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Bin Zhu, OMICS J Radiol 2016, 6:5(Suppl)
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Mesenchymal stem cells labeled with ferumoxytol-poly-l-lysine and non-invasive MR imaging

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Magnetic resonance (MR) imaging along with the development of SPIO nanoparticle have a promising effect on tracking of stem cells. However, SPIOs are no longer being manufactured. Therefore, it is urgent to find out a new reagent to label cells for in vivo monitoring. The present study aims to evaluate the efficiency and the safety of labeling minipigmesenchymal stem cells (MSCs) with ferumoxytol- poly-l-lysine (PLL). MSCs were cultured and incubated with ferumoxytol-PLL. Labeling efficiency was. The effect of ferumoxytol-PLL at iron concentration of 50ug/ml on cell viability, cell migration, proliferation and cell cycle were determined by MTT assay, transwell migration assay, 5-ethynyl-2′-deoxyuridine (EdU) staining assay and flow cytometryanlaysis respectively. A 1.5T MR system with T2*mapping sequences was used for in-vitro and in-vivo MR imaging. The labeling efficiency was 100%. The iron content of each cell was liner correlated with the iron concentration of the labeling media ($p<0.05$). There were not significant impairments were documented in cell viability, proliferation, migration and cell cycles at 50 μg/ml ($p>0.05$).The ferumoxytol-PLL labeling caused a stronger low signal attenuation effect on T2*WI. T2*value were negatively correlated with cell numbers and iron concentration of the labeling media, and positively correlated with cell culturing passages ($p<0.05$). Hypointense signals on T2*-weighed images were detected in infarcted myocardium after transplantation of MSCs pre-labeled with ferumoxytol-PLL. Significant increases in graft area and T2* value were observed 7 days follow-up versus 1 day ($p<0.05$). Further increase in T2*value occurred at 15 days ($p<0.05$), paralleled with a decrease in graft area ($p<0.05$). The result of Prussian blue staining was closely corresponded to MR findings. Ferumoxytol-PLL labeled MSCs can significantly shorten the T2* value without interference in cells' biological features. In-vivo MRI visualization in infarcted myocardium is feasible.

Biography

Bin Zhu is the Director of the Department of Radiology, Affiliated Drum Tower Hospital, Nanjing University School of Medicine. He has published more than 30 papers in reputed journals and has been serving as an Editorial Board Member of repute.

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Shivaram Poigai Arunachalam, OMICS J Radiol 2016, 6:5(Suppl)
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In-vivo assessment of systolic and diastolic myocardial stiffness in a pig using 3D magnetic resonance elastography

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Mayo Clinic, USA

Myocardial stiffness is a novel biomarker with both diagnostic and prognostic potential in a range of cardiac diseases such as ischemia or myocardial infarction known to have increased stiffness. Application of Magnetic Resonance Elastography (MRE) to the heart enables measurement of myocardial stiffness in vivo. This study was performed to assess the feasibility of measuring in vivo myocardial stiffness during systole and diastole in a pig using 3D MRE. A custom passive driver was placed on the chest and imaging was performed in prone position on a 1.5 Tesla whole body MR imager (Signa Excite; GE) with a 4-channel coil in oblique plane using ECG-gated spin-echo echo planar imaging sequence at 140 Hz vibration frequency with 5 breath holds of approximately 25 seconds. Systolic and diastolic short-axis acquisition was performed prescribing corresponding time delays observed from a FIESTA cine scan. Acquisition parameters: 1 shot, NEX=1; TR/TE=4600/52ms; FOV=28.8 cm; 96x96 image matrix; 11 continuous 3 mm thick slices with 0 mm spacing, isotropic acquisition; 2 motion-encoding gradient (MEG) pairs; x, y, and z motion-encoding directions; ASSET=2, and 4 phase offsets. MRE stiffness was obtained using 3D direct inversion algorithm and an ROI covering the left ventricle was used to report stiffness. The mean stiffness of the myocardium in systole was 6.3 kPa and 4.5 kPa in diastole. The results indicate that 3D MRE can differentiate systolic and diastolic myocardial stiffness. Follow up studies with a larger sample size are underway to further validate these findings.

Biography

Shivaram Poigai Arunachalam is a Research Engineer in the Department of Radiology, in Mayo Clinic, Rochester, MN USA. He works on developing technical tools for cardiac magnetic resonance eleastorgraphy imaging for non-invasive assesment of myocardial stiffness in vivo which can be useful in the prognosis and diagnosis of vareity of cardiac diseases. He is also a final year PhD candidate in the Department of Biomedical Engineering at the University of Minnesota, Minneapolis, MN working on developing novel cardiac mapping systems for Atrial Fibrillation (AF).

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e-Poster

Arush Honnedevasthana Arun et al., OMICS J Radiol 2016, 6:5(Suppl)
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Effects of exercises on calf muscles in patients with diabetis mellitus as validated by magnetic resonance imaging

Arush Honnedevasthana Arun, Vatsalya Somashekar, Shivaprasad A Chikop and Sairam Geethanath
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Purpose: Diabetes Mellitus (DM) is a multi-systemic disease associated with significant complications affecting multiple organs. Purpose of this work is to evaluate the changes in calf muscles for patients with Diabetic Mellitus (DM) using Magnetic Resonance Imaging (MRI) techniques.

Methods: Time of Flight (TOF) Maximum Intensity Projection (MIP), T1 maps with variable flip angles, T2 weighted spin echo imaging were performed on 4 volunteers (aged 30±5) and DM patients (aged 32, 68) pre-exercise, on a 1.5 T Siemens scanner. Total acquisition time was 6 minutes 20 seconds. Each volunteer & DM patient were then requested to perform yoga postures Supta Padangusthasana, Utkatasana and Calf raises for 6 minutes 30 seconds at maximum effort, outside the scanner and subsequently rescanned. To calculate significant signal increase, region of interest were drawn on TOF MIP coronal images in arteries of calf muscles. Student t-tests were performed to determine statistical significance.

Results: Amongst volunteers, significant signal increase in arteries of calf muscles can be noticed, signal intensity graphs are illustrated. In DM patients, signal increase in TOF MIP, T_2 weighted images can be seen in specific arteries (posterior, anterior tibial, posterior tibial) of calf muscles post-exercise. T_1 map depicts fat distribution in calf muscles for DM patients compared to volunteers.

Discussion: The study indicates that yoga has a positive short term effect on multiple DM related foot complications. This study depicts that MRI provides a potential insight into the benefits of yoga for DM patients through deriving biomarkers for preventive medicine relevant to yoga interception.

Biography

Arush Honnedevasthana Arun has completed Master's in Bio-medical Signal Processing and Instrumentation in Dayananda Sagar College of Engineering and his research interest is in the development of novel techniques in the domain of medical imaging, such as image processing techniques applied to medical imaging modalities to enable robust imaging and applications in MR reconstruction. He has 7 conference proceedings and 1 provisional patent filed.

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Rajiv Singh, OMICS J Radiol 2016, 6:5(Suppl)
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Medical image fusion: applications, approaches and evaluation

Rajiv Singh
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Medical image processing is a rapidly growing area of research for the last three decades. X-ray, ultrasound, MRI (magnetic resonance imaging) and CT (computed tomography) are a few examples of medical imaging sensors which are used for extracting clinical information. These sensors provide complementary information about patient's pathology, anatomy, and physiology. For example, CT is widely used for tumor and anatomical detection, whereas information about soft tissues is obtained by MRI. Similarly, other medical imaging techniques like fMRI (functional magnetic resonance imaging), PET (positron emission tomography), SPECT (single positron emission computed tomography) provide functional and metabolic information. Further, T1-MRI image provides details about anatomical structure of tissues, whereas T2-MRI image gives information about normal and abnormal tissues. Hence, one can easily conclude that none of these modalities is able to carry all relevant information in a single image. Therefore, multimodal medical image fusion is required to obtain all possible relevant information in a single composite image for better diagnosis and treatment. Spatial and transform domain approaches have been widely used for medical image fusion. These techniques include PCA (principal component analysis), linear fusion etc., and multiresolution fusion scheme using wavelet and pyramid transforms. Subjective and objective evaluations are the two possible ways to assess fusion algorithms. Subjective evaluation can be performed by medical experts, whereas for objective evaluation, reference and non reference metrics have been used. For medical image fusion, non-reference metrics are more suitable as we do not have any reference medical image for comparison of fused image. However, combined subjective and objective evaluation of fusion algorithms has been found beneficial for better analysis of fusion results.

Biography

Rajiv Singh is an Assistant Professor at the Department of Computer Science, Banasthali University, Banasthali, Rajasthan, India. His research areas of interest are medical image processing, computer vision, information fusion and wavelet analysis. He has published several papers in refereed journals and conferences. He has served as reviewer for reputed journals like Information Fusion, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Image Processing, IET Image Processing and many conferences. He is a member of IEEE and ACM.

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Norio Tagawa et al., OMICS J Radiol 2016, 6:5(Suppl)
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Development of ultrasound breast imaging system using mechanically rotated ultrasonic probe

Norio Tagawa, Takasuke Irie and Masakazu Sato
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In recent years, early detection and diagnosis of a breast cancer are very important medical problems. To date, both ultrasound imaging and mammography are used as a diagnosis method of breast cancer. Mammography diagnosis uses x-ray radiation to capture images of mammary glands. Therefore, frequent applications are not preferable. In this study, we have made an examination of ultrasound diagnosis with little harm for human body. The equipment for ultrasound diagnosis has been recently developed by a part of authors. This equipment has the automatic control system to rotate an ultrasonic probe mechanically and to acquire images automatically. The process for imaging mammary glands is as follows; first, the ultrasonic probe is rotated around a nipple on a breast to capture the B-mode images in the inner part of a breast. Next, the probe is rotated apart from a nipple to image the outer part of a breast. The collected B-mode images are integrated by the attached computer. A whole cross-sectional breast image of each direction is constructed by connecting laterally the four cross-sectional B-mode images measured and collected by the above-mentioned way while giving appropriate angles which are computed so that the mammary glands are shown clearly in the B-mode images and are connected smoothly across the boundary. By generating the whole cross-sectional images in all directions, 3-D volume data is constructed. Afterwards, arbitrary cross sections can be viewed by cutting out the corresponding date from the 3-D volume data, for example, C-mode imaging, which is expected to be very useful for effective diagnosis of a cancer.

Biography

Norio Tagawa has received the ME degree from Tokyo Institute of Technology in 1989 and the DE degree from Tokyo Metropolitan University in 1995. He joined Fujitsu Laboratories Ltd. in 1989, and now a Professor in the Graduate School of System Design, Tokyo Metropolitan University. His research interests are in Computational Vision and Medical Ultrasound Engineering.

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Pegah Arfae Fathollahkhani et al., OMICS J Radiol 2016, 6:5(Suppl)
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Evaluation of hysterosalpingography findings in infertile women referring to a private radiology clinic in Kerman in the year 2014-2013

Pegah Arfae Fathollahkhani and Farnaz Fahimi
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Objectives: Infertility is still prevalent problem in the world and the infertile people try different ways to solve the problem. Hysterosalpingography is still a common method to evaluate structures of uterine, cervix and fallopian tubules, thus used to evaluate infertility cause.

Materials & Methods: In this method, after the patient is given anesthesia, cervical lip is fixed with tanaculom and the contrast agent is injected to cervix with canula and then the graphy is taken. In this study, after getting permission from the patient, results of 100 patients were evaluated.

Results: The study showed that 71% of the patients had the normal hysterosalpingography and 29% had the abnormal one. And from these abnormal hysterosalpingographies, the most findings were tubular block with 8% in the right side, 4% in the left side and 6% in both sides.

Conclusion: With this high number of tubular blackness and as we know the pain in the hysterosalpingography method can cause spasm and spasm can cause tubular blackness, it is suggested to use more powerful antispasmodix before the start of hysterosalpingography. Also it can show that PID is still common in the city and is suggested to screen infertile patients for clamydia antigene.

Biography

Pegah Arfae Fathollahkhani has completed her medical degree from Kerman University of Medical Sciences.

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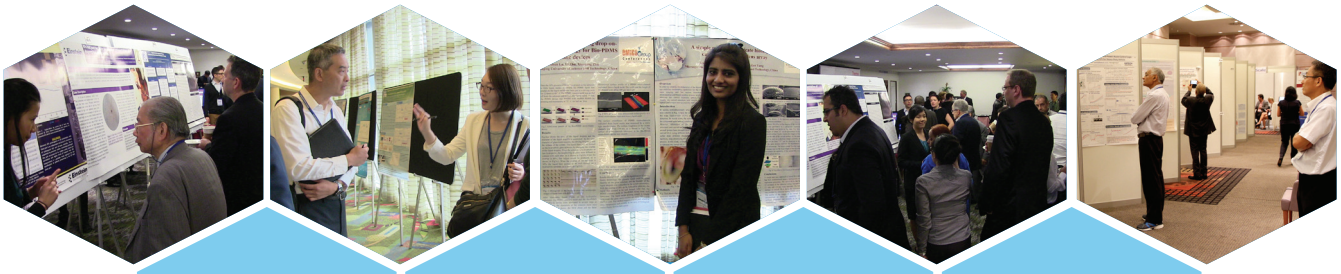

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3D MR imaging for navigational guidance: Correlation with MEG

Glenn H Roberson
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From November 2012 to October 2015, 163 patients at The University of Alabama at Birmingham (UAB) were studied with Functional Magnetic Resonance (fMR) & Diffusion Tensor Imaging for preoperative surgical planning or seizure disorder management. Presurgical planning included MR perfusion scans for regional blood flow analysis. 30+ of these had concurrent Magnetic Encephalographic (MEG) for eloquent speech lateralization. The processing of data was performed in a dedicated Brain Lab utilizing 3D analysis with a variety of 3D work stations. Images are then sent to the OR for navigation guidance. Comparisons of results, contributions and relative value of these modalities will be presented. Potential pit falls and errors are analyzed.

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Stain-free histopathology of cancer

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Histopathology, whether visualizing microstructure or selectively labeling molecules with special stains, has a long history of development and maturation, and has been instrumental in biological or clinical laboratories for basic research and in hospitals for disease diagnosis/screening. To avoid the artifacts associated with sample freezing, fixation, and staining (labeling), we develop a nonlinear penta-model spectro-microscopy to critically complement or potentially eliminate stained histology and histopathology. This technique requires a shift of focus from manipulating matter (the biological sample) to instead manipulating the optical waves (via customized excitation and signal detection) in order to generate molecular contrast. Instead of using the exogenous labeling agents in conventional optical microscopy to "physically" (invasively) label the chemical substances of interest; we initiate the use of rapidly switchable light excitation/detection channels to virtually "label" these chemical substances. Thus, the biological sample can be visualized in its physiologically authentic condition without sacrificing either molecular specificity or high spatial resolution. This technique is implemented in a programmable microscope requiring minimum optical realignment, so that a biologist or pathologist with no laser training can in the future selectively display a specific endogenous molecule (or molecular structure) on the computer screen by programming the excitation, or instantly compare the displayed molecule distribution with a different one by reprogramming the excitation. Using breast cancer as a prototypical application, we have imaged the well-known events in tumor microenvironment, including angiogenesis, lymphangiogenesis, extracellular matrix remodeling, non-native cell recruitment, extracellular vesicle up-production and switched metabolism toward biosynthesis. This allows us to identify early and quantifiable biomarkers in breast cancer development.

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Harmonization of imaging acquisition in radiogemics

Binsheng Zhao
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An increasing body of publications has reported the value of radiographic image features (radiomics features) for linking genetic alterations in certain cancer types using multiple imaging modalities. The findings were mostly based on retrospective analysis of imaging data from previous studies that were not designed for quantitative characterization of tumors. Despite the large variety of CT scanner types, imaging acquisition techniques, reconstruction parameters and tumor segmentation and quantification tools, little is known about the effects of such variations on radiomics features. We extracted radiomics image features to describe tumor size, shape, margin, density statistics (histogram-based) and density texture distributions and studied the effects of the various factors during the imaging acquisition and tumor measurement on the radiomics image features using both phantom and in-vivo lesions. Our findings suggest that radiomic features are reproducible over a wide range of CT imaging settings. Radiation dose, CT slice thickness and reconstruction affect radiomics features to different degrees; tumor texture features are more sensitive to the imaging settings compared to the size and shape related features. Our findings will raise awareness of importance of properly utilizing imaging and setting image acquisition parameters in radio genomics research.

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