

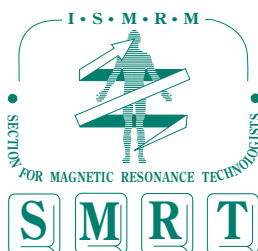
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SMRT 11th Annual Meeting Program Report

Gina Greenwood, R.T. (R)(MR), 2001-2002 Program Committee Chair

"Great meeting."

"This was excellent, material I can actually use, keep up the good work!"

"Excellent speakers and topics."

"As always this course offers informative speakers and current issues in MRI."



2002 SMRT Program Chair, Gina Greenwood (left) and Education Chair, Cindy Higgs.

These comments were among those on the attendee evaluation form indicating that the 11th Annual Meeting of the SMRT was a success. The theme for the meeting held May 18 and 19 in Honolulu, Hawai'i, was *"Strive for the Summit"* and that we did. Starting with the Poster Walking tour on Friday evening, attendees were able to interact with their peers sharing both technical information and social time. More than 40 poster presenters were on hand this

year to display their work. We appreciate that Mallinckrodt, Inc. sponsored the bounteous reception.

Incoming President, John A. Koveleski, moderated the first didactic session Saturday morning. Invited speaker, Brian David Ross, M.D., Ph.D., presented the technical aspects of Spectroscopy and set the tone for the rest of the meeting. Policy Board member, Cindy R. Comeau, B.S., R.T. (N)(MR) C.N.M.T., demonstrated Clinical Cardiac Imaging. The audience appreciated her detailed slides and handouts. Michael E. Moseley, Ph.D., shared his expertise with Diffusion and Perfusion Weighted Imaging.

The first session of proffered papers included: 1st Place Award-Clinical Focus *"3D VIBE Whole-Body MRI for Metastases Screening,"* by Eva Wembacher, R.T.; 1st Place Award- Research Focus *"Evaluation of Ischemia in a Primate Model: A Feasibility Study Combining X-ray Digital Subtraction Angiography and Fluoroscopy with Magnetic Resonance Imaging,"* by Julie Strandt-Peay,



2002 SMRT President, John A. Koveleski presents Heidi Berns, outgoing President, the commemorative presidential plaque.

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Editor's Letter

Julie Strandt-Peay, B.S.M., R.T. (R)(MR)



Greetings to new and renewed members of the SMRT. This issue of *Signals* is packed with particulars about the SMRT 11th Annual Meeting, held in Honolulu, Hawai'i, USA. Gratitude is extended to Program Chair, **Gina Greenwood**, for an excellent educational program. The efforts of Education Chair, **Cindy Hipps**, for her efforts on behalf of those MR technologists who submitted their work to be presented is very much appreciated. Thank you to **Anne Sawyer-Glover**, for once again acquiring nearly all of the photographs in this issue. This is a bigger job each year as more MR technologists participate in the Annual Meeting. Anne also reports on the first invited participation of the SMRT at the ISMRM Annual Meeting. It is the custom of *Signals* to publish the abstracts of the award winning presenters. The first in the series presented at the SMRT Annual Meeting are included for your information. More will be included in future issues.

Get to know **John Koveleski**, your new President and read about his plans for the future of SMRT. **Kelly Baron** shares information about the accompanying home study offering, and sponsor MRI Devices Corporation. **Robin Greene-Avison** provides Part II of her work on Stroke, an important area of practice for all MR technologists. An updated listing of SMRT committee chairs and members is included for your reference.

Please consider the "Call for Nominations" announcement. Perhaps it's time that you want to become more active in the SMRT or you know of a friend or colleague who would like to serve. **Heidi Berns** is the Chair of the Nominating Committee this year and would like to hear from you.

Due to the budget limitation of the number of pages that *Signals* can support, the SMRT Policy Board and Executive Committee are investigating expanding the information available on the SMRT website. This would mean you would have more information than ever accessible with your SMRT membership. Check the SMRT website frequently for updates important to you! ●

Getting to Know Your New SMRT President

Julie Strandt-Peay, B.S.M., R.T. (R)(MR)

Signals: John, How long have you been involved with MR?

John: It's been more than 16 years. Most of that time I worked in free standing clinics and with Low and Mid-field scanners.

Signals: When did you first participate with the SMRT?

John: My first involvement was in 1993 when I attended a SMRT Regional Seminar, chaired by Kelly Baron, at George Washington University, in Washington, D.C. After that, I organized a local chapter. I was elected to the Policy Board in 1998 and served as Program Chair for the 1999 Annual Meeting in Philadelphia. At that meeting, I assumed the vacant Treasurer's position which I held until 2001. I also was an invited speaker at the Denver meeting in 2000.

Signals: What do you see as your top priority as President of the SMRT?

John: The SMRT is an international society and I'd like to see it reach areas that we haven't tapped into as of yet. Just as important, I'd like to see the membership numbers rise in the USA. It still amazes me that there are so many MR technologists who have never heard of the SMRT and don't realize the benefits of joining our organization. I constantly field calls from MR technologists who are scrambling for credits. I tell them that they can join the SMRT and get all the credits they need and they'll all be MR credits. There's no reason for them to join any other society or to get credits in modalities in which they're not practicing.

Signals: As a leader in the Field of MR, what advice do you have to others working in the field, especially those who may be getting discouraged at the shortages of trained MR technologists?

John: The technologist shortage is very frustrating. It often makes a trained MR technologist work harder. It also gives them the opportunity to share their experience and teach new technologists. I've trained several technologists from scratch in my 16 plus years in MR and they're some of the best technologists that I've encountered. An excellent MR technologist will make a center successful. I feel as though radiologists and management are starting to realize it now. MR is a technology that can be very operator-dependant and a great technologist is a necessity. With the SMRT offering continuing education via the home studies, local chapter meetings, Regional Seminars, and the Annual Meeting, it's a perfect opportunity for MR technologists to expand their knowledge and make themselves indispensable to their employers.

Signals: What would you like to see the SMRT accomplish this year and in the future?

John: I'd like to see a continuation of international growth and also growth from the "grass roots" technologists— those working in the trenches at outpatient centers, etc., that represent well over 90% of the technologists employed in the field. ●

President's Letter

John A. Koveleski, R.T. (R)(MR)



I'm sure it's going to be the start of a very busy year for me. I appreciate the trust that the SMRT membership has in me as we go forward yet another year.

At our Annual Meeting in Honolulu, I was excited to see the enthusiasm that the SMRT membership displayed during an exceptional program. One of my goals as president is to have more technologists get involved in the Section. It's always great to reacquaint with old colleagues but it's exciting to meet colleagues that are new to the SMRT. In Hawai'i, there was a wealth of enthusiasm among the attendees as far as wanting to become involved with the SMRT. Radiographers from all corners of the world and all types of clinical settings are valuable members of the SMRT. From hosting a Regional Seminar to serving on a committee, there are numerous ways for the newcomers to show their support.

As you'll read in other articles in this issue of *Signals*, we had quite the program. Special thanks go out to Gina Greenwood (Program Chair) and Cindy Hipps (Education Chair) for their dedication in making the meeting the success that it was. Having a tropical background didn't hurt either.

Another goal that I have for this coming year is to see the membership grow. I often field phone calls and e-mails from MR technologists who find themselves running short on credits. By becoming a member of the SMRT, all of your CE credit worries are taken care of. The home studies will produce enough ECE to satisfy the ARRT plus they are all strictly MR. There is no reason to get credits in other modalities when the SMRT can do it all for you.

Please enjoy this issue of *Signals* and see all the fabulous work that was presented in Honolulu. All of the SMRT Executive Committee and Policy Board members put a lot of time and effort into our activities with the SMRT and we look forward to working with you in the near future. ●

SMRT Education Committee Report

Cindy T. Hipps, B.H.S., R.T. (R)(MR), 2001-2002 Education Committee Chair

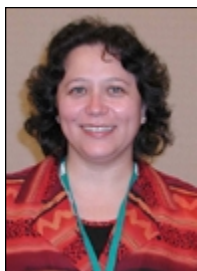
The SMRT 11th Annual Meeting held in Honolulu, Hawai'i, was truly one of those meetings that will long be remembered. As an attendee, I came home with some wonderful and exciting new information that I have already shared with my colleagues who did not have the privilege of attending. I encourage all of you to make it a top priority to attend these meetings and do whatever it takes to get there. Join a committee, run for Policy Board, present an abstract or poster, and get active. It is very rewarding to be involved in the SMRT!

I was in awe with the number of posters presented. The quality of each one was, without a doubt, some of the best work I have had the opportunity to view!

As one of the committee members who had the challenge of grading the 53 abstracts and 41 posters that were presented, it was indeed a challenging experience! Thirteen countries were represented overall in the abstracts. All the presenters, both orally and by poster should be commended for their excellent work and professional demeanor. Below is a list of the finalists in the oral and poster presentations.

A special thank you goes to the Education Committee Members, Gina Greenwood, SMRT Program Committee Chairman, and Jennifer Olson of the SMRT office for their hard work and dedication to the meeting in Hawai'i. It was a wonderful and successful meeting! ●

2002 Award Winners at the SMRT Annual Meeting



2002 President's Award—

Marcela B. Montequin, R.T. (R)(MR)

MRI Advanced Research Applications Specialist, GE Medical Systems

"Coronary Artery Imaging: A Patient Tailored Approach"

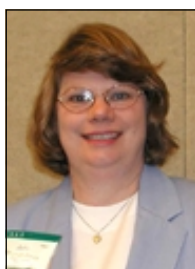


1st Place Award, Oral Clinical Focus—

Eva Wembacher, R.T.

Department of Radiology,
University Hospital Essen,
Essen, Germany

*"3D VIBE Whole-Body MRI for
Metastases Screening"*



1st Place Award, Oral Research Focus—

Julie Strandt-Peay, B.S.M., R.T. (R)(MR)

Department of Radiology,
University of Wisconsin Medical School,
Madison, Wisconsin, USA

*"Evaluation of Ischemia in a Primate Model:
A Feasibility Study Combining X-ray Digital
Sub-traction Angiography and Fluoroscopy
with Magnetic Resonance Imaging"*

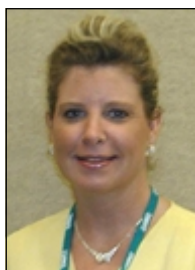


2nd Place Award, Oral Clinical Focus—

Frank J. Londy, R.T. (R)

Department of Radiology,
University of Michigan,
Ann Arbor, Michigan, USA

*"The Effect of Peripheral Arterial
Occlusive Disease on Venous Filling in
Gadolinium-Enhanced MRA of the Distal
Aorta and Lower Extremities"*



2nd Place Award, Oral Research Focus—

Catherine M. Callahan, B.S., R.T. (R)(MR), R.N.

Advanced MRI Consulting, Inc.,
Evergreen Park, Illinois, USA

*"Coronary Magnetic Resonance Angiography:
New Non-Contrast Technique"*



3rd Place Award, Oral Clinical Focus—

David W. Stanley, B.S., R.T. (R)

Applied Science Laboratory,
GE Medical Systems,
Milwaukee, Wisconsin, USA

*"Alternative Approach to Myocardial
Viability Assessment"*



3rd Place Award, Oral Research Focus—

Anne Dorte Blankholm, R.T.

MR Research Center,
Aarhus University Hospital, Denmark

*"3D Virtual Reality of the Heart,
Preliminary Results"*

SMRT Forum: MR Safety at the ISMRM Annual Meeting

Anne M. Sawyer-Glover, B.S., R.T.(R)(MR), SMRT Forum Organizer and Moderator, SMRT Treasurer, ISMRM Safety Committee Member



The International Society for Magnetic Resonance in Medicine, our parent society, invited the SMRT to organize and conduct a forum during the recent Annual Meeting of the ISMRM held in Hawai'i.

The topic selected for discussion this year was MR Safety. The forum took place during the mid-day session, on Monday, 20 May 2002. The agenda included four speakers and four panel

members to address questions from the audience. Approximately two hundred people were in attendance.

William Faulkner, B.S., R.T. (R)(MR)(CT), started the session off with a very complete and inspired review of "MR Screening Policies and Procedures." Bill, a well-known MR educator, is the MRI Education and Operations Consultant of William Faulkner and Associates, and the Vice President of Outsource, Inc. Bill's energized presentation included the use and

format of screening forms; the mechanics of screening visually and verbally; controlling areas for staff and patients; required ongoing training of MR technologists, physicians, and staff; significant contraindications; and facilitating support from the MR radiologists.

Frank G. Shellock, Ph.D., followed with a thorough examination of "MRI Safety and Compatibility for Implants and Devices: Update 2002." Frank is an Adjunct Clinical Professor of Radiology at the University of Southern California and the President of Shellock Research and Development Services. Frank has recently organized and implemented the IMRSE (Institute for Magnetic Resonance Safety, Education, and Research). The IMRSE is an independent, multi-disciplinary, professional organization devoted to promoting awareness, understanding, and communication of MR safety issues through education and research. Frank's illuminating talk included discussions about neurostimulation devices, aneurysm clips, spinal fusion stimulators, drug infusion pumps, intravascular stents, filters, and coils, and many other biomedical implants and devices. Frank also discussed the variance in effects by different types of magnets including field strength and design. Some of Frank's many publications on MR safety appear in most *Signals* newsletters from the SMRT. Frank maintains a MR safety website that provides support worldwide: <http://www.mrisafety.com>.

Michael Kean, R.T., gave an enlightening presentation, combining "The Prevention of RF Burns and Heating in the MR Environment" and "Pediatric MR Safety Issues." Michael is the Chief MR Technologist at the Howard Florey Institute at the Royal Children's Hospital in Parkville, Victoria, Australia. In addition to his widely-recognized expertise in imaging pediatric patients, he also conducts examinations on a 3.0T whole body MR scanner. Michael's comprehensive

Update on SMRT Educational Seminars Home Study Submissions!



Kelly D. Baron B.S., R.T. (R)(MR), Chair, SMRT Publications Committee



Work on the SMRT Educational Seminars continues! Thank you for all the comments received at the Annual Meeting. We are glad that the home studies are truly benefiting MR technologists worldwide. Starting with the current issue, *MRI of the Ankle and Foot*, you will see that the quiz answer sheet has been separated from the booklet. This has been done

to facilitate any changes that may need to be made to question sets when these issues are reprinted in the future. The remaining issues for this year are *MRI of the Breast*, and an issue on *Diffusion Weighted Imaging in the Brain*. As I have noted before, we will be trying to downsize the issues a bit only to allow to stay within our budget! We will continue to provide you with twelve approved credits per year in the field of MR. Please feel free to contact me with any suggestions or comments, or if you would like to participate in putting a home study together at: baron4mri@woh.rr.com. ●

Are you a new SMRT member? Did you miss an earlier issue?

All of the previously published SMRT Educational Seminars home studies are now available for purchase by SMRT Members in good standing for only US\$20 per issue.

For more SMRT membership information or an order form, please e-mail: smrt@ismrm.org or visit the SMRT website: <http://www.ismrm.org/smrt>

The SMRT gratefully acknowledges **MRI Devices Corporation**, Waukesha, Wisconsin, USA, for their generous support of the 2002 SMRT Educational Seminars home study series. This donation demonstrates the consideration of MRI Devices Corporation for quality MR technologist education.

Contact information can be found at www.mridevices.com

Continued on page 5 ➡

review provided a very personal look at the risks involved, the challenges we face on a daily basis, the ongoing training and education necessary to maintain a safe MR facility, and the many complex issues that arise in the imaging of infants and children.

Emanuel Kanal, M.D., F.A.C.R., completed the presentations with his detailed report regarding the recently published white paper from the *American College of Radiology: ACR Recommendations for MR Safety*. Manny is the director of Magnetic Resonance Services and Professor of Radiology and Neuroradiology at the University of Pittsburgh Medical Center and School of Medicine. Manny's very motivated talk covered the guidelines as recommended by the ACR including the establishment, implementation and maintenance of MR safety policies and procedures for each facility; limitation of site access to different areas ("zones") within the MR facility by patients, staff, MR technologists, physicians, and others; considerations for pregnant patients and staff; time-varying gradient magnetic field related issues (induced voltages and auditory considerations); time-varying radiofrequency magnetic field related issues (thermal); cryogen related issues; sedation and anesthesia; use of contrast agents; and, biomedical implants and devices. Manny also maintains a MR safety website that supports facilities worldwide: <http://www.radiology.upmc.edu/mrsafety>.

Time was included at the end of the presentations for questions from the audience and discussion with the panel members and speakers. The panel members included Cindy T. Hipps, B.H.S., R.T. (R)(MR); Maureen N. Hood, B.S., R.N.; Julia B. Lowe, B.S., R.T. (R)(MR); and, Laurian Z. Rohoman, R.T. (R)(MR), A.C.R. Cindy is the MRI Coordinator at the Greenville Radiology in Greenville, South Carolina. Maureen is the MR Research Coordinator at the Uniformed Services University of the Health Services, Department of Radiology, MR Research Division, in Bethesda, Maryland. Julia is the Clinical Research Specialist at the Indiana University School of Medicine,

Department of Radiology, Section of Imaging Science, in Indianapolis, Indiana. Laurian is the Technical Coordinator of MRI at the Montreal General Hospital in Montreal, Canada.

There were many questions from the audience and lively discussion followed. Some safety issues continue to cause concern for MR facilities such as whether to image in the presence of, for example, retained pacemaker wires, tattooed eyeliner, and brachytherapy implants. More current issues were voiced concerning the safety of clinical scanning on MR scanners at 3.0 Tesla especially when biomedical implants and devices are present. Engaging discussions continued well after the end of the two-hour session.

A complete syllabus, compiled with abstracts, presentations, journal articles and information from all of the speakers and panel members, was distributed to the attendees as well as other safety documentation from the SMRT. The syllabus will be valuable to many facilities in developing and maintaining their MR safety policies and procedures, and providing additional educational material for their colleagues.

Many thanks to the speakers and panel members for sharing their MR safety knowledge and contributing their MR safety documentation as well as their extremely valuable time during this very busy meeting. Thank you also to the ISMRM Program Committee and Executive Board for inviting the SMRT to actively participate in their Annual Meeting.

This extraordinary opportunity will be the start of a new tradition for the SMRT to contribute directly to the ISMRM Annual Meeting, bringing value to those attendees including clinicians, scientists, and technologists. This is one more way in which we support our commitment to provide education, promote communication and disseminate information in the field of magnetic resonance. ●

(Editor's note: For those of you not able to attend, there are copies of the 2002 SMRT Forum: MR Safety Syllabus available through the SMRT office. Call or see the website for details).



The Section for Magnetic Resonance Technologists would like to thank the following donors for their generous support of the SMRT Eleventh Annual Meeting:

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for their generous support of the SMRT Eleventh Annual Meeting.

SMRT would also like to thank:

MRI Devices Corporation
for its support of the
SMRT Educational Seminars Home Studies.

B.S.M., R.T. (R)(MR), and 2nd Place Award- Clinical Focus *"The Effect of Peripheral Arterial Occlusive Disease on Venous Filling in Gadolinium-Enhanced MRA of the Distal Aorta and Lower Extremities,"* by Frank J. Londy, R.T.

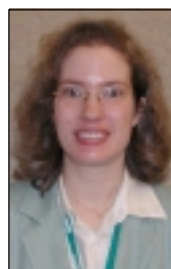
During the lunch break the SMRT Business Meeting incorporated the presenting of awards (see the Education Committee report for your peers who received awards for their submissions on page 3). Other awards presented were: Honorary Member, Carolyn Kaut Roth; Distinguished Service, Donna Underwood O'Brien; Fellows of the Section, Kelly D. Baron, and Julie Strandt-Peay. New Policy Board members and officers were introduced and those outgoing were thanked for their service. Heidi Berns turned the gavel over to John A. Koveleski who spoke to the attendees and began his term as SMRT President.

Outgoing President, Heidi Berns, moderated the afternoon session which began with Alan H. Stolpen, M.D., who imparted information about Body MRA. Offering "The Best Work of Your Life" was Pat Alea, M.B.A. Her motivating talk was well received by MR technologists who often face stress on the job. Marcela B. Montequin delivered the President's Award paper entitled *"Coronary Artery Imaging: A Patient Tailored Approach."* Finishing the day was Joshua M. Farber, M.D., who conveyed his thoughts on Musculoskeletal Imaging Protocols.

The didactic sessions continued Sunday Morning with Cindy T. Hips, Education Chair, moderating. Brian D. Ross, M.D., Ph.D., supplied the Clinical Impact in Part II of his Spectroscopy lecture. Policy Board member, Silke Bosk, R.T., addressed *"Preventive Imaging Without Radiation"* from her experience in Germany. Peter Choyke, M.D., instructed the audience about Functional Tumor Imaging with MRI.

Proffered papers followed and included: 2nd Place Award-Research Focus: *"Coronary Magnetic Resonance Angiography: New Non-Contrast Technique,"* by Catherine M. Callahan, B.S., R.T. (R)(MR), R.N.; 3rd Place Award-Clinical Focus: *"Alternative Approach to Myocardial Viability*

Invited Speakers



(l. to r.) Pat Alea, M.B.A., Silke Bosk, R.T., Cindy R. Comeau, B.S., R.T. (N)(MR), C.N.M.T., Peter Choyke, M.D., and Joshua M. Farber, M.D.



(l. to r.) Donald G. Mitchell, M.D., Michael E. Moseley, Ph.D., Brian David Ross, M.D., Alan H. Stolpen, M.D., and Keith Thulborn, M.D.



(l. to r.) Patrick A. Turski, M.D., and William T.C. Yuh, M.D., M.S.E.E.

SMRT MRI Safety Forum (l. to r.) moderator, Frank G. Shellock, and speakers Robert J. Herfkens, and Michael Kean.

Assessment," by David W. Stanley, B.S., R.T. (R); and 3rd Place Award-Research Focus: *"3D Virtual Reality of the Heart, Preliminary Results,"* by Anne Dorte Blankholm, R.T.

The MRI Safety Forum, back by request of the SMRT membership was held over the lunch break. Well known by members of the SMRT for his contributions to MRI Safety, Frank G. Shellock, Ph.D., moderated the forum. Robert J. Herfkens, M.D. and Michael Kean, R.T. provided specific information. A question and answer session enabled a lively discussion.

Gina Greenwood, Program Chair, was the moderator for the final session. Keith Thulborn, M.D. communicated his experience with 3T Imaging in a Clinical Setting. Proffered papers included: *"Imaging the Prostate Using*

Phased Array Surface Coils," by Bobbie Burrow, R.T. (R)(MR)(CT); *"Direct Contrast Enhanced 3D MR Venography,"* by Michael Kean, RT.; and *"Utilizing Fast Gradient Echo as a Breath Hold Technique in the Quantitative Assessment of Hepatic Steatosis,"* by Mark Smith, M.S., R.T. (MR).

Invited speaker, William T.C. Yuh, M.D., M.S.E.E., presented Diagnosis and Management of Acute Stroke. Comparing CTA and MRA was Patrick A. Turski, M.D. Donald G. Mitchell, M.D., imparted Body MRI Protocol Problems and Controversies to round out the session.

Thanks to all of you who attended this year and participated in this educational program. Whether you were able to come this year or not,

Continued on page 7 ➡



2002-2003 SMRT Board Members (seated l. to r.) Anne M. Sawyer-Glover, Heidi Berns, John A. Koveleski, William Faulkner, Nanette Keck, (standing l. to r.) Maureen N. Hood, Marcia Gervin, Laurian Rohoman, Bobbie Burrow, Cindy Hipps, James Stuppino, Michael Kean, John Christopher, Julie Strandt-Peay, Robin Greene-Avison, Kelly Baron, Scott Kurdilla, Silke Bosk, Carolyn Roth, Gina Greenwood, Cindy Comeau, and Maureen Ainslie (not pictured: Carolyn Brown, Muriel Cockburn, Raymond Cruz, Julia Lowe, and John Posh).



SMRT Presidents (l. to R.) President-Elect, Maureen Ainslie, President, John Koveleski, Past President, Heidi Berns.

it's not too early to think about next year, writing about your work, participating in the meeting or becoming a member of the Policy Board. The 2002-2003 Program Committee will take under advisement the comments and suggestions from this year as the next meeting is planned.

Thank you to all of the sponsors, listed in the Program syllabus and here in *Signals*, see page 5. I would personally like to thank all the members of the Program Committee for their help and the office staff, especially Jennifer Olson, for all their support. ●

(Editor's note: For those of you not able to attend the SMRT 11th Annual Meeting, there are syllabi available through the SMRT office. Call or see the website for details).

Call for Nominations

Heidi A. Berns, M.S., R.T. (R)(MR), Past-President and Chair, Nominating Committee

As Chair of the Nominating Committee of the SMRT, I am asking the membership for nominations for the Policy Board and for President-Elect. In order for one to be eligible for the Policy Board, a nominee must be a voting member in good standing. The term for this commitment is three years. There are five vacancies for members at-large for the Policy Board. Nominees for President-Elect must also be voting members in good standing, and also must be or have been at-large members of the Policy Board. This term is one year in length, with the following two years fulfilling the Presidency and Past President, respectively.

We have, in the past, had members fill these positions from not only various geographical areas, but also from various work environments. There have been members from universities, clinics, imaging centers, and corporations. The involvement within the SMRT in this capacity is rewarding in so many aspects. Successful nominees will learn the working

mechanisms of the SMRT and the ISMRM in addition to meeting new acquaintances and making friends. Please consider nominating yourself or a colleague for these upcoming vacancies. You may forward your nominations to me at heidi.berns@mercyic.org or at my telephone work number at: +1 319 339 3801. If you should have any questions, please feel free to contact me. Thank you in advance for your nominations. I look forward to hearing from you! ●

Call for Nominations!

Please submit nominations for:

- President-Elect
- Policy Board Members
- Crues-Kressel Award Recipient

Deadline for Nominations:
1 September 2002

Contact: Heidi Berns at
heidi.berns@mercyic.org

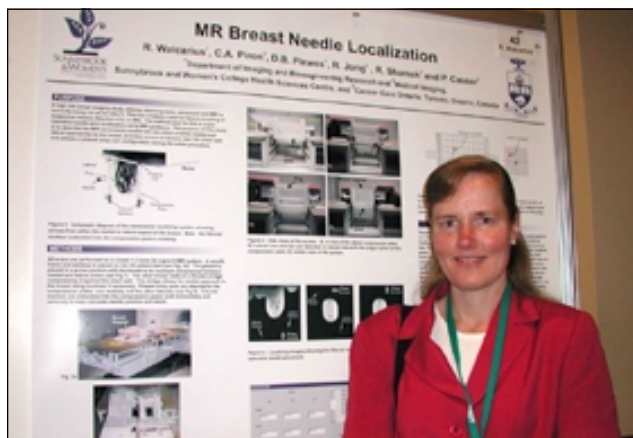
Award Winning Clinical Focus and Research Focus Poster Presenters at the SMRT Annual Meeting



2002 1st Place Clinical Poster– Cindy R. Comeau, Cardiovascular Research Foundation and the Lenox Hill Heart and Vascular Institute, Advanced Cardiovascular Imaging, New York, New York. “Optimization of a 15 Minute PV CE-MRA Protocol Using Automated Table Motion for Patients with Intermittent Claudication”



2002 1st Place Research Poster– Richard Niemczura, Northwestern University, Chicago, Illinois, USA, “A Step by Step Method for Coronary Magnetic Resonance Angiography”



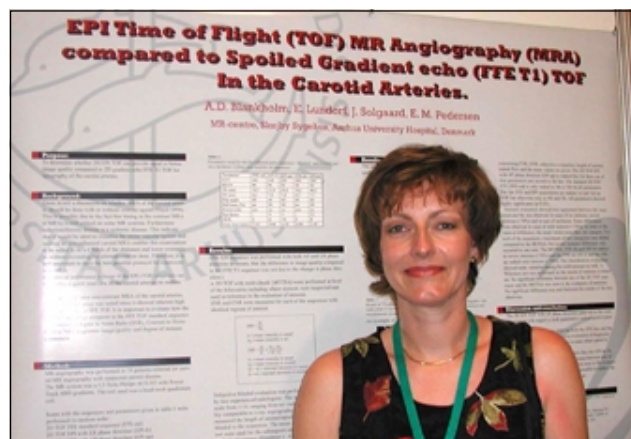
2002 2nd Place Clinical Poster– Rhonda F. Walcarius, Department of Imaging and Bioengineering Research and Medical Imaging, Sunnybrook and Women's College Health Science Center, Toronto, Ontario, Canada “MRI Breast Needle Localization”



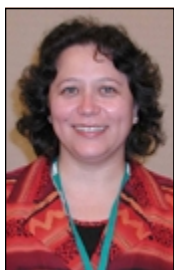
2002 2nd Place Research Poster– Julia B. Lowe, Department of Radiology, Indiana University School of Medicine, Indianapolis, Indiana, USA “Diagnostic MRI of Zoo Animals”



2002 3rd Place Clinical Poster– Catherine M. Callahan, Advanced MRI Consulting, Evergreen Park, Illinois, USA “Contrast-Enhanced 3D MRA Screening of Non-Peripheral Arterial Vasculature in 30-Minutes”



2002 3rd Place Research Poster– Anne Dorte Blankholm, MR-Centre, Skejby Sygehus, Aarhus University Hospital, Aarhus, Denmark “EPI Time of Flight (TOF) MR Angiography (MRA) Compared to Spoiled Gradient Echo (FFE T1) TOF in the Carotid Arteries”



2002 President's Award

Coronary Artery Imaging: A Patient Tailored Approach

M. Montequin¹, M. Saranathan¹, T. Foo¹, V. Ho², M. Hood², Advanced Research Specialist,
¹GE Medical Systems, Baltimore, Maryland, USA, ²USHUS, Bethesda, Maryland, USA

Purpose

Coronary arteries are small, narrow, tortuous vessels subject to significant cardiac and respiratory motion; hence the biggest challenge facing cardiac Magnetic Resonance (MR) today is the acquisition of high resolution, artefact-free images of the coronary arteries. Current MR strategies use a single technique—a 2D breath-hold or a 3D free-breathing acquisition—without taking into consideration the patient's breath-holding ability or his/her capability to maintain a steady respiratory rhythm. Focusing on just one technique has not been universally successful. To maximize the probability of acquiring images of diagnostic quality, a patient tailored approach using multiple, optimised, acquisition methods to image the coronary arteries is proposed.

Materials and Methods

All subjects were scanned on a 1.5T MR scanner (GE Medical Systems, Waukesha, Wisconsin, USA) with a 4-element cardiac phased array coil after obtaining informed consent. A total of 91 subjects (60 men, 31 women, mean age 42 years), were scanned at two centers. The three techniques considered in this study were:

- 3D Navigator gated FGRE: 10-15 minute duration.
- 2D breath-hold spiral: 12-16 second duration
- 2D navigator gated spiral: 1-2 minute duration

Early on, it was recognized that most patients maintained a steady respiratory pattern over a 1-3 minutes and could tolerate 15-20 second breath-holds. This led to a hypothesis that tailoring the acquisitions to the patients breathing characteristics could improve the success rate. The selection of which sequence to use first in each subject was based on the subject's ability to hold their breath or maintain a consistent respiratory rhythm. At least two of the three techniques were used on each subject, and an effort was made to image more than one vessel during each study.

All images were evaluated and graded in a blinded fashion. The right coronary system was graded separately from the left coronary system. The images (see below) were scored on a scale from 0 (worst) to 4 (best): 0 = coronary artery not visualized with severe ghosting/blurring; 1= coronary artery barely visible, moderate ghosting/blurring; 2 = coronary artery visualized, mild ghosting/blurring; 3= coronary adequately visualized, minimal ghosting/blurring; and 4 = coronary very well visualized, no ghosting/blurring. An image with a score of 2 or more was considered to be diagnostically relevant, which meant that it possessed adequate S/N, spatial resolution, was artefact-free, and the coronary artery was well visualized. The scoring scheme was designed so that images with scores of 3 or 4 could be diagnosed with high confidence.

Results

Diagnostic quality images (score equal or greater than 2) were used to calculate the success rate for each single individual technique and for the combined tailored approach.

Conclusion

The patient tailored approach significantly increases the success rate in visualizing the coronary arteries when compared to a single technique approach while making the study more tolerable for the patients. Both the 2D breath-holding technique and the 2D navigator spiral technique scored well for both the right coronary artery (RCA) and the Left Anterior Descending (LAD) in length of artery depicted and image quality. The 3D navigator FGRE sequence scored lower due to lack of blood-myocardium contrast and respiratory motion artifacts.

A multi-center evaluation is currently under way that will compare the sensitivity and specificity of coronary angiography to the patient tailored approach in MR. ●



Table 1.

	2D BH Spiral	2D Navigator Spiral	3D GRE Navigator	Patient Tailored Approach
Success rate %	88	85	68	93



2002 1st Place Proffered Paper–
Clinical Oral Presentation

3D VIBE Whole-Body MRI for Metastases Screening

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Introduction

Whole-body MRI has been proposed for generalized tumor staging. Limitations of whole-body MRI concepts have included long examination times in combination with limited spatial resolution. Recently VIBE (volumetric interpolated breath-hold examination), a fat saturated 3D gradient echo sequence with nearly isotropic resolution has become available. Inherently low signal-to-noise requires the use of surface coils for signal reception. Extending VIBE high-resolution coverage from a single to multiple anatomic regions toward a whole-body examination mandates rapid patient movement in conjunction with surface coil-based data reception. These requirements are fulfilled by a rolling table platform with integrated surface coils, actually developed for whole-body MR angiography (AngioSURF – System for unlimited rolling field-of-view). The technique was adapted for whole-body MRI (BodySURF). The purpose of this study was to evaluate the feasibility and accuracy of BodySURF based VIBE for whole-body MRI in patients with metastases using CT and nuclear medicine techniques as the standard of reference.

Methods

Fifty-nine patients with known primary malignancies potentially metastasizing to liver, lungs, bones and cerebrum were included in this study. Patients were examined on a high performance MR system (Siemens Sonata) equipped with a rolling table

platform (BodySURF). Patients were examined in the supine position after being placed on the rolling table platform (BodySURF). The system is commercially available and can be mounted on top of the original patient table of most MR systems manufactured by Siemens Medical Systems. For easy movement in the z-direction, the rolling table platform (length 270 cm, width varying between 50 and 33 cm) is placed on 7 pairs of roller bearings, which are easily installed on the patient table. Signal reception is accomplished using two elements of the spine coil, which are integrated into the patient table, and the body phased array coil, which remains stationary as it is attached to the original patient table. Positioned on the BodySURF platform, the patient glides through the isocenter of the magnet bore as well as over the posteriorly located spine coil and under the anteriorly located body phased array coil. Axial T1-weighted 3D VIBE data sets were collected in five stations following the intravenous application of paramagnetic contrast covering the body from skull to the knees. Sequence parameters included TR/TE = 3.1/1.2 ms, a flip angle of 12° and an acquisition time of 18sec. A slab thickness of 312mm was used for all measurements and the slice thickness amounted to 3mm. In addition, the chest and abdomen were imaged in the axial plane before contrast with T2 HASTE (TR/TE = 1200/60 ms, flip angle 150°, slice thickness = 7mm, acquisition time = 2x16s) and T1 FLASH (TR/TE = 124/1.83 ms, flip angle 70°, slice thickness = 7mm, acquisition time = 19s).

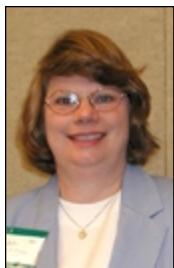
Mean examination time amounted to 11 (\pm 3) minutes. MRI findings were compared to results obtained with skeletal bone scintigraphy and CT-scans of the abdomen and chest.

Results

Whole body MR scanning was possible in all 59 patients. All exams were considered diagnostic. MRI revealed excellent correlation with scintigraphy and CT examinations. All pulmonary and hepatic metastases >6mm detected by CT were identified by whole-body MRI. Besides all cerebral metastases >8mm were detected by MRI. In three patients both MRI and CT detected subcutaneous metastases. Skeletal scintigraphy detected bone metastases in nineteen patients. In eighteen patients MRI confirmed these lesions. In one patient presenting with bone metastases in the ribs MRI failed to reveal the osseous lesions, whereas in four other patients MRI detected bone metastases missed by scintigraphy and eventually confirmed by biopsy.

Discussion

3D VIBE whole-body MRI screening for metastases correlates well with CT and scintigraphy. Use of the rolling table platform permits rapid whole-body imaging in 11 minutes on average. The preliminary results of the described technique indicate that 3D VIBE whole-body MRI has the potential to emerge as an all-encompassing alternative to conventional multi-modality tumor staging strategies. ●



**2002 1st Place Proffered Paper-
Research Oral Presentation**

Evaluation of Ischemia in a Primate Model: A Feasibility Study Combining X-ray Digital Subtraction Angiography and Fluoroscopy with Magnetic Resonance Imaging

**Julie Strandt-Peay, B.S.M., R.T. (MR), Charles Strother, M.D., Beverly Aagard, M.D., Alan Rappe,
Department of Radiology, University of Wisconsin Medical School, Madison, Wisconsin, USA**

Purpose

Our experiments tested the feasibility, in a primate, of inducing focal cerebral ischemia through mechanical obstruction of a cortical artery. The ischemia was monitored with repetitive Magnetic Resonance (MR) imaging (diffusion/perfusion and fast spin echo). The results of reperfusion hyperoxygenated autologous blood were assessed with additional MR imaging.

Methods

All studies were performed in a suite equipped for both Digital Subtraction Angiography (DSA) with fluoroscopy (OEC 9800) and MR imaging (General Electric 1.5 LX). The use of a prototype table and cradle allowed easy and repeated transfer of subjects between the two modalities. This prototype table also allowed subjects to remain in a fixed position throughout the experiment.

After induction of general endotracheal anesthesia, vascular access sheaths were placed into both common femoral arteries. Routine physiologic monitoring of ECG and O₂ saturation was performed throughout the duration of the experiment. The subject was placed on a Styrofoam platform designed so that the MR coil could be positioned and removed with ease. Baseline MR imaging was performed using the following sequences.

A T1-weighted Sagittal was obtained as a localizer: TR/TE 450/10, FOV 22cm, 256x224, 5mm skip 1mm, 1 NEX. Axial and Coronal scans were prescribed through the brain and images were acquired using T2- and

Diffusion-weighted imaging (DWI), and, except for the control subjects, Perfusion weighted sequences. A Coronal FLAIR sequence was obtained at the baseline as well. Parameters were as follows: T2/DWI: TR/TE 10000/114, FOV 14cm, 256x128, 5mm skip 1mm, 4NEX, scan time, 2:40. Images were acquired using B values of 2500 and 1000, in both the axial and coronal planes. Perfusion weighted scans used TR/TE 1500/ 100, FOV 14cm, 5 mm skip 1mm with an injection of diluted Gadolinium 10 seconds into the 0:54 scan. Coronal FLAIR images were acquired using: TR/TE 10002/150, TI 2200, FOV is 14, 256x224, 5mm, skip 1mm and 2 NEX for a scan time of 6:30. All images were acquired with a transmit / receive extremity coil.

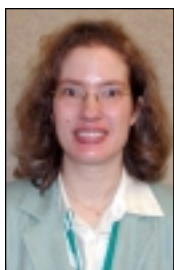
The subject was then moved to the x-ray angiographic modality and baseline angiography of one of the common carotid arteries was performed. Using roadmap fluoroscopic guidance, a 2.3 F microcatheter was navigated into one of the middle cerebral cortical branches to a point where a wedge position was obtained. Vascular obstruction was documented by way of contrast medium injection. The subject was then moved immediately back into the MR imager where images were obtained over a 90-minute interval. Then the arterial obstruction was removed and additional images were obtained over the subsequent 90 minutes. Some (N=3) animals were allowed to survive for an additional 3 hours and then sacrificed, others (N=4) were sacrificed immediately following the 90 minute period of reperfusion. One of the 8 had no images taken because we could not gain arterial access.

Results

To date eight primate studies have been carried out in this facility. In all instances diffusion/perfusion imaging allowed immediate recognition of ischemic tissue. While the DWI sequence was most sensitive, changes could be also detected on the T2 and Flair images within minutes of creating the arterial obstruction. T1 changes were noticed on the subsequent localizers, presumably because of previous injections of Gadolinium used for the perfusion imaging.

Conclusions

Working within the specially constructed suite and the operation of the prototype table made the procedure very efficient. There are challenges within the procedure that need to be addressed. Obvious are keeping the field sterile during the transfer from one modality to the other and most challenging, within the bore of the magnet. Catheters and patient monitoring equipment must necessarily come down the bore of the magnet, over the sterile field when obtaining the MR images. Physiological monitoring must be disconnected during the multiple transfers due to the length of the associated cables. It is feasible to evaluate ischemic disease using this method, however logistical matters remain that must be greatly refined before any human subject studies can be performed. ●



**2002 1st Place Proffered Paper—
Clinical Poster**

Optimization of a 15 Minute PV CE-MRA Protocol Using Automated Table Motion for Patients with Intermittent Claudication

C.R. Comeau, R. Day, and S.D. Wolff, Cardiovascular Research Foundation and the Lenox Hill Heart and Vascular Institute, Advanced Cardiovascular Imaging, New York, New York, USA

Purpose

Accurate assessment of peripheral vascular disease is now a reality with contrast-enhanced dynamic 3D imaging (CE-MRA). Improved hardware and software allows for automated table movement and the ability to image the peripheral vasculature (PV) in multiple, sequential stations following a single contrast bolus. The more advanced commercial MRI systems offer the ability to adjust the imaging parameters from stage to stage to optimize image quality. Imaging parameters such as scan plane orientation, spatial resolution, imaging time, and phase encoding order can be altered for each stage so as to optimize image quality. The total image acquisition time for a multi station study can be less than 1 minute, enabling an entire study to be completed extremely quickly. We would like to report our experience with a protocol that we optimized and which requires as little as 15-minutes of scanner time.

Methods

Considerations in optimizing our PV CE-MRA protocol included:

- 1) method of scout localization,
- 2) coil choice, 3) contrast dose and rate,
- 4) MRI parameter optimization
- 5) contrast arrival determination,
- 6) post processing, and 7) patient tolerance.

Following protocol optimization, we have performed and evaluated 265 PV CE-MRA clinical studies that were acquired on either a GE Signa Echospeed or CV/i scanner. The protocol begins with scout acquisitions. Axial 2D-TOF (stages I and II) and sagittal gradient echo (stage III) images are acquired to guide placement of the 3D imaging volume. The total imaging time for acquiring the scouts is 1.5 min. The bolus arrival time is then determined using a real-time protocol and a 2-3 ml test bolus. For the MRA, patients receive 40-45 ml of gadolinium contrast using a split-rate dose of 1.2-1.5 ml/sec for 15-20 cc followed by 0.8 ml/sec for the remainder of the contrast. 3D

imaging is performed twice, first before and then during contrast administration. Typical imaging times for stages I, II, and III are 18, 12, and 30 seconds respectively. Spatial resolution is 2.8-3.2 x 2.3-2.5 x 1.4-1.6 mm. Following image acquisition, the two 3D data sets are then subtracted and filmed for interpretation.

Results

The 2D-TOF scouts are quite effective for vessel localization and minimize the risk of arteries accidentally travelling outside of the 3D imaging volume (Figure 1). No saturation pulses are used in the TOF sequence so that veins as well as arteries are visualized. This technique works well even for those patients with severe peripheral arterial occlusive disease, because veins travel in the same general location as arteries and therefore mark the diseased arterial bed. Sagittal gradient echo images are acquired for stage III since they are faster to acquire and there is less variation of their anatomic location. The acquisition times for the first two stages of the 3-D dynamic imaging protocol are limited so as to avoid venous enhancement before the start of stage III image acquisition. The more linear trajectory of the superficial femoral arteries in stage II allows for the acquisition of fewer slice locations and hence a shorter imaging time than for stage I. Stage III is acquired with an elliptical (true-centric) phase-encoding order so as to minimize early venous enhancement. Imaging time for stage III is longer than for the other two stages to provide adequate signal-to-noise ratio (SNR) for the small infrapopliteal arteries. We chose not to use a peripheral vascular array coil because it increases set-up and clean-up times, leads to decreased signal homogeneity and is uncomfortable for many patients. Using this protocol, image quality is generally excellent and in only 4% of our studies did venous contamination interfere with the assessment of the infrapopliteal arteries. Image subtraction significantly improves visualization of smaller arteries.

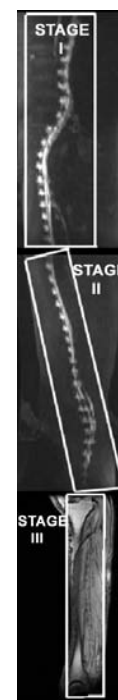


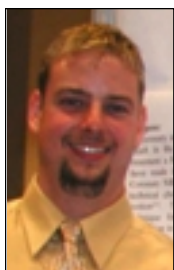
Figure 1.



Figure 2.

Conclusion

Our protocol yields consistent, high quality PV CE-MRA studies with a very low incidence of patient call-backs (Figure 2). This protocol is optimized for our patient population, which is primarily referred for evaluation of intermittent claudication. For those patients with more severe peripheral vascular disease (i.e. non-healing ulcers, gangrene, rest pain, etc.), we routinely acquire 2D-TOF images of the distal lower extremities and feet before CE-MRA. This increases the total imaging time for a minority of our PV CE-MRA studies. ●



2002 1st Place Proffered Paper-
Research Poster

A Step by Step Method for Coronary Magnetic Resonance Angiography

R. Niemczura, C. Callahan,* J.P. Finn, V. Deshpande, S. Shea, D. Li, R. McCarthy and J. Carr
Northwestern University, Chicago, Illinois, USA, *Advanced MRI Consulting, Inc., Evergreen Park, Illinois, USA

Purpose

Coronary artery disease (CAD) is the leading cause of death in the United States, making early detection and treatment a high-priority goal.¹ Recent MRI advancements have made imaging of coronary arteries more practical. Coronary MRI involves sophisticated protocol designs and technical challenges to deal with cardiac and respiratory motion.²⁻³ The purpose of this study was to evaluate a technique for step-by-step preparation, localization and acquisition in order to simplify coronary MR imaging.

Methods

Six normal adults and four adults with CAD were examined. Informed consent was obtained from all participants. Procedures were performed on a Magnetom Sonata, 1.5 Tesla MR System, Siemens Medical Solutions, Iselin, New Jersey. Step 1, Preparation: Chest area shaved (if needed), cleaned with NU-PREP (abrasive scrub), and palpated for apex beat. Electrodes placed along left ventricular axis for cardiac triggering. Patients coached on breath holding techniques for consistency/location of vessel of interest throughout exam. Anterior body phased array coiled utilized for optimum signal. Step 2, Localization: Three plane scouts provided initial localization. Using 3D axial oblique scout parallel to left coronary artery (LCA) angle, the LCAs were localized

(Figure 1). The LCA was identified branching off the aorta above the left coronary cusp while traveling inferiorly before bifurcating into left anterior descending (LAD) and circumflex (LC). LAD was followed laterally down interventricular septum. Using a cine sagittal oblique sequence perpendicular to the LCA, mid diastolic cycle was established for acquisition window. Using orthogonal 3D axial scout perpendicular to right coronary artery (RCA) (Figure 1), RCA was localized superior to right coronary cusp and followed anteriorly along the A-V groove. Step 3, Acquisition: Using the 3D scouts, 3-point tool for orientation was used for the high-resolution coronary acquisitions (Figure 2). Parameters were as follows using 3D True FISP: TR/TE = 4.05/2.03 ms, flip angle = 70°, bandwidth = 810 Hz/pixel, FOV = (166 -190) X 380 mm2, Matrix = (116 - 141) X 512 with an in-plane resolution of (1.0-1.2) X .7 mm2, # of phase encoding steps per cardiac cycle = 25-31, slab thickness = 18- 24 mm, # of partitions = 12, # of dummy pulses = 20, a fat saturation pulse and magnetization prep were applied before data acquisition. An axial-oblique orientation was used for the LCA (Figure 3) and a sagittal-oblique orientation was used for the RCA (Figure 4). For image evaluation, MPR and maximum intensity projection (MIP) were performed using standard Siemens software.

Results

This step-by-step method resulted in successful visualization of LM, LAD, and RCA arteries in all ten subjects. Proper electrode placement enabled reliable gating, and consistent breath holding minimized respiratory motion. The scout and 3D volume sequences provided excellent localization references. The cine provided diastolic information for optimum acquisition window timing. The high-resolution True FISP acquisition facilitated high-quality visualization of coronary artery anatomy.

Conclusion

Imaging of coronary arteries with MRI is becoming practical and topical. The imaging process is demanding, but by utilizing a step-by-step method, consistent preparation can provide a stable platform for vessel localization and imaging coronary artery anatomy.

References

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2. Deshpande, V. *Magn. Reson. Med.* 2001; 46: 494-502.
3. Li, D. *Radiology.* 2001; 219: 270-277.

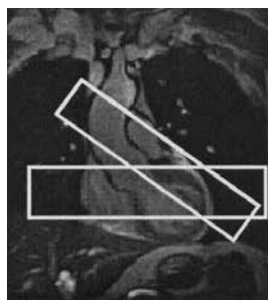


Figure 1. Position for 3D localization.

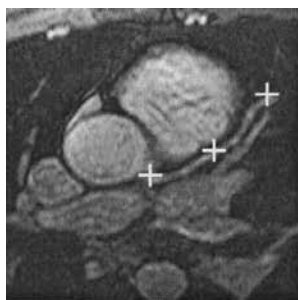


Figure 2. 3-point positioning for LCA.



Figure 3. True FISP LCA.



Figure 4. True FISP RCA.

Clinical Focus and Research Focus Oral and Poster Presenters at the SMRT Annual Meeting



Bobbie Burrow,
Department of Radiology,
Emory University Hospital,
Atlanta, Georgia, USA
*"Imaging the Prostate
Using Phased Array
Surface Coils"*



Michael Kean,
Royal Children's Hospital,
Melbourne, Australia
*"Direct Contrast Enhanced
3D MR Venography"*



Mark A. Smith,
Children's Hospital,
Columbus, Ohio, USA
*"Utilizing Fast Gradient
Echo as a Breath Hold
Technique in the
Quantitative Assessment
of Hepatic Steatosis"*



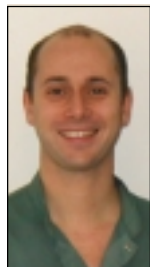
Cathy Blaesing,
Department of Radiology
MRI Division, University
of Michigan Health
System, Ann Arbor,
Michigan, USA
*"Optimization Techniques
of Gadolinium Bolus
Administration for Neck
MR Angiography"*



Anne Dorte Blankholm,
MR-Centre, Skejby
Sygehus, Aarhus
University Hospital,
Aarhus, Denmark
*"Contrast Enhanced MR
Angiography of the
Pulmonary Veins as a
Clinical Approach"*



Silke Bosk,
Department of Diagnostic
Radiology, University
Hospital Essen,
Essen, Germany
*"3D-Navigator MRA of the
Coronary Arteries:
Comparison of Gradient-
Echo and Steady State Free
Precession Sequences"*



Pablo Buzzi,
MRI Unit, Empreimientos
de Salud S.A., Hospital
Naval "Pedro Mallo,"
Buenos Aires, Argentina
*"MRI Technologist's Role in
the Diagnosis and
Management of Acute Aortic
Dissection"*



Anna Crawley,
MRIS Department,
Addenbrookes Hospital,
Cambridge, England,
*"Does MRI Have a
Diagnostic Role within
the Breast Screening
Situation?"*



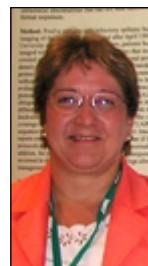
Denise Davis,
Department of Radiology,
University of Pittsburgh,
Pittsburgh, Pennsylvania,
USA
*"In-Vivo Quantification of
Skeletal Muscle Lipid
Content by Magnetic
Resonance Imaging"*



Tsukasa Doi,
Radiological Technologist
MRI Unit, Central
Department of Radiology,
Nara Medical University
Hospital, Shijo, Kashihara,
Nara, Japan
*"Evaluation of Appearance
with High Speeds CE-
3DDSA"*



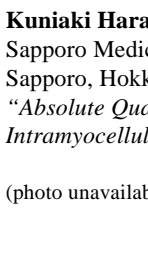
Benny Ehrnholm,
MR Center, Norwegian
University of Science
and Technology,
Trondheim, Norway
*"MR Imaging with
Quantitative Diffusion in
Patients with Parkinson's
Disease"*



Kaye Evans,
Department of Radiology,
Department of Neurology,
University of Michigan,
Chicago, Illinois, USA
*"Improved MRI Protocols
for Patients with
Refractory Epilepsy"*



Eun Hoe Goo,
Department of Diagnostic
Radiology, Seoul National
University Hospital, Seoul,
Korea
*"The Effect of Matrix Size
on Contrast-Enhanced
MRA of Portal Venous"*



Kuniaki Haradak,
Sapporo Medical University Hospital,
Sapporo, Hokkaido, Japan
*"Absolute Quantitative Analysis for the
Intramyocellular Lipid"*

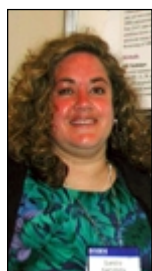
(photo unavailable)



Ho Yong Jung,
Department of Diagnostic
Radiology, Inje University,
Sang Gye Paik Hospital,
Seoul, South Korea
*"A Study for the Better
Quality of Fat Suppres-
sion Images by Varying
the ChemSAT Flip Angle"*

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Clinical Focus and Research Focus Oral and Poster Presenters



Sandra E. Kaminsky,
Department of Radiology,
Wake Forest University
Baptist Medical Center,
Winston-Salem,
North Carolina, USA
*"Diagnosing Upper
Extremity Veno-Occlusive
Disease: A Comparison
of GD-Enhanced MR
to Conventional
Venography"*



Scott Kurdilla,
Department of Radiology,
MR Research Center,
University of Pittsburgh
Medical Center, Pittsburgh,
Pennsylvania, USA
*"Reward and Punishment
in the Striatum"*



Zahid Latif,
MR Research Facility,
Wayne State University,
Detroit, Michigan, USA
*"Reduction of fMRI Motion
Artifacts and
Reproducibility of Head
Positioning Using Custom
Fitted Foam Head Holder"*



Nondas Leloudas,
Northwestern University,
Chicago, Illinois, USA
*"Evaluating Cardio-
thoracic Pathology with
Contrast Enhanced
Sub-second 3D MRA"*



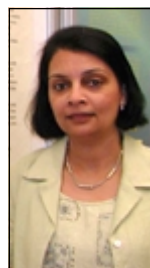
Marcella Montequin,
GE Medical Systems,
Baltimore, Maryland, USA
*"Dobutamine MRI vs. First
Pass Myocardial Stress
Perfusion"*



Ian T. Morris,
MRI Unit, Department
of Radiology, Sir Charles
Gairdner Hospital,
Nedlands, Australia
*"Application of Functional
Bold MRI in Pre-Operative
Neuro-surgical Planning"*



Kate Negus,
Barwon Medical Imaging,
The Geelong Hospital,
Geelong, Victoria, Australia
*"Diffusion Imaging—
The Effect of Resolution on
Sensitivity for Detecting
Ischemic Lesions"*



Nita Patel,
Department of Radiology,
University of Michigan,
Ann Arbor, Michigan, USA
*"Magnetic Resonance
Spectroscopy: A Tool for
Assessment of Brain
Metabolism"*



R.K. Puni,
MRI Unit, Urology
Department, Solihull
Hospital, West Midlands,
England, UK
*"Magnetic Resonance
Imaging in Prostatic
Cancer: A Comparison
Study Between an Inflatable
Endorectal Coil with the
Synergy Body Coil with
Pathological Correlation"*



Katrina Read,
Department of Radiology,
University of Maryland
Medical Systems,
Baltimore, Maryland, USA
*"MR Technique For
Evaluation of Adult Living
Donor Liver TX"*



Gunvor Robertsen,
MR-Center, Trondheim,
Norway
*"Benefits of Strong
Gradients"*



Laurian Rohoman,
Department of Radiology,
Montreal General Hospital,
McGill University Health
Center, Montreal,
Quebec, Canada
*"Added Value of High
Resolution Fast-Spin
Echo Relative to Single
Shot Fast Spin Echo
in the Evaluation of
Bile Duct Obstruction"*



Carol Rozell,
Department of Radiology,
MR Research Center,
University of Pittsburgh
Medical Center, Pittsburgh,
Pennsylvania, USA
*"A Protocol for Imaging
Brain Lithium in Bipolar
Patients with Magnetic
Resonance Spectroscopy
on a High Field Scanner"*



Susan Ryan,
Department of Radiology,
LaGrange Memorial
Hospital, LaGrange,
Illinois, USA
*"MRI As A Definitive
Diagnostic Imaging Tool
in Assessing Patients for
Vertebroplasty"*



Shirase Ryuji,
Division of Radiology
and Nuclear Medicine,
Sapporo Medical
University Hospital,
Sapporo, Hokkaido, Japan
*"Visualization of
Adamkiewicz Artery
using MRDSA"*

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Clinical Focus and Research Focus Oral and Poster Presenters



Motomichi Sakata,
Division of Radiology
and Department of
Otorhinolaryngology,
Sapporo Medical
University Hospital,
Sapporo, Hokkaido, Japan
*"High Resolution MRI
of the Labyrinth Selection
of Scan Parameter with
3D-FSE"*



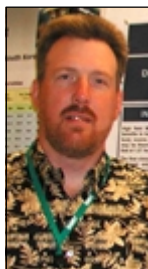
Elin Smenes,
MR-Center, University
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*"Presurgical Mapping of
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Tumor Patients with Bold
contrast fMRI"*



Mark Smith,
Children's Hospital and
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*"A Study on the Change of
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*"Initial Experiences of
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Radiology Department,
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*"MRI Comparative Study
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the Calculation of Iron
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Calculation of the T2 Time
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"Direct MR Venography
Using Paramagnetic
Contrast Agent"*

Y.M. van der Meulen,
Department of Radiology, University
Medical Center Nijmegen, Nijmegen,
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*"Short and Long Echo Time in 1H MR
Spectroscopy"*

(photo unavailable)



Judy Wood,
Department of Radiology,
Northwestern Memorial
Hospital, Chicago,
Illinois, USA
*"High Resolution 4D
Breast MRI"*

*At the Poster Walking Tour (l to r) Heidi
Berns, 2001 SMRT President, Lisa Vogt,
Marketing Manager, Mallinkrodt, Inc.,
Gina Greenwood, SMRT Program Chair, and
Thomas Coogan, Senior Product Manager
for MR Products, Mallinkrodt, Inc.*



*Scenes from the Friday evening
Poster Exhibit and Walking Tour.
This event provides an opportunity
for SMRT meeting attendees to
interact with Poster Presenters
and discuss their work.*



Early Stroke Detection Utilizing MRI

Part II: The Stories the Imaging Sequences Tell

Robin Greene-Avison, C.N.M.T., R.T. (N)(MR), The University of Kentucky, Lexington, Kentucky, USA. Part I of this article: "What is a Stroke," appeared in *Signals* issue Number 38, 2001, Issue 3.

Stroke remains the third leading cause of death throughout industrialized countries. The incidence of stroke is approximately 250-400 per 100,000 people, with a mortality rate of nearly 30%. Major break throughs in pharmacological treatments and therapies have prompted a world-wide campaign to educate patients about the early symptoms of stroke. The early diagnosis of stroke is crucial. Current medical practice states that if neurons are treated *while still in the process of dying*, the process may be reversed, resulting in less permanent damage.

The two major factors for patients receiving early treatment involve: (1) Getting the patient to a hospital as soon as possible after the onset of the stroke (this is where stroke symptom awareness education is crucial), and (2) Having the mechanisms in place for early detection (MR scanners should be preprogrammed with an acute stroke protocol and must have diffusion weighted (DWI) and perfusion weighted (PWI) imaging capabilities).

Many clinical MRI sites are now utilizing protocols that assess the effects of thrombolytic therapy in acute stroke victims. If your facility is not yet involved in stroke imaging, you soon may be. The latest "fashion trends" in diagnostic neurology are moving toward the administration of tissue salvaging pharmaceutical agents. The remainder of this article shall offer explanations as to how neurologists are requesting the MRI acute stroke protocols (i.e. why certain pulse sequences are of benefit or not).

Here is a sample protocol for an acute stroke patient. Your protocol may vary slightly because distinct radiologist, neurologists, and pharmaceutical manufacturers may have different preferences:

Acute MRI Stroke Protocol:

1. Scout/Localizer.
2. Diffusion Weighted Imaging (DWI).
3. MR Angiography (MRA).
4. Fluid Attenuated Inversion Recovery (FLAIR).
5. Perfusion Weighted Imaging (PWI).
6. T1/T2 Weighted (Optional).

Shimming

We are familiar with the use of **Scout** or **Localizer** images to ensure our successful positioning. In acute stroke imaging, is it often useful to utilize these images to perform the task of manual shimming. Shimming refers to the process of making adjustments to small shim currents in the magnet in order to regain any of the homogeneities lost by putting objects into the magnetic field (i.e. coils, patients, etc.) Most scanner manufacturers build the shimming into the pulse sequences, so that the computer makes the necessary adjustments without any input from the technologist.

MR technologists who are knowledgeable in the art of MR Spectroscopy will already be familiar with the procedure for performing a manual shim adjustment. Manual shimming requires practice before it can be performed correctly and efficiently.

Magnetic susceptibility refers to the magnetic conformity of material to an externally applied magnetic field. Manual shimming is extremely important in DWI and PWI (Echo Planar Imaging [EPI] based sequences) because these sequences are highly susceptible to distortion due to susceptibility artifacts.

Figure 1. shows two DWI images. Figure 1a. demonstrates a study performed with the manufacturer's autoshim process. Figure 1b. demonstrates the study on which the technologist performed the manual shim:

MR technologists who wish to learn how to perform this function on their specific MR scanner should be able to find instructions for manual shimming in the application manuals or by calling the local service or applications representative.

Diffusion is basically the random "walk" a molecule takes as it bumps into things that change its direction. As the molecule bumps into things it loses some of its energy. Therefore, on a normal diffusion weighted image, the areas of normal tissue will appear dark, because of this energy loss.



Figure 1a. Autoshim process.

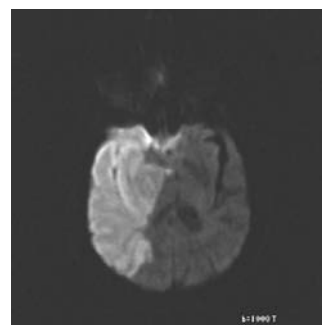


Figure 1b. Manual shim process.

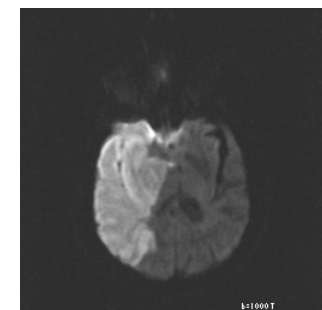


Figure 2.

Ischemic tissue is believed to change the dynamics of various biologic ionic pumps in the area. This changes the gradients and the diffusion is reduced. These areas in which diffusion is compromised will appear bright on the MR image. See figure 2.

The superior sensitivity of DWI enables an acute stroke to be identified before a conventional T1 or T2 weighted sequence (which may require several hours to elapse before the occurrence of an acute stroke episode can be detected) Decreases in diffusion can be seen as early as 1 hour post onset of symptoms with DWI. Figure 3a, b, c.

MRAs are usually requested for detection of the presence of a large vessel occlusion. The MRA information can assist in the interpretation of the perfusion weighted imaging sequence. The inclusion of the MRA in the acute stroke protocol is a matter of preference

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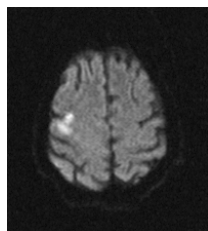


Figure 3a. DWI.

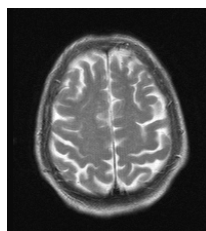


Figure 3b. T2-weighted image.

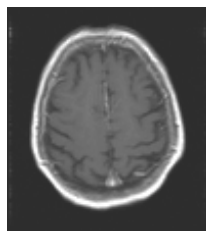


Figure 3c. T1-weighted image.

and may not be necessary. This is especially true if the time to perform the scan would prevent the patient from receiving thrombolytic therapy within the critical “administration after stroke onset” window.

FLAIR imaging is also not crucial, but may be of use to clinicians who want to compare the images with DWI sequences. Lesion volumes may be more accurately assessed with FLAIR because this sequence suppresses flow artifact from cerebral spinal fluid (CSF). By suppressing the signal from CSF in the ventricles and sulci, the lesion boundaries will be less ambiguous.

If you compare the boundary around the abnormal vs normal areas of diffusion, on the images in Figure 4a, b, slight differences in the ischemic area will be seen. The ability of FLAIR to suppress CSF motion artifact that may be present in the DWI will enable the clinician or researcher to measure the stroke volume with more precision.

Perfusion: The PWI can be qualitatively inspected for the presence of a perfusion defect without the need for image post-processing. The technique is a dynamically acquired image sequence, during which a rapidly

injected bolus of contrast agent is administered after the acquisition of several baseline images. The injection of IV contrast agent distorts the magnetic field around the capillaries (and large blood vessels).

This distortion produces a signal loss due to differences in magnetic susceptibility (T2 shortening). Tissues with higher flow show greater signal loss. Thus, normal tissue will demonstrate a dramatic signal drop and recovery. Ischemic tissue will show lack of or compromised response.

The IV contrast bolus must be timed perfectly in order to use the advantage of the sequence for differentiating between dead and struggling neurons. If your imaging site is fortunate to have a power injector, then poor bolus administrations will be minimized. IV infiltration is an exception.

The bolus should be sufficiently fast to produce a 25-40% drop in signal intensity on passage. The advantage of including the PWI sequence becomes more apparent when considering the pharmaceutical study MRI protocol. Figure 4c shows a baseline image and 4d shows the signal drop in the viable tissue upon entry of the contrast agent.

Conventional MRI T1- and T2-weighted images were listed in the protocol as options because in the acute stages of stroke both will be negative. The diagnostic advantage with these sequences is only if the patient did not have a stroke.

How MRI Can Be Used in Determining Pharmaceutical Efficacy in Acute Stroke Victims

According to animal studies, thrombolytic therapy appears to be beneficial for the treatment of acute ischemic stroke. However, there are several grounds in the determination of matching the pharmacological efficacy in humans. The most crucial factor is the time limitation. Early therapy may help to salvage cells that are in the process of dying. Delivering the therapeutic too late will not save the dying cells.

MRI techniques offer promise as an objective method to help assess different pharmaceutical agent's efficaciousness in saving dying neurons. As well, these studies assist in the selection as to

which patients will best benefit from treatment.

Ideal imaging protocols will assist in:

1. Identification of the size and location of the *ischemic penumbra*. That is the stunned but still salvageable tissue.
2. Identification of the *infarct core*. That is the irreversibly injured tissue.
3. Identification of (via MRA) an occlusion that may benefit from therapy and can benefit from a later administration time as well.
4. Quantification of stroke changes with time.
5. Selectivity for inclusion/exclusion criteria.
6. Accessibility to a range of tissue damage types.
7. Volume of Stroke which will increase with time.
8. Determination of whether pharmaceutical therapy arrests the progress of the death of cells.

The protocol previously described minus the Spin Echo T1- and T2-weighted images offers an example of an adequate study design that provides scientists with qualitative as well as quantitative information for pharmacological investigations. (Remember, the T2 images typically do not show changes indicative of a stroke event until many hours have elapsed. The spin echo images may be omitted in these studies to save time).

The essence of what MRI relates about pharmaceutical efficacy is indicating the potential areas of stroke that can be reversed. Certain areas on the image represent the primary site of the stroke (infarct core- denoted as orange). This tissue has been irreversibly compromised and will die. The DWI will appear hyper-intense and the PWI will demonstrate no flow (a classical mismatch). The secondary stroke site will surround the infarct core, and is referred to as the penumbra (denoted in blue). This area is the reversible diffusion abnormality and contains tissue / cells that are possibly salvageable but are at high risk.

Within the penumbral area (blue), the DWI is normal and the PWI has a perfusion deficit. If untreated, the DWI core lesion will grow into the penumbral region. Note how the area of injury looks slight larger in figure 6b than in figure 6a. This difference in lesion size between the DWI and PWI is the penumbral area and is the target area for thrombolytic therapy.

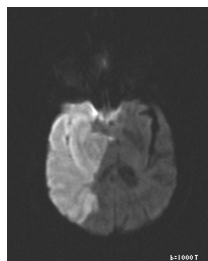


Figure 4a. DWI.

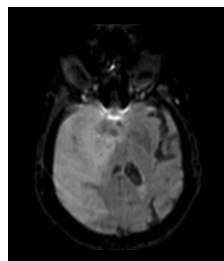


Figure 4b. FLAIR.

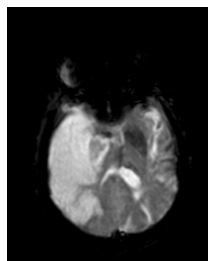


Figure 4c. Baseline.

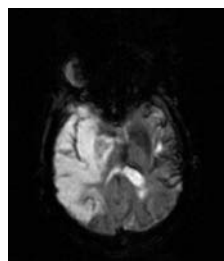


Figure 4d. Bolus entry.

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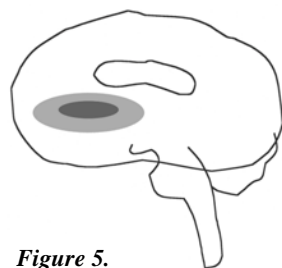


Figure 5.

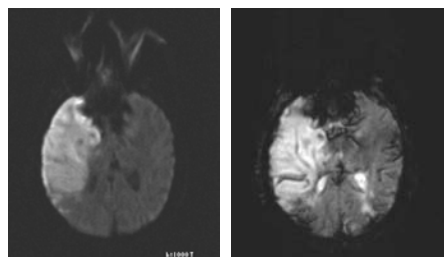


Figure 6a. DWI.

Figure 6b. PWI.

There are models that demonstrate the natural history of early diffusion lesions is to grow, over time, into part or all of the perfusion abnormality. Thus, mismatch symptoms are more favorable for those receiving thrombolytic therapy.

What investigators are racing to find out is, whether or not the infusion of certain pharmaceutical agents can prevent the migration of the infarct core into the area of the penumbra, thereby, salvaging the dying cells residing in the penumbra. This in turn may reduce patient suffering by confining the permanent, long term effects of the stroke. See figure 7.

In addition to quantifying the DWI / PWI data in order to extract match/ mismatch information, the PWI can also provide additional dynamic information. The PWI imaging allows the creation of bolus contrast delivery curves. When T2* weighted images are rapidly acquired following a bolus injection of the intravascular paramagnetic contrast agent, Gd-DTPA, changes in local blood volume over time can be evaluated.

It should be apparent, that the bolus needs to be intact and delivered at the proper rate in order to perform the perfusion curves. These curves are being calculated to distinguish normal from infarct core or penumbral region. See figure 8.

The natural history of most lesions is enlargement from the acute to chronic period. Lesions may not reach their final volume for as long as 24 hours. The PWI can be qualitatively inspected without the need for image post processing for the presence of a perfusion defect and of an obvious diffusion-perfusion mismatch. For quantification of perfusion

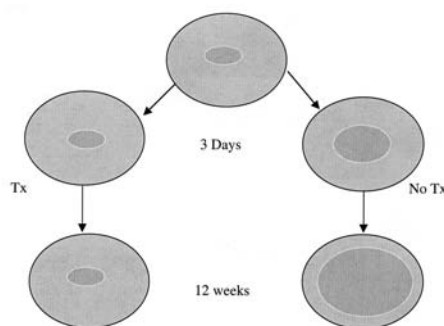


Figure 7.

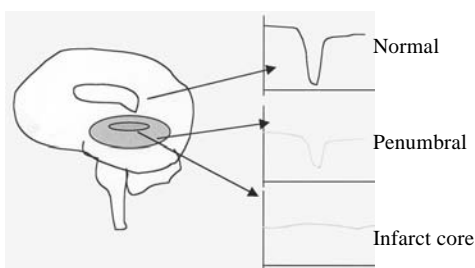


Figure 8.

defect, the time curve of signal change is used to derive relative indices of blood volume, blood flow, and mean transit time (MTT). The MTT map delineates the region of perfusion delay and is used for further quantification of hypoperfused lesion volume.

One of the promising applications for EPI MRI has been to evaluate the neuro-protective effects of pharmaceutical agents in clinical trials. By studying patients longitudinally (acute, and several follow-ups) MRI in conjunction with other neuro-evaluations may tell researchers if the particular therapy was efficacious. There are currently many manufacturers of therapeutic agents which are being evaluated by multi-center, multinational trials. These trials include MRI data analysis as part of the stroke evaluation.

To conclude, it must be remembered that the most important point is to recognize the symptoms of stroke and get the patient to a proper facility as soon as possible. With more and more clinical MRI systems possessing the tools required to visualize the infarct core from the penumbral regions, more and more patients may benefit from possibly being included in one of the neuro protective therapies. These therapies will eventually become routine practice in neurology. Once the clinical trials reveal which of the neuro-protective agents are efficacious, neurologists will be able to treat all patients with the hope of saving dying neurons. This will be an attempt to reduce the level of long term consequences as the result of stroke. ●

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... is published by the International Society for Magnetic Resonance in Medicine, 2118 Milvia Street, Suite 201, Berkeley, CA 94704, USA.

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