CHALMERS
UNIVERSITY OF TECHNOLOGY

Hyperbaric Oxygen Acutely Increases Wound Circulation as Assessed by Fluorescent Angiography

Citation for the original published paper (version of record):
Sorice, S., Lundh, T., Gurtner, G. et al (2016)
Hyperbaric Oxygen Acutely Increases Wound Circulation as Assessed by Fluorescent Angiography
Journal of Vascular Surgery, 63(6): 100S-101S
http://dx.doi.org/10.1016/j.jvs.2016.03.112

(article starts on next page)

Table.

Factors cited for choosing academic practice	*Women, %*	*Men, %*
Research opportunities	47.9	32.4
Mentorship	54.2	32.4
Teaching opportunities	58.3	39.2
Diversity/complexity of case load	52.1	36.5
Ability to subspecialize	4.2	8.8
Larger call pool	8.3	16.9
Other	2.1	2

Author Disclosures: A. E. Allen: Nothing to disclose; **J. G. Carson:** Nothing to disclose; **J. A. Freischlag:** Nothing to disclose; **N. Hedayati:** Nothing to disclose; **M. Kwong:** Nothing to disclose.

IP147.

Modern Fixed Imaging Systems Reduce Radiation Exposure to Patients and Providers

Lars Stangenberg, MD, PhD[1], Fahad Shuja, MD[2], Martijn van der Bom, PhD[3], Martine H.G. van Alfen, MSc[4], Allen D. Hamdan, MD[2], Mark C. Wyers, MD[2], Raul J. Guzman, MD[2], Marc L. Schermerhorn, MD[2]. [1]Kantonsspital Baselland Liestal, Basel, Switzerland; [2]Beth Israel Deaconess Medical Center, Boston, Mass; [3]Philips Healthcare, Andover, Mass; [4]Philips Healthcare, Boston, Mass

Objectives: Endovascular therapy for aortic and peripheral interventions is increasingly becoming the first-line treatment modality for a wide array of disease processes. High-definition fluoroscopic imaging is required to perform these procedures, which are furthermore growing in complexity, resulting in high radiation exposure to patient and providers. This is of particular importance for training institutions as residents and fellows, despite instruction in ALARA principles tend, to have high radiation exposures. Recently, there was an upgrade of the fixed imaging system at our institution. We used this opportunity to compare radiation exposure to patients and providers before and after the upgrade.

Methods: We performed a retrospective analysis of consecutive EVAR and SFA interventions at our institution in the years 2013 to 2014 and created two cohorts: pre and post upgrade. We analyzed body mass index (BMI), fluoroscopy times (FT) and air kerma (AK), and then matched 1:1 based on fluoroscopy times as well as BMI. We also analyzed individual surgeons' badge readings. The fixed imaging system was Allura Xper FD20 and was upgraded to Allura Clarity FD20 (both Philips Healthcare).

Results: We identified a total of 76 EVARs (53 pre, 23 post) and 123 SFA interventions (99 pre, 24 post) yielding cohorts of 23 patients each for EVAR analysis and of 24 patients each for SFA analysis. Complete data are shown in the Table. There was a 52% reduction in AK for EVAR and 72% for SFA interventions, respectively ($P < 0.001$ for both). Five of six surgeons experienced a reduction in their average monthly badge readings after system upgrade (Fig), most notably the fellow from 512 to 109 mrem ($P = .0032$).

Conclusions: Aortic and peripheral endovascular interventions can be performed with reduced radiation exposure to patients and providers using modern fixed imaging systems. This is of particular importance in light of more complex procedures such as fenestrated and branched endografting that will require substantial fluoroscopy to perform.

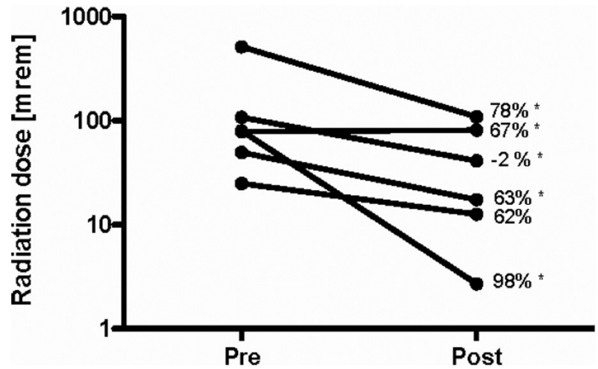

Fig. Surgeons' badge reading.

Table.

		No.	BMI	FT	Air kerma
EVAR, mean ± SD	Pre	23	25.8 ± 4.7	36.0 ± 19.3	1445 ± 798
BMI matched, mean ± SD	Post	23	25.7 ± 4.6	36.5 ± 11.9	767 ± 649
P value			.93	.61	.003
EVAR, mean ± SD	Pre	23	25.9 ± 3.5	38.1 ± 11.8	1594 ± 776
FT matched, mean ± SD	Post	23	25.7 ± 4.6	38.5 ± 11.9	767 ± 649
P value			.89	.92	<.001
SFA, mean ± SD	Pre	24	28.9 ± 6.0	22.3 ± 11.6	460 ± 369
BMI matched	Post	24	29.0 ± 6.0	31.1 ± 6.2	127 ± 72
P value			.99	.002	<.0001
SFA , mean ± SD	Pre	24	30.8 ± 7.8	31.1 ± 6.7	506 ± 394
FT matched, mean ± SD	Post	24	29.0 ± 6.0	31.1 ± 6.2	127 ± 72
P value			.36	.99	<.0001

BMI, Body mass index; *EVAR,* endovascular aneurysm repair; *FT,* fluoroscopy time; *SFA,* superficial femoral artery.

Author Disclosures: R. J. Guzman: Nothing to disclose; **A. D. Hamdan:** Nothing to disclose; **M. L. Schermerhorn:** AnGes, Cordis, and Endologix: consulting fees (eg, advisory boards); **F. Shuja:** Nothing to disclose; **L. Stangenberg:** Nothing to disclose; **M. H. G. van Alfen:** Philips Healthcare: salary; **M. van der Bom:** Philips: salary; **M. C. Wyers:** Nothing to disclose.

IP149.

Hyperbaric Oxygen Acutely Increases Wound Circulation as Assessed by Fluorescent Angiography

Sarah Cecilia Sorice, MD[1], Torbjörn Lundh, PhD[2], Geoffrey C. Gurtner, MD[1], Shannon Meyer, BS[3], Subhro Sen, MD[1], Robert Robertson, RN[3], Jeanie Parsley, PT[3], Venita Chandra, MD[1]. [1]Stanford University School of Medicine, Palo Alto, Calif; [2]Stanford University Hospital and Clinics, Stanford, Calif; [3]Stanford University Hospital and Clinics, Redwood City, Calif

Objectives: The efficacy of hyperbaric oxygen therapy (HBOT) to facilitate wound healing in diabetic lower

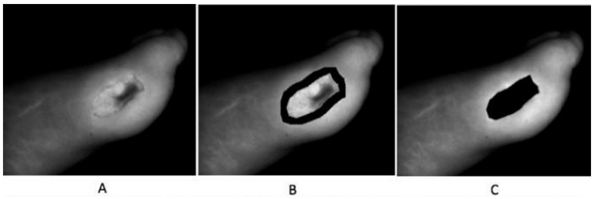

Fig. Sample masks (region of interest in black) used for image analysis. **A,** Unmarked wound. **B,** Periwound mask. **C,** Wound-bed mask.

extremity ulcers is well established. The exact mechanism of HBOT-mediated wound healing is unclear but is thought to relate to increased reactive oxygen species and reactive nitrogen species (ROS and RNS). ROS and RNS lead to many downstream affects that impact wound healing, including increased growth factors, diminished inflammatory responses, and improved neovascularization. The impact of HBOT, however, on tissue perfusion and flow is not known. The purpose of this pilot study was to ascertain the immediate effects of HBOT on the microvasculature of chronic wounds as assessed by fluorescent angiography.

Methods: Patients underwent fluorescent angiography at 4 different time points: immediately prior and immediately after the first and second HBOT treatments. Photo imaging with infrared camera began concurrently with the initiation of the IC-Green injection and lasted for 2.5 minutes. All videos were analyzed via MATLAB using a reference image at 65 seconds. The wound bed and the periwound area were then outlined as masks for the image analysis. The first and second derivatives were subsequently taken to define 4 time points of interest: the onset of inflow, the time of maximal inflow, the time of peak intensity, and the time of maximal outflow.

Results: Immediately after HBOT, there was evidence of increased flow. The time at which the maximum rate of arterial inflow and venous outflow was achieved occurred increasingly earlier in response to each HBOT. In addition, the difference in time at which the maximum rate of arterial inflow and venous outflow occur was shortened in response to cumulative treatments of HBOT, suggesting decreased overall time in the capillary bed.

Conclusions: This pilot study demonstrates that HBOT appears to immediately impact the microcirculation both on an inflow (arterial) and outflow (venous) level, and this effect also appears to be cumulative. If such a tissue response is in fact verified to be sustained in future study, this may better explain the benefit of HBOT and may expand the repertoire of diseases that may serve to benefit from this modality.

Author Disclosures: V. Chandra: Nothing to disclose; **G. C. Gurtner:** Nothing to disclose; **T. Lundh:** Nothing to disclose; **S. Meyer:** Nothing to disclose; **J. Parsley:** Nothing to disclose; **R. Robertson:** Nothing to disclose; **S. Sen:** Nothing to disclose; **S. Cecilia Sorice:** Nothing to disclose.

IP151.

Disparities in Patient Selection/Presentation for Initial Vascular Procedure Between Black and White Patients

Peter A. Soden, MD[1], Sara L. Zettervall, MD[1], Sarah E. Deery, MD[2], Kakra Hughes, MD[3], Michael Stoner, MD[4], Philip P. Goodney, MD, MS[5], Ageliki Vouyouka, MD[6], Marc L. Schermerhorn, MD[1]. [1]Beth Israel Deaconess Medical Center, Boston, Mass; [2]Massachusetts General Hospital, Boston, Mass; [3]Howard University and Hospital, Washington, D.C.; [4]University of Rochester, Rochester, NY; [5]Dartmouth-Hitchcock Medical Center, Lebanon, NH; [6]Mount Sinai Health System, New York, NY

Objectives: Prior literature has documented worse outcomes for black compared to white patients across a number of vascular procedures. However, there is a lack of data on when patients of difference races are selected to undergo revascularization. The aim of this study is to evaluate the severity of disease at time of initial major vascular intervention between black and white patients.

Methods: We identified black and white patients' initial procedure from all carotid (endarterectomy and stent), abdominal aortic aneurysm (AAA-EVAR and open repair), and peripheral artery (PAD-open and endovascular) revascularizations in the Vascular Quality Initiative from years 2009 to 2014. We excluded any patient with Hispanic ethnicity, suprainguinal-only endovascular intervention, and PAD procedures for asymptomatic disease. We then compared baseline characteristics and disease severity at presentation on a national and regional level.

Results: We identified 87,943 patients (9.3% black), with 37,388 carotid (4.7% black), 18,401 AAA (5.0% black), and 32,154 PAD revascularizations (17% black). Black patients were younger (carotid 67 vs 70 years, $P < .001$; AAA 70 vs 73, $P < .001$; PAD 65 vs 69, $P < .001$, respectively), more likely to be female (carotid 52% vs 39%, $P < .001$; AAA 32% vs 21%, $P < .001$; PAD 47% vs 36%, $P < .001$; Fig 1), diabetic (carotid 43% vs 29%, $P < .001$; AAA 46% vs 19%, $P < .001$; PAD 60% vs 57%, $P < .001$), and have congestive heart failure (carotid 16% vs 10%, $P < .001$; AAA 17% vs 10%, $P < .001$; PAD

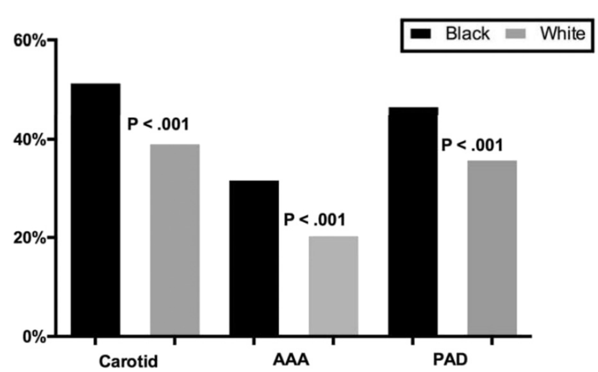

Fig 1. Proportion women across vascular interventions by race.