment with a primary or secondary diagnosis of PAD were enrolled. Baseline in- and outpatient data (up to 15 months) before the enrolment were assessed. Patients were followed up to 5 years (31 ± 18 months) for major adverse cardiac (MACE) and limb events (MALE). Adherence to GRT was defined as abstinence from nicotine, prescription of platelet aggregation inhibitors (PAI) and/or anticoagulation and the use of statins.

Results

A total of 21,261 patients (63.6% male, 74.1 ± 10.4 years) were analysed. At baseline 6,690 (31.5%) patients were adherent, but 14,571 (68.5%) were non-adherent to all 3 GRT. Of all patients, 87.7% were abstinent from nicotine, PAI/anticoagulants were prescribed in 64.7% and 49.0% were statin-users. During follow-up, 92.9% of all patients had at least one MACE or MALE and 41.8% of all patients died. In simple Cox-regression models, nonadherence to GRT was associated with significantly higher rates of stroke, limb amputation, revascularization, death and the composite of cardiac and limb events (all $P < 0.01$).

Conclusions

Secondary prevention is insufficiently implemented in patients with PAD. The gap between the evidence-based recommendations and their translation into realworld practice might contribute to the persistent high rates of cardiovascular and limb events determining the poor outcome of PAD patients.

P-3.3

Impact of COPD on outcomes of PAD patients

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Background

Tabacco is an important risk factor for both peripheral artery disease (PAD) as well as chronic obstructive pulmonary disease (COPD) and both diseases are affected by significant mortality. Although PAD has an equal or even worse prognosis than coronary artery disease, it received less attention than coronary artery disease in the awareness of the general population and physicians. Studies in PAD suggested that COPD as a comorbidity in PAD patients is accompanied by underweight, cancer and increased mortality, but the extent of the influence of COPD on the outcomes in PAD patients remained unknown. Thus, we aimed to investigate the impact of COPD on the in-hospital outcomes in PAD patients.

Patients and methods

PAD patients were selected based on ICD-code I70.2 of the German nationwide database, stratified for COPD and compared regarding adverse in-hospital outcomes (source: RDC of the Federal Statistical Office and the Statistical Offices of the federal states, DRG Statistics 2005–2015, own calculations). Uni- and multi-variate logistic regression models were computed to investigate the impact of COPD on the different study outcomes.

Results

Between 01/2005–12/2015, in total, 5,611,827 inpatients (64.8% males) were diagnosed with PAD; of those, 13.6% were coded with COPD. Overall, 277,894 PAD patients (5.0%) died during in-hospital course. Although PAD patients without COPD revealed more often cardiovascular risk factors, prevalence of cardiovascular diseases such as coronary artery disease (47.3% vs. 36.5%, $P < 0.001$) and heart failure (34.3% vs. 21.0%, $P < 0.001$) as well as cancer (12.1% vs. 7.0%, $P < 0.001$) was higher in PAD patients with COPD. PAD patients with COPD showed more often lower PAD stages according to Fontaine classification (PAD stage I: 27.1% vs. 19.3%, $P < 0.001$; PAD stage IIa: 34.9% vs. 35.5%, $P < 0.001$; PAD stage IIb: 14.5% vs. 13.6%, $P < 0.001$; PAD stage III: 11.8% vs. 14.8%, $P < 0.001$; PAD stage IV: 13.8% vs. 19.6%, $P < 0.001$).

The all-cause in-hospital mortality was significantly higher in PAD patients with COPD compared to those without COPD (6.5% vs. 4.7%, $P < 0.001$). Cardiovascular events comprising pulmonary embolism (PE, 0.7% vs. 0.4%, $P < 0.001$) and myocardial infarction (MI, 4.1% vs. 3.3%, $P < 0.001$) occurred more often in coprevalence with PAD and COPD. COPD was an independent predictor of in-hospital death (OR 1.16 (95%CI 1.15–1.17), $P < 0.001$) and PE (OR 1.44 (1.40–1.49), $P < 0.001$) in PAD patients.

Conclusions

COPD was associated with a high in-hospital mortality in PAD patients probably driven by higher frequencies of PE and cancer.

Cox Regression Analysis on cumulative survival in male and female PAD patients

P-3.4. Figure. Cumulative survival in unselected PAD patients was highly decreased, with outcome particularly being impaired in male patients (HR 1.365; 95%-CI 1.289-1.446; $p < 0.001$).

P-3.4

Sex differences of therapy in patients with peripheral artery disease – unused potentials for improved outcome?

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Background

There is an ongoing debate on the impact of sex on the therapy and outcome in patients with peripheral artery disease. Aim of this analysis is to evaluate sex-related differences in invasive therapy and medication, and therewith associated outcome parameter in a real-world scenario.

Patients and methods

We obtained data on 21.261 unselected PAD patients with an index hospitalization in 2010–2012 from the KNAPPSCHAFT health insurance. Of these, 7.740 (36.4%) were females. The data base included a follow-up period up to 8 years.

Results

Female PAD patients were at average 6 years older (median age 77.9 years), and had higher rate of concomitant hypertension (93% female vs. 89% male), chronic heart failure (41% vs. 32%), atrial fibrillation (29% vs. 23%), or chronic kidney disease (38% vs. 32%; all $p < 0.01$) compared to men. On the other hand, male sex was associated with higher ratio of lipid metabolism disorder (60% vs. 64%), coronary artery disease (48% vs. 53%), or smoking (13% vs. 22%; all $p < 0.01$), whereas frequencies of diabetes and obesity did not differ between both sexes. Female PAD patients presented at higher Rutherford grades during index hospitalization, and 65% presented with critical limb ischemia (CLI) compared to 53% in male PAD patients (RF4: 16% vs. 13%, RF5: 22% vs. 16%, RF6: 27% vs. 24%).

Diagnostic angiography (51% vs. 57%) and overall revascularization procedures (58% vs. 64%; all $p < 0.05$) were performed at lower frequency

in female compared to male PAD patients. Complication rates in terms of sepsis (3%), acute kidney failure (1.8%), and acute cardiac event (1%) were equal in both sexes, however stroke (0.7% vs. 0.4%) and overall infections (24% vs. 21%) were more common among females.

With regard to pharmacotherapy, there was a significantly higher use of antihypertensives and diuretics in females, however the use of statins was low with 43% in female and 54% in male PAD patients during follow-up. Similarly, the use of antiplatelet drugs was deficient with 45% in female and 52% in male patients. Preliminary data on outcome showed no significant difference in in-hospital amputation rates between male and female PAD patients (14%). In-hospital mortality was higher in female patients with 5.2% compared to 3.5% in male patients. However, during long-term follow-up, male sex was associated with decreased survival compared to female PAD patients (HR 1.365; 95%-CI 1.289-1.446; $p < 0.001$).

Conclusions

Observative routine-data show female PAD patients to be at higher risk for CLI, yet less often invasively treated. The use of guideline-recommended pharmacotherapy is low with focus on antiplatelet drugs and statins. In view of the overall dramatically decreased survival the data illustrate a wide margin of potentially unused resources to improve patients' outcome.

P-3.5

Long-term results of femoral interventions

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Background

For the treatment of femoro-popliteal stenosis and occlusions, various interventional options are available today, but the choice of the right technique and patient selection play an essential role in the long-term outcome.

Patients and methods

In our retrospective analysis, a total of 172 interventions from 2014 were evaluated and in particular the most frequent interventions, PTA, stent PTA and stent recanalization of the superficial femoral artery, were compared with each other with regard to the re-intervention rate and re-occlusion rate over a 4-year follow-up period. On average, patients were 73 years old, 58.7% male, and 41.3% female. The most frequently performed procedures were the superficial femoral artery recanalization (14.5%), superficial femoral artery PTA (12.2%), iliac artery stent PTA (10.5%) and superficial femoral artery stent PTA (9.9%). A total of 63 interventions, recanalization, stenting or dilatation, were performed in the femoral region.

Results

The total number of 172 interventions results in a re-intervention rate of 24.7% with an average patency of about 39.9 months (95%CI 36.3-43.5) and a re-occlusion rate of 11.0% in the follow-up period of 4 years. The mean occlusion length was about 7.5cm in the recanalization group. Subgroup analysis showed comparatively higher re-intervention rates in the stent PTA group (PTA: 23.3%, stent PTA 27.8%, recanalization 22.7%), while the recanalization group showed a higher re-occlusion rate of 20.0% compared to the stent PTA of 11.1% and the PTA without stent group (13.3%). In addition, occlusions after recanalization occurred on average about 2 months earlier than in the group of primary PTA or stent PTA, while in the stent PTA group re-interventions were necessary about 3-4 months earlier.

Conclusions

In summary, the recanalization of the superficial femoral artery generally shows a higher risk of re-occlusion, whereas the risk of necessary re-intervention was higher in the stent PTA group. A careful indication of the intervention seems to be particularly important for patients with an occlusion of the superficial femoral artery. Stenting of the femoral artery should be considered as second step after primary dilatation with a drug-coated balloon in case of a residual-stenosis or a dissection.

P-3.6

Low serum lathosterol levels predict fatal cardiovascular disease and all cause mortality – a prospective cohort study in patients admitted for coronary angiography

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Background

Identification of patients at “high cardiovascular risk” is essential in cardiovascular risk stratification. In this population-based prospective cohort study we investigated the relationships between serum markers of cholesterol homeostasis and cardiovascular events and all cause mortality in patients admitted for coronary angiography at a german university hospital.

Patients and methods

Markers of cholesterol synthesis - lathosterol, desmosterol and lanosterol -, as well as markers of cholesterol absorption - cholestanol, campesterol and sitosterol were quantified by gas chromatography-mass spectrometry in 377 subjects without lipid-lowering drugs prior to coronary angiography. All patients were followed for occurrence of fatal and non-fatal cardiovascular events over a period of 4.9+/-1.7 years. The standardized mortality ratio (SMR) was calculated as the ratio of the observed and the expected deaths. The latter were calculated using the population death rates obtained from the Regional Database Germany ("Regionaldatenbank Deutschland"). To compare all cause mortality between subgroups, Poisson regression (rate ratio, RR) was used. The SMR and RR's were standardized for sex, age category and calendar period. In addition, Cox regression (Hazard ratio, HR) was used to determine effect on the cardiovascular mortality in the cohort.

Results

A total of 42 deaths were observed in 1818 untreated person-years. The SMR was 0.99 (95% CI 0.71-1.33; p = 0.556). Out of the 42 deaths 26 were based on a cardiovascular event. In a Cox regression model lower levels of lathosterol were associated with increased cardiovascular mortality (hazard ratio: 1.88; 95% CI: 1.24-2.94; p = 0.004 adjusted for age and sex) and increased all cause mortality (hazard ratio: 1.61; 95% CI: 1.11-2.33; p = 0.011 adjusted for age and sex). Moreover, a lower lathosterol tertile compared to the adjacent higher tertile was associated with 1.6 times higher all cause mortality risk (RR 1.60; 95% CI 1.07-2.40; p for trend = 0.022). This corresponded with a 2.3 times higher mortality risk of a lathosterol-LDL ratio equal to or below the median versus levels above the median (RR 2.29; 95% CI 1.19-4.43; p = 0.013). None of the other cholesterol synthesis and absorption markers were associated with cardiovascular and all cause mortality.

Conclusions

In patients admitted for coronary angiography who were not on lipid-lowering drugs low serum lathosterol – a marker for cholesterol synthesis – correlated with cardiovascular death and all cause excess mortality. Future studies are required to assess the capacity of lathosterol to predict cardiovascular events and identify patients at “excess cardiovascular risk”.

P-3.7

Anticoagulation in patients with cancer and thrombosis – Patterns of medical care according to routine data from the German statutory health insurance [CERTIFICAT]

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Background

In cancer patients, the risk of venous thromboembolism is sevenfold increased when compared to non-cancer patients. Recurrence rates are high. National and international guidelines recommend low molecular heparin (LMWH) for maintenance therapy after initial anticoagulation. Up to now, there are no reliable data about the actual care in Germany regarding this point.

Patients and methods

The analysis comprises age and sex adjusted routine data of 4.1 million patients within the German statutory health insurance system (GKV) over the years 2011–2016. The data represent a sample size of 5.5 % of the German population. Patients were identified by the criteria „cancer“ (ICD 10 GM, chapter C), „incident thrombosis“ (ICD 10 GM, I80*), and prescription of any anticoagulant within the ambulant part of the GKV system. Anticoagulants under analysis were vitamin K antagonists (VKA), LMWH, or direct oral anticoagulants (DOAC). Patients were followed for 12 months after identification.

Results

Based on inclusion criteria, 7313 cancer patients with thrombosis and anticoagulation were identified (1,8/1000/a). Breast cancer and prostate cancer were the most common diagnoses (20 % and 15 %, respectively). 20 % had metastatic cancer. Within the follow-up period, 26 % of patients died. Most frequently, patients received a long term prescription of LMWH, followed by VKA and DOAC (57 % vs 24 % vs 17 %, respectively). 2 % received combination regimes. During follow-up, 6.4 % of patients had a bleeding episode necessitating hospitalization or during hospitalization. In the phase off anticoagulation the rate was 0.6 %. The most frequent bleeding types were intracranial and gastrointestinal. After cessation of anticoagulation, relapsing disease occurred in 7 %, identified as incident pulmonary embolism.

Conclusions

In Germany, the majority of cancer patients with thrombosis is treated with long term LMWH, as recommended by guidelines. Nevertheless, the rate of DOAC prescriptions was unexpectedly high. Bleeding episodes were frequent, by far more so during anticoagulation compared with the phase off anticoagulants. GKV routine data allowed to document the high rate of re-lapsing disease in cancer patients by identifying incident PE after cessation of anticoagulation.

P-4

Postersitzung

Cases: Interessante Verläufe – Risiken und Komplikationen

P-4.1

Selective thrombin injection into a persistent pelvic hemorrhage

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An 86 years old patient suffered from a clinical relevant hemorrhage into the left upper leg after surgery of a pelvic fracture. Angio-computed tomography located this hemorrhage to the obturator artery, a side branch of the internal iliac artery. Because of the limited operability, an interventional approach was chosen. With the help of digital subtraction angiography (DSA), a dilation balloon was positioned within the obturator artery close to the bleeding spot and inflated to two atm to avoid any backflow. After removal of the guide wire, a thrombin solution was injected through the lumen of the balloon sheath. Immediately after injection, the bleeding spot was totally occluded, and the extravascular hemorrhage was not refilled in the DSA control. This case shows that the interventional angiography is a powerful tool and a considerable alternative to traditional vascular surgery, which would have had a higher risk of complications in this particular case.

P-4.2

Ultrasound-guided recanalization of an occluded femoropopliteal bypass

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To avoid embolization of the only artery providing blood to the lower leg, an ultrasound-guided recanalization of an extra-anatomic, totally occluded and sectionally completely compressed, femoropopliteal synthetic vascular graft was conducted. Since X-ray contrast medium was unable to reach the occluded and compressed parts of the vascular graft during diagnostic DSA, we decided to use ultrasound visualization to precisely position a dilation balloon only into the compressed middle part of the vascular graft. After erecting and re-structuring of the vascular graft's round shape a loco-regional thrombolysis was performed overnight. The next day the causative stenosis was treated with angioplasty. Sonographic visualization and digital subtraction angiography showed a successful and excellent interventional result of the predominantly ultrasound-guided intervention with an open bypass on the one hand and no thromboembolism of the remaining artery of the lower leg on the other hand.

P-4.1. Figure.

P-4.2. Figure.

P-4.3. Figure. A Magnetic resonance angiography of the pelvic vessels; b angiography of the right femoral artery; c magnetic resonance imaging of the brain.

P-4.3

Complex malformation syndrome with absence of the right common femoral artery

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Background

Abnormalities of the vessels of the lower extremity are rare. This case report describes the absence of the right common femoral artery combined with malformations of the heart and the brain.

Patients and methods

In a 59 year old woman with peripheral arterial disease (PAD) stage IIb according the Fontaine Classification we found an agenesis of the right common femoral artery. There is also a history of repeated ischemic strokes starting at the age of 47.

Results

Detailed and profound history taking revealed several additional events in the past including surgical correction of a ventricular septal defect at the age of 10 years as well as repetitive ischemic insults suggesting a complex syndrome as cause. In former magnetic resonance imaging (MRI) a dysgenesis of the dorsal third of the corpus callosum and the cingulate gyrus and a cortical dysplasia of the left occipital cortex. Further testing of Fabry disease, CADASIL syndrome and porencephaly (Col4A1 syndrome) has been tested without any findings.

Conclusions

In addition, the patient's son had an ischemic insult at the age of 24 with a further history of a correction of an aortic coarctation as a child and alterations of the brain architecture. We suggest a complex malformation syndrome. Further workup has been initiated.

P-4.4

Traumatic dissection of the right proximal subclavian artery caused by boxing with consecutive embolic occlusions of distal upper extremity arteries and asymptomatic occlusion of the right vertebral artery

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A 31-year-old Hobby-Boxer reports a recurrent discomfort in the right hand during boxing for one year. Since December 2017 accompanied by paleness, pain in the index finger and algor. Eventually, conventional angiography revealed occlusions of distal arteries. An antikoagulation was started and further analysis regarding a possible thromboembolic origin revealed no cardiac reason. Duplex ultrasound revealed a dissection of the proximal subclavian artery and an asymptomatic occlusion of the right vertebral artery. A re-assessment of the conventional angiography reinforced this assumption. A cervical rip was ruled out.

We assume that a repetitive mechanical irritation of the subclavian artery due to Boxing led to a Dissection of the proximal subclavia artery with consecutive thrombotic aggregation and consequentially intermittently peripheral embolisation. Further Treatment is a matter of actual discussion.

P-4.4. Figure.

P-4.6. Figure. Ultrasound image showing the dislocation of the Viabahn endoprosthesis in B-Mode and colour Doppler.

P-4.5

Acute limb ischemia and atrial fibrillation – a case report

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Introduction

Acute limb ischemia is a common complication in patients with atrial fibrillation. Immediate reperfusion to avoid severe complications can be achieved by immediate catheter-intervention.

Case report

Hospitalization of a 66 years old female with acute onset of limb pain and arrhythmia. Motor function and sensibility are still intact. Doppler signal of the common femoral artery is without pathological findings, signal of the popliteal artery not detectable, signal of the tibial anterior artery with low amplitude continuous signal verifiable.

Due to the acuity of the situation and the disposability of the angiosuite angiography is carried out immediately. A spontaneous reopened closure of the popliteal artery was diagnosed, because of regredient pain and warm foot the intervention for the next day arranged. During the intervention (with excellent result) suddenly pain in the groin occurred. The computer tomography revealed a retroperitoneal hematoma; transfusion was not necessary and ambulation possible. A week later leg pain recurred with painfree walking distance of 50 meters. Now performed duplex sonography of the arteries reveals a giant cell arteritis affecting the right arm, the aorta, the iliacal arteries and the femoral arteries.

Discussion

As the immediate reperfusion of the critical leg was in the focus of the acute care and the diagnosis seeming clear as daylight all signs of another affection of the vessels were ignored. Even the interdisciplinary conference didn't reveal the right diagnosis because of the existing bias due to the history with arrhythmia and sudden onset of pain.

P-4.6

Multiple complications after endoprosthetic treatment of a popliteal aneurysm

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Background

Popliteal aneurysms are by far the most common peripheral aneurysms. Endovascular treatment increasingly replaces the surgical approach and is considered a safe and durable option with low complication rate and shorter hospitalisation.

Patients and methods

We describe a 71-year-old male patient with an unfavorable course after endovascular treatment of a popliteal aneurysm in the left leg with a Viabahn endoprosthesis in 2013. One month after the treatment, an acute occlusion of the prosthesis as well as distal arteries occurred. A recanalisation could be accomplished by an arterial local lytic therapy. Unfortunately, the lytic therapy induced a massive cerebral hematoma requiring an operative removal of the hematoma. Since then he suffers from a spastic hemiplegia, a hemianopsia and a neuropsychological deficit. Besides that, the patient developed after this a paracentral pulmonary embolism, probably caused by immobilization because of hemiplegia, wherefore anticoagulation was required. In the Duplex ultrasound we could observe a continuous increase of the popliteal aneurysm diameter despite the correct endovascular treatment of the aneurysm from initially 2.2 cm to currently 4.2 cm. No reason for this growth could be detected in the performed imaging techniques until in one of the last examinations, which presented a small side branch in the proximal part of the aneurysm leading to an endoleak. Eventually, we detected in the follow up examination a dislocation of the distal endoprosthesis with reperfusion of the aneurysm, leading to the indication of an operative conversion into a venous bypass.

Results

The endovascular therapy of popliteal aneurysms is considered as a safe and durable option with lower complication rates and shorter hospitalization compared to open surgery. We show in this case, that there are many possible complications that can take place in the endovascular therapy, which has to be taken into account.

Conclusions

Alternative therapies such as conservative treatment with anticoagulation alone in cases of partially thrombosed aneurysms or open surgery should be considered. The advantages and possible complications of all treatments must be discussed to identify the individually best treatment option for the patient.

P-4.7. Figure 1. Surgical preparation specimen.

P-4.7

Pulmonary embolism after bone cement instillation

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A 75-year-old lady was admitted to hospital with chest pain after lumbar osteosynthesis. She was fully oriented, spontaneously breathing, tachycardic and on vasopressor therapy. As to her recent medical history, bone cement was installed, since screws of a previous orthopedic surgery at her spinal column for lumbar torsion scoliosis had loosened.

Laboratory showed elevated CRP, d-dimers, LDH and CK levels with normal CK-MB. There was no relevant coronary artery stenosis on angiography. CT scan showed a pulmonary embolus reaching from the inferior vena cava across the right heart to the right pulmonary artery (ESM 3, movie).

The removal of the embolus was performed under protection of the heart-lung machine (Figure 1).

Post-operatively, the patient was relieved from chest pain and infectious markers decreased.

In summary, this case highlights the risk of life-threatening complications due to bone cement installation which is a commonly used procedure to fix osteoporotic and instable fractures.

See also the electronic supplementary material (ESM 3).

P-4.8

Takayasu's arteritis

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Introduction

Takayasu arteritis takes on special significance in high levels of migration. Prevalence is estimated at 108/1M Africans, 78/1M Asians and 22/1M Caucasians.

Case report

A 40-year-old Nepalese visited our medical center with pain in neck area. Left arm cold, pulseless. Takayasu Arteritis Type V was diagnosed affecting carotid- and left subclavian artery, all segments of the aorta and visceral- and renal vessels. On therapy with steroids regression of symptoms, improvement of general condition. Patient now complained about retrosternal pain. Coronary-CT observed minor irregularities of the LMS but thickened walls of aorta without dissection. We added Methotrexate; temporarily increased steroid dosage. 16 months on medication patient is free of thoracic discomfort; no signs of inflammation.

Conclusion

While Caucasians often exhibit isolated manifestation of supra-aortal branches in TA, involvement of whole aorta occurs in patients of Asian/ African origin in 47% of cases.

See also the electronic supplementary material (ESM 4).

P-4.9. Figure 1. Computed tomography angiogram showing a poplitea artery aneurysm.

P-4.9. Figure 2. Computed tomography angiogram showing a poplitea artery aneurysm.

P-4.9. Figure 3. Angiogram showing right popliteal artery aneurysm.

P-4.9. Figure 4. Angiogram showing deployed stent graft.

P-4.9. Figure 5. Angiogram showing patent distal run-off.

P-4.9

Endovascular treatment of ruptured popliteal aneurysm – a case report

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Case report – History and clinical presentation

A 56-years old male patient presented to a vascular outpatient facility complaining of shivering, progressive pain and swelling in his right calf for few days. The patient underwent duplex ultrasound, which showed a pulsating poplitea artery aneurysm (anteroposterior diameter 45 mm) with extravascular hematoma. The patient was transported to our hospital, suspicious for ruptured popliteal artery aneurysm. His medical history was remarkable for arterial hypertension, type 2 diabetes as well as cardiopulmonary resuscitation 12 years ago due to severe pancreatitis. There was no history of recent trauma. A clinical examination revealed hard swelling and livid discoloration of his right calf and a pulsating palpable mass on the medial aspect of the right knee. Peripheral pulses were palpable bilaterally. The sensory and motor functions were intact. His blood pressure was at 180/100 mmHg and heart rate at 92/min.

Investigations

Laboratory tests revealed low hemoglobin levels (12.5 g/dL), elevated D-dimere (0.83 mg/L), elevated creatinine kinase (509 U/L). A computed tomography angiogram showed a irregular, contrast-enhanced popliteal mass (30 x 40 x 35 mm) with a spindle-shaped connection to the popliteal artery (Figure 1, 2).

Therapy and course

The patient was transported to the angiographic suite for emergency angiography. Under local anesthesia, selective antegrade puncture of the right common femoral artery was performed. Diagnostic angiography showed a saccular popliteal aneurysm with patent distal run-off (Figure 3). A VIABAHN stent was deployed in the popliteal artery aneurysm. A final angiogram showed successful exclusion of the aneurysm (Figure 4) with excellent distal run-off (Figure 5). Post-intervention the patient was started on aspirine 100 mg and clopidogrel 75 mg once daily for 12 months. Duplex ultrasound showed biphasic flow in a patent graft and no endoleak was detected. Symptoms having settled down. After 3 days of hospitalization, the patient was discharged with ambulatory follow-up.

Conclusion

Endovascular therapy using stent grafts might be an alternative therapy option to exclude a rupture of a popliteal artery aneurysm.

P-4.10

CRPS 2 after femoropopliteal bypass – a case report

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Background Background

The complex regional pain syndrome (CRPS) has several etiological causes, is closely associated with vascular abnormalities and can cause differential diagnostic difficulties in angiological practice. The clinical picture includes pain, sensory and motor deficits as well as an abnormal vasoconstrictive and vegetative reaction of the affected body part. Treatment is complex and should be started early, so early diagnosis is essential.

Patients and methods

We report a case of the development of a complex regional pain syndrome type 2 after femoro-popliteal bypass with multiple revisions. A 53-year-old patient was presented with severe pain and limited mobility at the lower right extremity, which developed two months after revision (09/2016) with subacute closure of a femoro-popliteal P1 bypass (04/2016). In addition, a wound debridement and a Sartorius flap plastic of the inguinal region were performed.

Results

At the evaluation day, the skin on the calf was reddened and tense. A significant impairment of mobility with local pain but also claudication symptoms were reported. In the angiological evaluation, the patient showed no functional limitations. In the diagnostic evaluation, a complex regional pain syndrome (CRPS II) with nerve injury was clinically suspected. The scintigraphy showed CRPS. Membrane-stabilizing and pain-modulating agents (pregabalin 600 mg/d, amitriptylin 75 mg/d, oxycodone/naloxone 30 mg/d) as well as lymphatic drainage were initiated and led to an improvement of pain and improved mobilisation. The specific anamnesis to other relevant factors showed alcohol consumption and an existing LWK 4/5 intervertebral disc protrusion on the right side which could have caused predisposing pre-morbid damage of the neural structures.

Conclusions

In summary, the development of CRPS can also occur at the lower limb, e.g. after femoropopliteal bypass operations and multiple revisions. Other possible predisposing factors such as alcohol consumption with metabolic damage to the peripheral nerves or previous damage due to spinal disc herniation or neurodegenerative changes could also play a role. Patients with the listed risk factors constellation can undergo a separate stratification prior to the bypass operations and allow earlier diagnosis and therapy initiation.

P-5

Postersitzung

Cases: Herausforderungen in Diagnostik und Therapie

P-5.1

Palliative recanalization of a tumor-associated IVC-occlusion

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An 83 years old patient suffered from a symptomatic occlusion of the inferior vena cava (IVC), which was caused by a renal cell carcinoma reaching from the renal vein to the right atrium. The patient refused a conventional vascular surgery because of the involvement of the heart and asked for interventional recanalization. Thus, a percutaneous transluminal angioplasty supported by digital subtraction angiography was performed. Dilation with a standard balloon resulted in an immediate collapse of the dilated tunnel. In consequence, 5 overlapping self-expanding stents for arterial use were implanted forming a tunnel between the right atrium and the carcinoma-free part of the IVC leading to a hemodynamically excellent result with breath-modulated blood flow velocities in the femoral veins and the reduction of the leg swelling. This case demonstrates that angioplasty is a powerful tool to treat complex vascular diseases, which could serve as an equivalent alternative to vascular surgery.

See also the electronic supplementary material (ESM 1).

P-5.1. Figure.

P-5.2

Case report – infectiously triggered acute acral ischemic syndrome with puffy fingers

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In this case report, the networking of angiology with the disciplines of microbiology, dermatology and rheumatology will be presented. An infection with *Chlamydophila pneumoniae* was diagnosed as a cause of puffy fingers, which also triggered a scleroderma pattern in capillary microscopy of the nail fold. Initially the 36-year-old woman presented a swelling, sensibility disorder and pruritus of the left hand. The clinical examination revealed damage in the nail bed and a livid discoloration of the complete left hand with puffy fingers. Pre-existing conditions were Raynaud's phenomenon and hypertension. In the differential diagnosis of acral ischemic syndrome stenotic and inflammatory changes of the shoulder-arm arteries were excluded. The capillary microscopy of the fingers ensured a microcirculation disorder with an inhomogeneous distribution pattern, pronounced torquing, capillary thrombosis, microhemorrhages and megacapillaries. According to the classification of Cutolo, there was a late-stage scleroderma pattern in the microcirculatory disorder. Another striking feature was a cyanotic discoloration of almost capillaries.

After serological confirmation of an active bacterial infection with *Chlamydophila pneumoniae*, a 30-day antibiotic therapy with 400 mg per day doxycycline was performed. The capillary microscopic examination on day 7 and day 30 showed a complete decrease of the capillary thrombosis and a reddish discoloration of all capillaries. After 14 and 30 days, there was already a clinically significant decrease in finger swelling, paresthesia and pruritus. In summary, a bacterial infection could be identified as a cause in puffy fingers and a scleroderma pattern. Capillary microscopy in HDMI was ideal for controlling of the response to therapy of infectiously triggered acral ischemic syndromes.

P-5.5. Figure.

P-5.3. Figure.

P-5.3

Case report – capillary microscopy therapy monitoring of chronic infection by Lyme disease

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This special case represents the capillary microscopy as a valuable tool to control the treatment response of acrodermatitis chronica atrophicans triggered by an infection with *Borrelia*. The patient is male, 49 years old and works as a farmer. He complained a 5 years ongoing unclear swelling of the right leg together with disturbing numbness on the thigh and foot. Pre-existing conditions were bilateral varicosis with operative care via crossectomy. Occupational exposure to ticks was clearly affirmed. In the clinical examination sharply defined exanthemas at the affected areas were found. Venous thrombosis and recurrent varicosis were excluded by compression and duplex sonography. The results of the laboratory chemistry showed a lympho- and eosinopenia as well as an increase of the beta-2-globulin fraction in serum electrophoresis. The suspected diagnosis of acrodermatitis chronica atrophicans was confirmed with the serological positive detection of IgG and IgM titer against *Borrelia*.

Capillary microscopy of the exanthema revealed a dense network of branched capillaries. To assess a continuing microcirculation disorder, nail-folding microscopy was supplemented in HDMI, which showed multiple segmental microhemorrhages without disturbed capillary architecture. Oral antibiotic therapy with 100mg doxycycline 2 times was recommended. A 30-day treatment improved the patient's symptoms and the complete decline in microhemorrhages. After a 4 week washout, the patient developed again microhemorrhages without clinical evidence of recurrence. After another 3 weeks, the patient developed the same symptoms again with persistent microhemorrhages. In summary, the microcirculation disorder in late onset of Lyme disease was used for therapy monitoring and did not provide sufficient cure with oral administration of doxycycline. The capillary microscopy in HDMI for assessing the therapeutic response of a *borrelia* infection is a potentially useful new tool.

P-5.4

Critical cerebrovascular perfusion compensated by a double steal-phenomenon

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An 81-year-old woman with an extensive history of atherosclerotic diseases had an aortocoronary bypass grafting using the left internal mammary artery (LIMA). Symptoms at referral comprised progressive dizziness, recurrent ventricular tachycardia and angina, precipitated by exertion of both arms. Aortography showed a complete occlusion of the right brachiocephalic trunk and a highly calcified stenosis of the left subclavian artery (SA). Selective angiography revealed a double, tandem-like steal phenomenon with the following flow direction from the aortic arch: left SA → left vertebral artery (VA) → basilar artery (BA) → right VA → right SA → right carotid artery (Figure, Panel A-D, and video). In fact, her cardiac, cerebral and bilateral brachial functions were maintained by perfusion via the left SA, yet at risk by the high-grade stenosis. The SA stenosis was successfully treated by implantation of two 8x25mm balloon-expandable stents (Figure, Panel E and F). Her symptoms completely dissolved at discharge

See also the electronic supplementary material (ESM 2).

P-5.4. Figure.

P-5.5

Neurofibromatosis type 1 and vasculopathy

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A 23-year old man presented with symptoms of intermittent claudication after 200 metres walking distance and badly controlled hypertension with a systolic blood pressure over 200mmHg although taking six different antihypertensive drugs. The patient's medical history revealed that he had previous vascular interventions in his childhood and was diagnosed with Neurofibromatosis Typ I (NF-1) at the age of 3. ABI was impaired with 0.7 on both sides. Duplexsonography showed an aorto-hepato-mesenterico-birenal bypass and with regular function and a high-grade stenosis of the infrarenal aorta with poststenotic signals. The renal RI on the right side was markedly reduced compared to the left side. Thus, we performed a CT-angiography (presented picture) and confirmed the diagnosis of "mid aortic syndrome", a rare complication of NF-1, with reduction of the aortic diameter to 3mm and right-sided renal artery re-stenosis. Therapeutic approaches offered are PTRa and aortic replacement.

P-5.5. Figure.

P-5.6. Figures 1–4.

P-5.6

Incredible results of abdominal compression syndromes

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A 47 year old female patient had been examined by colour duplex scanning and following abdominal compression syndromes were diagnosed: Dunbar syndrome (compression of the celiac artery by the median arcuate ligament), nutcracker syndrome (compression of the left renal vein between the aorta and proximal superior mesenteric artery), pelvic congestion and inferior vena cava compression as well as May-Thurner syndrome (venous compression in the iliac veins by the arterial system) and a major vascular operation of all syndromes were indicated.

To gain a second opinion the patient was examined by another doctor 3 weeks later. Here none of the former diagnoses could be confirmed. There was no evidence for either syndrome, only the celiac artery was hypoplastic without an indication for an intervention. There was no vomiting and weight loss in patient's history. The measured data and the physiological understanding were the reason for such a difference.

We definitely need better criteria!

P-5.7

Clinical long-term course of a 21-year old patient with generalized arterial calcification of infancy

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Background

Generalized arterial calcification of infancy (GACI) is a rare autosomal recessive disorder characterized by infantile onset of widespread calcifications of large to medium sized vessels and intimal hyperplasia resulting in cardiovascular complications. About 75% of the cases are associated with biallelic loss-of-function mutations in ENPP1. This gene encodes for Ectonucleotide pyrophosphatase/ phosphodiesterase family member 1 (ENPP1), a plasma membrane protein, which generates inorganic pyrophosphate (PPi), a physiologic inhibitor of hydroxyapatite formation. Depending on the severity and the local distribution of the calcific stenoses, affected infants can present with neonatal heart failure, arterial hypertension and death within the first 6 months. Long-term courses are rarely described.

Patients and methods

Our patient was born as the third child of consanguineous Turkish parents. The male patient presented with heart failure and arterial hypertension refractory to conventional medical therapy in infancy and mitral and aortic valve and aortic calcifications. An ENPP1 mutation analysis revealed homozygosity for c.2677G>T (p.E893X). Under treatment with bisphosphonates, the patient developed hypophosphatemic rickets and bilateral renal artery and internal carotid stenosis. Balloon dilatation of both renal arteries was performed at the age of 8 years for the first time with only short-term effects on hypertension. At 15 years of age, recurrent syncope led to hospitalization. ECG monitoring revealed a third degree AV block. A thoracic CT scan detected calcifications of the interventricular septum in the area of the conduction system. At the age of 19, the patient presented

with acute decompensated heart failure. Coronary angiography revealed stenosis of the left anterior descending coronary artery, calcification of both atria and both ventricles, all heart valves as well as pulmonary hypertension. Moreover, a 90% stenosis of the right renal artery and a moderate stenosis of the left renal artery were uncovered. The patient underwent angioplasty with stenting of the right renal artery at age 19.

Results

Currently, at the age of 21 years, our patient is in fair general health condition. With additional pharmacotherapy including beta blocker, ACE inhibitor, loop diuretics and a selective aldosterone receptor antagonist, the blood pressure is normal.

Conclusions

GACI-patients need constant cardiovascular monitoring. Bisphosphonate treatment is associated with survival beyond infancy. Aggressive anti-hypertensive therapy is warranted. Cardiac arrhythmias are a rare complication of GACI caused by calcifications of the cardiac conduction system.

P-5.8

Recanalization of the brachial artery controlled by duplex sonography

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75-year-old patient with pain of the left arm. Duplex sonography on the left: Triphasic flow of the subclavian and axillary artery, 5 cm long occlusion of the left brachial artery with distal monophasic flow profiles. Installation of a 4F introducer sheath into the right common femoral artery, insertion of a 35" wire into the aortic arch, DSA via RIM catheter shows occlusion of the left brachial artery. Switch to long 6F, probing the left brachial artery with a 18" wire. Subsequent intervention with duplex sonographic monitoring shows catheter and wire in the left brachial artery. Now successful wire recanalization of the occlusion exclusively controlled by ultrasound followed by multiple (DCB)-PTA. Duplex sonography is a safe additional tool in the interventional treatment of PAD, which may help reduce radiation exposure / contrast agent application.

P-5.8. Figure.

P-5.9

Ischemic monomelic neuropathy – a rare but serious diagnosis

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Ischemic monomelic neuropathy: a rare but serious diagnosis. An 80-year-old female patient presents with an acute shunt re-occlusion on her right arm as an emergency in our vascular clinic. The patient is left-handed and pre-existing disease include dialysis-related renal insufficiency due to diabetes mellitus, arterial hypertension and stage IIb PAD.

Due to the lack of revision options on the right arm, a prosthetic shunt (GORE® ACUSEAL Vascular Graft, USA) had to be implanted on the left upper arm. The post-interventional course was problem-free and the short-term result was good. The puncture of the shunt was easy on the first postoperative day, but the patient complained of pain in the left hand during dialysis. This symptom of symptoms was progressive in the following days and paresthesia and paresis of the left arm occurred.

In the duplex sonographic examination, a shunt flow volume of 1182 ml/min was calculated. The arterial flow to the periphery of the left arm (A. radialis and A. ulnaris), however, was acceptable and did not explain the symptoms of the patient. An angio-CT scan of the Brain was performed, which did not detect evidence of cerebrovascular genesis as a cause. In the neurological interdisciplinary review the diagnosis of a monomelic neuropathy was made because of a steal syndrome of the left arm. The ischemic monomelic neuropathy is a rare form of steal phenomena. Here, the vasa privata of the extremity nerves in patients with diabetes mellitus due to the diabetic / uremic vascular damage are already so narrow-eyed and pre-damaged that a newly created shunt immediately leads to ischemia of the nerve.

A revision of the shunt prosthesis was performed immediately and the symptoms improved immediately. However, the neurological symptoms persisted initially, but showed an improvement in the course of inpatient stay and under physiotherapeutic therapy.

The further inpatient stay was uncomplicated, so that the patient could be discharged in the following days. Summary: If unexplained pain and nerve damage occur after a shunt procedure, an ischemic monomelic neuropathy must be considered. A revision is to be carried out immediately; otherwise the nerve damage is irreversible.

P-6

Postersitzung Grundlagenforschung, Apparate Studien, Innovationen

P-6.1

Validation of oscillometric pulse-wave velocity-measurement for vascular stiffness

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Background

Arterial stiffness is a major independent predictor of cardiovascular morbidity and mortality. While the tonometric measurement of aortic

pulse-wave velocity (PWV) is the current Goldstandard oscillometric assessment of PWV comes with lower costs, a faster training curve and less procedural time effort.

A detailed validation of automated oscillometric PWV determination has not been evaluated in detail. Therefore, we investigated the diagnostic accuracy of tonometric and oscillometric arterial stiffness determination.

Patients and methods

In a single-center crossover study, we evaluated healthy subjects and patients with peripheral arterial disease (PAD) undergoing ABI and PWV measurements using oscillometric PWV-measurement (BoSo, Bosch + Sohn) compared to the tonometric method (SphyMoCor, Atcor Australia). For classification of PAD stadium, we assessed the ankle-brachial index (ABI), painless walking distance and history of PAD for each patient. Healthy subjects did not have a known history of cardiovascular disease, no limitation of walking distance and an ABI > 0.9. Remaining subjects were known to have PAD. For each group Pearson's correlation analysis was used to assess the relationship between measurements of PWV between both devices. Sensitivity, specificity, positive and negative predictive values were calculated for the oscillometric device.

Results

104 subjects underwent assessment of both oscillometric and tonometric PWV measurement. Healthy subjects (n = 58) with an ABI of 0.99 ± 0.09 did not differ in age (63.1 ± 16.0 vs. 65.7 ± 9.8 years, $p = 0.336$) and gender (male: n = 37 vs. 34, $p = 0.454$) to patients with PAD (n = 46). As expected, the ABI in PAD patients was lower (0.70 ± 0.22 , $p = 0.003$). Systolic blood pressure was higher in the PAD-group compared to healthy subjects (152.4 ± 27.3 mmHg vs. 141.4 ± 20.5 , $p = 0.023$).

PWV measurements showed significant correlations in healthy subjects ($r = 0.633$, $p = 0.001$) and in patients with PAD ($r = 0.702$, $p = 0.001$). This was corroborated by oscillometric ABI measurements compared to standard Doppler techniques ($r = -0.524$, $p = 0.001$). Sensitivity, specificity, positive predictive value and negative predictive value of the oscillometric measurement for detecting PAD reached 93%, 84%, 86%, and 92%.

Conclusions

Using a simple and rapid automated oscillometric device, we provide a good diagnostic accuracy for the determination of arterial stiffness through PWV, both in healthy subjects and in PAD patients. This might help in terms of cost-effectiveness simplification in daily practice to screen for cardiovascular morbidity and for vascular damage in atherosclerosis.

P-6.2

Peripheral endovascular treatment improves local endothelial function

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Background

Endothelial dysfunction is involved in the initiation and the progression of arteriosclerosis and has been correlated to higher incidences of MACCE or the need for interventions.

Endovascular treatment of symptomatic atherosclerotic peripheral artery disease (PAD) has gained widespread acceptance and is recommended as the primary revascularization strategy. The plethora of interventional strategies aims to restore tissue perfusion. However, the interventional treatment might affect endothelial function, perpetuating dysfunctional vascular homeostasis.

Endothelial function and the vasomotion of the vessel wall can be measured by FMD (flow-mediated dilation). The aim of this study was to investigate the impact of peripheral vascular interventions on local and systemic vascular function measured by FMD.

Patients and methods

To this aim patients with known PAD who underwent interventions in the iliofemoral and femoropopliteal arteries and healthy controls were included. FMD was determined before the intervention and with a six-month

follow-up in the target limb, contralateral control limb and the brachial artery as a parameter of systemic arterial function. Additionally, ABI, walking distance and Fontaine classification were assessed for each patient.

Results

50 patients were included and compared to 10 healthy controls. Mean age was 70.3 ± 9.8 years with 34% female and 66% male patients. Symptoms were classified by Fontaine class (IIa 8%, IIb 64%, III 8% and IV 20%). Iliac vessel intervention was performed in 20 and femoropopliteal intervention in 20 cases. A stentless approach was feasible in 28 patients with DCB treatment and atherectomy (Rotarex n = 9, Hawk n = 2, Angiojet n = 9). In 22 limbs a stent implantation was necessary. Brachial and femoral endothelial function was reduced in PAD patients as compared to controls (brachial 4.2 ± 0.1 vs. 5.1 ± 1.4 , $p = 0.02$; femoral 3.7 ± 0.1 vs. 4.7 ± 0.2 , $p < 0.01$) and showed a significant correlation comparing brachial and femoral FMD ($r = 0.43$; $p < 0.001$) in healthy controls PAD patients.

After the 6 months follow-up the ABI improved significantly in the target limb (0.8 ± 0.4 vs. 0.9 ± 0.4 , $p = 0.007$), while the control limb remained unaffected (0.9 ± 0.3 vs. 0.9 ± 0.5 , $p = 0.68$). Interestingly, endothelial function increased after endovascular treatment only following a stentless approach in the target limb as compared to control limb ($p = 0.01$ for target, $p = 0.2$ for control). Intervention with a nitinol stent prevented an improved endothelial response with unaltered FMD in the target or control limb ($p = 0.1$ and $p = 0.2$, respectively).

Conclusions

Our findings provide the first evidence for an improvement of local endothelial function after endovascular treatment with a stentless approach of symptomatic atherosclerotic PAD. Further studies have to determine the optimal interventional strategy with respect to different treatment modalities and novel stent platforms to maintain vessel function.

P-6.3

Repetitive remote occlusion stimulates eNOS-dependent blood flow and collateral expansion in hindlimb ischemia

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Background

Collateral expansion is an important compensatory mechanism to alleviate tissue ischemia after arterial occlusion. We investigated the efficacy and mechanisms of temporary remote hindlimb occlusion to stimulate contralateral blood flow and collateral expansion after hindlimb ischemia in mice and evaluated translation to peripheral artery disease in humans.

Patients and methods

We induced unilateral hindlimb ischemia via femoral artery excision in mice. We studied central hemodynamics, blood flow, and perfusion of the ischemic hindlimb during single and repetitive remote occlusion (RRO) of the contralateral non-ischemic hindlimb with a pressurized cuff. Similar experiments were performed in patients with unilateral peripheral artery disease (PAD).

Results

Contralateral occlusion of the non-ischemic hindlimb led to an acute increase in blood flow to the ischemic hindlimb without affecting central blood pressure and cardiac output. The increase in blood flow was sustained even after deflation of the pressure cuff. RRO over 12 days (8/day, each 5 min) led to significantly increased arterial inflow, lumen expansion of collateral arteries, and increased perfusion of the chronically ischemic hindlimb as compared to control. In NOS3^{-/-} and after inhibition of NOS (L-NAME), the acute and chronic effects of contralateral occlusion were abrogated. Pilot studies in PAD patients demonstrated that contralateral occlusion increased arterial inflow to ischemic limbs and improved walking distance.

Conclusions

Repetitive remote contralateral occlusion acutely stimulates arterial inflow, perfusion, and functional collateral expansion in chronic hindlimb ischemia via an eNOS-dependent mechanism underscoring the potential of remote occlusion as a novel treatment option in peripheral artery disease.

P-6.4

Induction of repetitive remote occlusion promotes collateral growth in an age-dependent manner after unilateral hindlimb ischemia

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Background

Shear stress induced by increase of flow velocity is the driving force of collateral growth after artery occlusion. Often, resulting collaterals cannot compensate for the occluded artery to preserve sufficient tissue perfusion. We aimed to improve collateral growth in a clinical relevant manner by repetitive remote occlusion in vivo.

Patients and methods

Male 12 week or 24 months old C57/Bl6 mice were previously subjected to hindlimb ischemia (HLI) by ligation of the femoral artery. Over the following two weeks mice were either subjected to repetitive temporary occlusion of the contralateral femoral artery by inflation of a vascular occluder, resulting in an increase of flow velocity within the collateral vessels of the operated hindlimb. To assess vascular regeneration, perfusion recovery was monitored by laser Doppler perfusion imaging, in relation to the measurements taken prior to induction of HLI. To measure blood volume passing through the collateral circuit we obtained flow velocity and vessel diameters using high resolution ultrasound. Measurements were taken from the iliac artery and the immediate up-stream vessel to the collaterals (caudal femoral artery) on day 2 and 14 after surgery. Morphometric analysis was performed by conducting vascular casts by post-mortem microfil injection.

Results

After induction of unilateral hindlimb ischemia, perfusion decreased to <10 % of the basic value and increased within 14 days by $44 \pm 5\%$ in control animals. Perfusion recovery was blunted by NOS-inhibition. Young mice receiving RRO showed a significant improvement in perfusion recovery. Perfusion recovery was significantly reduced in old mice. However, RRO-treatment in old mice led to a significant improvement of reperfusion recovery. Further, application of the sGC activator Cinaciguat partially compensated for age-dependent deficiency of recovery. Combination of both treatments, RRO and Cinaciguat, improved hindlimb reperfusion even more in old mice. Measurement of collateral vessel diameters in the ischemic hindlimb showed a significant increase in lumen expansion in young mice being subjected to RRO compared to control group. This effect was also seen in old mice, both, when being subjected to RRO or when fed Cinaciguat. In old mice, combination of both treatments led to an even further collateral lumen expansion.

Conclusions

Our data suggest that repetitive remote occlusion improves collateral growth after induction of unilateral hindlimb ischemia by stimulation of flow velocity. Age-dependent impairment of mechano-sensing can be partially overcome by activation of sGC.

P-6.5

Effect of intradialytic ultrafiltration rate on aortic pulse wave velocity in hemodialysis patients

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Background

Increased pulse wave velocity (PWV) has been identified as an independent predictor of cardiovascular mortality in hemodialysis patients. High intradialytic ultrafiltration rates (UFR) are associated with increased sympathetic activity and may therefore affect PWV. The aim of the present study was to assess the effect of high intradialytic UFR on PWV in hemodialysis patients.

Patients and methods

18 hemodialysis patients with high UFR (mean UFR averaged over 12 hemodialysis sessions > 2,5 kg) were matched in respect of age and systolic and diastolic blood pressure with 18 hemodialysis patients with low UFR (<1,5 kg). Brachial artery blood pressure was measured using an automatic sphygmomanometer. Aortic pulse wave velocity was measured using the noninvasive automatic device Complior[®] after hemodialysis session. PWV was calculated by the transit time and the distance travelled by pulse between carotid and femoral artery.

Results

Mean UFR was $3,2 \pm 0,2$ kg (SEM) versus $1,3 \pm 0,1$ kg. Age was $64,8 \pm 1,8$ years versus $65,4 \pm 0,8$ years, blood pressure was $125 \pm 2,9/74 \pm 1,5$ mmHg versus $121 \pm 2,2/71 \pm 1,5$ mmHg in patients with high and low UFR. Heart rate was $72 \pm 1,3$ /min versus $74 \pm 1,2$ /min. Time on dialysis was 37 ± 11 months versus 62 ± 12 months in patients with high and low UFR (n.s.). Aortic pulse wave velocity was not significantly different in patients with high UFR when compared to those with low UFR (PWV $11,2 \pm 0,7$ m/s versus $11,3 \pm 0,6$ m/s, n.s.).

Conclusions

High ultrafiltration rates in hemodialysis patients did not have a significant effect on aortic pulse wave velocity. The data suggest that increased pulse wave velocity in hemodialysis patients is due to structural wall changes rather than to acute changes in fluid load.

P-6.6

Safety study – Apixaban vs. Vitamin-K antagonists in patients with atrial fibrillation and hemodialysis treatment (AXADIA)

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AXADIA AFNET-8 ist eine präarztinitiierte, nationale, offene, randomisierte, multizentrische, Phase IIIb Studie zur Überprüfung der Sicherheit des neuen, oralen Antikoagulanz Apixaban gegenüber dem Vitamin-K Antagonisten Phenprocoumon hinsichtlich der Prävention von Blutungen und thromboembolischen Ereignissen bei chronisch nierenkranken Patienten (CKD Stadium 5D) mit nicht-valvulärem Vorhofflimmern.

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P-6.6. Figure. AXADIA AF-NET 8 Study Design.

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Both-legs ultrasonography on suspicion of deep vein thrombosis

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Background

The need to examine both the symptomatic and the asymptomatic leg of patients suspected with deep vein thrombosis (DVT) with doppler ultrasonography is unclear. The possibility to overlook a contralateral DVT can cause a postthrombotic syndrome as well a higher lethality because of the risk of pulmonary embolism (PE). The aim was to identify the rate of bilateral DVT in a predefined population of patients with diagnosed DVT and to analyse if patients benefit from an initial bilateral doppler ultrasonography.

Patients and methods

A single-center retrospective study was carried out including patients with DVT. Both legs were examined with doppler ultrasonography by physicians from the department of angiology of the Martin-Luther-University Halle-Wittenberg. We analysed the rate of bilateral DVT and correlated this with risk factors for bilateral DVT.

Results

963 patients with DVT were included in the study (men 48.6%, mean age 67.16.8 y.). 323 patients (33.5%) were identified with a bilateral DVT. The most DVT-causing factors were: 32.4% tumor-associated, 29.8% postoperative and 25.4% during immobilisation. 10.9% were unprovoked DVT.

From all 640 patients with unilateral DVT, 59.2% showed a proximal DVT, 26.6% a distal DVT and 14.2% an isolated muscle vein thrombosis (MVT). From all 323 patients with bilateral DVT 7.4% had a bilateral proximal DVT, 55.1% in one leg a proximal and in the contralateral leg a distal DVT and 31.9% a bilateral distal DVT. 5.6% showed a bilateral isolated MVT.

A bilateral DVT was diagnosed more often in patients with coincident PE ($p < 0.0001$), developing DVT during a stationary stay ($p < 0.0001$), underwent intracranial surgery ($p < 0.0001$), with immobilisation ($p = 0.03$) and in patients older than 67 years ($p = 0.037$).

74.9% ($n = 721$) of all patients showed symptoms of DVT. 25.1% ($n = 242$) did not show any symptoms of DVT. 36% ($n = 87$) of these asymptomatic patients had a bilateral DVT. 606 patients showed symptoms of DVT in one leg. 20.3% ($n = 123$) of them had a bilateral DVT. In this subpopulation of 606 patients, the multivariable analysis identified bilateral DVT to be more often diagnosed in patients with a distal DVT in the symptomatic leg ($OR = 35.4$; $p < 0.0001$), with isolated MVT ($OR = 7.4$; $p < 0.0001$) and in patients who developed the DVT during a stationary stay ($OR = 2.9$; $p < 0.0001$).

Conclusions

The here identified high rate of bilateral DVT suggests the dire need to examine entire venous system of both legs in patients suspected with lower limb DVT.

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