27. MINIATURIZATION AND MULTIPLEXING OF LIPID SAMPLE PREPARATION FOR GC-MS ANALYSIS

JOSHUA G. SINGH[1], MATTHEW B. AU[2]; LINGYI L. DENG[2]

[1]Boston University, Department of Biomedical Engineering, Boston, MA.

[2]Boston Medical Center, Department of Medicine, Boston, MA

Introduction: Although there have been many advances in lipid characterization methods, lipid extraction continues to be conducted using the traditional Folch method which is both toxic and low-throughput. We evaluated the feasibility of a novel preparation methodology which reduces sample volume, decreases solvent toxicity and increases throughput. Our hypothesis was that the lipid extraction procedure can be miniaturized and multiplexed to make it compatible with modern sample preparation devices.

Methods: A solvent extraction and phase partition system was used to extract lipids from human serum samples. The extracted lipids were then chemically derivatized and analyzed by GC-MS. Different containers and solvents were tested to optimize the extraction process. The optimal container and solvent pair was evaluated based on two criteria: its lipid yield and its ability to minimize plastic contamination. The miniaturization potential of the system was tested by analyzing the differences in lipid yield from four different human serum sample volumes. Plastic contamination was quantified in a separate experiment by assessing the presence of phenols, hydrocarbons and other plastic markers.

Results: A 96 well-plate with glass inserts was chosen for the container as it is solvent resistant, compatible with laboratory devices and can increase throughput by 32-96x. Iso-octane rather than chloroform was chosen as the solvent to decrease toxicity. Also, a device that can serve as a “keeper” for chemical treatments and extraction processes was identified. Finally, fatty acid analysis for four different sample volumes (15 ul, 30 ul, 50 ul and 100 ul) showed that the system can decrease the amount of sample needed by 50-75% depending on the application.

Conclusions: The developed methodology can be paired with laboratory devices to automate the lipid extraction procedure. This could greatly enhance the ability of labs to conduct clinical lipid analysis studies by increasing process throughput by up to 96x.

7. CAROTID ARTERY ATHEROSCLEROSIS, CORONARY HEART DISEASE RISK, AND COGNITIVE IMPAIRMENT: THE FRAMINGHAM HEART STUDY

SONJA KYTÖMAA, MPH[1], PRAJAKTA JOSHI, BDS, MPH[1,2,] , JING YUAN, MD[1,2,3], YIJING LIN, BS[1.2,] RHODA AU, PHD[1,2,4,5]

1. Department of Anatomy and Neurobiology, Boston University School of Medicine, Boston, MA, United States
2. Framingham Heart Study, Framingham, MA, United States
3. Department of Neurology, Peking Union Medical College Hospital, Beijing, China
4. Department of Neurology, Boston University School of Medicine, Boston, MA, United States
5. Department of Epidemiology, Boston University School of Public Health, Boston, MA, United States

Introduction: Several coronary heart disease (CHD) risk factors are associated with cognitive impairment. Addressing these risk factors may prevent cognitive impairment. However, the mechanism underlying the association is unclear.

Hypothesis: We hypothesized that the association between CHD risk and cognitive function is mediated by atherosclerosis.

Methods: We included 1924 participants (mean age=56.54±8.94) from the Framingham Offspring cohort who completed neuropsychological (NP) testing and ultrasound studies between 1999-2014. To estimate the proportion of the association between CHD risk and NP mediated by atherosclerosis, we used regression models relating CHD risk to NP and compared risk ratios adjusted and unadjusted for atherosclerosis. Models were also adjusted for education. We calculated CHD risk using a validated algorithm that combined age, gender, blood pressure, cholesterol, diabetes and smoking status. We aggregated domain-specific NP tests to derive executive function, memory and global cognition scores. Ultrasound measures of atherosclerosis included carotid artery stenosis, defined by peak-systolic velocity, and mean intimal-media thickness (IMT).

Results: CHD risk was inversely associated with memory (RR=0.49, p<0.001) executive function (RR=0.94, p<0.001), and global cognition (RR=0.40, p<0.001). Common carotid bulb IMT mediated 36% (p<0.001), 42% (p<0.001) and 36% (p<0.001) of the association between CHD risk and memory, executive function, and global cognition scores, respectively. Similar results were observed for internal carotid artery (ICA) IMT (estimated mediation for memory=25% p<0.001, executive function=23% p=0.002, global cognition=24% p<0.001) as well as left and right ICA stenosis (estimated mediation for memory=26% p<0.001, and 21% p<0.001, global cognition=23% p<0.001 and 21% p<0.001, respectively). Left and right ICA stenosis were not associated with executive function (p=0.46 and 0.08, respectively), thus did not mediate the association between CHD risk and executive function.

Conclusions: The association between CHD risk and cognitive function is partially mediated by several atherosclerotic markers. These results provide insight into how CHD risk may increase risk of cognitive impairment.

1. PREDICTED VITAMIN D STATUS AND INCIDENCE OF COLORECTAL CANCER IN THE BLACK WOMEN'S HEALTH STUDY

LAUREN BARBER,[1] HANNA GERLOVIN,[2] KIMBERLY A. BERTRAND,[3] LAURA F. WHITE,[4] HERMANT K. ROY,[5] LUCILE L. ADAMS-CAMPBELL, [6] LYNN ROSENBERG, [3] JULIE R. PALMER, [3]

[1] Department of Epidemiology, Boston University School of Public Health, Boston, MA; [2] U.S. Department of Veterans Affairs, Boston, MA; [3] Slone Epidemiology Center at Boston University, Boston, MA; [4] Department of Biostatistics, Boston University School of Public Health, Boston, MA, [5] Section of Gastroenterology, Boston Medical Center/Boston University School of Medicine, Boston, MA, [6] Georgetown Lombardi Comprehensive Cancer Center, Washington, DC

Introduction: Observational studies, mostly among white populations, suggest that low vitamin D levels increase risk of colorectal cancer. African Americans, who are disproportionately burdened by colorectal cancer, tend to have lower vitamin D levels compared to other populations. Observational studies, mostly among white populations, suggest that low vitamin D levels increase risk of colorectal cancer. African Americans, who are disproportionately burdened by colorectal cancer, tend to have lower vitamin D levels compared to other populations.

Methods: We assessed predicted vitamin D score in relation to colorectal cancer incidence among 49,534 participants in the Black Women's Health Study (BWHS), an ongoing prospective cohort study of African American women followed from 1995 to 2017 through biennial questionnaires. We used a previously validated prediction model, based on actual 25-hydroxyvitamin D values from a subset of participants, to derive predicted vitamin D scores at each questionnaire cycle for all BWHS participants. We calculated the cumulative average of predicted vitamin D score at every 2-year questionnaire cycle by averaging predicted scores up to and including the current timepoint. We used Cox proportional hazards regression to estimate hazard ratios (HR) and 95% confidence intervals (CI) for overall and site-specific colorectal cancer incidence according to quartiles of predicted vitamin D score, adjusting for colorectal cancer risk factors.

Results: During follow-up, 488 colorectal (370 colon; 105 rectal) cancer cases were confirmed. Women in the lowest quartile of predicted vitamin D score were estimated to have a 41% (HR=1.41, 95% CI 1.05-1.90) higher risk of colorectal cancer compared to those in the highest quartile. Comparable HRs were 1.44 (95% CI 1.02-2.01) for colon cancer and 1.34 (95% CI 0.70-2.56) for rectal cancer.

Conclusions: The results suggest that low vitamin D status may contribute to the disproportionately high incidence of colorectal cancer experienced by African Americans.

12. EVALUATING AND QUANTITATING AN INTRAPERATIVE FLURSCOPIC PROTOCOL TECHNIQUE FOR COMPONENT POSITION DURING ANTERIOR TOTAL HIP ARTHROPLASTY

SEHAR RESAD, RAHUL BHALE, RUIJIA NIU, MICHAEL KAIN

BMC Orthopedic Surgery, Boston University School of Medicine

Introduction: The outcome of total hip arthroplasty (THA) is highly dependent on the proper placement to the acetabular and femoral components to restore proper hip mechanics and equal leg lengths. Currently, many techniques such as robotics, navigation, custom implants, and intraoperative digital assessment programs have been shown to help ensure adequate component position. The goal of this study is to analyze the accuracy of implant position using basic preoperative planning templating and a standard intraoperative assessment protocol.

Methods: A retrospective review of THAs performed at an academic hospital from January 2018 to December 2019 via a direct anterior approach (DAA) were identified. Patient demographics such as sex, age at THA, BMI, laterality, and indication for THA were recorded. Postoperative standing radiographs at least 4 weeks after surgery were used to evaluate final implant position by measuring abduction angle, inclination, offset, and leg length discrepancy using the program TraumaCad.

Results: 77 THAs in 72 patients were included in this study. Postoperative measurements showed mean acetabular cup abduction of 24.5°±2.1, acetabular cup inclination of 44.7°±2.1, leg length discrepancy of 1.3±7.1 mm and hip offset of 75.7±5.9 mm with a mean difference in offset of 0.41±2.8 mm compared to the contralateral side. Significant differences were seen in cup inclination in right hips compared to left hips and hip offset in obese patients compared to non-obese patients.

Conclusions: A single surgeon's technique using preoperative planning templating and an intraoperative assessment protocol without the use of external guidance programs or intra-operative technology achieved acceptable implant position.