

SSA04-02

Lung Nodule Consistency and Relative Risk of Future Lung Cancer Diagnosis: Does Sex Matter?

Sunday 10:55-11:05 AM | SSA04-02 | NA

PURPOSE

To compare differences in the relative risk (RR) of lung cancer (LC) by nodule consistency and sex in the CT arm of the NLST.

METHOD AND MATERIALS

By study design, all CT-detected nodules measuring 4-30 mm were characterized by consistency (solid=SN, nonsolid/ground glass=GGN, and part-solid=PSN). For each nodule consistency, the following were calculated: sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for LC for both men (M) and women (W). For each nodule consistency, RR was calculated as the ratio of the probability of LC given a reported nodule consistency to the probability of LC given no nodule of the same consistency.

RESULTS

Of 26,455 participants in the CT arm of the NLST, 9994 (37.8%) had a positive screen at ≥ 1 time point. 8062 (81%) had 1 nodule consistency and 1932 (19%) had >1 nodule consistency. The RR of LC was significantly higher for women than men for GGNs (2.68 W vs. 1.68 M, $p=0.0026$), and a similar trend was observed for PSNs (4.45 W vs. 3.19 M, $p=0.0556$). In contrast, SNs were associated with a comparable RR for both sexes (4.48 vs. 3.77, $p=0.1970$), along with nearly equivalent sensitivity and specificity for LC (sensitivity = 69.6% W, 68.5% M; specificity = 69.6% W, 68.5% M). Women demonstrated a higher sensitivity than men for subsolid nodules, including GGNs (26.7% W, 12.6% M) and PSNs (16.2% W, 10.2% M). PSNs had the highest PPV in both sexes (15.3% W, 12.3% M), whereas SNs had the lowest PPV in women (7.9%) and GGNs had the lowest PPV in men (6.6%).

CONCLUSION

Rates of lung cancer are influenced by both nodule consistency and sex. Subsolid nodules are associated with a higher risk of lung cancer for women than men.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware of sex-related differences in risk of lung cancer for subsolid nodules when interpreting CT screening studies.

SSG10-06

Cracking the Case on "Knuckle Cracking": The Sonographic Evidence

Tuesday 11:20-11:30 AM | SSG10-06 | NA

PURPOSE

1] Report the static and dynamic appearance of knuckle cracking (KC) with sonography (US) and 2] analyze the performance of US for the diagnosis of KC.

METHOD AND MATERIALS

A prospective, IRB-approved study was performed on healthy adult subjects with and without a history of habitual KC. Exclusion criteria were a history of pain or arthritis in the hands. Recorded clinical history included KC events per day multiplied by the number of KC years (allowing the calculation of "crack-years") and a QuickDASH questionnaire. Physical examination, including grip strength and Beighton scoring, was performed by two subspecialty orthopaedists blinded to subject KC history. US (with temporal resolution of 87 frames/sec) was conducted by a single sonographer, with static and cine images recorded before, during, and after metacarpophalangeal joint (MPJ) distraction was performed by the subjects. Two blinded musculoskeletal radiologists interpreted the images for a definite hyperechoic focus during and after MPJ distraction (not present prior to distraction); this was compared against the reference standard of an audible "crack" during joint distraction.

RESULTS

We studied 400 MPJs of 40 subjects (17 women, 23 men), with mean age of 33 years (range, 18-63). In comparing 10 non-KC subjects (with 0 "crack-years") versus 30 KC subjects (with "crack-years" ranging from 16 to 800), there was no significant difference in sex, age, QuickDASH score, grip strength, or Beighton score. In 62 of the 400 MPJs, there was an audible "crack" during manual distraction. Range of motion was noted to significantly increase in these 62 MPJs with respect to active and passive flexion, and passive extension between pre and post KC ($p < 0.05$). With US, blinded readers had a good sensitivity (R1, 75%; R2, 80%) and excellent specificity (R1, 94%; R2, 95%), with a very good inter-observer reliability of 0.87 ($p < 0.0005$). A brilliant hyperechoic flash that was simultaneous with the KC event and arose over approximately 115 msec was highly characteristic.

CONCLUSION

US examination during movement of the MPJs can show distinctive findings of KC with relatively high specificity and inter-observer reliability. US features corroborate the theory of cavitation as the etiology for sound generation in voluntary KC.

CLINICAL RELEVANCE/APPLICATION

Audible emissions may be associated with a broad array of (intraarticular and extraarticular) clinical conditions, but KC has a characteristic US appearance.

FIGURE (OPTIONAL) http://abstract.rsna.org/uploads/2015/15015811/15015811_kskh.jpg

HS-2A-02

Trends in Breast Cancer Screening: Impact of Early Medicaid Expansion

Monday 12:15-12:45 PM | HS-2A-02 | NA

PURPOSE

The Affordable Care Act (ACA) has resulted in sweeping changes in how we provide health insurance for the average American. To implement the coverage mandate, some states have responded by expanding Medicaid coverage. California, Connecticut, Minnesota, New Jersey, Washington, and District of Columbia were considered early expanders, implementing their programs by 2011. We sought to determine whether expansion of access to health insurance in these early expansion states has resulted in improved breast cancer screening adherence, particularly among low-income individuals, for whom the ACA represented potentially large expanded access.

METHOD AND MATERIALS

Data from the 2008 and 2012 Behavioral Risk Factor Surveillance System was used to compare Self-reported screening mammography adherence by state expansion status and by survey year for all sample and low-income women. Logistic regression models were also used to estimate self-reported screening outcome as a function of state Medicaid expansion status, controlling for age, race, education, and income.

RESULTS

In 2008, screening mammography adherence reached 78.5% among women 40-70 in early expansion states compared to non-expansion states (76.3, $p=0.0002$). In 2012, rates declined in both groups, with screening remaining higher in expansion states (77.0% vs 73.5, $p<0.0001$). In low income women, similar rates of decline were identified between 2008 and 2012 regardless of expansion status. Despite the overall decline in screening rates between 2008 and 2012, when adjusting for age, race, education, and income, low-income women in expansion states were 25% ($p=0.006$) more likely to adhere to screening in 2012 compared to 2008.

CONCLUSION

In states with early Medicaid expansion breast cancer screening adherence has improved in precisely the population who would benefit the most from the ACA. Adoption of expansion by more states can result in considerable improvement of income disparities in breast cancer screening.

CLINICAL RELEVANCE/APPLICATION

Lack of health insurance results in disparities in breast cancer screening. Affordable Care Act (ACA) intends to reduce the number of uninsured by providing a more extended coverage through Medicaid expansion.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15008977/15008977_i8kh.jpg

PD201-SD-SUA2

Obese children fMRI brain connections for food odor stimuli

Sunday 12:30-1:00 PM | PD201-SD-SUA2 | NA

PURPOSE

Obesity is a precursor of health problems, In Mexico this condition affects more than 70% of the population It is known that odor/smell is one of the principal cues for the appearance and control of appetite To fight obesity it is crucial to understand the brain mechanisms of this stimulus There is no information on the changes in connectivity between brain regions for this age group. In this work we studied the different brain fMRI activations and connections between normal weighted (NW) and obese (OB) infants for different types of food odors.

METHOD AND MATERIALS

30 volunteers infants 8.4±2 15 males/15 females were studied Two cohorts of 15 subjects each were obtained from the sample one with BMI between 19 and 24 kg/m² (NW) and the other with BMI over 30 kg/m² (OB)Volunteers received 3 odor cues One was pleasant and represented caloric foods (chocolate) the second was healthy and presented low calorie foods(onion) the third was a neutral odor not associated with food(diluted acetone)We used a 1.5 T Philips Intera Achevia scanner using 35 coronal slices covering the whole of the brain were acquired with a Fast-Echo-EPI sequence over a period of 13.9 minutes TR=3sTE=50 ms 64x64 matrix with a 3.6 x 3.6 mm in plane resolution and 4 mm slice thickness. Data was analyzed with SPM8 software Results for both analysis were corrected for multiple comparisons (FWE p<0.05) and data was presented overlaid on template images

RESULTS

All food smells presented larger activations in cerebellum for NW volunteers probably corresponded to the pleasure regulation function of this area The cingulate gyrus was much more active for OB infants when presented with food smells This response was possibly related to the emotional processing or the memory functions of this area These two findings clearly indicated different mechanisms of interpretation of these stimuli between

CONCLUSION

Clear differences in fMRI and connectivity between the OB and NW groups were found, pointing at a very different processing of odor cues in infants.

CLINICAL RELEVANCE/APPLICATION

if we know where there is a failure in connectivity in obese patients maybe we can influence this area trying to avoid the problem of obesity development before it appears to the emotional processing or the memory functions of this area. These two findings clearly indicated different mechanisms of interpretation of these stimuli between

FIGURE (OPTIONAL) http://abstract.rsna.org/uploads/2015/15007823/15007823_tufe.jpg

SSK16-02

Can Gaming Consoles Be Used to Improve X-Ray Imaging? A Feasibility Study

Wednesday 10:40-10:50 AM | SSK16-02 | NA

PURPOSE

<p>To test the feasibility of using gaming console technology to improve the quality of X-ray projection imaging by automatically measuring body part thickness and mitigating the causes of repeat examinations.</p>

METHOD AND MATERIALS

Proprietary software was developed for the Microsoft Kinect 1.0 for Windows using C#. Both the optical camera and infrared sensor outputs were recorded and tested with a mock-up wall stand. The software was designed to control radiation dose variation by measuring body-part thickness. It also was designed to reduce common reasons for repeating images including wrong body part, motion, positioning, and clipped anatomy.

RESULTS

The system recognized body part and left/right side of the body to reduce taking the wrong body part. Thickness measurements were automatically displayed with a precision of 1 mm at the central ray, defined body part, or at a user-specified point. The system identified the relationship of the patient's ordered anatomy with respect to the location of automatic exposure chambers (AECs) and image receptor. The software was designed to highlight the body part in red when it was not overlying the AECs, yellow when partially on a specified AEC, and green when completely covering that AEC. Motion was tracked graphically over time displayed with red indicating gross motion, yellow as slight motion, and green as no motion. Clipped anatomy was displayed with an overlay of the collimated light field. Positioning was confirmed with the optical camera. The display output included a stylized body with highlighted body part, optical visualization of the patient, thickness measurement, and motion over time displayed graphically as shown in the figure (shown: left hand centered over the center AEC, recent but no current motion, and 19 mm thick in the AP projection at the central ray).

CONCLUSION

This feasibility study shows that body-part thickness can be measured automatically and can aid in setting technique based on patient thickness without physical contact measurement (e.g. calipers). The system can reduce repeat rates by confirmation of the correct body part, and checking for motion, positioning, and collimation immediately before the radiograph.

CLINICAL RELEVANCE/APPLICATION

<p>This feasibility study indicates that technology can be adapted from mass-produced gaming consoles to control radiation dose and reduce repeat rates. This device can help the radiology community adhere to the ALARA principle.</p>

SSK04-06

Cardiac Effects of Prolonged Apnea in Elite Divers Investigated with Comprehensive Cardiac Magnetic Resonance

Wednesday 11:20-11:30 AM | SSK04-06 | NA

PURPOSE

Apnea diving is getting more and more popular as a recreational sport activity and performance of apnea divers has been constantly rising in the recent years. Prolonged apnea leads to the so-called diving response (i.e. bradycardia, reduced cardiac output, peripheral vasoconstriction) which burdens the heart and leads to changes in circulation. This study investigated the effects of prolonged apnea to the heart and hemodynamic alterations using comprehensive cardiac magnetic resonance imaging (CMR).

METHOD AND MATERIALS

We investigated 17 (15 male, 2 women) elite divers using CMR at 1.5T before, during, and after apnea in air. Subjects performed two sessions: in the first cardiac function (left ventricular end-diastolic volume (LV-EDV), end-systolic volume (LV-ESV), ejection fraction (LV-EF), fractional shortening (FS)) was repeatedly measured using steady state free precision (SSFP) imaging in SAX and VLA; in the second blood flow was measured in both common carotid arteries (ACC) using phase contrast imaging. Apnea was performed in maximal inspiration.

RESULTS

Mean breath hold duration was 297s±52 in the cardiac session and 276s±78 in the flow session. Maximal apnea time reached was 8:03min. Over time, apnea (AP) resulted in a progressive increase of LV-EDV (baseline: 131ml±33; AP: 190ml±35; p<0.0001), slight decrease of LV-EF (baseline: 63%±10; AP: 58%±8; p=0.0112) and a consecutive increase of LV-ESV (baseline: 49ml±20; AP: 80ml±18; p<0.0001). FS as a parameter of regional function also decreased significantly during apnea (baseline: 35%±5; AP: 25%±5; p<0.0001). Flow measurement revealed an increase of blood-flow to the brain (left ACC; baseline: 5.0ml±2.0; AP: 12.8ml±6.4; p=0.0026; right ACC; baseline: 5.1ml±2.2; AP: 12.4ml±6.3; p=0.0009).

CONCLUSION

This work reveals that prolonged apnea results in massive hemodynamic changes to the heart and an increase of blood-flow to the brain as expected from the diving reflex. In particular, apnea leads to a transient cardiac dilation, decrease of LV-EF and fractional shortening, a similar pattern as seen in patients with systolic heart failure.

CLINICAL RELEVANCE/APPLICATION This study shows that prolonged apnea has tremendous effects to the heart and the vascular system; therefore moderate trained subjects, especially with known medical conditions, should perform maximal apnea with caution.

SSC07-03

Weight Loss Is Associated with Slower Cartilage Degeneration Over 48 Months in Obese and Overweight Subjects:
Data from the Osteoarthritis Initiative

Monday 10:50-11:00 AM | SSC07-03 | NA

PURPOSE

To investigate the association of different degrees of weight loss with progression of knee cartilage degeneration in overweight and obese subjects.

METHOD AND MATERIALS

In this study, 290 subjects (age 61.7±9.1y; 171 females) with a BMI ≥25kg/m² from the Osteoarthritis Initiative (OAI) with risk factors for OA or radiographically mild to moderate OA were included. Subjects with weight loss were categorized into groups with a large (≥10%, n=36) or moderate amount of weight loss (5-10%, n=109) over 48 months, and were frequency matched to a group with stable weight (BMI change <3%, n=145). Changes of focal cartilage defects assessed with 3T MRI cartilage WORMS (Whole-Organ Magnetic Resonance Imaging Score) and T2 maps of the right knee for five cartilage compartments (patella, medial and lateral femur, medial and lateral tibia) including laminar and texture analysis, were analyzed using multivariate regression models adjusting for age, sex, baseline BMI and KL.

RESULTS

Overall cartilage WORMS showed significantly less progression in both weight loss groups compared to the stable weight group (5-10% weight loss, P=0.035; ≥10% weight loss, P<0.0001) over 48 months and changes were associated with changes of BMI (r=0.31, P=0.02). Subjects with ≥10% weight loss showed significantly less T2 value increase in the bone layer averaged over all compartments compared with stable weight subjects (mean diff. 1.0msec [95%CI 1.3, 0.6] P=0.01), suggesting slower cartilage deterioration, yet no significant change in T2 was found between 5-10% weight loss and stable weight group. In the medial compartment of the ≥10% weight loss group, overall T2 and cartilage WORMS changes were significantly less (P<0.0001, for each) and homogeneity was increased (P=0.004), compared to the group with stable weight.

CONCLUSION

While changes in cartilage defects were significantly associated with the amount of weight loss in all subjects, only subjects with ≥10% weight loss showed significantly reduced cartilage deterioration measured with T2. Our data show evidence that weight loss has a protective effect against cartilage degeneration and that a larger amount of weight loss is more beneficial.

CLINICAL RELEVANCE/APPLICATION

MR-based knee cartilage T2 measurements and semiquantitative grading allow monitoring of the protective effect of weight loss on joint health and are useful to determine which amount of weight loss is most beneficial in overweight and obese patients.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15011594/15011594_h184.jpg

SSQ21-08

Effect of Patients' Negative Affect on Adverse Events in Interventional Radiology

Thursday 11:40-11:50 AM | SSQ21-08 | NA

PURPOSE

Self-fulfilling prophecy of thoughts and feelings about health outcomes and the mood contagion between patients and physicians are contested topics in the current literature and lay press. In this study we assessed whether a patient's negative affect is predictive of adverse events during interventional radiological procedures.

METHOD AND MATERIALS

This IRB-approved HIPAA compliant study includes 230 patients who underwent percutaneous peripheral vascular and renal interventions in a randomized sequence. Prior to their interventions patients filled out the Positive Affect Negative Affect Schedule (PANAS), rating 10 adjectives each related to either positive affect (PA) or negative affect (NA) using a 5-point rating scale ranging from "1=Very slightly/Not at All" to "5=Extremely". Adjectives for NA were: Distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid. Adjectives for PA were: Interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active. Adverse events included prolonged hypoxia, hypertensive or hypotensive episodes, prolonged bradycardia, postoperative bleeding. Summary scores for NA and PA were split into high and low over their medians and correlated with absence or presence of adverse events using logistic regression. Odds ratios, standard error (SE), confidence intervals (CI), and p-values were reported using SAS 9.1.3.

RESULTS

Patients with high NA had significantly more adverse events than those with low NA (22% vs 12%; odds ratio 0.48, SE 0.17, CI 0.23 - 0.97, p=0.04). The degree of PA did not significantly affect outcome (odds ratio 0.76, SE 0.27, CI 0.38 -1.53, p=0.44).

CONCLUSION

Patients with high negative affect fared significantly worse in terms of adverse events as compared to patients who had low negative affect. The degree of positive effect did not make significant difference.

CLINICAL RELEVANCE/APPLICATION

The mood contagion from the patient's negative affect should be of concern for the practicing interventional radiologist because it may result in a self-fulfilling prophecy of a negative outcome.

BR-5A-01

Association of breast density with breast cancer risk in screening mammography

Thursday 12:15-12:45 PM | BR-5A-01 | NA

PURPOSE

The purpose of this study was to assess the distribution of breast density of the patients with detected breast cancer during mammography screening, and to evaluate the association of high mammographic density and breast cancer.

METHOD AND MATERIALS

We used data from National Breast Screening Programme in a single county. Women age 50-69 years have been invited every two years for mammography screening. 52962 mammography exams have been done during 5 years at 5 mammography units. Density analysis was performed from one craniocaudal and one mediolateral view from both breasts. The percent of the area of the mammogram occupied by radiologically dense breast tissue was determined by two independent radiologists who estimated visually the proportion of the occupied area. According to ACR (American College of Radiology) criteria breast density has been categorized into four groups: 1-almost entirely fatty, 2-scattered fibro-glandular densities, 3- heterogeneously dense, 4-extremely dense. Each woman with detected carcinoma was added her matching control: the woman of same age and same place of living. Patients were divided into low density breast tissue group (ACR density group 1-2) and high density breast tissue group (ACR 3-4) and data was compared between these two groups.

RESULTS

Out of 230 detected breast cancers, 6% were stage 0, 47% stage I, 17% stage II and 28% stage III/IV, according to AJCC criteria. Mammographic density distribution in breast cancer patients was as following: 47.64% in ACR1 group; 36.32% ACR2; 13.21% ACR3 and 2.83% ACR4. Low mammographic density (<50% parenchyma) had 83% patients in breast cancer group vs 89% controls; high mammographic density (>50% parenchyma) had 17% breast cancer patients vs 11% controls. There was no significant difference in mammographic density between breast cancer and control group: Fisher's exact test $p=0.083$ (OR=1.65 95% CI=0.97-2.81; $z=1.85$, $p=0.064$).

CONCLUSION

Our results suggest that higher mammographic densities were not associated with higher risk of breast cancer among menopausal women. Majority of screened woman have low breast density. Mammography is efficient method for early detection of nonpalpable breast cancer.

CLINICAL RELEVANCE/APPLICATION

Mammography is the best tool for population-based breast cancer screening.

SSM20-01

Biomodeling and 3D Printing for Simulation of Surgical Separation of Conjoint Twins

Wednesday 3:00-3:10 PM | SSM20-01 | NA

PURPOSE

We describe a unique use of biomodeling and 3D printing in the setting of surgical simulation of thoracoabdominal conjoint twin separation.

METHOD AND MATERIALS

Surgical planning on thoraco-omphalo-pyopagus female twins commenced at 7 months for planned separation at 10 months of life. The modeling process was initiated by a volumetric CT using a 320 detector scanner with target mode prospective EKG gating for the cardiovascular structures, and helical ungated acquisition for the chest, abdomen and pelvis. Intravenous contrast was separately administered into both twins, while oral contrast was administered only into 1 twin. Image segmentation yielded individual segments of the skin, skeleton, heart, lungs, airway, GI tract, abdominal vasculature, urinary tract, and gynecologic structures. In preparation for 3D printing, structures to support the models in a vertical position were created. In one operation, polyjet multi-material 3D printing was used to print skeletal structures, base and supports in hard plastic resin, and the organs in rubber like material. The livers were printed as separate pieces of the transparent resin, with the hepatic and portal vessels in white for better visibility. Pegs were designed so the liver could be attached or removed from the assembly. The models were designed such that they could be assembled together or separated during the surgical planning process. Findings on biomodels and 3-D print were compared to findings at surgical separation.

RESULTS

The twins underwent surgical separation by a multidisciplinary surgical team. No discrepancy was noted involving the cardiopulmonary, hepatic, intestinal, renal and skeletal anatomy. Preoperative simulation successfully predicted assignment of the pelvic viscera to each twin based on the vasculature. There was one hemorrhagic complication at surgery, unrelated to preoperative anatomical characterization.

CONCLUSION

We have demonstrated a unique use of 3D modeling and 3D printing for simulation and planning of conjoint twin separation, with representation of the surgically relevant viscera and vasculature in a single 3D printed model.

CLINICAL RELEVANCE/APPLICATION

Describe a novel application of 3D printing for simulating conjoint twin separation, which involves representation of all surgically relevant visceral and vascular anatomy in a single 3D print.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15017835/15017835_kqh3.jpg

SSA17-05

Advanced Atherosclerotic Disease with Intraplaque Hemorrhage is Present in Non-Stenotic Carotid Arteries of Diabetic Patients

Sunday 11:25-11:35 AM | SSA17-05 | NA

PURPOSE

Diabetic patients have an increased risk of ischemic cerebrovascular events with worse outcomes than the non-diabetic population. Carotid artery stenosis currently stratifies patient risk but, even without significant stenosis, intraplaque hemorrhage (IPH) may predict cerebrovascular events. We report the prevalence of IPH in an asymptomatic diabetic population without carotid artery stenosis, using 3-dimensional (3D) magnetic resonance imaging (MRI) and investigate its association with carotid artery wall volume.

METHOD AND MATERIALS

Patients were recruited from a prospective dietary trial between 2010 and 2013, with a carotid intima-media thickness (IMT) ≥ 1.2 mm and non-stenotic carotid arteries on ultrasound. All were asymptomatic type 2 diabetic patients who underwent baseline 3D T1-weighted black blood imaging for visualization of intraplaque hemorrhage (3D-MRIPH) and 3D- time of flight imaging. Carotid artery vessel wall (VW) volumes and IPH volumes were determined bilaterally for a standard 32 mm segment centered at each carotid bifurcation, using a validated approach with the software, VesselMASS (Medis, Netherlands). Descriptive statistics as well as repeated measures linear regression analyses were performed.

RESULTS

159 patients were included with mean age 63.1 ± 7.9 years, 62.3% male, 17.9% with a smoking history and 69.2% on hypertensive medication. The prevalence of IPH was 23.3% (n=37) with five patients exhibiting IPH in both carotid arteries. VW volume of the IPH positive carotid arteries was found to be significantly different from IPH negative arteries ($\beta = 0.15 \text{ mm}^3$ SE=0.03, $p < 0.01$) and independent from other factors that affected VW volume - age ($\beta = 0.01 \text{ yrs}$ SE=0.002, $p < 0.01$), sex ($\beta = 0.21$ SE=0.04, $p < 0.01$), BMI ($\beta = 0.22$ SE=0.10, $p = 0.03$) - when adjusted (none significant) for disease duration, smoking, blood pressure, and medications (statins, anti-hypertensive, anti-platelet).

CONCLUSION

IPH can be found in the absence of carotid artery stenosis in asymptomatic diabetic patients and is associated with an increased carotid artery wall volume as measured by 3D-MRI. It represents a biomarker of advanced atherosclerotic disease and may identify individuals at higher risk of cardiovascular disease.

CLINICAL RELEVANCE/APPLICATION

3D MRI can identify high risk cardiovascular biomarkers, such as intraplaque hemorrhage, in diabetic patients before onset of stenosis.

SSK04-07

Is it Possible to Investigate Archeological Hearts Using CT and MRI? About Five Archeological Hearts

Wednesday 11:30-11:40 AM | SSK04-07 | NA

PURPOSE

Five archeological hearts were found in an archeological site last year. Several graves were found in the basement of a church. In addition to different archeological bones found, five heart shaped lead polls were discovered. These findings were found in vaults from elite class families. At the opening of the polls, findings were very interesting: five well conserved hearts dating from the end on the 16th century, to the beginning of the 17th century.

METHOD AND MATERIALS

Thanks to the embalming process, archeological hearts were well conserved. Each archeological heart has been studied with CT scanner and with MRI, before and after balm extraction, and after rehydration. CT parameters were standard, using a 16 row CT scanner. MRI parameters were difficult to optimize. This was due to lack of hydration of these archeological pieces.

RESULTS

First images acquired were very impressive, but with poor information. This was due to important vegetal embalming process. Hearts were first scanned with their balms. Then, they were carefully "cleaned". Finally, they were rehydrated. CT and MR examinations were performed for each heart. Because of an intra tissue lead diffusion, especially in infra epicardial fat, there was an impressive natural contrast on CT images. This element permitted to identify different heart structures like chambers, valves and coronary arteries. MRI images were hard to obtain because of lack of hydration. Therefore, images after rehydration were relevant and allowed to better identify myocardial muscles

CONCLUSION

Study of archeological smooth tissues like heart is possible using CT and MRI, but it requires a good knowledge of the embalming process and MR technical parameters.

CLINICAL RELEVANCE/APPLICATION

Until now, no radiological examination of archeological hearts was described in the literature data.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15007811/15007811_kt17.jpg

SSC07-04

The TEFR Field Study: Results of Continuous Biochemical and Morphological Cartilage Analysis of Hindfoot, Ankle, and Knee Joints in Course of a 4,500 km Ultramarathon Race throughout Whole Europe Using T2*-mapping on a Mobile MRI Truck Trailer

Monday 11:00-11:10 AM | SSC07-04 | NA

[RSNA Country Presents Travel Award] Award: RSNA Country Presents Travel Award

PURPOSE

We took advantage of the possibility for a continuous, mobile MR surveillance of cartilage integrity during a transcontinental ultramarathon over 4,486 km. Biochemical changes, thickness and focal lesions of the cartilage of knee, ankle, and hindfoot joints as well as muscle mass and respective relationships were presented.

METHOD AND MATERIALS

MRI data were acquired with a mobile 1.5T scanner travelling with 44 participants of the TransEurope FootRace (TEFR) for 64 days. Repeated follow-up scans were obtained using a T2* GRE-, a TIRM-, and a fat-saturated PD-sequence. T2* values were obtained from inline reconstructed T2* maps by using a pixelwise, monoexponential nonnegative least squares fit analysis. Statistical analyses regarding cartilage T2* and thickness changes and influencing factors were done on the finishers of the race.

RESULTS

With exception of the patellar joint, nearly all cartilage segments showed a significant initial mean T2* signal increase within the first 1500km run: ankle 25.6%, subtalar joint 20.9%, midtarsal joint 26.3%, femorotibial Joint (FTJ) 25.1 to 44.0%. Interestingly, an unexpected secondary T2* decrease was observed in ankle (-30.6%) and hindfoot joints (-28.5% and -16.0%), but not in the FTJ. A significant loss of cartilage thickness was detected in the FTJ, but not in the other joints. A side dependent, positive relationship between muscle volumes of the thigh and cartilage T2* at baseline could be found in the FTJ. Osteochondral lesions were detected, however all were already present at baseline and showed no changes throughout TEFR. Reasons for stopping the race were not associated with joint problems.

CONCLUSION

After initial significant intrachondral matrix changes, a subsequent T2* value recovery indicates the ability of the cartilage matrix to regenerate under ongoing running burden in ankle and hindfoot joints. In contrast, for the FTJ no T2* signal recovery could be observed accompanied by loss of cartilage thickness. No new lesions were observed during TEFR. Asymmetry of cartilage T2* behavior is in line with the hypothesis of the "breaking" limb and demonstrates leg-preference even in well-trained ultra-runners.

CLINICAL RELEVANCE/APPLICATION

The capability of most parts of human cartilage to recover in the presence of extreme physical stress has not been shown previously indicating a high regenerative potential of human joint cartilage.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15003074/15003074_mkgv.jpg

RC314-12

Bariatric Embolization for Morbid Obesity, First Western Hemisphere Experience: Gastric Artery Embolization Trial for Lessening Appetite Nonsurgically (GET LEAN)

Tuesday 11:05-11:15 AM | RC314-12 | NA

PURPOSE

The purpose of this pilot study is to achieve the collection of safety and efficacy data in patients undergoing left gastric artery embolization for morbid obesity in the Western Hemisphere.

METHOD AND MATERIALS

This is an FDA-IDE pilot study. 5 patients have been approved to undergo the left gastric artery embolization procedure for the purpose of weight loss using Beadblock 300-500 micron particles. All patients will undergo EGD follow up pre and post procedure. Ghrelin, Leptin and CCK levels will also be measured at baseline and post procedure per follow up protocol. Inclusion Criteria Morbid obesity with a BMI \geq 40 Age \geq 22years Ability to lay supine on an angiographic table \leq 400lbs due to table weight limits Appropriate anesthesia risk as determined by certified anesthesia provider evaluation preprocedure Subjects who have failed previous attempts at weight loss through diet, exercise, and behavior modification (as it is recommended that conservative options, such as supervised low-calorie diets combined with behavior therapy and exercise, should be attempted prior to enrolling in this study).

RESULTS

The first patient has lost 30lbs at 3 months. Second patient has lost 12lbs at 1 month. Third patient has lost 6lbs in 1 week. There have been no major adverse events. The final 2 patients in this study are still being selected.

CONCLUSION

This is the first experience in the United States of performing left gastric artery embolization for the purpose of treating morbid obesity. Early results are promising and show no major adverse events thus far. The radial artery has also proven to be a feasible approach to performing this procedure with implications for a safer access site.

CLINICAL RELEVANCE/APPLICATION

Morbid obesity is a prevalent and deadly public health problem. Obesity affects about 30% of the United States population. It is responsible for numerous comorbidities including diabetes mellitus and its complications, cardiovascular disease, sleep apnea, and premature osteoarthritis. This is the first use of left gastric artery embolization in the Western Hemisphere to treat morbid obesity. This is also the first radial artery access experience with implications for the morbidly obese where groin access may be more challenging.

SSC08-02

Reduced Cerebral Blood Flow Detected after Clinical Recovery in Acute Sports-related Concussion

Monday 10:40-10:50 AM | SSC08-02 | NA

PURPOSE

Sport-related concussion (SRC) is a major health problem, affecting millions of people each year. While the clinical effects of SRC (e.g., symptoms and impairments in neuropsychological functioning) typically resolve within several days, increasing evidence suggests persistent neurophysiological abnormalities beyond the point of clinical recovery after injury. This study was aimed to evaluate cerebral blood flow (CBF) changes in acute SRC, as measured using advanced arterial spin labeling (ASL) MRI.

METHOD AND MATERIALS

We compared CBF maps assessed using 3D pCASL (pseudo continuous ASL) MRI in 18 concussed football players (age 17.8 ± 1.5 years) obtained within 24 hours and at 8 days after injury, in comparison to a control group of 19 matched non-concussed football players at the same interval. Clinical assessments including the Sport Concussion Assessment Tool 3 (SCAT3) and Standardized Assessment of Concussion (SAC) were obtained at each time point.

RESULTS

While the control group did not show any changes in CBF between the two time points, concussed athletes demonstrated a significant decrease in CBF at 8 days relative to 24 hours ($p < 0.01$, FWE corrected). Moreover, scores on the clinical symptom (SCAT3) and cognitive (SAC) measures demonstrated significant impairment (versus pre-season baseline levels) at 24 hours (SCAT $p < 0.0001$, SAC $p < 0.01$) but returned to baseline levels at 8 days.

CONCLUSION

Our preliminary results suggest that advanced ASL MRI method might be useful for detecting and tracking the longitudinal course of underlying neurophysiological recovery from concussive injury.

CLINICAL RELEVANCE/APPLICATION

Abnormal CBF was found using 3D pCASL MRI in acute concussed patients even after clinical recovery, which might have important implication for clinical decisions on return-to-play after concussion.

SSE20-03

Increased Gray Matter Volume of Emotional Circuits in Children without Direct Parental Care

Monday 3:20-3:30 PM | SSE20-03 | NA

PURPOSE

With the economic boom, hundreds of millions of laborers are migrating away from their children to pursue a better job. This international parental migration has resulted in millions of left-behind children (LBC) and has raised widespread concern. However, it is still unclear where and how the brain is affected in these children who lack parental care. Therefore, we aimed to explore the gray matter volume alteration in LBC in relative to those with parental care.

METHOD AND MATERIALS

This study was IRB approved and written informed consent was obtained from guardians. Thirty-eight LBC (age=9.6±1.8yrs, 21boys) and 30 comparison children (age=10.0±1.95yrs, 19boys) were included and performed a 3.0T MR scan. The LBC is defined as children who living with the absence of both of their biological parents for a period over six months. Image preprocessing and statistical analyses were performed with optimized voxel-based morphometry in SPM8. IQ of all participants was measured to quantify cognitive function.

RESULTS

Compared to controls, LBC showed significantly greater gray matter volume in bilateral fusiform gyri, bilateral parahippocampus, right superior parietal lobe, right thalamus, right superior occipital gyrus, left cuneus, right superior temporal gyrus, right superior medial frontal gyrus, left postcentral gyrus, left middle occipital gyrus and left putamen ($p < 0.05$, FDR corrected). The mean value of IQ scores in LBC was not significantly different from that in controls. Furthermore, gray matter volume in bilateral parahippocampus gyri in LBC was negatively correlated with IQ score ($p < 0.05$).

CONCLUSION

This study provided the first empirical evidence of larger gray matter volumes, especially in emotional circuits in LBC than children living with their parents, suggesting the parental care affects the brain development. Since the larger gray matter volume may reflect insufficient pruning and mature of brain, the negative correlation between the gray matter volume and IQ scores suggest that growing without parental care may delay the development of brain.

CLINICAL RELEVANCE/APPLICATION

To our knowledge, this study provides the first empirical evidence of larger gray matter volumes in emotional circuits in LBC, suggesting that parental care affects brain development. From a public health perspective, the study highlighted the importance of parental care in children and indicated early intervention and stimulation are needed to LBC.

FIGURE (OPTIONAL)

http://abstract.rsna.org/uploads/2015/15008346/15008346_15wq.jpg

SST09-01

Subclinical Cardiac Dysfunction Relates to Imaging Markers of Subclinical Brain Disease in the General Population

Friday 10:30-10:40 AM | SST09-01 | NA

PURPOSE

To investigate the association between NT-proBNP, a marker of heart disease, and imaging markers of subclinical brain disease on magnetic resonance imaging (MRI) in community-dwelling persons who are free of stroke, dementia, and a clinical diagnosis of cardiovascular disease.

METHOD AND MATERIALS

In 2,475 persons (mean age 56.6 years; 57.3% women) from a prospective population-based study we measured NT-proBNP in serum. All persons underwent brain MRI on a 1.5-tesla MRI system, yielding imaging markers for global brain structure, focal abnormalities (lacunes, white matter lesions, cerebral microbleeds), and microstructural white matter integrity. We used multivariable linear and logistic regression models to investigate the association between NT-proBNP (continuous levels and per tertile) and markers of subclinical brain disease.

RESULTS

Higher NT-proBNP was associated with smaller total brain volume (mean difference per SD increase in NT-proBNP: -0.023, 95% confidence interval [CI] -0.036;-0.009, $p=0.001$), predominantly driven by grey matter volume (mean difference per SD increase in NT-proBNP: -0.037, 95%CI -0.057;-0.017, $p<0.001$), and less by white matter volume. Higher NT-proBNP was associated with larger white matter lesion volume (mean difference per SD increase in NT-proBNP: 0.099, 95%CI 0.060; 0.137, $p<0.0001$), and with lower fractional anisotropy and higher mean diffusivity in white matter.

CONCLUSION

In community-dwelling persons, subclinical cardiac dysfunction as reflected by serum NT-proBNP levels, is associated with global and microstructural imaging markers of subclinical brain disease.

CLINICAL RELEVANCE/APPLICATION

Our data provide more insight into the heart-brain connection, which is essential since both cardiac dysfunction and subclinical brain disease are growing problems in an aging population.