ISMRM Workshop on
Perfusion MRI:
From Head to Toe

04-07 March 2022
USC Health Sciences Conference Center
Los Angeles, CA, USA

Chair: Hanzang Lu, Ph.D.

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ISMRM Workshop on Perfusion MRI: From Head to Toe
USC Health Sciences Conference Center, Los Angeles, CA, USA

ORGANIZING COMMITTEE

Chair: Hanzhang Lu, Ph.D.
Johns Hopkins University, Baltimore, MD, USA

Udunna C. Anazodo, Ph.D.
Lawson Health Research Institute, London, ON, Canada

Laura C. Bell, Ph.D.
Barrow Neurological Institute, Phoenix, AZ, USA

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Danny JJ Wang, Ph.D.
University of Southern California, Los Angeles, CA, USA

Henk-Jan Mutsaerts, M.D., Ph.D. – *Trainee Observer*
Amsterdam University Medical Center, Amsterdam, The Netherlands

Xingfeng Shao, Ph.D. – *Trainee Observer*
University of Southern California, Los Angeles, CA, USA

ISMRM Workshop on Perfusion MRI: From Head to Toe

OVERVIEW

Perfusion MRI is increasingly used as a diagnostic marker in many diseases throughout the body, allowed by considerable technical advances that have been made in the past decade. Standardization efforts are also ongoing through several consortia. Notably, the last Perfusion workshop was held in 2012.

A significant development over the ten years since the last ISMRM perfusion workshop is the expansion of the field beyond the brain and into other organs of the body, with considerable activity in cancer applications (for instance, breast and prostate) and in the heart, but increasingly also in other tissues such as liver, kidneys, lung, pancreas, spleen, or muscle. Each body area presents its particular challenges, but there is also a strong common basis. With the theme "Perfusion MRI: From Head to Toe," the workshop strives to highlight the increasing breadth of the field and present a unifying perspective that will facilitate a transfer of expertise.

The purpose of the workshop is to bring together scientists and clinicians interested in technical research and application-oriented innovations in perfusion MRI. We anticipate this to facilitate the exchange to ideas, techniques, and data; to seek consensus on the acquisition, processing, analysis, and interpretation of perfusion MRI; to break new frontiers of research on perfusion and related physiological parameters; to encourage dialogue between academic investigators and industrial, pharmaceutical, and regulatory partners; and to foster collaborations among the broader research community.

TARGET AUDIENCE

This workshop is targeted toward scientists and clinicians interested in perfusion MRI techniques and basic science or clinical applications.

EDUCATIONAL OBJECTIVES

Upon completion of this activity, participants should be able to:
- Explain recent advances in ASL, DSC, and DCE perfusion techniques as well as the latest consensus in these fields;
- Describe advancements in clinical biomarker development;
- Describe current state of perfusion MRI in body, MSK, and extremities, in addition to that in the brain;
- State physiological parameters beyond CBF that can be measured with perfusion MRI techniques;
- List several new perfusion MRI techniques that are not based on ASL/DSC/DCE; and
- Explain the basic principles behind the Open-Source Initiative for Perfusion Imaging.

ISMRM Workshop on Perfusion MRI: From Head to Toe

SPEAKER UPLOAD INFORMATION (Audiovisual Preview): Please see program for additional times (breaks & lunch).

The audio-visual staff will be located in the back of the meeting room. Uploading presentations is available on a first-come, first-served basis. Hours are:

- Saturday, 05 March, to Monday, 07 March 2022, from 07:30-08:30

PROGRAM CREDIT DESIGNATION

The International Society for Magnetic Resonance in Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. This workshop does not offer CME credits.

CERTIFICATE OF PARTICIPATION

To obtain your Certificate of Participation for this workshop, log into the ISMRM membership portal at www.ismrm.org, then click on "My Meeting Evaluations" on the menu, select "View Meeting Evaluation" by the appropriate meeting name, and follow the instructions provided.

DECLARATION OF FINANCIAL RELATIONSHIPS

The ISMRM is committed to:

1. Ensuring balance, independence, objectivity, and scientific rigor in all Continuing Medical Education programs; and
2. Presenting CME activities that promote improvements or quality in healthcare and are independent of commercial interests.

Therefore, it is the policy of the Society that any person who has influence over the content of a program designated for *AMA PRA Category 1 Credits™* must disclose any real or apparent financial interest or other relationship (i.e., grants, research support, consulting fee, royalty, honorarium for promotional speakers' bureau, ownership interest) that they or their spouse/partner have had in the last 12 months with "any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients."

The ISMRM does not imply that such financial interests or relationships are inherently improper or that such interests or relationships would prevent the speaker or organizer from making an objective contribution. However, it is imperative that such financial interests or relationships be identified so that potential conflicts can be resolved before the program, and participants at the CME activity may have these facts fully disclosed in advance. It then remains for the audience to determine whether an individual's outside interests may reflect a possible bias in either the exposition or the conclusions presented.

Following are the names of all presenters, committee members, and other organizers who had influence upon program content. If individuals have disclosed real or apparent financial interests or relationships, the interests or relationships are described.

ISMRM Workshop on Perfusion MRI: From Head to Toe

SPEAKERS

Octavia Bane, Ph.D............................No relationships to disclose
Michael A. Chappell, D.Phil.............Royalty: Commercial Licensing of FMRIB Software Library; Oxford Neuroimaging Primers (Oxford University Press)
Seung Hong Choi, M.D., Ph.D........No relationships to disclose
Erin K. Englund, Ph.D.......................No relationships to disclose
Sean B. Fain, Ph.D............................Grant/Research Support: General Electric
Anahita Fathi Kazerooni, Ph.D..........No relationships to disclose
Luis Hernandez-Garcia, Ph.D...........No relationships to disclose
Jacobus F.A. Jansen, Ph.D ....No relationships to disclose
Dengrong Jiang, Ph.D.....................No relationships to disclose
William Kim, M.Sc............................No relationships to disclose
Ina N. Kompan, Ph.D.......................No relationships to disclose
Tushar Kotecha, Ph.D.,
   MBChB, MRCP(UK), Mpharm......No relationships to disclose
Thomas Lindner, Ph.D.....................No relationships to disclose
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Andre M. Paschoal, Ph.D.................No relationships to disclose
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Qin Qin, Ph.D...................................No relationships to disclose
Keith St. Lawrence, Ph.D. ....No relationships to disclose
Yuriko Suzuki, Ph.D. ....No relationships to disclose
Manuel Taso, Ph.D. ....Grant/Research Support: General Electric
Matthias J.P. van Osch, Ph.D...........Grant/Research Support: Philips
Peter van Zijl, Ph.D. ....Grant/Research Support, Speaking/Teaching Honoraria: Philips
Ze Wang, Ph.D. ....No relationships to disclose
Danny JJ Wang, Ph.D.......................Ownership Interest: Translational MRI, LLC
Ona Wu, Ph.D. ....Royalties: General Electric, Imaging Biometrics, Olea Medical

ORGANIZERS

Udunna C. Anazodo, Ph.D...............No relationships to disclose
Laura C. Bell, Ph.D...........................Employment: Genentech; Spouse Employed by Hyperfine
María A. Fernández-Seara, Ph.D......No relationships to disclose
Xavier G. Golay, Ph.D. ....Employment, Ownership Interest: Gold Standard Phantoms
Linda Knutsson, Ph.D.......................No relationships to disclose
C.C. Tchoyoson Lim, M.D.,
   MBBS, FRCR.............................Grant/Research Support: Hanalytic Biomind; Royalty: Iota MedTech
Xin Lou, M.D.....................................Please see online addendum

Hanzhang Lu, Ph.D...........................No relationships to disclose
Catherine A. Morgan, Ph.D...............No relationships to disclose
Henk-Jan Mutsaerts, M.D., Ph.D........No relationships to disclose
Krishna S. Nayak, Ph.D......................Please see online addendum
Xingfeng Shao, Ph.D.........................No relationships to disclose
Steven P. Sourbron, Ph.D..................No relationships to disclose
Danny JJ Wang, Ph.D.........................No relationships to disclose

MODERATORS

Laura C. Bell, Ph.D............................Employment: Genentech
Julie C. DiCarlo, Ph.D........................Royalty: General Electric
Zhaoyang Fan, Ph.D. ....No relationships to disclose
Patricia Figueiredo, D.Phil................No relationships to disclose
Xavier G. Golay, Ph.D........................Employment, Ownership Interest: Gold Standard Phantoms
Meher R. Juttukonda, Ph.D...............No relationships to disclose
Linda Knutsson, Ph.D.........................No relationships to disclose
Doris D.M. Lin, M.D., Ph.D.................No relationships to disclose
Peiying Liu, Ph.D. ....No relationships to disclose
Irene K. Mikkelsen, Ph.D...................No relationships to disclose
Aaron Oliver-Taylor, Ph.D..................Employment, Ownership Interest: Gold Standard Phantoms
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John C. Wood, M.D., Ph.D.................Grant/Research Support: Philips
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Lirong Yan, Ph.D................................No relationships to disclose
Xiaohong Joe Zhou, Ph.D.,
   DABR, DABMP............................No relationships to disclose

ISMRM STAFF

Gerardo Mopera................................No relationships to disclose
Melissa Simcox..................................No relationships to disclose

FUTURE ISMRM
ANNUAL MEETINGS

2022 | **LONDON**

2023 | **TORONTO**

2024 | **SINGAPORE**

2025 | **HONOLULU**

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ISMRM Workshop on Perfusion MRI: From Head to Toe

OPENING RECEPTION/DINNER: FRIDAY, 04 MARCH 2022	
18:00	Opening Reception/Dinner

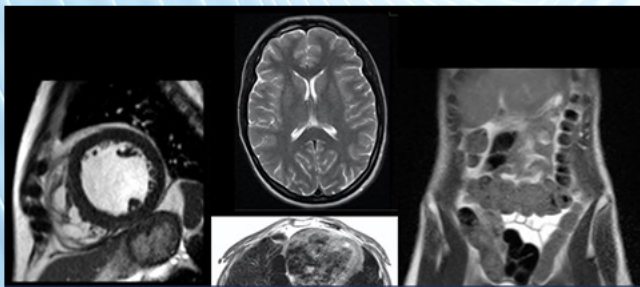| DAY 1: SATURDAY, 05 MARCH 2022		
07:30	Registration & Speaker Upload Available Breakfast	
08:30	Welcome & Conference Goals	Hanzhang Lu, Ph.D. Johns Hopkins University Baltimore, MD, USA
Session 1: New Frontiers in ASL		
Moderators: Xavier G. Golay, Ph.D. & Lirong Yan, Ph.D.		
08:45	*Multi-Delay ASL*	Michael A. Chappell, D.Phil University of Nottingham Nottingham, England, UK
09:00	*Recent Advances in ASL*	Luis Hernandez-Garcia, Ph.D. University of Michigan Ann Arbor, MI, USA
09:15	*Velocity-Selective ASL*	Qin Qin, Ph.D. Johns Hopkins University Baltimore, MD, USA
09:30	*Clinical ASL*	Thomas Lindner, Ph.D. University Medical Center Hamburg-Eppendorf Hamburg, Germany
09:45	*Body ASL*	Manuel Taso, Ph.D. Beth Israel Deaconess Medical Center Boston, MA, USA
10:00	Power Pitch Session	
	Simultaneous Hemodynamic & Structural Imaging of Ischemic Stroke with MR Fingerprinting ASL	Hongli Fan, B.Sc. Johns Hopkins University Baltimore, MD, USA

	Comparison of Image & Extracorporeal Derived Arterial Input Functions (AIF) for Quantitative DCE-MRI in Mice Using a Multimodal Cross-Validation Approach	Florian Gierse, M.D. Candidate University of Münster Münster, Germany
	CBF & CVR Quantification Using Multi- & Single-Delay Arterial Spin Labeling MRI	Koen Baas, M.Sc. Amsterdam UMC Amsterdam, The Netherlands
	Quantitative Transport Mapping (QTM) for Perfusion Quantification Without Arterial Input Function	Yi Wang, Ph.D. Cornell University New York, NY, USA
10:20	Break & Speaker Upload Available	
	Session 2: Hot Topics in DSC/DCE MRI	
	Moderators: Linda Knutsson, Ph.D. & Xiaohong Joe Zhou, Ph.D., DABR, DABMP	
10:45	*Consensus Efforts in the DSC/DCE Field Towards Becoming Quantitative Imaging Biomarkers*	Ona Wu, Ph.D. A.A. Martinos Center for Biomedical Imaging Charlestown, MA, USA
11:05	*Water Exchange with Contrast Agent*	Laura M. Parkes, Ph.D. University of Manchester Manchester, England, UK
11:25	*Pharmacokinetic Parameters at Dynamic Contrast-Enhanced MRI*	Seung Hong Choi, M.D., Ph.D. Seoul National University Hospital Seoul, South Korea
11:45	Power Pitch Session	
	Measuring Spinal Cord Blood Flow with Multi-Delay Pseudo Continuous Arterial Spinal Labeling (pCASL)	Qinyang Shou, B.Sc. University of Southern California Los Angeles, CA, USA
	Investigating Cerebral Perfusion with High Resolution Hyperpolarized [1-13C] Pyruvate MRI	Jasmine Y. Hu, B.Sc. University of California, San Francisco San Francisco, CA, USA

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	Free-Breathing Renal ASL Using Velocity-Selective Inversion Labeling & Multi-Echo-EPI Acquisition: Evaluation of Background Suppression & Retrospective Motion Correction	Dan Zhu, Ph.D. Johns Hopkins University Baltimore, MD, USA
	3D Inflow-Based Vascular-Space-Occupancy (iVASO) MRI: Optimization & Reproducibility	Chunming Gu, B.Sc. Johns Hopkins University Baltimore, MD, USA
	Multi-Delay ASL Perfusion Imaging: Impact of Modeling Dispersion & Interaction with Denoising Strategies	Sara Monteiro, M.Sc. University of Lisbon Lisbon, Portugal
	Tracking Treatment Response via DCE-MRI with an Optimal Temporal Sampling Method	Julie C. DiCarlo, Ph.D. University of Texas at Austin Austin, TX, USA
	Pseudo-Continuous Arterial Spin Labeling at 7T Using Tic-Tac-Toe Head Coil Design for Human Brain	Salem Alkhateeb, M.Sc. University of Pittsburgh Pittsburgh, PA, USA
	Rapid ASL-Based Non-Contrast Enhanced 4D MRA by Combining CAIPI & Self-Supervised vBM3D Model	Zhifeng Chen, Ph.D. University of Southern California Los Angeles, CA, USA
	Cerebrovascular Brain Age	Mathijs Dijssehof, M.Sc. Amsterdam UMC Amsterdam, The Netherlands
	Age-Dependent Cerebrospinal Fluid-Tissue Water Exchange Detected by Non-Invasive Magnetization Transfer Indirect Spin Labeling MRI	Anna Li, M.Sc. Kennedy Krieger Institute Baltimore, MD, USA
12:15	Group Photo & Lunch	
13:45	Group Activities	
17:30	Poster Sesssion (with light dinner & drinks)	
19:30	Adjourn	

2022 ISMRM **WORKSHOPS**

ISMRM Workshop on Low Field MRI
17-18 March 2022 | **VIRTUAL**

ISMRM Workshop on Ultra-High Field MR
19-22 March 2022 | Lisbon, Portugal

ISMRM Workshop on Magnetic Resonance Elastography
25-26 August 2022 | Berlin, Germany

ISMRM Workshop on Motion Detection & Correction
30 August-02 September 2022 | Oxford, England, UK

ISMRM Workshop on Neurofluids:
Anatomy, Physiology & Imaging
21-24 September 2022 | Rome, Italy

ISMRM Workshop on Diffusion MRI: From Research to Clinic
10-14 October 2022 | Amsterdam, The Netherlands

ISMRM Workshop on MRI of Neuromodulation: Target
Engagement, Neural Mechanism & Biomarker Development
17-19 October 2022 | Bethesda, MD, USA

ISMRM Workshop on MR Safety:
From Physics & Physiology to Policies & Practice
21-23 October 2022 | New York City, NY, USA

ISMRM Workshop on Perfusion MRI: From Head to Toe

DAY 2: SUNDAY, 06 MARCH 2022		
07:30	Registration & Speaker Upload Available Breakfast	
	Session 3: Perfusion Imaging & Applications in the Body	
	Moderators: Patricia Figuereido, D.Phil. & Peiying Liu, Ph.D.	
08:30	*Cardiac Perfusion*	Tushar Kotecha, Ph.D., MBChB, MRCP(UK), Mpharm Royal Free Hospital London, England, UK
08:50	*Liver & Pancreas ASL*	Petros Martirosian, Ph.D. University Hospital of Tübingen Tübingen, Germany
09:10	*Lung Perfusion MRI in Idiopathic Pulmonary Fibrosis*	Sean B. Fain, Ph.D. University of Iowa Iowa City, IA, USA
09:30	Power Pitch Session	
	Lung Perfusion at 0.55T Using ASL: Feasibility & Initial Results	Ziwei Zhao, M.Sc. University of Southern California Los Angeles, CA, USA
	Blood-Brain Barrier Permeability in Response to Caffeine Challenge	Zixuan Lin, Ph.D. Johns Hopkins University Baltimore, MD, USA
	Dynamics of Insulin Secretion & Pancreatic Bloodflow: A Simultaneous ASL Perfusion Imaging Hyperglycemic Clamp Study	Manuel Taso, Ph.D. Beth Israel Deconess Medical Center Boston, MA, USA
	Prostate Perfusion Mapping Using Advanced Velocity-Selective Pulse Trains: Choice of Cutoff Velocity & Comparison with Brain	Dapeng Liu, Ph.D. Johns Hopkins University Baltimore, MD, USA

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	Optimizing Arterial Spin Labeling (ASL) MRI in Rat Thoracic Spinal Cord at 9.4T	Seongtaek Lee, M.Sc. Marquette University & Medical College of Wisconsin Milwaukee, WI, USA
	Validation of Sinusoidal CO2 Respiratory Challenge for Perfusion MRI	Chau Vu, M.Sc. University of Southern California Los Angeles, CA, USA
	Blood Brain Barrier Permeability & White Matter Hyper-Intensities in APOE4 Carriers	Ararat Chakhoyan, Ph.D. University of Southern California Los Angeles, CA, USA
	The Effect of Label-Crossing the Blood-CSF Barrier on Partial Volume Correction: Source of Error or Opportunity for Quantification?	Leonie Petitclerc, M.Sc. Leiden University Medical Center Leiden, The Netherlands
	Establishing a Dual-Echo-Based CBV Threshold for Fractional Tumor Burden Mapping in Recurrent Glioblastoma	Aliya Anil, M.Sc. Barrow Neurological Institute Phoenix, AZ, USA
	Resting-State Based Cerebrovascular Reactivity (CVR) Mapping at High Spatial Resolutions	Lincoln Kartchner, M.S.E. University of Maryland, Baltimore Baltimore, MD, USA
	Impact of Fieldmap Susceptibility Distortion Correction on Perfusion Imaging by pCASL with Segmented 3D GRASE Readout	Catarina Domingos, M.Sc. Universidade de Lisboa Lisbon, Portugal
10:00	Break & Speaker Upload Available	

	Session 4: Perfusion Imaging & Applications in MSK & Extremities	
	Moderators: Meher R. Juttukonda, Ph.D. & Yi Wang, Ph.D.	
10:30	*Perfusion/Oxygenation in MSK*	Erin K. Englund, Ph.D. University of Colorado Aurora, CO, USA
10:50	*ASL MR Angiography*	Yuriko Suzuki, Ph.D. University of Oxford Oxford, England, UK

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11:10	*Perfusion of the Kidney*	Octavia Bane, Ph.D.
		    Icahn School of Medicine
		    at Mt. Sinai
		    New York, NY, USA

	Proffered Papers - Oral Session	

11:30	*Prognostic Potential of Multiparametric MRI in the Assessment of Renal Allografts Early After Transplantation*	Rebeca Echeverria-Chasco, M.Sc.
		    University of Navarra
		    Pamplona, Spain

11:40	*Differential Information of Perfusion & Diffusion MRI Following Traumatic Spinal Cord Injury in the Rat*	Briana Meyer, B.Sc.
		    Medical College of
		    Wisconsin
		    Milwaukee, WI, USA

11:50	*Assessment of Placental Perfusion in Normal & Hypertensive Pregnancies Using pCASL at 3T: Preliminary Findings*	Yiming Wang, M.Sc.
		    University of Texas
		    Southwestern Medical
		    Center
		    Dallas, TX, USA

12:00	Lunch & Speaker Upload Available	
13:30	Poster Session	
15:30	Break & Speaker Upload Available	
Session 5: Physiological Imaging Beyond Blood Flow		
Moderators: Aaron Oliver-Taylor, Ph.D. & John C. Wood, M.D., Ph.D.		

16:00	*Oxygenation Techniques*	Dengrong Jiang, Ph.D.
		    Johns Hopkins University
		    Baltimore, MD, USA

16:20	*Non-Contrast-Based BBB Techniques*	Yolanda L.A. Ohene, Ph.D.
		    University of Manchester
		    Manchester, England, UK

16:40	*IVIM Perfusion Techniques*	Jacobus F.A. Jansen, Ph.D.
		    Maastricht University
		    Medical Centre
		    Maastricht, The
		    Netherlands

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	Proffered Papers - Oral Session	

17:00	*Concurrent Laminar CBF, CBV, T2 BOLD & CMRO2 fMRI at 7T in Human Primary Motor Cortex*	Xingfeng Shao, Ph.D.
		    University of Southern California
		    Los Angeles, CA, USA

17:10	*Quantitative Cerebrovascular Reactivity MRI in Mice Using Acetazolamide Challenge*	Zhiliang Wei, Ph.D.
		    Johns Hopkins University
		    Baltimore, MD, USA

17:20	*"Reverse Perfusion" Imaging of the Cerebral Venous System with Displacement Spectrum Imaging (DiSpect)*	Ekin Karasan, B.Sc.
		    University of California, Berkeley
		    Berkeley, CA, USA

17:30	Adjourn	
18:00	Dinner	
	DAY 3: MONDAY, 07 MARCH 2022	
07:30	Registration & Speaker Upload Available Breakfast	
	Session 6: Avant-Garde Techniques in Perfusion Imaging	
	Moderators: Laura C. Bell, Ph.D. & Zhaoyang Fan, Ph.D.	

08:30	*Sugar as a Contrast Agent in Imaging of Perfusion in Tissue & CSF*	Peter van Zijl, Ph.D.
		    Johns Hopkins University
		    Baltimore, MD, USA

08:50	*AI in Perfusion MRI*	Ze Wang, Ph.D.
		    University of Maryland
		    Baltimore, MD, USA

09:10	*PET/MR in Perfusion/CMRO2*	Keith St. Lawrence, Ph.D.
		    Lawson Health Research Institute
		    London, ON, Canada

	Proffered Papers - Oral Session	

09:30	*MR Multitasking-Based Dynamic Imaging for Cerebrovascular Evaluation (MT-DICE): Development & Feasibility Study on Brain Cancer*	Zhehao Hu, Ph.D.
		    University of Southern California
		    Los Angeles, CA, USA

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09:40	*Quantitative IVIM Perfusion at Normocapnia, Hypercapnia, Acute Stroke & Stroke Treatment Predicts Neutron Capture Microspheres*	Mirabai Liu, B.S. University of Chicago Chicago, IL, USA
09:50	*Amyloid Burden & Vascular Risk Factors Correlate with Regional Cerebral Blood Flow in a Cognitively Unimpaired Population*	Beatriz Padrela, M.Sc. Amsterdam UMC Amsterdam, The Netherlands
10:00	Break & Speaker Upload Available	
	Session 7: Emerging Techniques & Applications	
	Moderators: Irene K. Mikkelsen, Ph.D. & Jiadi Xu, Ph.D.	
10:30	*Perfusion in COVID*	William Kim, M.Sc. Sunnybrook Health Sciences Centre Toronto, ON, Canada
10:50	*Emerging Methods in ASL Perfusion*	Matthias J.P. van Osch, Ph.D. Leiden University Medical Center Leiden, The Netherlands
11:10	*High-field & Low-Field Perfusion MRI*	Danny JJ Wang, Ph.D. University of Southern California Los Angeles, CA, USA
	Proffered Papers - Oral Session	
11:30	*Fast Whole-Brain MR Imaging of Dynamic Susceptibility Contrast Changes in the CSF (cDSC MRI)*	Di Cao, B.Sc. Johns Hopkins University Baltimore, MD, USA
11:40	*Assessment of Choroid Plexus Perfusion & the Blood-CSF Barrier with Multi-Post Label Delay Arterial Spin Labeling MRI & Vasodilation*	Yufei Zhu, B.Sc. University of California, Davis Davis, CA, USA
11:50	*The Origins of BOLD Signal Fluctuations in Non-Gas-Inhalation CVR Mapping: An fMRI-EEG Study*	Parimal P. Joshi, M.Sc. University of Maryland, Baltimore Baltimore, MD, USA
12:00	Lunch & Speaker Upload Available	

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Session 8: OSIPI Updates		
Moderators: *Julie C. DiCarlo, Ph.D. & Doris D.M. Lin, M.D., Ph.D.*		
13:30	*Results of the OSIPI Challenges (ASL)*	Andre M. Paschoal, Ph.D. University of Sao Paulo Sao Paulo, Brazil
13:45	*OSIPI-DCE Challenge: Preliminary Results*	Anahita Fathi Kazerooni, Ph.D. University of Pennsylvania Philadelphia, PA, USA
14:00	*DCE/DSC Perfusion Imaging Lexicon & Reporting Framework*	Ina N. Kompan, Ph.D. German Cancer Research Center (DKFZ) Heidelberg, Germany
14:15	*OSIPI Inventory of ASL Pipelines*	Jan Petr, Ph.D. Helmholtz-Zentrum Dresden Rossendorf Dresden, Germany
Closing Session		
14:30	Closing Remarks	
14:45	Adjournment	

ISMRM Workshop on Perfusion MRI: From Head to Toe

ON-SITE POSTERS

Poster	Title	Author
1	*Simultaneous Hemodynamic & Structural Imaging of Ischemic Stroke with MR Fingerprinting ASL*	Hongli Fan, B.Sc. Johns Hopkins University Baltimore, MD, USA
2	*Comparison of Image & Extracorporeal Derived Arterial Input Functions (AIF) for Quantitative DCE-MRI in Mice Using a Multimodal Cross-Validation Approach*	Florian Gierse, M.D. Candidate University of Münster Münster, Germany
3	*CBF & CVR Quantification Using Multi- & Single-Delay Arterial Spin Labeling MRI*	Koen Baas, M.Sc. Amsterdam UMC Amsterdam, The Netherlands
4	*Quantitative Transport Mapping (QTM) for Perfusion Quantification Without Arterial Input Function*	Yi Wang, Ph.D. Cornell University New York, NY, USA
5	*Measuring Spinal Cord Blood Flow with Multi-Delay Pseudo Continuous Arterial Spinal Labeling (pCASL)*	Qinyang Shou, B.Sc. University of Southern California Los Angeles, CA, USA
6	*Investigating Cerebral Perfusion with High Resolution Hyperpolarized [1-13C] Pyruvate MRI*	Jasmine Y. Hu, B.Sc. University of California, San Francisco San Francisco, CA, USA
7	*Free-Breathing Renal ASL Using Velocity-Selective Inversion Labeling & Multi-Echo-EPI Acquisition: Evaluation of Background Suppression & Retrospective Motion Correction*	Dan Zhu, Ph.D. Johns Hopkins University Baltimore, MD, USA
8	*3D Inflow-Based Vascular-Space-Occupancy (iVASO) MRI: Optimization & Reproducibility*	Chunming Gu, B.Sc. Johns Hopkins University Baltimore, MD, USA
9	*Multi-Delay ASL Perfusion Imaging: Impact of Modeling Dispersion & Interaction with Denoising Strategies*	Sara Monteiro, M.Sc. University of Lisbon Lisbon, Portugal
10	*Tracking Treatment Response via DCE-MRI with an Optimal Temporal Sampling Method*	Julie C. DiCarlo, Ph.D. University of Texas at Austin Austin, TX, USA
11	*Pseudo-Continuous Arterial Spin Labeling at 7T Using Tic-Tac-Toe Head Coil Design for Human Brain*	Salem Alkhateeb, M.Sc. University of Pittsburgh Pittsburgh, PA, USA
12	*Rapid ASL-Based Non-Contrast Enhanced 4D MRA by Combining CAIPI & Self-Supervised vBM3D Model*	Zhifeng Chen, Ph.D. University of Southern California Los Angeles, CA, USA
13	*Cerebrovascular Brain Age*	Mathijs Dijssehof, M.Sc. Amsterdam UMC Amsterdam, The Netherlands

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Poster	Title	Author
14	*Age-Dependent Cerebrospinal Fluid-Tissue Water Exchange Detected by Non-Invasive Magnetization Transfer Indirect Spin Labeling MRI*	Anna Li, M.Sc. Kennedy Krieger Institute Baltimore, MD, USA
15	*Diffusion & Perfusion MRI Analysis in Breast Cancer: Intravoxel Incoherent Motion (IVIM) Versus Compartmental Tracer Kinetic Model at 1.5 T*	Nicolas Moyano Brandi, B.E. Fundacion Argentina para el Desarrollo en Salud Mendoza, Argentina
16	*Improving the Interpretation of Cerebral Perfusion MRI by Cross-Validation with Whole-Brain Histological Slices in a Rat Model*	Bram Callewaert, M.Sc. Katholieke Universiteit Leuven Leuven, Belgium
17	*APOE Genotype-Related Cortical & Subcortical Differences in Cerebrovascular Hemodynamics*	Nikou L. Damestani, M.Sc. A.A. Martinos Center for Biomedical Imaging Charlestown, MA, USA
18	*GRASPnet: Spatiotemporal Deep Learning Reconstruction of Golden-Angle Radial Data for Free-Breathing Dynamic Contrast-Enhanced MRI*	Ramin Jafari, Ph.D. Memorial Sloan Kettering Cancer Center New York, NY, USA
19	*DCE-DRONE: Robust Perfusion MRI Parameter Estimation Using a DRONE Neural Network*	Soudabeh Kargar, Ph.D. Memorial Sloan Kettering Cancer Center New York, NY, USA
20	*A Three-Dimensional Convolutional Neural Network in ASL with Reduced Number of Inversion Times or Averages*	Donghoon Kim, M.Sc. University of California, Davis Davis, CA, USA
21	*T2-Oximetry-Based Cerebral Venous Oxygenation Mapping: Comparing Fourier-Transform-Based & Conventional Velocity-Selective Pulse Trains for Venous Isolation Preparation*	Wenbo Li, Ph.D. Johns Hopkins University Baltimore, MD, USA
22	*Augmentation of Perfusion with Simultaneous Vasodilator & Inotropic Agents in Experimental Acute Middle Cerebral Artery Occlusion*	Mirabai Liu, B.S. University of Chicago Chicago, IL, USA
23	*A Simple Measure for Quality Assessment of DCE for BBB Leakage Detection*	Irene Klærke Mikkelsen, Ph.D. Århus University Århus, Denmark
24	*A Vortical Phantom for ASL Perfusion MRI*	Aaron Oliver-Taylor, Ph.D. Gold Standard Phantoms London, England, UK
25	*Feasibility of Arterial Spin Labeling to Assess Blood-Brain Barrier Permeability in Clinical Environment: Application to Multiple Sclerosis Patients*	Andre M. Paschoal, Ph.D. University of Sao Paulo Sao Paulo, Brazil
26	*QTM Quantifies Velocity of Tumor Vasculature in Gliomas*	Dominick Romano, B.Sc. Cornell University New York, NY, USA

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27	*Impact of Breathing-Induced Off-Resonance on Labeling Efficiency in Renal Arterial Spin Labeling*	Manuel Taso, Ph.D. Beth Israel Deconess Medical Center Boston, MA, USA
28	*Noninvasive Prediction of Lung Shunting Fraction for Yttrium-90 Treatment of Hepatocellular Carcinoma Using Dynamic Contrast Enhanced MRI with Kinetic Modeling & Quantitative Transport Mapping (QTM)*	Qihao Zhang, B.Sc. Cornell University New York, NY, USA
29	*Lung Perfusion at 0.55T Using ASL: Feasibility & Initial Results*	Ziwei Zhao, M.Sc. University of Southern California Los Angeles, CA, USA
30	*Blood-Brain Barrier Permeability in Response to Caffeine Challenge*	Zixuan Lin, Ph.D. Johns Hopkins University Baltimore, MD, USA
31	*Dynamics of Insulin Secretion & Pancreatic Bloodflow: A Simultaneous ASL Perfusion Imaging Hyperglycemic Clamp Study*	Manuel Taso, Ph.D. Beth Israel Deconess Medical Center Boston, MA, USA
32	*Prostate Perfusion Mapping Using Advanced Velocity-Selective Pulse Trains: Choice of Cutoff Velocity & Comparison with Brain*	Dapeng Liu, Ph.D. Johns Hopkins University Baltimore, MD, USA
33	*Optimizing Arterial Spin Labeling (ASL) MRI in Rat Thoracic Spinal Cord at 9.4T*	Seongtaek Lee, M.Sc. Marquette University & Medical College of Wisconsin Milwaukee, WI, USA
34	*Validation of Sinusoidal CO2 Respiratory Challenge for Perfusion MRI*	Chau Vu, M.Sc. University of Southern California Los Angeles, CA, USA
35	*Blood Brain Barrier Permeability & White Matter Hyper-Intensities in APOE4 Carriers*	Ararat Chakhoyan, Ph.D. University of Southern California Los Angeles, CA, USA
36	*The Effect of Label-Crossing the Blood-CSF Barrier on Partial Volume Correction: Source of Error or Opportunity for Quantification?*	Leonie Petitclerc, M.Sc. Leiden University Medical Center Leiden, The Netherlands
37	*Establishing a Dual-Echo-Based CBV Threshold for Fractional Tumor Burden Mapping in Recurrent Glioblastoma*	Aliya Anil, M.Sc. Barrow Neurological Institute Phoenix, AZ, USA
38	*Resting-State Based Cerebrovascular Reactivity (CVR) Mapping at High Spatial Resolutions*	Lincoln Kartchner, M.S.E. University of Maryland, Baltimore Baltimore, MD, USA
39	*Impact of Fieldmap Susceptibility Distortion Correction on Perfusion Imaging by pCASL with Segmented 3D GRASE Readout*	Catarina Domingos, M.Sc. Universidade de Lisboa Lisbon, Portugal

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40	*Towards Vendor-Independent Velocity-Selective Inversion Arterial Spin Labeling for Breast Imaging*	Mareike A. Buck, M.Sc. Fraunhofer Institute for Digital Medicine MEVIS Bremen, Germany
41	*Dual-Subspace dMRA: Synergistic Combination of Golden-Angle Radial Acquisition & Dual-Constraint Subspace Modeling Reconstruction for Rapid ASL-Based Dynamic MRA with High Spatiotemporal Resolution*	Zhifeng Chen, Ph.D. University of Southern California Los Angeles, CA, USA
42	*Multi-Delay pCASL with Optimal Post-Labeling Delay Times by Incorporating ATT Probability Distribution Improves the Accuracy of CBF Measurement*	Yining He, M.Sc. University of Southern California Los Angeles, CA, USA
43	*Assessment of Cerebrovascular Reactivity Across Vascular Scales as a Biomarker of Cognitive Decline*	Elizabeth Keeling, B.Sc. Barrow Neurological Institute Phoenix, AZ, USA
44	*Motion-Free IVIM Quantification Method Using Spatial Transformer Network & Convolutional Neural Network*	Wonil Lee, M.S. Korea Advanced Institute of Science & Technology Daejeon, South Korea
45	*Cerebrospinal Fluid-Tissue Exchange Revealed by Phase Alternate Labeling with Null Recovery MRI*	Anna Li, M.Sc. Kennedy Krieger Institute Baltimore, MD, USA
46	*Increased Permeability of Blood-Brain Barrier in the Aging Human Brain: A Multi-TE ASL Study*	Amnah Mahroo, M.Sc. Fraunhofer Institute for Digital Medicine MEVIS Bremen, Germany
47	*There Is Nothing like a Free Lunch, or Can T1w-MPRAGE Be Used to Visualize the Neck Arteries?*	Wibeke Nordhøy, Ph.D. Oslo University Hospital Oslo, Norway
48	*Analysis of Microvascularization Through IVIM & a Conventional Comportamental Model in Prostate Cancer*	Trinidad González Padin, Undergraduate Fundacion Argentina para el Desarrollo en Salud Mendoza, Argentina
49	*Blood-Brain Barrier Water Exchange Measurements Using FEXI: Do T1 & T2 Relaxation Effects Matter?*	Elizabeth Powell, Ph.D. University College London London, England, UK
50	*Tracer Kinetic Field Theory: Towards Spatiotemporal Recovery in Two Compartment Systems*	Eve Shalom, M.Sc. University of Leeds Leeds, England, UK
51	*Rapid Parameter Estimation for Combined Spin & Gradient Echo (SAGE) Imaging*	Nicholas Sisco, Ph.D. Barrow Neurological Institute Phoenix, AZ, USA

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52	*Open Science Initiative for Perfusion Imaging (OSIPI): Arterial Spin Labeling Imaging & Analysis Lexicon & Reporting Recommendations*	Yuriko Suzuki, Ph.D.
		   University of Oxford
		   Oxford, England, UK

53	*Estimating Perfusion & Permeability from DCE MRI Using Deep Neural Network with Training Dataset-Generated Based on Vasculature Construction & Computational Fluid Dynamics Tracer Propagation Simulation*	Qihao Zhang, B.Sc.
		   Cornell University
		   New York, NY, USA

54	*Dispersion & Delay of the Arterial Input Function in a Branching Vessel Network*	Qihao Zhang, B.Sc.
		   Cornell University
		   New York, NY, USA

55	*Enhanced Superselective Pseudo-Continuous Arterial Spin Labeling Using Parallel Transmission with B1 Phase Shimming at 7T*	Chenyang Zhao, M.Sc.
		   University of Southern California
		   Los Angeles, CA, USA

56	*Perfusion Elevated: Cerebrovascular Reactivity Measurements Using PET/MRI*	Moss Zhao, D.Phil.
		   Stanford University
		   Stanford, CA, USA

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VIRTUAL ABSTRACTS
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Site- & Scanner-Dependence of Estimated Renal Blood Flow Measured with Phase Contrast & Dynamic Contrast-Enhanced MRI: A Two-Site Comparison in Patients with Type-2 Diabetes	Bashair Alhummiany, M.Sc.
	    Universtiy of Leeds
	    Leeds, England, UK

Arterial Spin Labelling in the Setting of Acute Stroke: Development of a Clinical Imaging Protocol	Manojkumar Balakrishnan, M.Appl.Sc.
	    University of Saskatchewan
	    Saskatoon, SK, Canada

ASL Reproducibility Between and Within Scanners & Scan Sessions: A Systematic Review	Soetkin Beun, M.Sc.
	    Ghent University
	    Ghent, Belgium

Assessing the Influence of ECG-Triggering & Respiration Strategy on ASL-Based Renal Perfusion Quantification: Preliminary Results	Irène Brumer, M.Sc.
	    Heidelberg University
	    Mannheim, Germany

Synthetic Kidney ASL Data for Evaluation & Comparison of Processing Pipelines	Irène Brumer, M.Sc.
	    Heidelberg University
	    Mannheim, Germany

Clinical Utility of Intraoperative Arterial Spin Labeling for Resection Control in Brain Tumor Surgeries: A 3T Study	Marta Calvo-Imirizaldu, M.D.
	    University of Navarra
	    Pamplona, Spain

Estimating Arterial Transit Time (ATT) from ASL MRI Acquired at a Single Post-Labeling-Delay Time	Aldo Camargo, Ph.D.
	    University of Maryland, Baltimore
	    Baltimore, MD, USA

SAR-Reduced Asymmetric tr-FOCI Pulses for PICORE-ASL	Didi Chi, M.Eng.
	    University of Melbourne
	    Parkville, VIC, Australia

To What Extent Is DSC-MRI Able to Detect Subtle Blood-Brain Barrier Leakage in Cerebral Small-Vessel Disease?	Elles Elschot, M.Sc.
	    Maastricht University Medical Center+
	    Maastricht, The Netherlands

Characterization of the Glymphatic Function in Multiple Sclerosis Using Time-Resolved Contrast-Enhanced MRI	Refaat E. Gabr, Ph.D.
	    University of Texas Health Science Center at Houston
	    Houston, TX, USA

Feasibility of Flow-Related Enhancement Brain Perfusion MRI	Julian M.W. Glandorf, M.D.
	    Hannover Medical School
	    Hannover, Germany

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Dual-Module Velocity-Selective ASL (dm-VSASL) with Dramatically Improved Temporal SNR	Jia Guo, Ph.D. University of California, Riverside Riverside, CA, USA
Deep Learning for Under-Sampled Non-Cartesian ASL MRI Reconstruction	Yanchen Guo, B.Sc. State University of New York at Binghamton Binghamton, NY, USA
Transparent Non-Linear Support Vector Machine Learning to Identify Spatial Patterns of Cerebral Blood Flow Abnormalities Associated with Alzheimer's Disease	Jack Highton, Ph.D., M.Phys., M.Res. University College London London, England, UK
Free-Breathing 3D ASL Imaging of the Human Liver Using Prospective Motion Correction: Preliminary Results	Jörn Huber, M.Sc. Fraunhofer Institute for Digital Medicine MEVIS Bremen, Germany
Multi-PLD/Multi-TE Perfusion Data of the Human Liver Assessed by Pseudo-Continuous Arterial Spin Labeling	Jörn Huber, M.Sc. Fraunhofer Institute for Digital Medicine MEVIS Bremen, Germany
Blood Flow Effects on the Post COVID-19 Brain Measured With DSC-MRI	Aravinthan Jegatheesan, M.Appl.Sc. Sunnybrook Research Institute Toronto, ON, Canada
Cerebral Microvascular Hemodynamics & White Matter Lesion Burden in Typically Aging Older Adults	Meher R. Juttukonda, Ph.D. Massachusetts General Hospital Charlestown, MA, USA
The Minimal Processing Pipeline for Arterial Spin Labeling Data from the Human Connectome Project Lifespan Studies of Aging & Development	Flora A. Kennedy McConnell, D.Phil. University of Nottingham Nottingham, England, UK
Flow-Related Enhancement Brain Perfusion MRI: A Correlation to pCASL-MRI	Norman Kornemann, M.D. Hannover Medical School Hannover, Germany
Pain & Cerebral Blood Flow in Children Following Mild Traumatic Brain Injury Compared to Orthopedic Injury	Vivian Kwan, M.Sc. University of Calgary Calgary, AB, Canada
VSASL Perfusion in the Evaluation of Treated High Grade Gliomas at 1.5 Tesla	Sebastian P. Lambrecht, B.Sc. Johns Hopkins University Baltimore, MD, USA

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Focused Ultrasound-Induced Blood-Brain Barrier Opening Detection with Reduced Gadolinium Dose Using Deep Learning	Pin-Yu Lee, M.Sc.
	    Columbia University
	    New York, NY, USA

Blood-Brain Barrier Water Exchange Rate Is Associated with Cognitive Performance in Mild Cognitive Impairment & Early Alzheimer's Disease	Catherine A. Morgan, Ph.D.
	    University of Auckland
	    Auckland, New Zealand

Assessing Resting-State Fluctuations with Accelerated 3D Resting-State ASL in MS Patients: A Preliminary Analysis	Fanny Munsch, Ph.D.
	    Beth Israel Deconess Medical Center
	    Boston, MA, USA

Combined Angiographic, Structural & Perfusion Radial Imaging Using Arterial Spin Labeling	Thomas W. Okell, D.Phil.
	    University of Oxford
	    Oxford, England, UK

A Biphasic Pattern of Cerebral Blood Flow Increases During Infancy Revealed with 3D Multi-Shot, Stack-of-Spirals pCASL & Phase-Contrast MRI	Minhui Ouyang, Ph.D.
	    Children's Hospital of Philadelphia
	    Philadelphia, PA, USA

Cascaded Weighted UNET-SDM for Kidney Segmentation on Low Resolution ASL-MRI Images	Anne Oyarzun, M.Sc.
	    Public University of Navarrra
	    Pamplona, Spain

ROI-Focused Non-Rigid Groupwise Registration Approach for Motion Correction in ASL Renal Blood Flow Imaging	Anne Oyarzun, M.Sc.
	    Public University of Navarrra
	    Pamplona, Spain

The Spatial-Temporal Behavior of Pulmonary Perfusion Studied with Non-Contrast ASL	Rui C. Sá, Ph.D.
	    University of California, San Diego
	    La Jolla, CA, USA

Multi-Delay Pseudo-Continuous Arterial Spin Labeling During Intraoperative MRI: Feasibility Study & Initial Results	Carmen Sánchez Albardíaz, B.E.
	    University of Navarra
	    Pamplona, Spain

Multi-Delay Pseudo-Continuous Arterial Spin Labeling for Perfusion Quantification in the Spleen	Sergio M. Solis-Barquero, M.Sc.
	    University of Navarra
	    Pamplona, Spain

A 3D-FiLM-cGAN Architecture for the Synthesis of Cerebral Blood Flow Maps	Michael Stritt, M.Sc.
	    mediri GmbH
	    Heidelberg, Germany

Assessment of Intra-Tumoral Heterogeneity of Prostate Cancer Using Intravoxel Incoherent Motion (IVIM)	Sirisha Tadimalla, Ph.D.
	    University of Sydney
	    Camperdown, NSW, Australia

Correction of Artefacts in Simultaneous Multi-Slice Multi-PLD Arterial Spin Labelling Data Using Gaussian Process Regression	Jack A. Toner, M.Eng.
	    University of Nottingham
	    Nottingham, England, UK

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Predicting Penumbral Tissue Death with Perfusion Parameters Using Intravoxel Incoherent Motion MRI in a Canine Large Vessel Occlusion Model	Zeynep Vardar, M.D. University of Massachusetts Worcester, MA, USA
Three-Component IVIM Fitting in Cerebrovascular Disease Using Physics-Informed Neural Networks: Repeatability & Accuracy	Paulien Voorter, M.Sc. Maastricht University Medical Center+ Maastricht, The Netherlands
The Effect of the Contrast Agent Injection Protocol on Carotid Artery Dynamic Contrast Enhanced MRI	Yajie Wang, B.Sc. Tsinghua University Beijing, China
Longitudinal Assessment of Tumor Perfusion in Glioblastoma Using Arterial Spin Labeled MRI: Preliminary Findings	Yiming Wang, M.Sc. University of Texas Southwestern Medical Center Dallas, TX, USA
Comparison of Velocity-Selective ASL & PCASL with Phase-Contrast MRI for Measuring CO2-Induced Cerebrovascular Reactivity	Feng Xu, Ph.D. Johns Hopkins University Baltimore, MD, USA
Velocity-Selective Inversion-Prepared Arterial Spin Labeling: A Test-Retest Reproducibility Study	Feng Xu, Ph.D. Johns Hopkins University Baltimore, MD, USA
Doubling Temporal Resolution Using Multiscale-Wide-Inference & Ensemble Learning-Based Deep Neural Networks	Lei Zhang, Ph.D. University of Maryland, Baltimore Baltimore, MD, USA
Effect of Meditation on Brain Function During an Attention Task Using ASL & BOLD fMRI	Yakun Zhang, M.Sc. State University of New York at Binghamton Binghamton, NY, USA
Age-Related Changes in Regulation of Cerebral Blood Flow by the Basal Forebrain	Zongpai Zhang, Ph.D. State University of New York at Binghamton Binghamton, NY, USA
Volumetric Renal Perfusion Imaging with pCASL: Comparison of 3D TSE & 3D GRASE Readout	Limin Zhou, B.Sc. University of Texas Southwestern Medical Center Dallas, TX, USA

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