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NEWSLETTER OF THE SECTION FOR MAGNETIC RESONANCE TECHNOLOGISTS

IN THIS ISSUE

Message from the President

Karen Bove Bettis, R.T. (R)(MR)

Members of the SMRT enjoy tangible and intangible benefits with their membership including multiple, quality continuing education opportunities through the Chapter Meetings, Regional Seminars, the Annual Meeting and especially through the *Educational Seminars* Home Study Program. Often overlooked is the value of networking with other MR professionals. A recent ISMRM Workshop, held in my locale, reminded me of this benefit when I was able to hobnob, however briefly, with members over lunch. How wonderful it is to mix with and discuss MR issues and general healthcare concerns with other MR professionals. I am looking forward to meeting with our large, international MR professional membership in Seattle. Will I see you there?

The busy autumn Regional Seminar season is ending but will ramp up again in March of 2006, with the President's Regional. One question I hear from members is why are Regional Meetings not generally held from mid-November to June? The reasons can vary but it has more to do with holidays, weather, and schedules of those who would be presenting the programs. This does not mean that the SMRT or the ISMRM/SMRT corporate office located in Berkeley, California, USA is idle. Mid-November brings the ISMRM abstract deadline followed by Radiological Society of North America (RSNA) meeting held in Chicago, Illinois, USA. Because the RSNA is the largest medical meeting in the world, it is a convenient place for executive and policy board members to meet mid-way through the year. The holidays come quickly on the heels of the RSNA bringing us into the New Year. January brings the SMRT abstract deadline and scoring tabulation of the SMRT abstracts. March brings the SMRT Electronic Poster scoring tabulation followed quickly by the final preparation for the Annual Meeting. Meeting documents, including the board meeting materials, are shipped to the convention site well in advance. The time needed to prepare, pack, and then unpack the materials consumes the time of our central office professionals and volunteers.

The President's Regional, scheduled for 18 March 2006, will be hosted by the SMRT Virginia Chapter in beautiful Charlottesville, Virginia, USA about 1 1⁄2 hours from Washington, DC. Just a few months later, the Annual Meeting occurs in Seattle, Washington, USA. Barcelona, Spain, will host the 2007 Annual Meeting. Another question members ask is why, seemingly, there are few meetings scheduled for outside of North America. It has been the decision of the ISMRM Board of Trustees to hold the meetings in three-year cycles. The first two meetings are held in North America, usually on one coast, then the subsequent year the other. The third year the meeting is held "off shore." The off shore meetings are balanced between the Pacific Rim and European countries. Convention sites are chosen years in advance by ISMRM Board Members working with a local planning committee and the professional staff working with local meeting planners. Reasons for siting can include, convention site and size, hotel vacancies in the vicinity, and ease of travel. The SMRT looks to local members who are knowledgeable about the city and convention locale and who are connected to the MR community as a whole. SMRT members Vern Terry and Denise Echelard have been working with the Program and Education Committees, chaired by Todd Frederick and Carolyn Bonaceto respectively, to make sure the 2006 Annual Meeting in Seattle goes well. President Elect, Cindy Comeau, is already preparing for the Barcelona Meeting by forming a local planning committee to assist her and the 2007 Program and Education Committees. The

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Remember these dates!

18 January 2006...SMRT abstract submission deadline

13 March 2006...SMRT Electronic Poster deadline

18 March 2006...SMRT President's Regional in Charlottesville, Virginia, USA

5-7 May 2006...15th SMRT Annual Meeting in Seattle, Washington, USA

planning for regional seminars and the annual meeting take time and preparation by committed individuals. The SMRT is always looking to its members for support in this endeavor. If there is no regional seminar in your area, then why not offer to host a meeting? We have an increasing membership worldwide and look forward to those seminars previously scheduled and for those seminars waiting for committed member volunteers.

By now, members should have voted for the selection of the 2006-2007 executive committee and policy board members. The makeup of these boards depends not only on the members nominated, but just as importantly, it depends on those who remember to vote. Did you remember to mail in your ballot?

Members should also have received the "SMRT Call for Papers" for abstract submissions. In successive years we have experienced a rapid increase in the number of abstract submissions, and there is good reason to think this year will continue the trend. **All MR technologists** are invited to submit an abstract based on their work, a research project, policy planning, etc., regardless of membership status. Full details and complete guidelines for submission can be found on the SMRT website (www.ismrm.org/smrt). The SMRT is the largest, MR dedicated, professional organization that not only encourages technologists to share their work but also rewards their extraordinary efforts. Professional recognition in one's chosen field is worth more than any monetary award. Nevertheless, monetary awards may help to offset travel expenses. Those who are acquainted with the abstract submission process can and should help fellow technologists by offering mentoring assistance. After all, the evolution of a professional organization depends not only on its present membership but also on those who may one day join. Frankly put, the professionalism of an organization depends on the effort of those involved. ●

SMRT Educational Seminars Home Study Program

Anne Marie Sawyer, B.S., R.T. (R)(MR), Editor

The SMRT is pleased to present Educational Seminars, Volume 8, Number 4: "Parallel MR Imaging." This is the thirtieth home study developed by the SMRT, exclusively for the SMRT members.

As magnetic resonance imaging continues to evolve, pulse sequences and imaging options become increasingly complex, making their interpretation and daily application more challenging for health care professionals operating the MR systems. If we were to believe everything we read in marketing brochures, the implementation of recent advances in MR imaging software requires neither evaluation nor compromise on the part of technologists or radiographers. Fortunately, we know differently. And luckily for us, the challenges we encounter daily in the comprehension and successful utilization of our intricate MR system software is something we seek out, something we relish. Parallel imaging, in its variety of designs, is certainly one of those contemporary imaging sequences that require continuing education to effectively integrate into our current scanning protocols.

A very special thank you to our authors for taking the time from their busy schedules to write these articles. We are extremely fortunate to have these two particular individuals write specifically for this publication. Dr. Donald W. McRobbie is the Head of the Radiological & MR Physics at the Radiological Sciences Unit at the Hammersmith Hospitals NHS Trust and the Senior Lecturer in the Imaging Sciences Department at the Imperial College, Charing Cross Hospital, in London, England, UK. Dr. McRobbie has an extensive background in the field of magnetic resonance, conducting research and teaching at academic institutions and invited lectures worldwide. Dr. McRobbie is a well-known published author of book chapters, peer-reviewed abstracts and articles and the widely acclaimed book "MRI from Picture to Proton." Dr. Roland Bammer is an Assistant Professor at Stanford University School of Medicine, Department of Radiology in Stanford, California, USA and a Professor of Medical Physics and Biophysics, Medical University of Graz, Austria. Dr. Bammer is also a published author with many peer-reviewed abstracts, articles and book chapters to his credit. Dr. Bammer teaches courses in physics and magnetic resonance at both universities, Graz and Stanford, and has participated as faculty for many invited lectures around the globe. Both authors have previously participated as faculty speakers at SMRT annual meetings and regional educational seminars.

Thanks to Michael E. Moseley, Ph.D., Professor at Stanford University School of Medicine, Department of Radiology, in Stanford, California, USA, for participating as our expert reviewer.

Thanks to Mark Spooner, SMRT Publications Chair, and in the Berkeley, California, USA office of the ISMRM/SMRT, Jennifer Olson, Associate Executive Director, and the staff for their insight and long hours supporting these educational symposium.

Accreditation (USA) for all home study issues of the *Educational Seminars* is maintained annually by the SMRT. Previous issues may be obtained from the SMRT/ISMRM office located in Berkeley, California, USA for twenty dollars (USD) each. For a complete list of back issues, please go the SMRT website: www.ismrm.org/smrt.

Finally, I would like to thank Tom Schubert, John Wilkie and all of the wonderful people at Invivo/MRI Devices Corporation who support our home studies program, SMRT Educational Seminars. Their continuing support of technologist and radiographer education brings quality continuing education to the SMRT membership worldwide. ●

Editor's Letter

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

Greetings,

This 2005 fourth quarter issue of *Signals* wraps up a busy year for the SMRT. We begin with the message from President **Karen Bove Bettis** who reminds us that it is important to be involved professionally and we all must undertake that responsibility. The accompanying issue of the Educational Seminars Home Study is announced by Past-President, **Anne Marie Sawyer**. Parallel MR imaging is the pertinent and timely topic for this educational offering.

We are proud to recognize **Mark Spooner**, Publication Chair for receiving the Imaging Professional of the Year award from *Advance Magazine*. We congratulate him on his achievement. The External Relations Chair, **Julia Lowe** shares current news in organizations related to those who work in MR technology. Her report is evidence of the involvement of the SMRT nationally and internationally to advance the professionalism of MR Technologists and Radiographers world wide. Past-President **Cindy Hipps** reports on the Ad Hoc Committee for Educational Standards. This committee chaired by Past-President **Luann Culbreth** is a significant indication that the SMRT is the recognized professional organization representing MR Technologists in the United States.

The Local SMRT Chapter in Northeast Ohio leads off the educational seminar news with a report from **Kathryn Hampton**. Boston was the site of the SMRT Northeast Regional as described by **Carolyn Bonaceto**. Several SMRT members were in attendance at the ISMRM Safety Workshop held in McLean, Virginia. Past-President **Maureen Ainslie** and **Anne Sawyer** co-hosted a two day SMRT West Regional Seminar. President-Elect **Cindy Comeau** shares the experience of the SMRT New York City Regional Seminar.

We have included the abstracts of those individuals who were awarded second place at the 2005 Annual Meeting. They were invited to give oral presentations of their work during the didactic sessions. **Heather Dulcie** presented the research focus paper and **Hina Jaggi** presented the clinical focus paper. Educational information continues with Part II of the material prepared by **Filip DeRidder** addressing artifacts in MR. Part I is found in *Signals* 54 2005 Issue 3. MR Safety expert **Frank Shellock** addresses an implant that MR Technologists and Radiographers need to note. He also announces the "Reference Manual for MR Safety, Implants, and Devices: 2006 edition."

Education Chair **Carolyn Bonaceto** and Program Chair **Todd Frederick** invite us to the 15th SMRT Annual Meeting in Seattle and announce the preliminary schedule of speakers. Make your plans now to be a part of this educational opportunity and occasion to share experiences with others. You will learn a lot from both encounters.

You may have noticed the use of Past-President as a descriptor of some of the authors and contributors in this issue of *Signals*. This is to remind us all of the continuing commitment by those individuals for the advancement and promotion of the SMRT on your behalf, including this Past-President, 1999-2000. As always, you are reminded to check the calendar of upcoming events not only in this publication but on the SMRT web site as well. ●

Congratulations to Mark Spooner: Imaging Professional of the Year

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

SMRT Publications Chair, Mark Spooner, B.P.S., RT(R) (MR) (CT) has been recognized as the Imaging Profession of the Year by *Advance for Imaging and Radiation Therapy Professionals*. According to the 17 October 2005 publication, Mark was nominated for this award by Cooperative Magnetic Imaging's (CMI) director of marketing Lori Damody. She was quoted in her essay about Mark: "Not only does he bring us updates in the field of MRI technology, but he also brings us information we can use for business purposes."

According to the article Mark played an integral role in attending educational sessions at the Siemens Training center in preparation for an expansion in services at CMI and then taught that information to technologists, nurses and support staff. Mark is described as highly motivated to pursue his own professional education and to eagerly distribute what he has learned with others.

The article continued to explain that Mark plays a key role in developing educational materials for marketing, which are used for referring providers. He recently designed a newsletter with interesting case studies which will be used to promote MRI to family practice providers in the Syracuse area.

He further shares his talents by working as a clinical instructor at the SUNY Upstate Medical University MRI Technologist program. Since beginning this activity in 2002 he has recruited new graduates to his area for employment, much to the delight of those in the facility.

When colleagues were asked to describe Mark, it is reported that words like educator, leader, team player and mentor were used. The commentary concluded by stating that he remains modest despite his accomplishments and always has a positive and professional attitude.

The *Signals* newsletter committee certainly concurs with these words about Mark. He has been active with the SMRT and in the second year of his term on the Policy Board serves as the chair of the Publications Committee which includes not only the newsletter, but the Educational Seminars home study series, and the electronic web site. Recently Mark co-chaired a SMRT Regional Education Seminar in Syracuse, New York.

We are proud that Mark is one of our own and echo the words of acknowledgement for his professionalism and achievements. It is a pleasure to work with him! ●

External Relations Committee Report

Julia B. Lowe, B.S.R.T. (R)(MR), Chair, External Relations Committee

The External Relations Committee (ERC) was implemented to serve as a liaison between the SMRT and government at all levels, and to establish and foster relations with other professional and ethical societies, industry, and the public at large. The ERC has interacted with many different groups this year, which made for a busy agenda throughout the summer and fall.

The SMRT continues to be an active supporter of the Consumer Assurance of Radiologic Excellence (CARE) Bill or RadCARE Bill. The Alliance now has 97 co-sponsors signed on to the CARE Bill and has plans to be re-introduced to Congress during the week of October 17th, 2005. The SMRT would like to thank those of you that responded to the request of Past President, Cindy Hipps, to contact your congressmen and voice your support for the bill. The Alliance is a group of health care workers, educators and other related bodies that promote the CARE Bill and will be meeting in Spring, 2006 in Washington D.C. The ERC will send a representative to D.C. to continue to refine the Health and Human Services (HHS) draft regulations that concern the Standards for Accreditation of Educational Programs for Magnetic Resonance Technologists. To read the current Alliance HHS draft regulations, go to the below address and look under Case Bill Resources. The MRI standards are listed specifically on pages 16-19 of the regulations.

http://www.asrt.org/content/GovernmentRelations/CAREBill/Federal_Minimum_Standards.aspx

The Health Professions Network (HPN) met in Louisville, KY on September 22-25, 2005 and Julia Lowe, ERC Chair attended. The focus for the Fall HPN meeting was "New Initiatives in Allied Health". A highlight of the meeting was a board discussion with Gina King, Department of Labor and Young Song, Department of Health Resources and Services Administration on "Federal Initiatives Regarding Health Care Workforce Development". As a result of this discussion an HPN representative will meet with the Department of Labor to improve the government's recognition and definition of the many different allied health professions. The Health Professions Network celebrated National Allied Health Week November 7-12, 2005. Another important topic of the meeting was the Allied Health Reinvestment Act. There is work being done now to amend the Public Health Service Act and to promote and improve the allied health professions. It is the purpose of this Act to provide incentives for individuals to seek and complete high quality allied health education and training and provide additional funding to ensure that such education and training can be provided to allied health students so that the United States health care industry will have a supply of allied health professionals needed to support the health care system of the United States in this decade and beyond. Look for more on this topic from the SMRT in 2006.

The Coalition for Allied Health Leadership (CAHL) Conference first came to the attention of the SMRT through the HPN. During the 2005 SMRT annual meeting the Policy Board and Executive Committee voted to nominate an SMRT representative to attend the CAHL workshops. The workshops are designed to strengthen personal leadership capabilities and the capacity to address the allied health community as a whole. The SMRT plans to nominate an SMRT member to attend the 2007 CAHL workshops. The government will not be funding CAHL workshops for 2006. The Spring HPN meeting will be in Atlanta, Georgia, March 16-19th, 2006.

Julia Lowe, External Relations Chair, and Cindy Comeau, President-Elect were invited to attend a meeting with Jim Coffin, President of American Registry of Magnetic Resonance Technologists, (ARMRIT) and Dr. Wilfrido Sy, CEO of ARMRIT, on June 30th, 2005 in New York City. The meeting served as a good opportunity to better understand the mutual goals of our organizations.

The Australian Institute of Radiography, (AIR) has approved the SMRT Educational Seminars Home Study Program as a Continuing Professional Development (CPD) activity. CPD is now a compulsory requirement of membership with the AIR. The SMRT was granted Affiliate Status with the AIR meaning that the they consider affiliation with the SMRT to be beneficial to their membership. This affiliation was accomplished through the work of Australian SMRT member, Wendy Strugnell, ERC, Global Relations Chair. SMRT members might notice the AIR logo that will be printed on future publications of Home Studies which signifies our affiliation with the AIR. The SMRT is hoping to attract more international members with such affiliations. We encourage other countries to participate in such affiliations.

The ERC has recently been busy preparing for the Radiological Society of North America, (RSNA) meeting that was held in Chicago November 27th-December 2nd, 2005. The SMRT is affiliated with the Associated Sciences Consortium (ASC) of RSNA which is a collaboration of associated sciences groups in radiology in a conjoint effort to promote education. The ASC annual meeting was held on Sunday, November 27th, 2005 in Chicago. Several ASC members, along with the SMRT, volunteered to staff a booth in the vendor section of RSNA in an effort to promote each organization and attract new members.

The External Relations Chair, Julia Lowe, is a member of the RSNA Recognized Continuing Education Evaluation Mechanism (RCEEM). In preparation for the RSNA educational program for technologists, Julia reviewed and approved Category A credit for scientific posters, refresher courses and the Associated Sciences Symposium. The American Association of Physicists in Medicine (AAPM) offered a basic physics lecture for the radiologic technologist on PET/CT that was also approved for Category A credit.

An ERC committee member will plan to attend these future meetings: the ASC planning meeting for RSNA 2006 in Chicago, January, 2006, the HPN meeting in Atlanta, March, 2006 and the Alliance meeting in Washington, D.C. in March, 2006.

SMRT AdHoc Committee for Educational Standards

Cindy Hipps, B.H.S., R.T. (R)(MR)

The SMRT Executive Committee and Policy Board approved the formation of a new SMRT AdHoc Committee for Educational Standards at the Annual Meeting in Miami. With advances in a primary educational pathway for MR Technologists on the horizon, the Policy Board felt a new committee was necessary to stay on top of this issue as well as the many more challenges that will arise with MR education. The committee is comprised of a vast array of individuals who are interested in quality MR educational standards for those working in the field and those preparing to enter the field of MR. The committee is comprised of the following individuals:

Luann Culbreth, M.Ed., R.T.(R)(MR)(QM)CRA, Chair
Cindy T. Hipps, B.H.S., R.T.(R)(MR), Co-Chair
Karen E. Bove Bettis, R.T.(R)(MR)
Patrick Beaulieu, R.T.(R)(MR)
Carolyn A. Bonaceto, B.S., R.T.(R)(MR)
David Clemente
Cindy R. Comeau, B.S, R.T.(N)(MR)
John V. Crues, III, M.D.
Denise Davis, B.S., R.T.(R)(MR)
Rosemary Fisher, R.T.(R)(CT)(MR)
Christine Harris, R.T.
E. Mark Haacke, Ph.D.
Tamara D. Lee, R.T.
Julie B. Lowe, B.S., R.T.(R)(MR)
Vera Kimbrell Miller, B.S., R.T.
Nita Patel
Sonja Kay Robb-Belville, A.S.,R.T.(R)(MR)
Carolyn K. Roth, R.T.(R)(MR)(CT)(M)(CV)
Mark Spooner, B.P.S., R.T. (R)(MR)(CT)
Karen E. Smith, R.T.(R)(MR)
Charles Stanley, R.T.(R)(CT)(MR)
Rhonda Walcarius, BSc,RT(R)(MR)

The ARRT invited representatives from the SMRT to attend a roundtable discussion pertaining to the primary pathway for MR Technologists in their Minnesota office. In September, Luann Culbreth, Cindy Hipps and Carolyn Bonaceto joined individuals from other organizations to discuss this very important issue. Representatives from the ARRT, ASRT, JRCERT, ACR and other educational institutions were present for the meeting. The ARRT is set to release the new clinical competency and content specifications for the primary pathway in December 2006. Members of the SMRT Educational Standards Committee were asked to review these content specifications and report their opinions directly to the ARRT as an individual reviewer.

The meeting at the ARRT was a time to share our opinions concerning the elements of a quality education program for entry level MR Technologists. The group present did share the SMRT's mission of quality MR education. We were asked to share our thoughts on key questions that needed answers such as:

- What issues surround non-RT's performing MRI Procedures?
- What assumptions are made when the individual has an RT background?
- What are the characteristics of a quality MRI program?

The group was able to come to a consensus with regards to these questions as well as the foundation of an entry level MR program. The ARRT plans to develop guidelines for accreditation mechanisms.

In follow up to this meeting, plans are to approach the AERS once again to establish a curriculum guideline for this primary pathway as a model for MR programs. The SMRT Educational Standards Committee will be instrumental in this process! ●

SMRT Northeast Ohio Chapter Educational Seminar

Kathryn M. Hampton, R.T.(R)(MR)

The NE Ohio SMRT Chapter Educational Seminar, held in Salem, Ohio, on 30 October was a huge success! MRI technologists from all over northeast Ohio came out on a beautiful fall Sunday to participate in this meeting and help to kick-off our local chapter.

Kris Barnhart, President of the chapter, welcomed all attendees. Kathy Hampton then spoke on the benefits of SMRT membership to the group of over 50 technologists. Chris Hawks was our moderator for the meeting, and introduced our first speaker, Dr. Peter Apicella, a Radiologist from Salem Community Hospital.

Dr. Apicella's presentation was entitled, "Stroke: Diagnosis, Imaging and Therapy." This very informative talk focused on the risk factors symptoms, causes, and preventative measures of strokes. He also covered methods of evaluation, including CT and MR Perfusion, and the more common MR pulse sequences used to diagnose strokes.

Next up was Mr. Mark Canupp, R.T.(R)(MR), who presented "MR of the Breast". Mark's very thorough presentation included the following topics: MR sequences for breast imaging, subtraction techniques, specificity vs. sensitivity, routine protocols, patient positioning, and emerging technology such as the RODEO technique.

After a quick lunch, and a chance to mingle, we resumed our meeting with the ever-popular Dr. Frank Shellock, whose presentation, "MR Safety," was a showstopper! Dr. Shellock covered all of the basic aspects of MR safety. He then expounded on that, with up to the minute information on the newest implants and state-of-the-art pacemakers that all MR technologists should be on the lookout for. He also explained the newest safety terms that we should make ourselves familiar with in the upcoming year.

Our fourth and final speaker was Ms. Carolyn Kaut Roth, RT (R)(MR)(CT)(M)(CV), who brings fun to the MR world with her down-to-earth presentation style. Candi presented two topics, "MR Parameters, Options & Artifacts," and "MR Pulse Sequences." She talked about MR parameter trade-offs, and the effects on signal to noise when parameters are changed. She also discussed the different types of coils, and common artifacts. Candi then went directly into a discussion of MR pulse sequences, which she was able to present with a light touch for the audience. She explained the main MR pulse sequences, how they compare and contrast to one another, and touched on the basic MR parameters necessary for successful imaging.

We received very positive comments on the seminar, and we plan to host two educational seminars each year. We are very grateful to the SMRT for their guidance and support of our new chapter, and to our corporate sponsors who gave very generously to help make this meeting a success! ●

SMRT Northeast Regional

Carolyn Bonaceto, B.S., R.T. (R)(MR)

On October 22, 2005 the Louis Bornstein Family Amphitheater at Brigham and Women's Hospital in Boston, Massachusetts was the site of the SMRT Northeast Regional Education Seminar. The co-chairs Patricia Devine, B.S., RT(R)(MR), John Shirosky, M.Ed., RT(R)(MR), and Paul Wilson, B.S., CNMT did a phenomenal job of organizing a diverse and informative collection of educational lectures addressing so many of the hot topics of interest to the highly motivated MRI Technologists present. Over 100 technologists representing 5 New England states were in attendance and 10 became new SMRT new members.

The co-chairs were honored that former SMRT President Maureen Ainslie, M.S., RT(R)(MR) volunteered to staff the registration table while SMRT regional representative Carolyn Bonaceto, B.S., RT (R)(MR) greeted attendees enjoying the continental breakfast. The meeting got underway as John Shirosky, the moderator for the morning session, welcomed everyone and thanked them for their willingness to share a beautiful fall Saturday expanding their knowledge of the practice of MR Imaging.

The first lecture of the day was presented by Nathan McDannold, Ph.D. Dr. McDannold brought the attendees up to date on MRI guided focused ultrasound thermal ablation methods. The lecture addressed instrumentation. Brigham and Women's uses an ExAblate2000 system developed by Insightec Inc. (Haifa, Israel) in collaboration with investigators at the hospital. It was outlined that systems that are able to use MRI guidance offer the opportunity to oblate larger tumors. Dr. McDonald went on to describe treatment planning, sonications, and MR Imaging. The portion of the lecture addressing MRI's use to obtain temperature sensitive images was especially interesting. He went into detail describing the importance of patient prep and he rounded out the presentation by describing the clinical experiences of his team.

The next speaker was Tuan Minh Luu, B.S., CNMT. Tuan is an MRI technologist at Brigham and Women's Hospital whose specialty is cardiac imaging. His lecture focused on Cardiac imaging from a technologist's perspective. Tuan's slides highlighted MRI's use for imaging for cardiac stress function, myocardial perfusion, and myocardial viability. Details of current monitoring systems and tips on lead placement were terrific. His material included a slide showing the cover of the SMRT's recent cardiac home study!

As the next lecturer, Carolyn Bonaceto reviewed the history and current C.A.R.E bill status. The bill has garnered more support in the current congress than in any of its earlier introductions and there is much confidence that legislation establishing minimum standards for education at the federal level will soon be a reality. It is expected that shortly there will also be a senate version of the bill. The question and answer period involved a very lively discussion of the current state of our profession and where we are going with the advent of the ARRT's recent decision to recognize MRI as a separate and distinct imaging profession.

Lunch was served nearby and gave the attendees the opportunity to get to know some fellow MRI technologists and catch up with old friends and colleagues. Following lunch, our afternoon moderator, Patricia Devine, B.S., RT (R)(MR), gave away several copies of "Reference Manual for Magnetic Resonance Safety, Implants and Devices" which where generously provided by the author, Frank G. Shellock, Ph.D.

Patricia introduced Koenraad Mortele, M.D. who reviewed current practices in MRCP imaging and expectations for the future. His slides demonstrating both normal and abnormal pancreatic and adjacent anatomy were invaluable to those of us performing these exams daily. Of great interest was his mention that we may be seeing pineapple juice used as a negative oral contrast agent in the very near future.

It was an honor to have Maureen D. Ainslie, M.S., RT (R) (MR) educate us on MR Spectroscopy. Maureen works with the leaders in the field at Duke University, in North Carolina. Every slide and piece of information Maureen shared concerning MR Spectroscopy's use in the clinical and research settings was helpful. In one of the best lessons, she taught the use of the mnemonic "Lying Lazy No Good Crooks Collected My Insurance" to remember and identify the peaks existing in the proton spectrum: Lactate, Lipids, NAA,

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Attendees Kristin McClellan and Christine M. Emord.

Organizers and speakers at the Northeast Regional gather for a photo.

Glutamate/Glutamine Pool, Creatinine/ Phosphocreatine, choline, and Myo Inositol.

Co-chair John Shirosky talked about creating and delivering on-line MR Safety Training. Acknowledging the difficulty and very real concerns about having potentially non- or under-educated health care workers in the magnetic environment John successfully established an on-line training module at Brigham and Women's Hospital. Distance learning will play a greater role of all learning in the future. John quoted a study which found that on-line CME programs were as effective or more effective than traditional learning models. John demonstrated that on-line remote learning offers flexibility and availability that was until recently unattainable. This lecture was both timely and necessary in our changing environment.

Janice Fairhurst, R.T. (R) (MR) has a truly unique job. She shared her experience in the use of MR in the OR during her lecture. The information was captivating. She discussed MRT's history and its future. Janice brought and passed around some of the coils used in this very specialized environment. This technique has been successful for neurological applications, biopsy procedures for the brain, prostate, and bone. It can be used for minimally invasive cryotherapy and the systems unique design allows patients to be scanned in a sitting position. This hospital is anxiously awaiting the installation of a new suite and Janice shared some fascinating images of its eventual configuration. It is inevitable that more facilities will offer similar systems.

The organizers did an extraordinary job on this event and it was clearly a huge success. This success however would have been impossible without the generous support of Berlex industries, GE Healthcare, and The Institute for Magnetic Resonance Safety, Education, and Research, Magnetic Safety Testing Services who helped sponsor the event. ●

MRI Safety: Update, Practical Information and Future Implications

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

McLean Virginia, USA, was the site for the ISMRM workshop organized by Daniel J. Schaefer, Ph.D. and Frank G. Shellock, Ph.D. and held on 5-6 November 2005. Approximately 160 international attendees who included more than 30 MR Technologists enjoyed the beautiful fall setting. The program consisted of four focus sessions, proffered papers, poster presentations and a few commercial exhibits of safety related equipment. Breaks and meals provided ample opportunity for discussion and connecting with colleagues.

The first focus session was entitled "Practical Information for Clinical and Experimental MRI." Our own Anne Sawyer, B.S., R.T. (R) (MR) presented "Screening Patients and Other Individuals" during that portion of the workshop. The second focus session, "Interventional MR Procedures: Applications and Safety Aspects" illustrated the wide variety of MR imaging systems available and the associated concerns. Sunday morning began with the focus session: "MRI Safety for Implants and Devices" with Frank Shellock, Ph.D. taking the lead. The afternoon focus session was "MRI Safety Standards, Guidelines, and Recommendations" which included speakers from international regulatory agencies.

Information during the workshop included the current recommendations for safety screening of devices and implants, use of contrast agents and the concern over radio frequency (RF) heating and potential gradient switching issues. Of interest to SMRT members in the United States is the shift in language from indicating items that are MRI compatible or MRI safe to the FDA presented language of MRI Safe, using a rectangle shaped notation, MRI Conditional, using a triangle shaped notation, and MRI Unsafe using a circle shaped with the diagonal line across. It was felt that this language and signage would be much less confusing to all who work in or near the magnet environment.

A result of this workshop was the formation of the MR Safety Study Group of the ISMRM. The attendees enthusiastically signed up to form this new group. Watch for meeting times and additional information on the ISMRM web site. Syllabus material is available by contacting the ISMRM office in Berkeley, CA., USA. ●

(left):
(l to r) Speaker and moderator Patrick M. Colletti, M.D. and workshop organizing co-chairperson Frank G. Shellock, Ph.D. stop for a coffee and a pose.

(right):
(l to r) SMRT Members; Julie Strandt-Peay, Maureen Ainslie, Maureen Hood, and Vera Miller

SMRT West Regional Education Seminar

Maureen D. Ainslie, M.S., R.T.(R)(MR)

Top to bottom, left to right:

Anne Sawyer and Maureen Ainslie, SMRT West Regional Seminar co-chairs.

Bill Faulkner, Mike Moseley and Michael Kean, invited speakers at the the SMRT West Regional Seminar.

Frank Shellock and Bart Lane, invited speakers at the SMRT West Regional Seminar.

Cindy Comeau and Bob Herfkens, invited speakers at the SMRT West Regional Seminar.

The two-day SMRT West Regional educational seminar began on Saturday, November 12th at Lucile Packard Children's Hospital at Stanford University in Stanford, California, USA. Over eighty attendees gathered to learn, exchange information and network with their peers. A continental breakfast was provided prior to the beginning of the meeting. This seminar was co-chaired by Anne Sawyer from Stanford and Maureen Ainslie from Duke University in Durham, North Carolina, USA.

After a warm welcome by Anne, the morning session began with Daniel Spielman, Ph.D., Associate Professor at Stanford, discussing the "Basics of MR Spectroscopy." Dr. Spielman reviewed the details of single and multivoxel spectroscopy, and clinical and research uses of this important MR tool. Next, Barton Lane, M.D., Professor at Stanford, provided an "Update on MRI of the Brain."

Dr. Lane reviewed appropriate imaging sequences and scan parameters useful in demonstrating many diseases and conditions affecting the brain. He finished with applications in MR imaging of the spine including dynamic (kinematic) imaging.

Following a break, Michael Kean, R.T., from Royal Children's Hospital in Melbourne, Victoria, Australia, presented on "Optimization of Pediatric Protocols 101, How and Why." He reviewed the unique protocol challenges associated with pediatric MR imaging, and provided a case review highlighting the sequences and imaging protocols used to image the neonatal and pediatric population. Bill Faulkner, B.S., R.T. (R)(MR)(CT) of William Faulkner & Associates and Chattanooga Imaging in Chattanooga, Tennessee, USA, followed by providing an update on "Recent Advances in Imaging Sequences and Options." Bill reviewed hardware options such as MR systems that allow upright imaging and higher field strengths such as 3.0T. He also discussed many recently developed sequences such as TRICKS and Propeller, and finished with the use of newer contrast media such as Multihance.

An excellent lunch selection was enjoyed by attendees in a sunny courtyard near the auditorium. The next speaker, Michael Moseley, Ph.D., Professor at Stanford, gave a comprehensive and informative overview on "Diffusion- and Perfusion-Weighted MRI." Dr. Moseley discussed the physics and principles as well as current applications. He was followed by Bill Faulkner, who provided an overview on "MR Angiography Techniques and Applications." Bill compared the various techniques and provided helpful tips to ensure success in obtaining a quality MRA study.

After a short break, Frank Shellock, Ph.D., Keck School of Medicine at the University of Southern California and the Institute for Magnetic Resonance Safety, Education and Research, provided an "Update on MRI Safety" including recent device and implant testing conducted at 3.0T. Dr Shellock generously donated copies of his Reference Manual for MR Safety, Implants and Devices to the attendees.

The day wrapped up with Dr. Frandics Chan, M.D., Assistant Professor at Stanford, presenting on "Cardiac MRI: Basic Techniques, Anatomy and Physiology." Dr. Chan covered vector ECG gating and the cardiac imaging techniques employed at the Stanford MR facilities.

The meeting adjourned at 5 p.m. A reception was held at the Lucas Center for MRS/I at the Stanford School of Medicine. Attendees recapped the day's meeting while enjoying refreshments. After necessary and appropriate screening, tours of the new 7.0 T suite at the Lucas Center were provided by Anne.

Early Sunday morning, Maureen welcomed attendees to the second day of the seminar. The day commenced with an excellent update of "MRI Imaging of the Breast" presented by Bruce L. Daniel, M.D., Associate Professor at Stanford. Dr. Daniel provided a comprehensive assessment of the indications for breast MR imaging followed by a review of Stanford's current approaches. Robert J. Herfkens, M.D., Professor at Stanford, followed with a presentation on "MR of the Abdomen." Dr Herfkens highlighted the challenges associated with abdominal MR imaging, and gave a glimpse of new developments that show promise in improving image quality and diagnostic capability of these exams.

After a short break, Michael Kean again shared his proficiency in providing a comfortable experience for pediatric patients and their parents with his talk on "Pediatric MRI: A More Child Friendly Approach." He was followed by Cindy R. Comeau, B.S.,

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R.T.(N)(MR) from the Cardiovascular Research Foundation in New York, New York, USA, who demonstrated her expertise in performing high quality cardiac MR imaging in her presentation titled "Cardiac MRI: Advanced Techniques and Applications."

After a delicious lunch, Dr. Herfkens reviewed common "MR Image Artifacts," their causes and tactics for resolution in daily MR imaging." He was followed by Roland Bammer, Ph.D., Assistant Professor at Stanford, who offered current applications and approaches in "Parallel MR Imaging Techniques."

As the day wound down, attendees enjoyed a comprehensive lecture by Dr. F. Graham Sommer, M.D., Professor at Stanford, on "MR of the Kidneys and Pelvis." The last speaker of the day was Garry E. Gold, M.D., Assistant Professor at Stanford, who gave an excellent presentation on current technical considerations and strategies for success in "Musculoskeletal MRI" including imaging at 3.0T.

Many thanks to all the sponsors including Bracco; G.E. Healthcare; Medrad, Inc.; Philips Medical Systems; Siemens Medical Solutions; West Physics Consulting; and the Lucas Center for MRS/I. A final thanks goes out to all the attendees who committed their weekend and enjoyed an excellent seminar while investing in themselves as MR professionals. ●

SMRT New York City Regional Seminar

Cindy R.Comeau, B.S., RT (N)(MR)

The SMRT Northeast Regional was held in the "Big Apple" on Saturday October 15, 2005 at New York Presbyterian Hospital & Milstein Hospital, New York, New York, USA. It was a great day of education for all technologists who attended from the local area and from outside of the New York area!! First off, I have to sincerely thank my co-chair Carol Finn for assisting me in making the meeting a great success! The program was approved for eight SMaRT category A credits by the SMRT.

After a very busy morning of registration the meeting promptly started with Carol Finn presenting on Breast Imaging. Carol did a wonderful job explaining her hints for performing a Breast MRI exam from a technologist's perspective. She was joined by Dr. Elise Desperito who demonstrated some very interesting clinical examples on the impact of Breast MRI imaging in patient management. Following was Dr. Bob Zimmerman who gave the group a very thorough and detailed information about the advantages of 3T imaging versus 1.5T. He explained very nicely the physics differences between the two field strengths Next up was Dr. Steven Wolff who presented some very remarkable cardiac clinical cases and also explained to the group the clinical advantages of performing a cardiac MRI exam versus other modalities. Before lunch Dr. DeLaPaz gave a terrific presentation on Functional MRI imaging and gave us some excellent tips for performing these types of exams.

After lunch Dr. Carrie Shapiro introduced the group to time resolved imaging and presented some very interesting clinical cases. Time resolved imaging certainly makes performing a MR angiography study much easier. Her presentation paved the way for Dr. Martin Prince who is well known by everyone in the area of MR Angiography. He wowed the group with showing some very new and exciting techniques for imaging the vascular system. During the break the group was able to ask Dr. Prince questions which was greatly appreciated by all. The last clinical presentation was given by Cindy Comeau who presented on the basics of Cardiac MRI. Her presentation gave the group a great starting point for learning cardiac MRI. She also outlined to the group the advantages for becoming an SMRT member!

To close out the day was Dave Stanley's "MRI Jeopardy". The New York group is quite competitive as judge Carol Finn had to make the final ruling on the correct answer! Dave really had the group engaged in this learning activity and everyone was given a 2005 MR Safety book for their participation, donated by Dr. Frank Shellock. Also the winning team was able to pick from MRI books donated by Bracco Diagnostics and items donated by Mike Harper from GE Healthcare Biosciences.

We had tremendous sponsor support for this meeting. We would like to especially thank GE Healthcare Biosciences, Institute for Magnetic Resonance Safety, Education and Research, Medrad Inc., Bracco Diagnostics and West Physics Consulting, LLC.

We would specifically like to thank Mike Harper for his support and the New York Presbyterian Hospital Radiology Department for graciously donating the room for this meeting. The SMRT would also like to thank all of the speakers who took time out of their busy schedules to participate and all of the attendees for spending their Saturday learning and advancing their knowledge. Lastly, Carol and I need to thank Jennifer Olson and Amanda Knapp at the ISMRM office for their guidance and assistance in organizing this meeting as they truly make hosting a regional a very rewarding experience! We hope to see more technologists attend next year! ●

Dr. Prince answering questions about MRA imaging and offering tips to the attendees.

Carol Finn, Regional Co-chair assisting Dr. DeLaPaz at the podium.

2005 Annual Meeting 2nd Place Oral Presentation, Research Focus

The Identification of Structural Brain Anomalies Associated with IQ Decline in Preterm Children

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Purpose

IQ is generally stable over time, but in certain atypical populations, such as preterm children, IQ has been observed to decline over time. Studies of preterm children often include those with obvious neural insults and it could be that the decline in IQ scores is largely attributed to the inclusion of these children in the samples. However, we have shown that as a group, preterm children who were apparently neurologically normal demonstrate a decline in IQ in the period between 7 years of age and adolescence. The aim of this study is to try to identify the neural regions that might be associated with such a decline in IQ. Since no consistent relationship was observed between visually identified structural abnormalities and IQ decline, the quantitative analysis approach of voxel-based morphometry (VBM) was used to attempt to identify more subtle brain abnormalities that are not detectable on visually assessed MRI.

Method

Sixty-five children were scanned on 1.5-T Siemens Vision system. They were all members of a cohort of preterm infants born between 1982 and 1985 who participated in a series of follow-up studies. All children were born at 30 weeks gestation or less. They were first seen for IQ assessment in childhood at 7 years of age and we included in this study only those classified as neurologically normal. They were again assessed in adolescence at 15 years of age. Therefore, IQ data at two time points were available for the 65 patients. MRI was only carried out at adolescence. Investigations included: (i) magnetization-prepared rapid acquisition gradient echo (MPRAGE 3-D) volume acquisition with repetition time of 10ms; echo time 4ms; inversion time, 200ms; flip angle, 12 degrees; matrix size 256 x 256; field of view, 250mm; partition thickness, 1.25mm, and acquisition time, 8.3min: (ii) coronal and axial turbo spin-echo T2-weighted scans. The scans were first inspected visually by a neuroradiologist, blind to group membership and all cognitive data. The 3D MRI data sets were then analysed using VBM. The data sets were processed using SPM99 software, running in Matlab5 on a unix workstation. Since developmental abnormalities are often bilateral, data sets were spatially normalized to a symetric template, segmented into grey and white matter and then smoothed using a 12mm kernel. We then correlated both absolute IQ scores and IQ decline scores with grey and white matter intensities. For statistical analyses, each subject was assigned VIQ (visual IQ) and PIQ (performance IQ) change scores. In addition to the VBM analysis, hippocampal volumes were measured. For these measurements, the 3D MPRAGE data sets were reformatted into 1mm thick contiguous slices in a tilted coronal plane perpendicular to the long axis of the hippocampus. The areas of contiguous 1mm were measured manually and summed.

Results

As mentioned above, visual neuroradiological assessment of the MRI scans indicated no consistent differences between those children who showed a decline in IQ compared with those who did not.VBM analyses designed to detect bilateral abnormalities showed a positive correlation between VIQ decline and white matter in a frontal lobe region and a negative correlation in the temporal lobe region. There was also a negative correlation between PIQ decline and grey matter in the hippocampal region. Subgroup analyses between a large decline group and a small decline group showed that the large decline group had significantly more white matter than the small decline group in the same frontal region. Although the grey matter analyses revealed no significant relationships with changes in the VIQ, it is interesting to note that the large decline group had less grey matter in the same region as the white matter increase. Manual hippocampal volume measurements were consistent with the VBM findings

Conclusions

In conclusion, preterm children are at risk of declining IQ over time even if they have not suffered obvious neurological damage, and we can identify the neural correlates of these declines in IQ using VBM analysis. The findings of this study show that VBM analysis can show the presence of subtle morphometric differences indicating that some insult to the brain may have taken place, even in the absence of frank lesions, with subsequent cognitive consequences. ●

2005 Annual Meeting 2nd Place Oral Presentation, Clinical Focus

Dynamic Female Pelvic Floor Imaging

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Purpose

The female pelvic floor is a very complex muscle structure. With increasing age, pelvic floor weakness is common in middle-aged and elderly parous women. Stress incontinence, uterine prolapse, constipation and incomplete defecation are some of the disorders most commonly associated with the muscle weakness and pelvic floor prolapse (PFP). Excellent visualization of normal anatomy, physiology and disease processes makes MRI the premium modality of choice.

Kinematic evaluation of the pelvis has become easier with the advent of high-quality surface coils and rapid T2-weighted imaging techniques such as TRUFISP, HASTE, and SSFE.

Method

Between 1/2001-11/2003, 57 patients were included in the study. MR examination was done on a 1.5T MR system (Magnetom Sonata, Siemens Medical Systems, Erlangen, Germany). The patients were positioned on the MR imager with a multicoil array wrapped around the pelvis. The sequences were obtained in the following order:

- Scout images were obtained to identify a midline Sagittal plane that showed pubic symphysis, urethra, vagina, rectum and coccyx.
- 10mm thick sag images of midline were obtained using rapid half Fourier (HASTE) T2 weighted sequence. With a 30cm field of view TR 1180 TE 64, slice thickness 5mm, Flip Angle 14 degrees, 7 measures were performed with a resolution of 256x256. Time of acquisition 1.43 min., voxel size 2.5x1.2x5.0mm. These images were obtained while the patient was at rest.
- Sagittal, Coronal and Axial T2 weighted images were obtained from iliac crest to the urethra to include adnexa with the FOV of 300mm, TR 6000, TE 132ms, slice thickness 5mm, flip angle 15 degrees, I measure, resolution 256x256, time of acquisition 1.06min, voxel size 2.5x1.2x5.0mm.
- Sagittal, coronal and axial TruFisp images with a FOV of 350, TR3.41 ms, TE1.71 ms, slice thickness 8mm, FOV 350mm, Flip angle 59 degrees, resolution 256x256, 45 measures, secs. Voxel size 1.7x1.4x8.0mm were acquired continuously for 49 secs. The sequence was acquired while the patient performed the fast strain maneuver , alternating between rest and strain.
- Coronal images of midline were obtained using rapid Half Fourier (Haste) T2 weighted sequence. With a FOV of 400mm TR1280, TE68, slice thickness 5mm, flip angle 18 degrees, 1 measure, resolution 256x256, voxel size 1.6x1.6x5.0mm with an acquisition time of 25 secs. Were acquired while the patient was at rest.
- Axial In/Out of phase images were obtained from bifurcation to the urethra to include distal aorta and iliac vessels.
- After completing all image acquisition, images are sent to the workstation, where the dynamic images are visualized as a movie clip. Pearson's correlation of paired-samples was utilized to test difference between initial examination, MRI, and operative findings.

Results

Of the 57 patients scanned, mean age was 67 years. Mean duration of prolapse was 6.1 years. Mean MRI room time was 25 minutes. Resultant images were of excellent quality, and clearly displayed pelvic anatomy. All patients were operated upon for symptomatic PFP with or without associated voiding dysfunction. After comparing all the studies the T2 weighted GRASS sequence quantitated anatomy of pelvic floor prolapse and assessed anatomical changes produced by surgical repair. T2 weighted TruFisp sequence allowed for higher frame rate and better in-plane resolution to evaluate the pelvic muscle weakness.

Discussion

Kinematic cine MRI and ultrafast T2 weighted gradient echo images of pelvic floor is a promising new method for the detection of organ morphology, physiology and prolapse.

Conclusions

The particular advantage of Dynamic MR Imaging is that no paramagnetic or iodinated contrast neither for intravenous nor rectal administration is needed. In addition, the rapid imaging techniques proved to be rather insensitive to motion artifacts, which make MR a compelling competitor. The T2 weighted Haste sequence in conjunction with the TruFisp sequence proved to be superior for the detection of enterocele, cystocele, rectocele or a uterine prolapse. MRI can also used as a reliable postoperative follow-up tool and facilitate definitive surgical management. Of particular interest was that MRI more accurately detected enteroceles than did physical examination. Clinical uncertainty regarding the components of pelvic floor prolapse is increased by the severity of the process, especially since there is space competition by the various components, which can result in under-diagnosis of enteroceles. Given all of this, the stunning resolution possible with the latest techniques is a compelling reason for adopting the MRI imaging tool to evaluate female pelvic disorders. ●

Acknowledgements

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Artifacts in Clinical Magnetic Resonance Imaging, Part II: Identification and Correction, A Review

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Magic angle phenomena

The orientation of highly ordered collagen fibers in the static field is responsible for the frequent occurrence of increased signal intensity on MR images (47). Examples include tendons and ligaments, which contain parallel fibrous bands. Increased signal intensity from the shoulder, wrist, knee and ankle caused by the "magic angle" phenomena may be misdiagnosed as injury, degeneration or inflammation (Fig. 18).

For these tissues T2 is particularly short, leading to low signal intensity on most MR images. However, if these parallel bands are oriented at 55° relative to the main magnetic field, the T2 facilitation is decreased, leading to increasing signal intensity. This artifactual increased intensity might potentially be confused with pathology and is a potential cause of a false-positive diagnosis. The location of the increased signal varies with position and angle of the fibers relative to the main magnetic field (48). The magic angle phenomena is a variable observed in actual clinical practice (49). For example, although it is clearly seen in some patients when the ankle tendons are at the magic angle with respect to the static field, it is not well seen in others. The reason for this variability is unknown, but it may be caused by differences in the orientation of the collagen fibers. Whatever the cause, the effect of this variability is to render more difficult the interpretation of the significance of increased signal in the tendons in regions in which the magic angle phenomena could be present. Recently, the magic angle phenomena in the articular cartilage have been emphasized (50). The intensity of the artifact is affected by the TE and flip angle. Low TE values and high flip angle demonstrates the greatest magic angle effect (51). Increased signal intensity on short TE images is commonly due to the magic angle phenomenon rather than to meniscal tear or degeneration.

Partial volume

Partial volume averaging occurs when the voxel dimensions are comparable to the dimension of the object being imaged. Because most imaging is performed by using anisotropic techniques (lower resolution in one dimension than in the other two), partial volume averaging is most severe in the direction of the slice selection (Fig. 19), which is the direction in which the voxel dimension is the greatest. Partial volume averaging can simulate, obscure lesions or interfere with their characterization (15). Structures that commonly undergo partial volume averaging are the brain, spinal cord, and liver. Thereby simulating hepatic lesions including the hepatic flexure of the colon, gallbladder, duodenum and exophytic right adrenal or renal lesions. Careful inspection of contiguous images usually allows partial volume averaging to be distinguished from an actual pathologic entity. When doubt remains, improving spatial resolution can minimize partial volume averaging. This can be accomplished by reducing the slice thickness, by reducing the field of view and/ or increasing the number of matrix elements. However, either maneuver results in a reduction in the signal to noise ratio, which may necessitate increased signal averaging and proportionately increased acquisition time. Because the voxel is usually much larger in the direction of slice selection, a reduction in slice thickness generally provides a greater reduction in partial volume averaging than a reduced field of view. It may also be helpful to acquire images in alternate planes. For example, coronal images often clarify the nature of partial volume effects that are encountered on transversal images.

Cross excitation (cross talk, coherence artifact)

The effects of cross excitation are changes in image contrast (Fig. 20). Radio-frequency section profile imperfections produce unintended excitation of the tissues adjacent to the slice being imaged (52, 53). As a result, the adjacent tissues can become saturated and display reduced contrast and signal to noise ratio that contributes to poor lesion depiction. To avoid this situation, image acquisition can be interleaved such that alternating slices are initially acquired, subsequent acquisition of intervening sections allows for more complete relaxation of these tissues. Alternatively, an intersection gap of approximately 25-50% of the nominal slice thickness can be introduced to avoid cross excitation. Optimized radio frequency pulses (i.e.

Fig. 18: Sagittal T2 weighted fast spin echo (TR 4200, TE 90, FL 90°) image of the ankle. Increased signal intensity is seen within the achilles tendon due to the magic angle phenomena. This increased intensity can be a cause of a false-positive diagnosis the collagen fibers are oriented 55° to the main magnetic field.

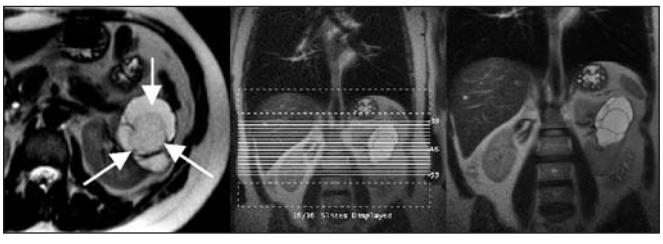

Fig. 19: A multilocular cystic nephroma is seen on axial and coronal HASTE images. A well-defined cystic mass arises from the lateral part of the left kidney. Internal septations are present, which are low in signal intensity (arrow). Impression of a solid part inside the tumor on the axial image due to "partial-volume-effect" makes the mass suspicious for a renal-cell cancer.

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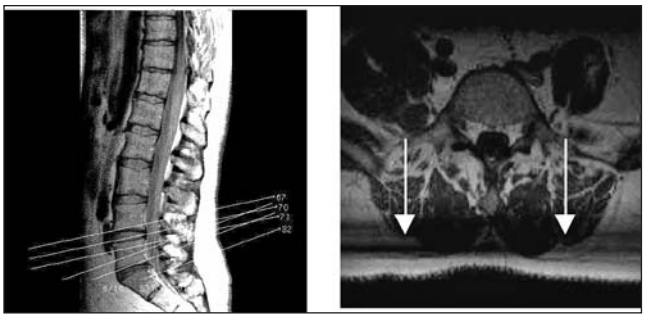

Fig. 20: Axial T1 weighted spin echo (TR 560, TE 12, FL 90°) image of the lumbar spine. The dark bands visible on the T1 spin echo transverse images (arrow) are due to the intersection of other transverse images through the image. These are acquired in a multi-planar fashion and thus cause pre-excitation (saturation) of the protons in the area where the slices intersect The sagittal image illustrates where the slices were obtained and how they intersect posterior.

square) can be used to reduce this artifact.

RF field artifacts

The RF pulses utilized to excite protons in MR share frequency ranges with many extraneous RF sources, including fluorescent lights, television, radio, electric motors such as in CT scanners, pumps, floor cleaning equipment, elevators, computers and devices for patient monitoring. Penetration of these extrinsic RF energies into an MR system result in image noise, with the degree of image degradation dependent on the frequency range of the noise source and the MR system resonance frequency and bandwidth (54), whereas an extrinsic narrow-frequency signal causes linear bands of interference perpendicular to the frequency-encoding direction (Fig. 21). The exact location of the RF interference is related to the difference between the center frequency of the scanner and the frequency of the extraneous signal. A 1.5T MR system has a proton resonance frequency of 64.0 MHz that lies within the frequency domain of 60 to 66 MHz assigned to television channels. Shielding from extrinsic RF sources is necessary for MR image preservation from external noise by a factor on the order of 80 to 100 dB depending on the installation. RF leaks can occur through pipes and electrical lines. This can be avoided by enclosing the lines in wave-guides.

RF noise enters if the door is left open or if the flexible copper tabs along the sides, top and bottom of the door break off. Of course, poor image quality is not always due to excessive noise. Poor image quality also results from low signal intensity caused by a bad choice of imaging technique, RF coil, or improper pre-scan adjustments. Optimization of image quality requires proper maintenance procedures, including keeping a log of ambient noise levels and signal to noise ratio in a standard phantom. In an analog fashion, an object on the surface of a patient may act as a shield from the system RF pulses, generating local magnetic inhomogeneity and signal loss or distortion. Potential internal RF shields are metal-containing dressing, electric disks or RF impermeable objects in the patient's clothing. Removal of the shielding objects restores RF homogeneity. Prevention of extraneous RF noise in images is achieved through proper planning of MRI system location and effective shielding. If discrete RF noise lines perpendicular to the readout direction persist in the image despite all shielding efforts, field service can always change the magnetic field and RF synthesizer frequency up or down within 200,000 Hz to find a clean imaging bandwidth. Discrete RF noise lines oriented along the readout or phase-encoding direction arise from the imaging system itself and are most often from bad electric or RF grounding and the responsibility of the field service. RF field artifacts loss of signal is an inherent problem in surface coil imaging because of loss of RF intensity away from the center of the coil (55). The peripheral drop-off of signal intensity (also called shading artifact) occurs in all possible modes of operation with RF surface coils. Optimal positioning of the coil minimizes the loss of diagnostically useful information. Signal inhomogeneity across the image can be improved by appropriate rescaling of the image. (56). The phased-array coil provides an improved signal to noise ratio, especially in the chest, abdomen and pelvis with small field of views. Two factors that can limit image quality in phased-array imaging are increased motion artifacts, largely caused by the high signal intensity from moving subcutaneous fat in the anterior near field of the coil, and non-uniformity of signal as distance from the coils increase. Significant improvements in image quality may occur with improved techniques for decreasing motion artifact, particularly breath-hold imaging. Another artifact that we see on surface imaging with multiple coils is phased array malfunction. Due to the fact that an individual coil element is out of phase with the other coils, dark lines can be made visible in the individual coil element (Fig. 22).

Shading artifact

The signal intensity of each voxel is directly related to the radio-frequency strength at that location. When the transmitter or receiver coil produces a non-uniform radio frequency field, the signal intensity of the image will be uneven. This artifact is inherent in all images of the spine obtained with surface coil because the radio frequency field decreases markedly away from the coil. The marked decrease causes a gradual loss of image brightness (Fig. 23).

Patient-induced artifacts

Motion and flow artifacts

Motion artifacts are probably the most frequently encountered and most disturbing artifacts in MR imaging. As in other forms of imaging, involuntary motion due to respiration, swallowing or bowel peristalsis produces image blurring and is usually easily recognized. Motion artifacts occur because the phase gradient cannot predictably alter

Fig. 21: Sagittal T2 weighted turbo spin echo (TR 4600, TE 128, FL 180°) image of the lumbar spine. The high intensity thin line at the center of the image is caused by RF leaking from the transmitter to the receiver (arrow) orientated in the phase encoding direction (frequency and phase-encoding directions where switched, phase-wrap, to avoid flow void). Due to the fact that the leakage is at the resonance frequency it will appear at the center of each projection.

Fig. 22: Axial T2 weighted haste fat suppression (TR 4.4, TE 64, FL 160°) image shows a phased array coil malfunction. One coil of a phased array multi-coil is out of phase with the other coils (arrow). This results in bands of phase addition and cancellation.

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the radio waves arising from moving tissues (57). As a result, moving areas are reconstructed over and over in the rows along the phase-encoding direction. The appearance of a motion artifact depends on the type of motion, speed of the moving object and strength of the magnetic field. A high field MR system is more sensitive than a low field unit to patient motion (58). Motion causes two main types of artifacts. Random motion causes image blurring with decreased definition of anatomic structures because the signal from an object is spread out over the range of the object. Periodic motion (e.g. due to cardiac pulsation or flowing blood) causes ghost artifacts (59, 60), or replicas of the moving structure in an abnormal but predictable position (Fig. 24). If the motion is repeating at a constant frequency, discrete ghost images are displayed along the phase-encoding direction. The number, position and brightness of the "ghosts" depends on the amplitude and frequency of pulsation causing the periodic motion artifact (Fig. 25).

For example, the brightness of the ghosting artifact is directly proportional to the amplitude and speed of the motion (61). The intensity of the ghost artifact also increases in proportion to the signal intensity of the moving tissue. For example, ghost artifacts resulting from pulsatile flow are worse on entrance slices because of the high signal intensity from unsaturated blood protons. Motion can also be chaotic, as when there is turbulence in the blood or CSF. Such motion results in a mixture of increased signal intensity. CSF pulsation artifacts in the brain are often seen on Flair (FLuid Attenuated Inversion Recovery) sequences (Fig. 26), most common at the fourth ventricle followed by the third and the lateral ventricles (62). Although the sequence is widely used, problems sometimes arise in diagnosis because of artifactual high signals in CSF within the ventricular system and subarachnoid space, which simulate disease and obscure the brain. These high signals may occur because of inadequate inversion of the CSF magnetization at the periphery of the transmitter coil and hence are usually most apparent in the posterior fossa. By increasing the slice width of the initial inversion pulse the pulsation artifact can be reduced, but a better solution is to use a nonslice-selective inversion pulse. While this controls the CSF flow artifact, multislice implementations has two disadvantages: the TI is increased from slice to slice, which alters tissue contrast and the number of slices that show nulling or useful reduction in the signal from CSF is limited (63). Motion can also be continuous, as with blood flowing in a vessel. Most commonly, such motion results in a flow void (a total loss of signal from within the vessel) because the blood has moved out of the imaging volume before acquisition of the image. Continuous motion can also result in increased signal from within the vessel due to the inflow of new blood. The appearance depends on the image acquisition parameters and the direction of blood flow. Increased signal from flow can be acquired with fast pulse sequences using very short TR and TE, when flow compensation is applied or when an intravenous contrast agent is administered. Other factors that affect the positions of ghost artifacts are the number of signals averaged and the dimension of the field of view (64).

There are situations in which motion artifacts aid in the diagnosis. For instance, absence of CSF pulsation artifacts, which manifests as improved contrast between the CSF and spinal cord and absence of ghost artifacts; may indicate significant compression of the spinal cord even in patients without symptoms of this condition (65). Ghosts are also subject to aliasing, that is, a shift into the imaging area when they occur outside the field of view. Random motion artifact from respiration, swallowing and peristalsis do not usually pose a major problem in MR imaging. Inadvertent patient motion is not uncommon, especially in pediatric and elderly patients. Solutions for motion artifacts include the

Fig. 23: Sagittal T2 weighted turbo spin echo (TR 4800, TE 128, FL 90°) image of the lumbar spine shows a marked decrease in signal intensity away from the surface coil (arrow).

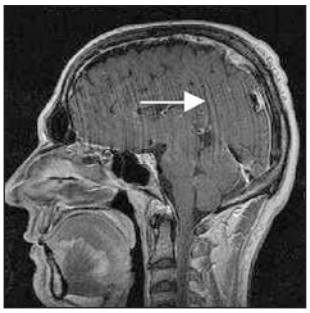

Fig. 24: Sagittal T1 weighted spin echo (TR 560, TE 15, FL 90°) image of the mid brain. Ghost like artifacts can be seen due to the blood pulsation in the sagittal sinus .

Fig. 25: Axial T1 weighted gradient echo (TR 40, TE 4.6, FL 80°) image of the liver shows a rounded focus of decreased signal intensity in the left hepatic lobe. The signal intensity of this lesion (artifact) is lower than that of the aorta; the cross-sectional shape and size of the apparent lesion resemble those of the aorta (pulsatile ghost artifact).

Fig. 26: Axial Flair (FLuid Attenuated Inversion Recovery) (TR 11000, TE 140, FL 90°) image of the brain shows a high signal artifact in the fourth ventricle (arrow). The pulsation artifacts are caused by inversion delay and ghosting effects.

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use of a tight-fitting coil that is fixed in position to the scanning table (66, 67). Flexible coils are prone to motion artifacts as they lack rigidity. Immobilization devices such as the liberal use of cross-table Velcro straps and if necessary sandbags are helpful. Using a tight-fitting enclosing coil, e.g. extremity coil for the knee and quadrature coil for the wrist, to match the size of the region of interest helps minimize patient motion. Sponges and soft pads should be used to ensure a tight fit between the patient's skin and the inside surface of the coil. Besides improved patient immobilization, patient reassurance and or sedation can be useful for reducing random motion artifacts. Even, when the previous reported tools are not very helpful, the effects of motion artifacts can be controlled with a variety of effective techniques (68-72). The traditional approaches include gating, dynamic reordering of the phase-encoding direction, centrally ordered phase encoding, varying the repetition time and number of excitations, reducing the intrinsic signal of moving tissue, physically restraining body motion, swapping phase-encoding and frequency-encoding direction, gradient refocusing and presaturation. Techniques also exist that permit images to be acquired within a breath-holding interval (73, 74) or so rapidly that motion is essentially frozen, for instance echo planner imaging. Major advances in the spin-echo pulse sequences are the use of short TE sequences and post processing advances. Respiratory gating is an effective but inefficient way to reduce ghost and blurring artifacts. MR echoes are acquired only during a predetermined phase of the respiratory cycle. This can be accomplished by using physiologic gating techniques (measurement of the chest wall expansion by mechanical bellows or airflow). Data collected during phases of the respiratory cycle other than end-expiration must be discarded. This inefficiency typically leads to a two to fourfold increase acquisition time. Technical difficulties may also be encountered in obtaining consistent gating. More efficient techniques for eliminating respiratory artifacts are respiratory ordered phase encoding (75), centrally ordered phase encoding (76) (Rope –respiratory ordered phase encoding-, MAST –motion artifact suppression technique). These techniques are based on reordering the sequence of phase-encoding steps that normally proceed from one end of K space to the other into another sequence that matches the respiratory cycle. By doing this, the periodic motion caused by respiration is converted into slow, gradual motion equally distributed throughout the imaging interval. Unlike respiratory gating, ordered phase-encoding methods increase the image time by less than 15%. Fast non echo planner imaging such as fast gradient echo and the reduced acquisition matrix Fourier-acquired steady state technique, acquire a set of images in less than 30 seconds. These sequences are useful in abdominal and thoracic imaging. Synchronizing the image acquisition to the cardiac cycle can reduce the effect of cardiac pulsations. The spectral components of each image are acquired with the same delay within the cardiac so that the anatomic structures appear nonpulsating. Each image is acquired at a different point of the cardiac cycle, that is, in cardiac-gated imaging of the chest, some images will depict the heart in systole, others in diastole. Cardiac gating prolongs the imaging time because it introduces pauses in image acquisition to maintain synchronization. Moreover, good T1 contrast cannot be achieved because the minimum value for the repetition time is determined by the R-R interval. Signal averaging is another effective technique for reducing motion artifacts. This technique is based on the observation that noise is usually a random process, whereas the MR signal is not (77). Averaging therefore attenuates the signal generated by moving structures while increasing that of stationary structures. The signal intensity of ghost artifacts, like background noise, can be reduced by the square root of the number of excitations. This technique has proved particularly effective in imaging of the chest and abdomen (78). However, signal averaging causes a proportionate increase in acquisition time, rendering it impractical for T2 weighted acquisitions because of the long TR. The technique of signal averaging can be made more effective by increasing the time interval between averages (79). This technique of so-called serial averaging reduces the likelihood of acquiring multiple averages at the same point in the respiratory cycle: put another way, spreading out the averages improves the sampling of the respiratory cycle. Another approach to reducing the intensity of the ghosts is to reduce the intensity of the source tissue. For imaging of the abdomen, fat signal can be selectively eliminated by the application of lipid frequency-selective RF saturation pulses (inversion time) or by inversion recovery sequences. Stir (Short TI Inversion Recovery) sequences have been suggested to be useful for detecting liver masses at low and high fields. Stir sequences have the drawback of a relatively low signal to noise ratio, but good results are obtained with short scan times by using a Stir fast spin-echo sequence. Another drawback for abdominal imaging is that, although ghost artifacts from subcutaneous fat are suppressed, ghost artifacts from liver masses and bowel loops are enhanced, because these tissues demonstrate high intensity on stir images. The visibility of pulsation artifacts can be reduced by carefully choosing the phase- and frequency encoding directions (gradient reorientation). Although the artifacts are not eliminated, the pulsation artifacts can be rotated and do not obscure the region of interest. However, new pitfalls may compound by gradient swapping (80). For example, popliteal artery pulsatile anterior-posterior phase axis ghosts on sagittal MR images can be removed from the cruciate ligaments and their depiction improved by swapping the phase direction to superior-inferior. The new problem that can exist is that knee motion ghosting along the superior-inferior direction from the bone marrow traversing the menisci, which mimics a tear. Swapping the phase-encoding and frequency-encoding direction can also be useful for obtaining a better myelogram effect in the cervical and thoracic spine. Normally, the frequency-encoding gradient is oriented along the long direction of the spine, which is also the direction of CSF flow. This results in large phase shifts, associated signal loss and ghost artifacts that obscure the spinal cord, spondylitic changes and disk herniations. By orienting the frequency-encoding gradient perpendicular to the direction of flow, signal loss is minimized. An additional benefit of this method is that artifacts arising from motion of subcutaneous fat in the anterior neck, which is prominent with Helmholtz and solenoidal surface coils, are directed off the spine. However, rotating the motion artifacts also rotates the chemical-shift artifact, which is now parallel to the axis of the intervertebral disks. Small disk protrusions can be obscured by the chemical-shift artifact (81). Changing the positions of the slices in the imaging stack or reacquiring the images with different parameters can demonstrate the absence of abnormalities. Decreased signal from flow can be induced by using spatial presaturation (e.g. when placing a presaturation slab over the knee the popliteal artery will be dark and also removes the blood vessel pulsation artifact). In many cases, artifacts due to several types of motion are present simultaneously. Pre-saturation is accomplished by the use of special RF pulses inserted before the conventional pulse sequence. Any gradient can be used for definition of the pre-saturation volume in conjunction with the pre-

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saturation pulse, independent of the gradients used for the rest of the pulse sequences. Pre-saturation pulses can be used to eliminate two types of artifacts: ghost and wrap-around artifact. Pre-saturation pulses are routinely used in spine imaging and for eliminating signal from outside the field of view, thus eliminating wrap-around artifact along the phase-encoding direction. Several new fast pulse sequences have been developed with short TE's that reduce ghost and blurring artifacts caused by motion. They all feature as a common denominator either a short TE or a short echo space time between the phase-encoding 180° RF pulses in fast spin-echo MRI. Because dephasing and therefore motion-related artifacts worsen with lengthened TE, a significant incentive is present to reduce TE, especially for MRA. Many of these allow breath holding during fast acquisitions. Segmented K-space acquisitions for breath-hold cine MR have also proved extremely effective in reducing artifacts in cardiovascular studies. The breath-hold studies show no ghost artifact and the cardiac edges are clearly identified because of the reduced blurring. Ultra-fast techniques, such as echo-planer imaging, allow acquisition of images in less than 100 msec., virtually eliminating all motion (including cardiac pulsation) at the expense of a poor signal to noise ratio (82).

Conclusion

MR imaging artifacts are commonly seen at all clinical imaging sites. To obtain high-resolution, high-quality MR images, careful attention must be given to the use of correct imaging techniques. The use of motion suppression, flow compensation techniques and careful screening of patients for metal in clothing can help reduce the occurrence of artifacts. The more common artifacts should be recognized by practitioners so as to avoid diagnostic errors and to maintain image quality. Some artifacts, due to protocol errors such as aliasing, cross excitation and motion artifacts are predictable and can be manipulated to reduce their degradation of the image in the anatomic region of interest. Others, such as gradient related artifacts are more sporadic and difficult to diagnose and correcting them requires field service engineers. Murphy's law (" whatever can go wrong will go wrong") definitely applies to this group of artifacts. Even if the MR imaging artifact cannot be completely eliminated, recognition of the artifact can help avoid misinterpretation. The clinical impact of MRI artifacts is minimized by routine preventive maintenance and quality control checks. In our opinion it is important that the radiologists are familiar with the causes of artifacts on MRI to maintain optimal image quality and to tailor the potentially exhausting troubleshooting process.

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Glaucoma Drainage Implants and MRI Safety

Frank G. Shellock, Ph.D., FACC, FACSM

A glaucoma drainage implant or device, also known as a tube shunt, is implanted to maintain an artificial drainage pathway to control intraocular pressure for patients with glaucoma. Intraocular pressure is lowered when aqueous humor flows from inside the eye through the tube into the space between the plate that rests on the scleral surface and surrounding fibrous capsule (1-3). The implantation of a glaucoma drainage device is used to treat glaucoma that is refractory to medical and standard surgical therapy (1-3). These are usually cases where standard drainage procedures have failed or have a poor prognosis including failed trabeculectomy, buphthalmos and juvenile glaucoma, neovascular glaucoma and glaucoma secondary to uveitis, traumatic glaucoma, cataract with glaucoma and high risk cases of primary glaucoma (1-3).

Importantly, for certain glaucoma drainage implants, radiographic findings may suggest the diagnosis of an orbital foreign body if the ophthalmic history is unknown, as reported by Ceballos and Parrish (3). In this case report, a patient was denied an MRI examination for fear of dislodging an apparent "metallic foreign body." In fact, the patient had a Baerveldt glaucoma drainage implant, which was mistakenly identified as an orbital metallic object based on its radiographic characteristics (i.e., due to the presence of barium-impregnated silicone (3).

At least one glaucoma drainage implant, the ExPRESS miniature glaucoma shunt (Optonol Ltd., Neve Ilan, Israel) is made from 316L stainless steel (4, 5). However, many glaucoma drainage implants are made from nonmetallic materials and are safe for patients undergoing MRI procedures (3).

Commonly used devices that do not contain metal include, the following:

Baerveldt glaucoma drainage implant (Pharmacia Co., Kalamazoo, MI)

Krupin-Denver eye valve to disc implant (E. Benson Hood Laboratories, Pembroke, MA)

Ahmed glaucoma valve (New World Medical, Rancho Cucamonga, CA)

Molteno drainage device (Molteno Ophthalmic Ltd., Dunedin, New Zealand)

Joseph valve (Valve Implants Limited, Hertford, England)

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ISMRM/SMRT CALENDAR

ISMRM Workshop on Real-Time MRI: Dynamic Interactive Imaging and Its Applications
23-24 February 2006
Santa Monica, California, USA

SMRT President's Regional Seminar
18 March 2006
University of Virginia, Charlottesville, Virginia, USA

SMRT 15th Annual Meeting
5-7 May 2006
Seattle, Washington, USA

ISMRM 14th Scientific Meeting and Exhibition
6-12 May 2006
Seattle, Washington, USA

2006 Annual Meeting Update

Carolyn Bonaceto, R.T., (R)(MR), Education Committee Chair
Todd Frederick, R.T., (R)(MR), Program Committee Chair

Join us! The 15th Annual Meeting of the SMRT is being held 5-7 May 2006 in the beautiful Pacific Northwest city of Seattle, Washington, USA, at the Washington State Convention and Trade Center. The Program Committee has the wheels in motion to bring the international MR technologist community a wide breadth of educational experiences addressing the cutting edge advances taking place in the MR field worldwide. We have a fantastic lineup of speakers and topics to provide you with MRI information you can use in your daily practice.

The Annual Meeting traditionally begins with our Friday evening poster reception. This year the event is scheduled for May 5th and it is always a terrific way to start the weekend by getting reacquainted with your friends in the MR technologist community while enjoying light refreshments. In the past, the success of this event has been due to the truly phenomenal abstract submissions from technologists worldwide. These efforts illustrate countless hours of work and dedication to the field. The posters display new techniques, interesting ideas, and future developments in MRI. There will be posters with both a research focus and a clinical focus, so there will be something of interest for everyone. We are anticipating many more impressive submissions this year. In addition to the educational aspect of the poster exhibit, this opportunity is a great time to simply visit and meet with fellow MRI Technologists/Radiographers from around the world.

Saturday morning, our SMRT President, Karen Bove Bettis, and the 2006 Program Chair, Todd Frederick, will greet the meeting attendees with opening remarks. The didactic program will begin with an update on Diffusion Imaging. We will hear from one of the leading innovators in Diffusion Imaging on the newest techniques and clinical applications of diffusion, diffusion tensor, and white matter tractography. We will also learn from a Technologist who is involved in these imaging techniques.

Since MRI is not just about physics, we have the pleasure of a presentation by Gina Greenwood on "Colorful Communication." We interact and communicate with many different people throughout our workdays. Gina will present an interesting and fun approach to how we communicate. Norman Farrar will present the latest in MR imaging of the prostate, and Dr. Gareth Barker will explain how pulse sequences are developed, tested, and brought to clinical use.

Lunch will be provided on Saturday to all as we conduct the Annual Business meeting and awards presentation. This is the one time each year that the SMRT membership meets together, discusses, and votes on important matters regarding our profession. This is an opportunity to see your elected representatives at work. We are committed to being your voice. SMRT is its membership. During this time you might consider stepping up to the plate and volunteering for one of our many committees. It's a great chance to get your feet wet and see if you might be interested in taking on more

within the organization. All members in good standing are encouraged to participate this way. At the SMRT business meeting, awards will be presented to the most outstanding papers and posters submitted in both the clinical and research arenas. Also presented are the special awards to SMRT members who have made significant contributions to the organization and the field of MR. We will also witness the passing of the gavel as those newly elected begin their terms. Please plan on participating in this important session of the Annual Meeting.

After lunch and the business meeting, this year's program will offer several lectures focusing on 3T Imaging and Body MRI. Speakers will present 3T updates in pediatric, cardiac, body, and neuro imaging. Award-winning proffered papers will be presented throughout the meeting program. Dr. Diego Martin is an advocate of body MRI, and he will complete the Saturday schedule by presenting the importance of MRI of the body and showing different clinical applications.

Sunday morning, the incoming SMRT president, Cindy Comeau, will welcome meeting attendees. The morning will begin with speakers who will bring attendees the latest information on MRI of the breast. Talks will be presented by a Radiologist and Technologist on the latest clinical techniques and applications of breast MRI. As safety is always first on MR technologists' minds, we are pleased to continue the tradition of holding our Safety Forum, led by Dr. Frank Shellock. He will include an important safety update for all in attendance. Following is an occasion to look into how MRI suites are designed for optimal safety. The popular speaker Tobias Gilk of Junk Architects will present this topic.

Following the break for Sunday lunch the didactic sessions continue. The program topics will include Economics and Marketing of your MRI Center, Planning for Gamma Knife Radiotherapy, Imaging for Clinical Trials and Recent Advances in fMRI. The Annual meeting will conclude with an international forum presented by MR Technologists/Radiographers from around the world. They will explain the educational and certification requirements of their regions. This will be an informative and enlightening forum that will focus on understanding the current state of education and certification for MR technologists internationally. As you can see, the Education and Program Committees have tried to present a broad range of topics for the SMRT annual meeting. We have invited speakers who will provide many different perspectives on these important topics. The SMRT 15th Annual Meeting program will be accredited for 15 Category A Continuing Education Credits (pending approval by SMRT).

The ISMRM and SMRT Joint Forum Presentation will be held at 14:00, Monday, 8 May 2006. Your registration for the SMRT Annual Meeting allows you to attend this SMRT/ISMRM presentation. This year, the forum topic is titled "Imaging of the Mother, Fetus and Newborn Child," organized by Dr. Jeffrey L. Duerk and Bobbi Lewis. The two-hour forum will consist of an overview of the technical and clinical aspects of performing MRI on the expectant mother, fetus and the newborn child. The presentations will focus on the "how to" of optimizing the technical aspects of the exam as well as reviewing the most pertinent clinical applications.

Make sure you leave some of that time to explore the surroundings. Seattle, which sits on Puget Sound, is amazingly beautiful. Pike Place Market, the Space Needle and the Experience Music Project Museum are not to be missed. And, if the tentative schedule remains true, you might consider catching a Seattle Mariner's baseball game against Tampa Bay on Monday or Tuesday.

We hope to see you, your friends and co-workers in Seattle. Our goal is to bring you the most up-to-date, pertinent information so that you can be your best. Make your plans now to attend and we hope to see you in May! ●

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SMRT 15TH ANNUAL MEETING PROGRAM

SEATTLE, WASHINGTON, USA

Friday, 5 May 2006, 18:30-20:30

SMRT Poster Presentation and Walking Tour Reception

Saturday, 6 May 2006, 07:45-17:00

07:45-08:00	Welcome Karen Bove Bettis, R.T. (R)(MR), SMRT President 2005-2006 Announcements Todd Frederick, R.T. (R)(MR), 2006 Program Chair
Moderator	Charles Stanley, R.T. (R)(CT)(MR)
08:00-09:20	Trends in Diffusion Imaging Michael Moseley, Ph.D. Speaker – To Be Announced
09:20-09:50	Proffered Papers
09:50-10:05	Break
10:05-10:55	Colorful Communication Gina Greenwood, B.S., R.T. (R)(MR)
10:55-11:25	MRI Prostate Technique Norman Farrar, R.T. (R)(MR)
11:25-11:55	Pulse Sequence Design and Testing Gareth Barker, Ph.D.
11:55-13:15	SMRT Business Meeting & Awards Luncheon
Moderator	Pamela Vincent, MPA, R.T. (R)(M)(CT)(MR)
13:15-15:15	3T Update Forum
13:15-13:45	Pediatric Imaging – 3T, Michael Ditchfield, M.D.
13:45-14:15	Cardiac Imaging – 3T, Paul Finn, M.D.
14:15-14.45	Neuro Imaging – 3T, David Stanley, B.S., R.T.(R)(MR)
14:45-15:15	Body Imaging – 3T, Neil Rofsky, M.D.
15:15-15:30	Break
15:30-16:00	Proffered Papers
16:00-17:00	The Current and Developing Approach to Body MRI: How and Why We Do It Diego Martin, M.D., Ph.D.

Sunday, 7 May 2006, 07:45-17:00

07:45-08:00	Welcome Cindy Comeau, B.S., R.T. (R)(MR), President 2006-2007 Announcements Todd Frederick R.T. (R)(MR), 2006 Program Chair
Moderator	Steve Shannon, R.T., (R)(MR)
08:00-09:30	Breast Forum
08:00-08:45	MR Breast Constance Lehman, M.D.
08:45-09:30	MR Breast Technique Michael Coles, R.T.
09:30-10:00	Proffered Papers
10:00-10:15	Break
10:15-11:45	MR Safety Forum
10:15-11:00	MR Safety Update – 2006 Frank Shellock, Ph.D.
11:00-11:45	MRI Facility Safety: How The Design Of Your MRI Suite Impacts Patient Safety Tobias Gilk, Ph.D.
11:45-13:00	Lunch
Moderator	Vera Miller, B.S.,R.T. (R)(MR)
13:00-13:30	Economics, Design & Marketing Considerations of Your MRI Center James Stuppino, B.S., R.T. (R)(MR)
13:30-14:00	MRI Planning for Gamma Knife Radiotherapy James Stuppino, B.S., R.T. (R)(MR)
14:00-14:30	Imaging for Clinical Trials Maureen Ainslie, M.S., R.T. (R)(MR)
14:30-14:45	Break
14:45-15:15	Recent Advances in fMRI Rasmus Birn, Ph.D.
15:15-17:00	MRI Education and Certification Forum Technologists/Radiographers From Around the World U.S. – Carolyn Roth, R.T. (R)(MR) (CT)(M)(CV) Canada – Caron Murray, M. R.T. (R) A.C. (MR) Australia – TBA Asia – TBA Europe – TBA
17:00	Adjourn

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