EVALUATION OF THE IMPACT OF SARCOPENIA IN PATIENTS WITH ACUTE MESENTERIC ISCHEMIA

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INTRODUCTION

Acute mesenteric ischemia can lead to intestinal necrosis and death and can is associated with extremely high rates of mortality and morbidity.
Sarcopenia corresponds to a loss of the skeletal muscle mass and is considered as a general marker of frailty. Its interest as a predictor of post-operative complications and overall survival has been proposed in several visceral surgical procedures including pancreatic resection, nephrectomy, hepatectomy or colon resection but its impact has not yet been evaluated in acute mesenteric ischemia.

AIM OF THE STUDY

The aim of this study was to investigate the impact of sarcopenia in patients with acute mesenteric ischemia.

METHODS

Consecutive patients who were diagnosed with an acute mesenteric ischemia were retrospectively included at the University Hospital of Nice .
The diagnosis of acute mesenteric ischemia was based on the association of clinical symptoms and biological and imaging analyses. Sarcopenia was assessed by the measurement of the cross-sectional area of the right and left psoas muscles (Total Psoas Area: TPA) on CT-scan (Fig 1). The TPA was measured at the level of the third lumbar vertebra by contouring the psoas muscle using the software Aquarius iNtuition Edition® version 4.4.8 (TeraRecon,Inc. San Mateo)® by 3 independent blinded operators. The correlation of the measurement between observers was checked and the average was calculated. The TPA was then normalized for height (TPA/H mm^2/m^2) as a convention for body composition measurement. Sarcopenia was defined as the presence of a TPA/H inferior to the lowest sex-specific quartile.

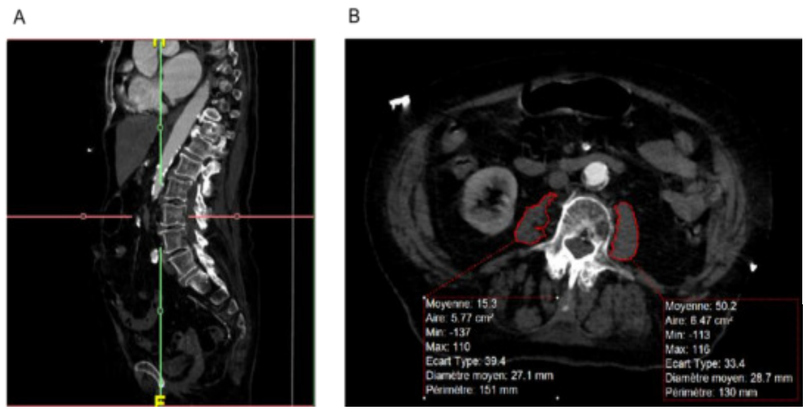


Fig 1 : Representative images of the measurement of the TPA. (A) The third lumbar vertebra was identified by counting from the lombo-sacral junction. The axial image at the L3 level in which both transverse processes were visualized was selected. (B) The measurement of the TPA was performed by manual outlining of the right and left psoas muscle borders.

RESULTS

Between January 2011 and February 2019, 80 patients with acute mesenteric ischemia were included in the study.
The lowest quartile of the TPA/H that defined sarcopenia was 406.1 mm^2/m^2 for men and 307 mm^2/m^2 for women.
There was no significant difference regarding the management of the acute mesenteric ischemia between sarcopenic and non-sacropenic patients. The rate of revascularization or the need of intestinal resection did not significantly differ (10.5% vs 26.2%, P=0.214 and 26.3% vs 47.5%, P=0.118 respectively). Although there was a tendency of a higher 30-day mortality rate in sarcopenic patients, the difference did not reach statistical significance (63.2% vs 47.5%, P=0.297),
The correlations between the TPA/H and the clinical and biological parameters were investigated. The TPA/H was significantly negatively correlated with the neutrophil, thrombocyte and monocyte counts (r=-0.283; -0.288, -0.225, P<0.05) and positively correlated with the hemoglobin concentration and the glomerular filtration rate (r=0.368; 0.261, P<0.05) (Fig 2).

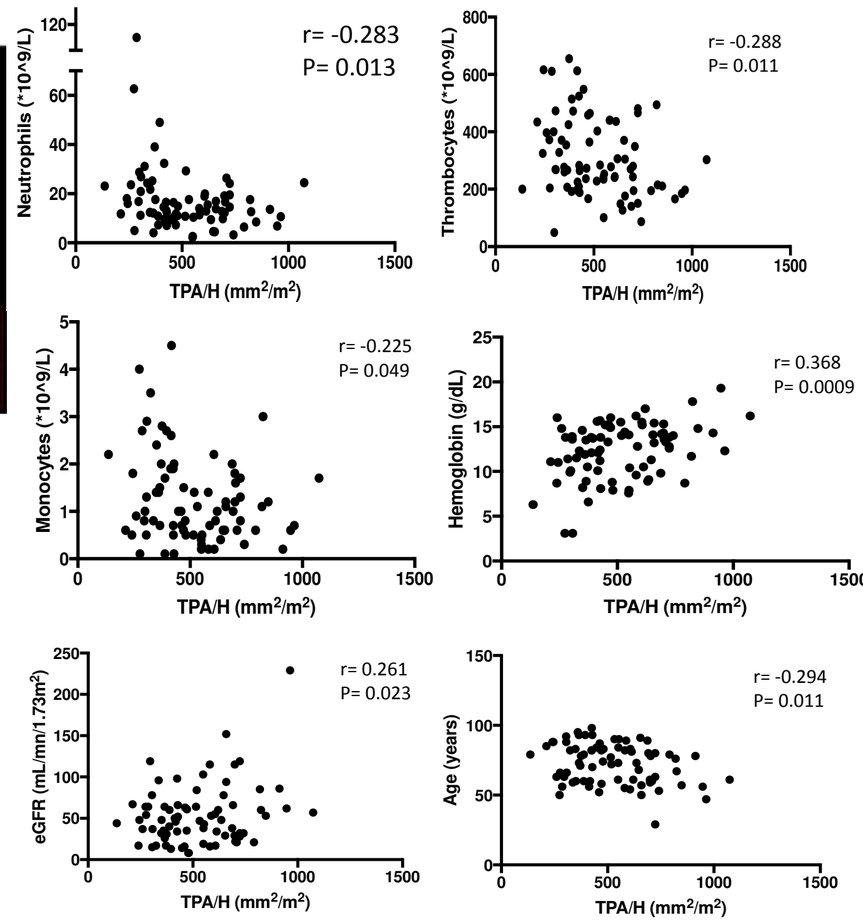


Fig 2 : Correlation between index of sarcopenia and biological or clinical parameters
TPA/H: Total psoas area normalized for height (mm^2/m^2)
eGFR: estimated glomerular filtration rate

CONCLUSION

In this study, the 30-day mortality rate tended to be higher in sarcopenic patients but with no statistical significance. The TPA/H was significantly correlated with inflammatory markers. The TPA/H is an interesting marker of the general condition of the patient as it may be impacted by pathological states that could predispose the patient to a poorer prognosis including inflammation, age, hemoglobin decrease or alteration of the renal function.

INDOCYANINE GREEN FLUORESCENCE ANGIOGRAPHY FOR EVALUATION OF THE EFFECTS OF SPINAL CORD STIMULATION TO THE IMPROVEMENT OF MICROPERFUSION IN PATIENTS WITH PERIPHERAL ARTERIAL OCCLUSIVE DISEASE WITH NO REVASCULARIZATION OPTIONS

D.M. Stillitano, S. Kennel , M. Tenholt

INTRODUCTION

The fluorescence angiographic imaging of the perfusion of the Planta pedis is a validated and proven method for testing the improvement of local perfusion of ischemic foot lesions(1). Before and after intervention or open surgical femoro-distal reconstructions, changes in the angiosomal perfusion of the leg can be detected. In the treatment of end stage PAOD with a spinal cord stimulator, the correct placement of the electrodes and the control of the correct position of the probes as well as the function of the entire implant could only be determined through in-depth patient interviews with the help of an external control, similar to the external setting of a pacemaker (2). The intention of the study is now to record the probe function of the SCS after the implantation before and during the stimulation using fluorescence angiography.

MATERIALS AND METHODS

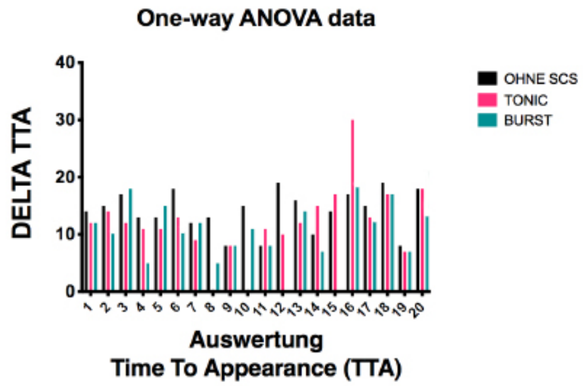
For this purpose, we included 25 patients with PAOD in Rutherford stage IV, V or VI who consented to the examinations and already had an implanted SCS, as well as all patients who agreed and who needed an SCS during the study. Indocyanine green was used as contrast agent. Its concentration could be measured by its optical density independently of the oxygen saturation of the blood in serum, blood and plasma, since the absorption maximum of ICG is in the identical wavelength range in which oxygenated hemoglobin has the same optical density as deoxygenated hemoglobin. To perform the angiography a PDE Near infrared fluorescence camera was used and indocyanine green was administered intravenously.Time to appearance in the planta pedis was measured beginning from time to appearance in the facial area to exclude individually different transit times. The statistical analysis of the data was done by means of SPSS. The comparison of the differences between values before and after SCS activation occurs in the normal distribution by the t-test for connected samples. The data are presented as mean and standard deviation as well as median and span (minimum and maximum).

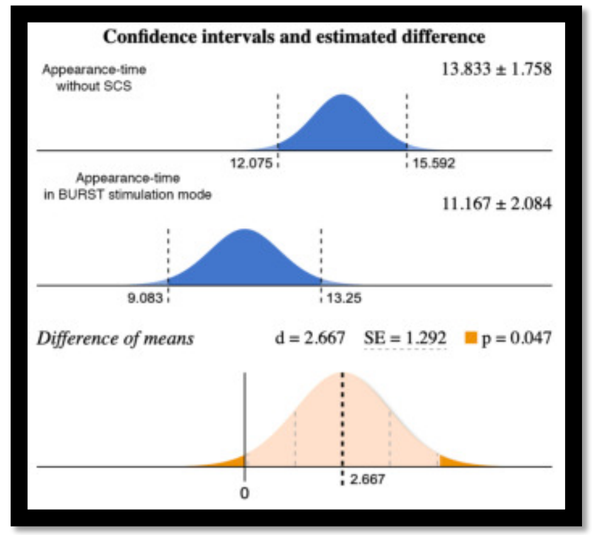
RESULTS

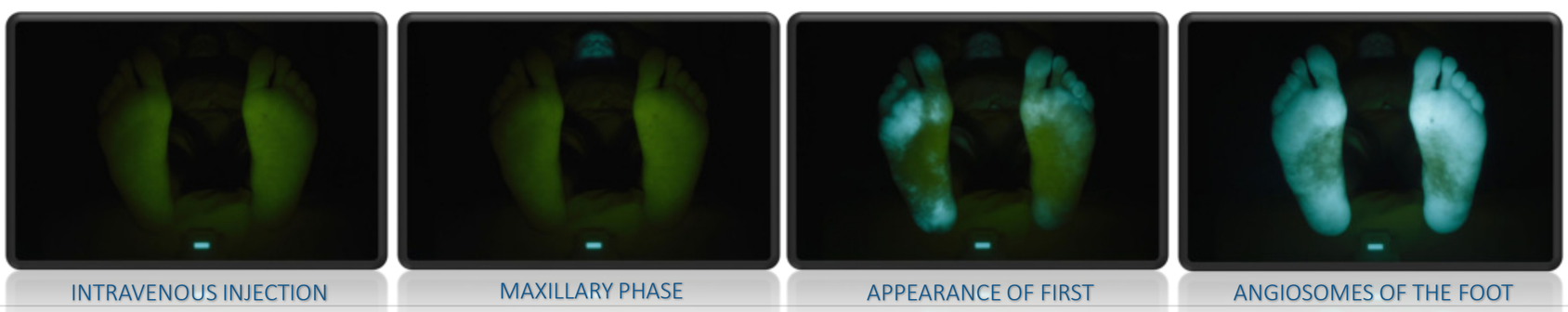
Comparing the latency times (TTA) to the appearance of first fluorescence signals pre- and post- SCS activation, it could be shown that the appearance-time (AT) post SCS activation is shortened on average by 2.66 seconds under burst stimulation. The results of t-test and the P-Value confirms the validity of the hypothesis under consideration for the burst stimulation modus.(Tab. 2).

CONCLUSION

Until now, it was not only unclear if the mechanism of epidural spinal cord stimulation was based on an improvement of the micro perfusion through peripheral vasodilation or whether there was a neurological mechanism of action through "pain coverage" during stimulation. In our experience it was possible to ascertain and define the real positive effect of spinal cord stimulation on microcirculation. Indocyanine fluorescence angiography was used as the method of choice to reproducibly prove effects of spinal cord stimulation on plantar microcirculation. Further potentialities arise from the union of these two methods for the better understanding and treatment of the angiosomal plantar perfusion in patients with critical end stage PAOD by SCS.







POTENTIAL CONFLICTS OF INTEREST

The study was sponsored by:

Abbott Medical GmbH Eschborn, Germany

The study was carried out using:

Proclaim™ Elite Recharge-Free SCS system (Abbott Inc., U.S.A.) Indocyanine green (ICG) used as contrast agent and PDE Near Infrared Fluorescence Imager (PULSION Medical Systems, Munich)

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Infrapopliteal Carbon dioxide (CO2) angiography in diabetic patients with critical limb ischemia. Limb rescue and prevent kidney failure

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ABSTRACT

Introduction:

The objective of this study is to evaluate the diagnostic and therapeutic carbon dioxide (CO2) angiography in patients with diabetes mellitus, peripheral arterial vascular disease (PAD) and chronic kidney disease (CKD) to determine whether to use of carbon dioxide angiography in this type of patients should be a standard.

Methodology:

Lower limb angiography below the knee with CO2 (diagnostic and diagnostic-interventional) were collected from the database of our clinic of 129 consecutive patients between 2012 and 2018 and retrospectively reviewed.

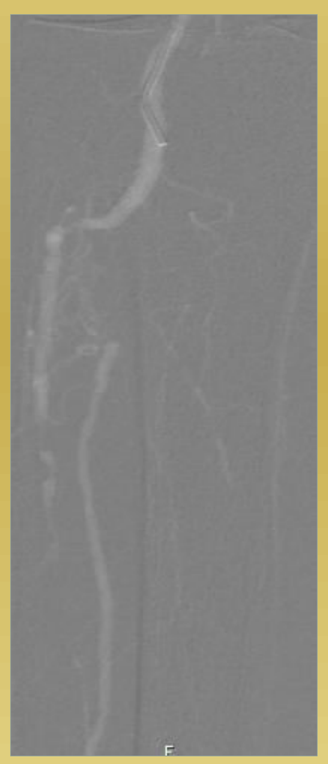
Of the 129 patients with PAD undergoing CO2 angiography 128 had a admitting diagnose of CRI≥ stage III(GFR<45, moderate tosevere Kidney function loss) and PAD stage IV.

Results:

Of the 128 patients undergoing CO2 angiography and CLI, 122 (95%) had diabetes mellitus. Of the patients without known diabetes mellitus at the begin of medical hospitalization, 6 (5%) had a glycated haemoglobin levels above 6.4%. The admitting renal insufficiency was: stage III 62%, stage IV 29% and stage V 9%(with residual excretion). All of them had a necrosis or ulceration in the foot area. Lower limb angiographic procedures with CO2 in diabetics, were performed diagnostically at 9 patients(7%) and diagnostically-interventional at 119 (93%). From the 128 angiography in 36 patients(28%) we did under CO2 at least one crural artery revascularization. Balloon dilatation of 2 crural vessels in the same intervention was performed in 24%. The anterior tibial artery was dilated 63 times, posterior 33 and fibular 49. Postinterventionall, 95% of patients didn't have any deterioration of the renal parameters. In 119 patients (92%) we avoid a major amputation.

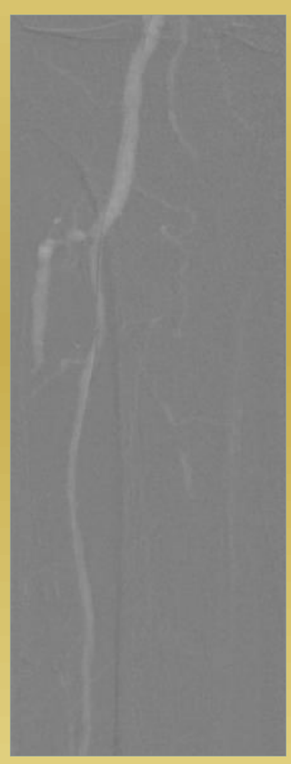
Conclusion:

CO2-guided angiographies are technically safe; reduce the need of a iodinated contrast medium(ICM) application. Early and late limb salvage can be achieved based on CO2 endovascular revascularisation of infrapopliteal arteries. This method can be an important treatment option in diabetic patients to prevent deterioration of renal function in patients with pre-existing renal insufficiency. These patients require quickly and low-risk (kidney-safe) lower limb imaging to help preserve the leg

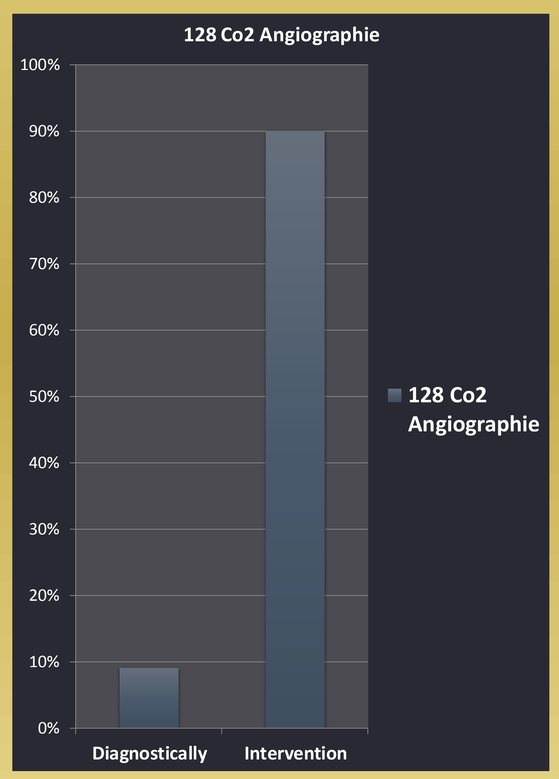


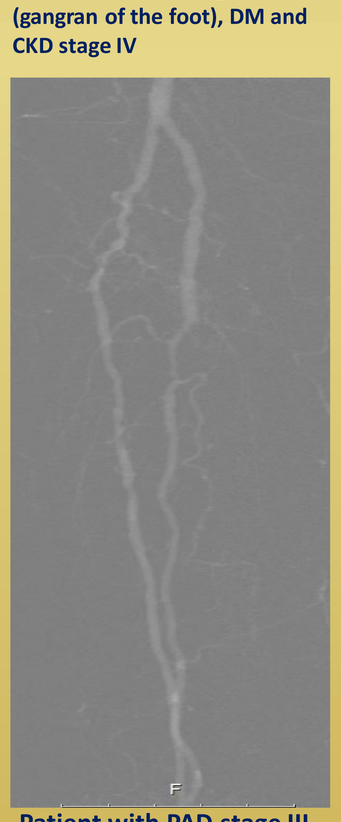
Patient with PAD stage IV (gangran of the foot), DM and CKD stage IV

CO2Angiographie, Ballondilatation of ATP

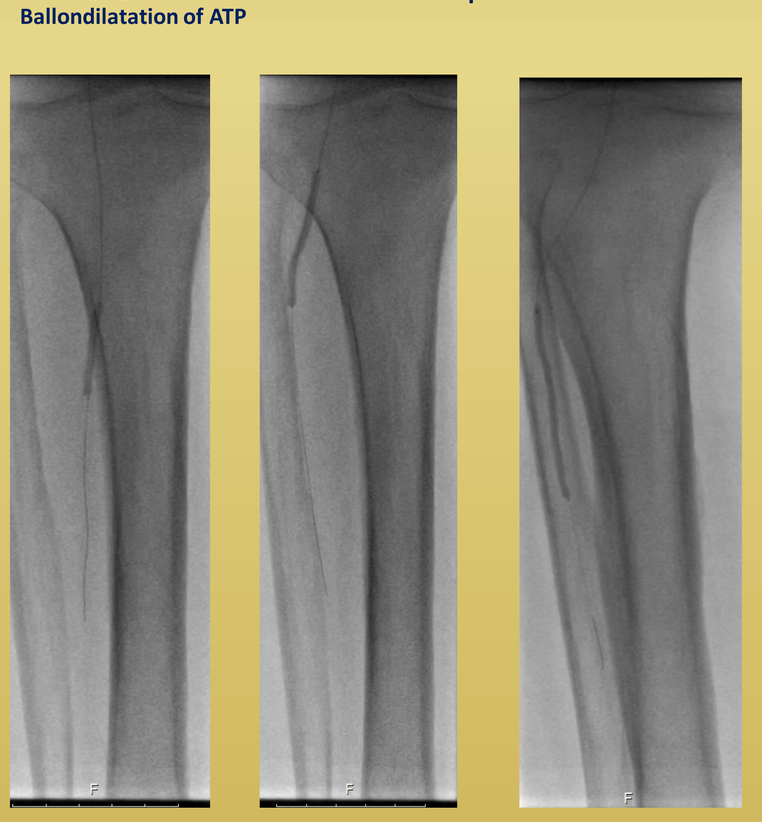


ATP postinterventional

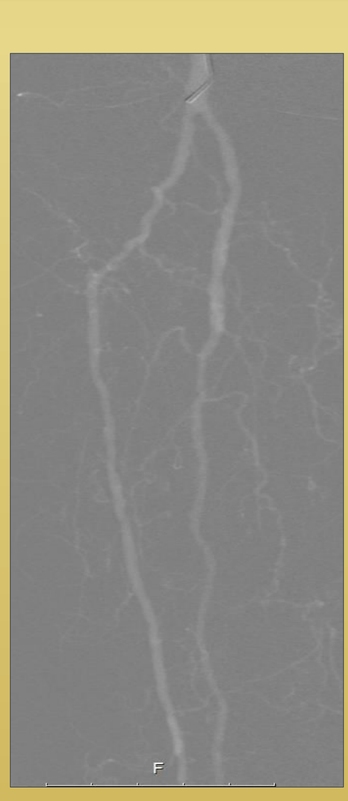




Patient with PAD stage III, CRI stage III and DM



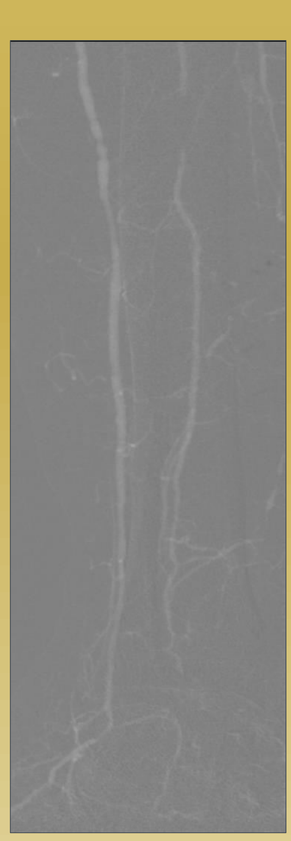
Ballondilatation of ATP and A. fib



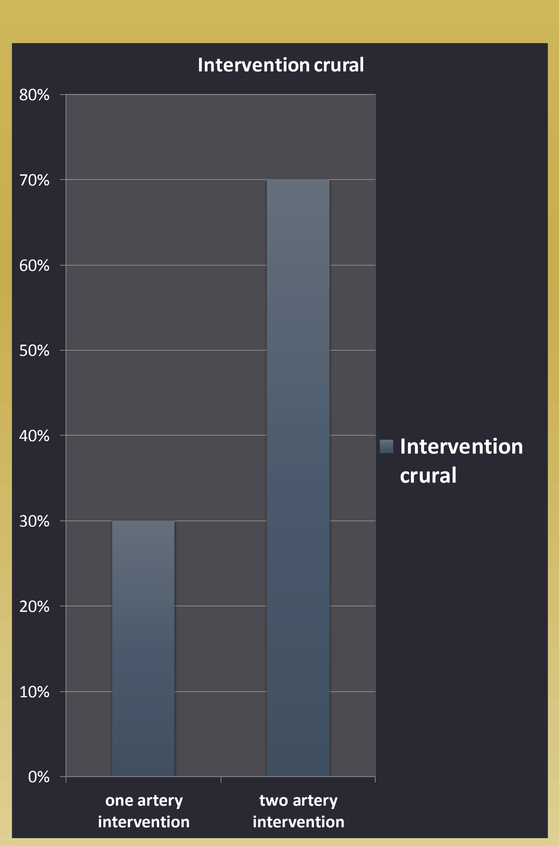
Postinterventional

Patient PAD stage IV(nekrosis lof two toes)

Ballondilatation of the distal ATA segment



Repermeabilisation of the ATA



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2. Stegemann E[1], Tegtmeier C[1], Bimpong-Buta NY[1], Sansone R[1], Uhlenbruch M[1] et all - Carbondioxide-Aided Angiography Decreases Contrast Volume and Preserves Kidney Function in Peripheral Vascular Interventions. Angiology. 2016 Oct;67(9):875-81. doi: 10.1177/0003319715614701. Epub 2015 Nov
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Useful Imaging to detect Macrophage Localization in the Media and Adventitia of the Abdominal Aortic Aneurysm Wall using Ex Vivo Superparamagnetic Iron Oxide-Enhanced Magnetic Resonance Imaging

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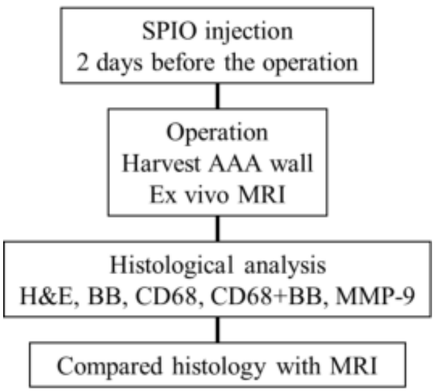
TOHOKU UNIVERSITY

▻ ▻ ▻ Introduction

- Macrophages in the aneurysmal wall play an important role in the pathogenesis of AAAs.
- Superparamagnetic iron oxide (SPIO) is a macrophage-specific contrast agent that results in negative enhancement on T2* weighted image (MRI).
- **This study aimed to visualize macrophage localization using SPIO-MRI in the media and adventitia of AAA wall.**

▻ ▻ ▻ Methods

SPIO (N=7)



Study flow diagram

Oct. 2016 to Nov. 2017
[Inclusion criteria]
elective open surgery of AAA, sufficient number of macrophages (mean ≧1/view/case)
[Exclusion criteria]
mycotic, inflammatory, urgent surgery

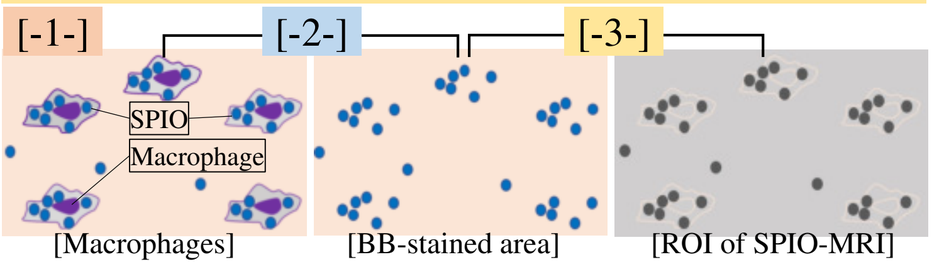
Also, 6 controls were accessed that background of iron is significantly small.

We indirectly compared the number of macrophages with MRI, using the BB-stained area by three steps evaluation as follows:

[-1-] If SPIO was endocytosed by macrophages.

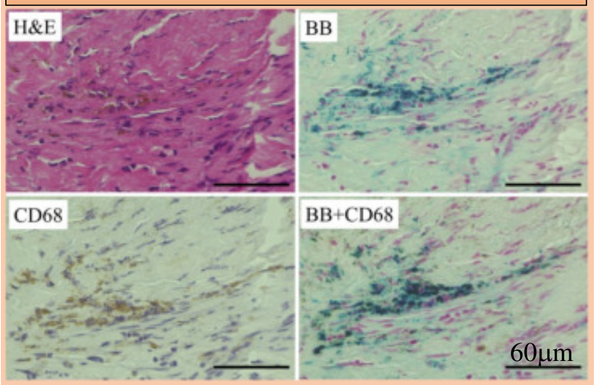
[-2-] Correspondence between the number of BB-stained macrophages and BB-stained area

[-3-] Correspondence between BB-stained area and ROI of MRI



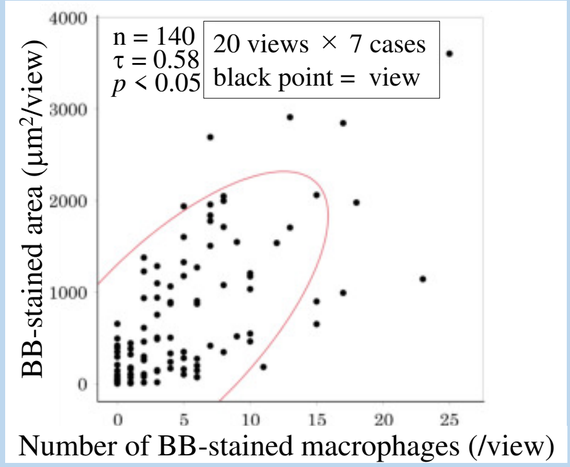
▻ ▻ ▻ Results

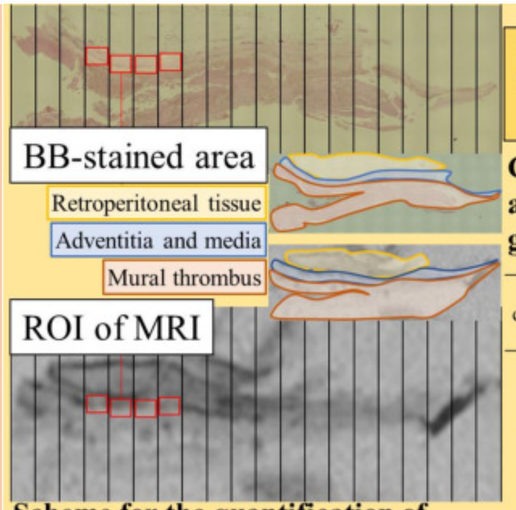
[-1-] SPIO was endocytosed by macrophages



Histological images (×400)

[-2-] BB-stained macrophages and areas were correlated



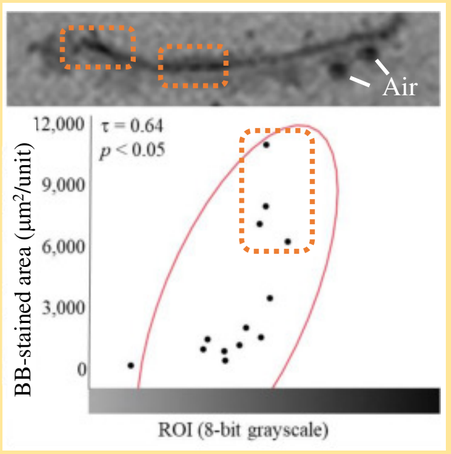


Scheme for the quantification of BB-staining and MRI

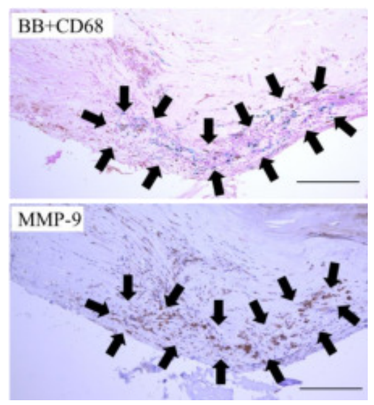
[-3-] BB-stained area and ROI of SPIO were correlated

Correlation between the BB-stained area and ROI for each case in the SPIO group

case	BB-stained area median (IQR) (μm²/unit)	ROI median (IQR)	τ	*P value*
1	817 (106–3,095)	189 (179–200)	0.58	**< 0.05**
2	933 (518–2,905)	132 (130–155)	0.10	0.62
3	2,278 (151–5,175)	161 (118–202)	0.65	**<0.05**
4	5,920 (3,389–11,195)	209 (205–220)	0.44	**<0.05**
5	1,090 (256–10,369)	126 (117–140)	0.50	**<0.05**
6	272 (58–1,246)	130 (115–141)	0.25	0.21
7	1,429 (816–6,408)	171 (159–180)	0.64	**<0.05**



BB-stained area and MRI (Case 7)
The BB-stained area and ROI of MRI were correlated. BB-stained area was negatively enhanced on T2*WI.



BB+CD68 and MMP-9
The distribution of Berlin Blue and MMP-9 were co-located. It may support that BB-stained area can visualize the degenerating area of the AAA wall.

▻ ▻ ▻ Conclusion

SPIO-MRI can visualize macrophage localization of the AAA wall. This technique may apply to in vivo MRI to detect the degenerating region of the AAA wall.

VISUALIZATION OF BLOOD FLOW IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE USING CONTRAST-ENHANCED ULTRASOUND PARTICLE IMAGE VELOCIMETRY

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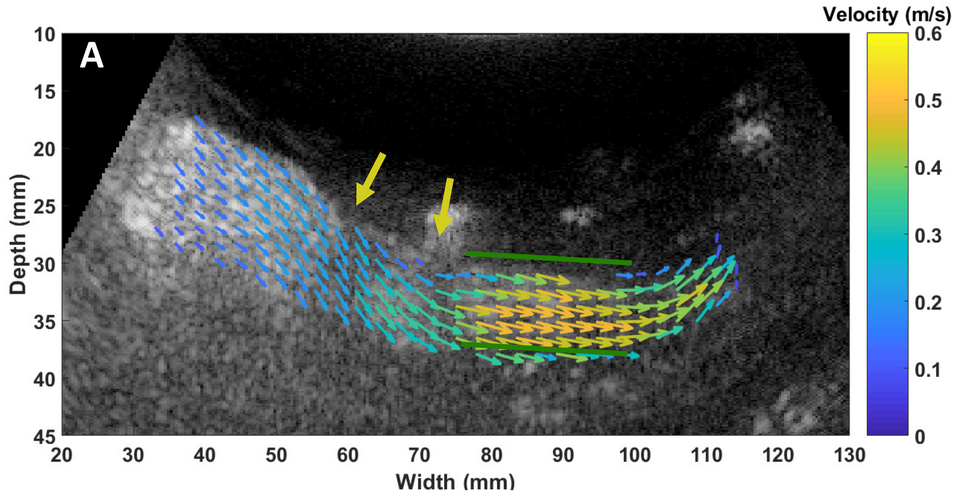
Purpose & Conclusion

Introduction - Visualization of blood flow patterns in the aorto-iliac region is challenging, due to the complex flow patterns that occur here. These flow patterns are clinically relevant as they can affect disease progression and stent patency. High-frame-rate (>1000 fps), contrast-enhanced ultrasound (HFR-CEUS) in combination with particle image velocimetry (PIV), or echoPIV, can be used to quantify blood flow real-time.

A previous feasibility study with echoPIV in healthy volunteers showed that accurate visualization of blood flow patterns is possible using this technique [1]. However, the clinical significance remains unknown.

Objective – To investigate the predictive value of echoPIV measurements on the clinical outcome of patients with peripheral arterial disease. First results of this study are reported.

Conclusion – First results show that 2-dimensional visualization of blood flow patterns is feasible with echoPIV in diseased aorto-iliac arteries, both in stented and non-stented regions. However, calcifications cause a significant signal drop in the HFR-CEUS images, making accurate PIV analysis in these particular areas challenging. EchoPIV has the potential to be of clinical value in the treatment and follow-up of peripheral arterial disease.



Methods & Results

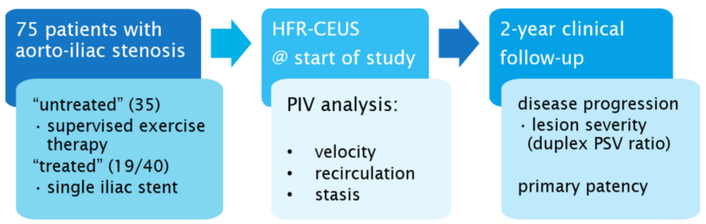


Figure 1: Overview of the patient study. SonoVue™ microbubbles were used as a contrast agent for the HFR-CEUS measurements.

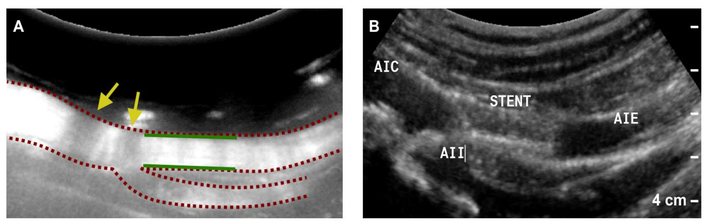


Figure 3A: Example of contrast visualization in a stented vessel. Red dotted lines indicate the vessel wall. Yellow arrows show locations with calcium and shadowing. Green lines represent the stent. B: B-mode reference image.

Figure 2: EchoPIV measurement performed by a vascular ultrasound technologist and technical physician.

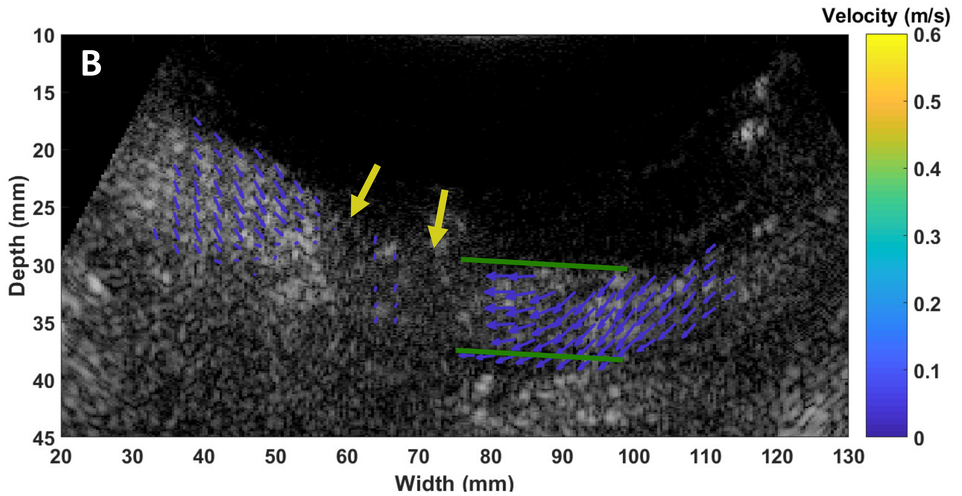


Figure 4: Visualization of blood flow with echoPIV in a stented vessel. No flow disturbances were detected in this patient. A: Systolic phase. Higher velocities were detected inside the stent (green lines). B: Diastolic phase. Backward flow is visible in the external iliac artery, while forward flow is present in the common iliac artery. PIV analysis could not be performed in the regions with shadowing caused by calcification (yellow arrows).

Computed angiography in assessment of critical occlusive carotid disease – ability to observe different types of pathology: critical stenosis, near-occlusion and local occlusion with distal collateral supply through atypical ascending pharyngeal artery

Moscow Regional Research and Clinical Institute (MONIKI

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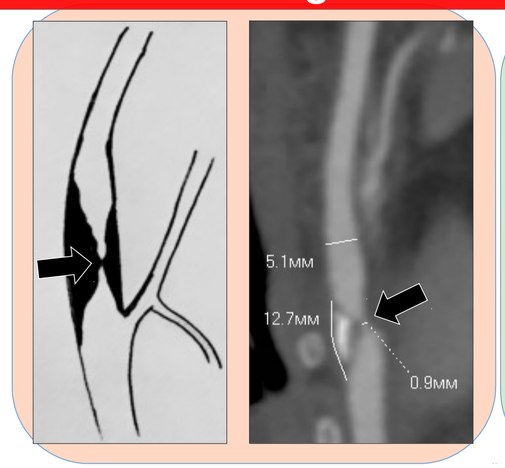
The pathologies corresponding to almost terminal occlusion of internal carotid artery (ICA) can vary a lot. Several types were described – critical stenosis, near-occlusion and local occlusion of the artery. Differential diagnosis between them could be achieved with assessment of upper artery segments

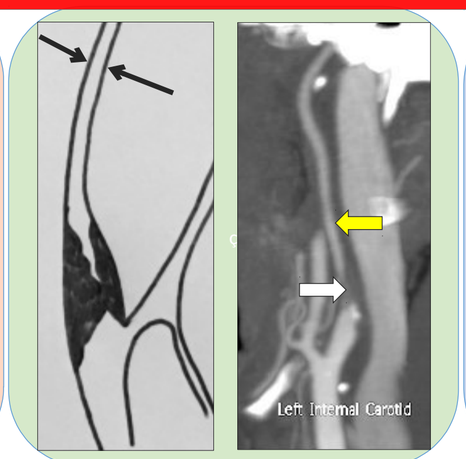
Aim of our study was to assess computed angiography (CTA) abilities in analysis of internal carotid artery critical atherosclerotic changes

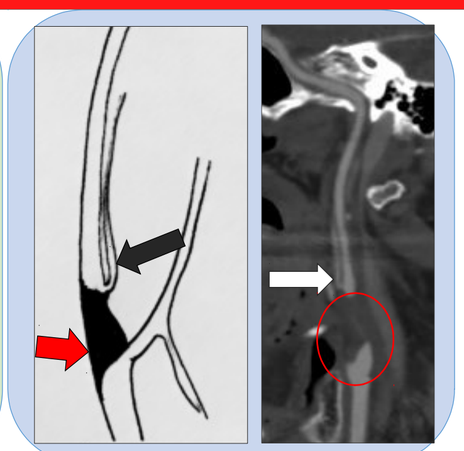
Methods: 2016-2018 years - 323 patients

- **Ultrasound and CTA (Philips iCT 256 slices) of brachiocephalic arteries.**
- **Stenosis more than 60%, critical stenosis, near-occlusion, local occlusion.**
- **Surgical treatment of ICA occlusive disease.**

Results: ICA stenosis up to critical level was observed in 104 patients (32,2% from all patients).



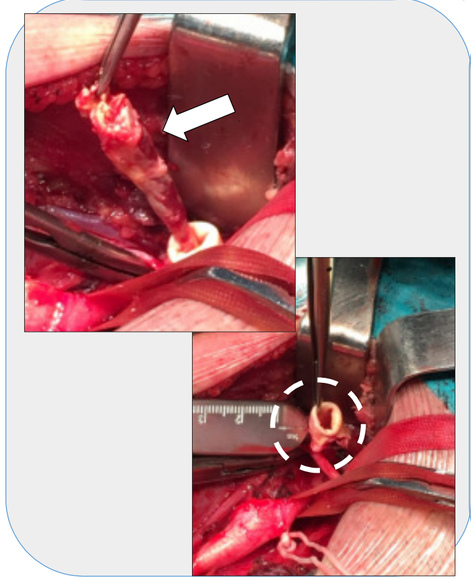


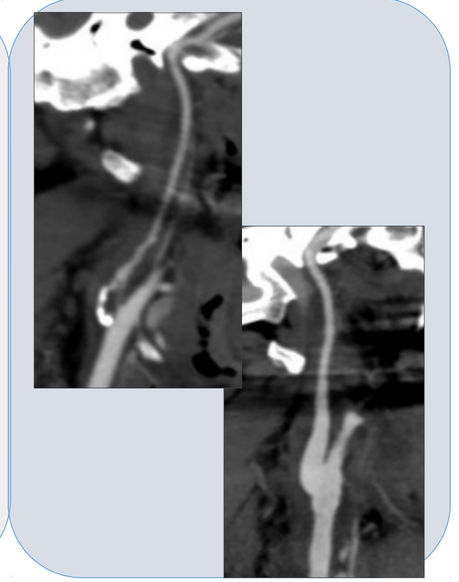


- **Critical narrowing of ICA at atherosclerotic lesion level and normal distal portion - critical stenosis (84 patients – 26%).**
- **Critical narrowing at atherosclerotic plague level and diffuse decrease of upper segments - near-occlusion (18 cases - 5,6%).**
- **Local occlusion of ICA in the bulb with distal circulation through atypical ascending pharyngeal artery (2 cases – 0,6%).**

No cases with congenital ICA hypoplasia were detected. In patients with diffuse decrease of upper ICA segments all elements of the circle of Wills were detected in 70% of cases.

During surgery CTA results were confirmed. Atherosclerotic plague extension was higher than observed at CTA approximately at 10 mm.





Conclusion: We can refer critical stenosis, near-occlusion and local occlusion to critical atherosclerotic ICA changes. The one should consider CTA limitations in differentiation of upper part of atherosclerotic plague. In majority of cases decrease in ICA diameter was associated with severe atherosclerotic involvement not with congenital condition of the circle of Wills.

Usefulness of 18F-FDG-PET/CT in therapy control of Inflammatory and Mycotic Aneurysms

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Background and aims

Mycotic aneurysms (MA) are infectious aneurysms of either the thoracic or the abdominal aorta, whereby the management of mycotic aneurysms carries a high mortality. The aim of the study was to evaluate the usefulness of positron emission tomography/computed tomography with 18F-fluorodeoxyglucose (PET/CT) in the long-term monitoring of patients with proven mycotic or inflammatory aneurysms.

Methods

Fifty-seven PET/CT were performed in 16 patients with 15 mycotic and one inflammatory aneurysm (seven patients were prospectively included into the study, nine retrospectively). We quantified the metabolic activity in all aneurysms by using maximum standardized uptake value (SUVmax). We performed clinical follow-up of all patients and recorded patient data at the time of imaging and at the latest clinical visit. Recorded data included laboratory values such as leucocyte count, results of microbiology and other diagnostic procedures, information on patient's treatment and general health condition.

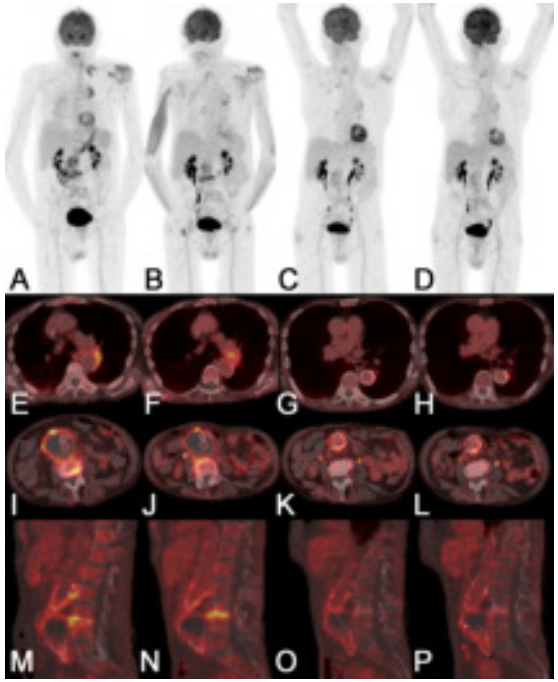
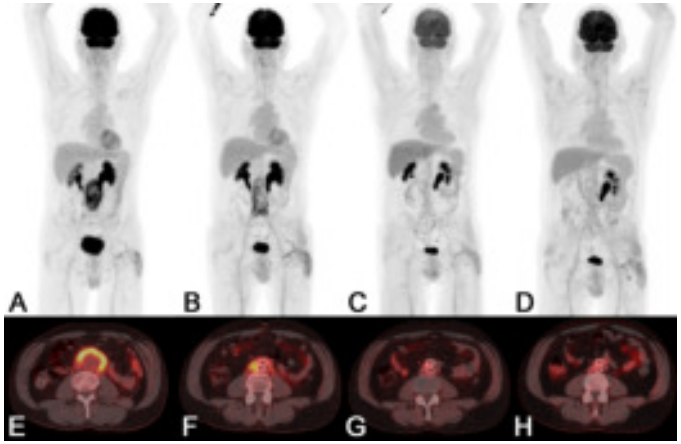


Figure 1: The PET/CT of a 82-year old male patient with known spondylodicitis and a known vascular graft infection (VGI) of the abdominal aorta (Maximum intensity reconstructions of PET (A) and fused PET/CT images (I, M)) showed a new focal FDG uptake in the wall of the thoracic aorta (E) in Sep 2017 (at that time the patient received antibiotic treatment, C-reactive protein (CRP) was 95 mg/L and white blood cell count (WBC) was 10.2/nl). Both readers rated the thoracic finding to be an mycotic "aneurysm" despite the fact that the vessel was not pathologically widened. The first PET/CT follow-up in Nov 2017 revealed a progression of the mycotic aneurysm both in size with stable increased FDG uptake (B, F); at the same time the FDG uptake of the spondylodicitis increased (N) while it partially decreased in the VGI (J); CRP decreased to 72 mg/L and WBC decreased to 8.9/nl.
Two further PET/CT follow-ups before (Apr 2018: C, G, K, O) and after (Jul 2018: D, H, L, P) termination of antibiotic treatment showed faint residual FDG uptake in all sites of infection. At the last clinical follow-up in Jan 2019 the patient was in good clinical condition with no signs for infection.

Results

Patients were clinically followed for median 1050 days (IQR 704-3187). Endovascular repair was performed in all patients. Two patients (13%) died because of reasons considered not to be directly linked to mycotic or inflammatory aneurysm (one due to gastrointestinal bleeding, the other due to endocarditis). At the last clinical visit, three patients (19%) were on continuous antibiotic or steroid treatment and clinical conditions were stable. One patients (6%) showed recurrent signs of infection at the last clinical visit, which were considered to be due to an infected pancreatic cyst. All other patients (n = 10, 63%) did not show any signs of infection at the last clinical visit and all were without antibiotic or antiinflammatory medication.
As compared to the course of C-reactive protein alone, PET/CT provided additional or altering information on the course of disease in at least 14 feasible comparisons (54%) in 11 patients (69%).
Median SUVmax measured in the aneurysms at the initial PET/CT was high (7.0 (interquartile range (IQR) 5.9-21.8) and lower at the last PET/CT prior to the end of antibiotic treatment (3.9 (IQR 2.7-6.8; n = 11) as well as in the PET/CT after the end of the treatment (3.9 (IQR 3.0-4.4; n = 6).

Figure 2: A 58-year old male patient presented with back pain and fever. The initial PET/CT examination in Feb 2015 (A and E) was performed after initiation of antibiotic treatment and showed strongly increased FDG-uptake in the wall of an abdominal aortic aneurysm, suggestive for a mycotic aneurysm, however, the the final diagnosis was inflammatory aneurysm caused by Morbus Ormond. At first PET/CT follow-up in Sep 2015 (B and F) (ongoing steroid treatment, no antibiotic treatment, after endovascular repair) a strong focal FDG-uptake was detected adjacent to the graft, which fulfilled all imaging criteria for a vascular graft infection Consecutive follow-up PET/CT in Mar 2016 and Dec 2017 showed very faintly (C, D, G and H) increased FDG-uptake, higher than background activity in the mediastinal blood. At the last clinical follow-up in Dec 2017 the patient was in good clinical condition with no signs for infection.



Conclusion

PET/CT adds additional information in therapy control of inflammatory and mycotic aneurysms, and may have contributed to an excellent clinical outcome in the present study. Of note, metabolic activity in the aneurysms remains slightly elevated after the end of antibiotic treatment.

Funding and acknowledgements
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The members of the VASGRA Cohort Study are (in alphabetical order): A. Anagnostopoulos, B. Hasse (PI), N. Eberhard, M. Hoffmann, L. Husmann, D. Jaeger, B. Ledergerber, Z. Rancic, C. Mestres, R. Zbinden, A. Zinkernagel.

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A protocol development study investigating the use of Hounsfield units from CT angiograms in patients presenting with Critical Limb Ischaemia

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INTRODUCTION

- Management of patients with peripheral arterial disease (PAD) and particularly critical limb ischaemia is challenging.
- Many patients require foot debridement or amputations.
- Identifying those ultimately requiring amputation is difficult.
- In this protocol development study we investigate the validity of Hounsfield Units (HUs) as a tissue quality assessment tool to enable future prediction of foot surgery.

AIMS

- Identify whether contrast causes significant changes in HU on CT Angiograms (CTAs).
- Compare methods of HU measurements and results from symptomatic and asymptomatic limbs.

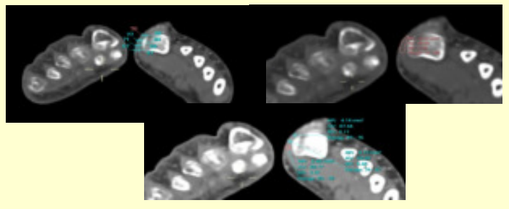
METHODS

- Pre and post-contrast CTA HUs from different tissue types were compared using a pre-determined protocol.
- HUs for key areas of clinical significance patients with unilateral severe PAD, were determined using three methods: Pixel, Large Region of Interest (LRoI) and Multiple RoI (MRoI).
- Clinically relevant areas were
  1. First MTPJ: common toe amputation site
  2. Dorsum and plantar foot: transmetatarsal amputation
  3. Heel: involvement often necessitates major amputation
  4. Calf: at the level of a below knee amputation
- Protocol repeatability and reproducibility were determined.
- HUs were compared from symptomatic and asymptomatic limbs.

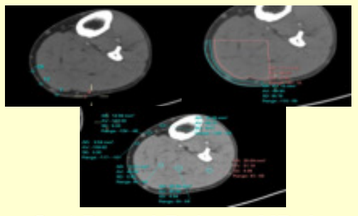
RESULTS

- CTAs from 15 patients were used, with 3 independent reviewers.
- Pre- and post-contrast HUs of bone, liver and deep muscles were different ($p<0.05$), superficial muscle and fat were not ($p>0.05$).
- Pixel and Multiple RoI methods were not consistently repeatable/reproducible.
- Large RoI measurements were reproducible for all areas excepting plantar region (ICC>0.7).
- Comparing symptomatic and asymptomatic limbs (RoI method), significant differences in heel were found ($p<0.05$).
- HU measurements for symptomatic heels were closer to 0 (water) than asymptomatic limbs.

Example measurements from clinically relevant anatomical areas



First MTPJ Pixel, LRoI and MRoI



Calf Pixel, LRoI and MRoI

Foot (Dorsum, Plantar, Heel) Pixel, LRoI and MRoI

DISCUSSION

- It is acceptable to use post-contrast CTAs to measure HUs of superficial muscle and soft tissue.
- Large RoI method is reproducible and may give an indication of tissue quality in PAD patients.
- Having established a valid protocol, further work will use large RoI method to determine any correlation with clinical outcomes.