deleterious role for macrophages in tumor progression. Next, using nearest neighbor analysis we examined the effect of HLA-DR and Ki67 expression on spatial distribution of CD3+ CD8+ T cells. We find that CD8+ T cells are closer to myeloid (CD68+) cells expressing HLA-DR. This is consistent with the potential of HLA-DR expressing cells to present antigens to T cells, and suggests that T cells may preferentially interact with HLA-DR expressing myeloid cells. Conversely, we find that Ki67 expression on tumor (SOX10+) cells correlates with increased distance from CD3+ CD8+ T cells relative to SOX10+ Ki67- tumor cells. This finding is consistent with the observation that more advanced tumors with higher mitotic rates have decreased T cell infiltrates, and suggests that dividing melanoma cells are less likely to interact with T cells. In addition, we performed analysis to determine whether spatial relationships defined above impact prognosis. Clinical oncology follow-up was available on 35 of the 57 patients evaluated above. We compared proximity of CD3+ CD8+ cells to both myeloid (CD68+) and tumor (SOX10+) cells in patients who recurred and those with no evidence of recurrence. We found that CD3+ CD8+ cells in patients who had recurrence were closer to CD68+ HLA-DR− cells than in patients who had no recurrence (*t*-test, $p = 0.0377$), this correlated with DSS ($p = 0.003$). Conversely, distance from CD3+ CD8+ to CD68+ HLA-DR+ in relationship to recurrence was not significant with a trend towards CD3+ CD8+ T cells being closer in nonrecurrent patients (*t*-test, $p = 0.1362$). DISCUSSION/SIGNIFICANCE OF IMPACT: Consistent with the literature, we find that densities of CD8+ T cells correlates with favorable outcomes in early stage melanoma. We also find that density of CD68+ macrophages in stroma correlates with poor outcome. If proximity is a surrogate for interaction, these data indicate that dividing, Ki67+, melanoma cells interact less with CD8+ T cells than do Ki67+ melanoma cells. Further, HLA-DR expression on CD68+ infiltrating cells likely enhances their interaction with T cells. Interestingly, on further analysis, CD3+ CD8+ cells were significantly closer to CD68+ HLA-DR− cells in patients who recurred, implying that interactions between these cell types may not be favorable. This analysis demonstrates that spatial analysis may be useful in predicting prognosis in early stage melanoma, and this is the first report of this type of analysis predicting outcomes in primary tumor specimens to our knowledge. Further staining and analysis of the complete patient cohort (n = 120) is ongoing.

2370

Understanding epicardial fat biology by imaging

Jadranka Stojanovska, Thomas Chenevert, Alex Tsodikov, Carey Lumeng and Charles Burant

University of Michigan School of Medicine, Ann Arbor, MI, USA

OBJECTIVES/SPECIFIC AIMS: The goal is to understand the underlying mechanism of epicaridial fat biology and its response to cardiometabolic disease by using quantitative multi-echo Dixon (mDixon) of water and lipid sequence, T2* blood-oxygen-level-dependent (BOLD) sequence of iron content, and data analysis methods to determine the quantity of brown Versus white fat. To accomplish this goal, we propose to define the histological, genetic, and metabolite state of epicardial fat and to confirm the relationship between fat phenotype and magnetic resonance (MR) characteristics. We will then investigate whether MR is more effective in identifying patients with lower cardiovascular disease risk than computed tomography (CT). METHODS/STUDY POPULATION: We will recruit 100 patients undergoing open-heart surgery and will quantify mDixon (proton density fat fraction), BOLD (T2*), and T2/T1 maps of epicardial, extrapericardial, and subcutaneous fat before their surgery. We will then (a) validate MR findings by direct depot-specific tissue analysis for lipid content, histological, and genetic markers of inflammation and brown and white fat, (b) develop plasma and fat depot specific metabolite profiling of cardiovascular disease risk and correlate with imaging characteristics. We will categorize cardiovascular risk score (Cardiovascular Health Status) of our 100 patients on quartiles. We will then build models where the categorized cardiovascular risk score are regressed on MR measures (epicardial fat fraction, T2*, and T2/T1 maps) and CT measures (epicardial fat volume and coronary calcium score). RESULTS/ANTICIPATED RESULTS: We anticipate to learn about epicardial fat biology and the role of inflammation in cardiometabolic disease. We will validate proton density fat fraction, T2* and T2 map against histology of epicardial fat for lipid content, established markers of brown and white fat and inflammation, respectively, to help us translate imaging technique to clinical practice. In respect to our second aim we anticipate that MR identifies patients at lower cardiovascular risk quartile than CT. DISCUSSION/SIGNIFICANCE OF IMPACT: Interest in epicardial fat as a visceral fat of the heart and coronary arteries is rapidly growing as the scientific based evidence indicates that the anatomic specificity is an important contributor to the cardiovascular diseases. The transformation of epicardial fat from a cardioprotective phenotype to a pro-inflammatory, atherosclerosis-promoting state triggers inflammation that is coincident with the expansion of epicardial fat volume detected by anatomic imaging. This study will impact the management of patients at risk for cardiovascular disease because it will demonstrate that quantification of epicardial fat status by MR identifies fat tissue changes validated by histology at lower cardiovascular disease risk quartile than CT.

2371

Perception- and behavior-related attention systems distinguished by phase amplitude coupling and high-gamma power

Ravi Varkki Chacko, Kenny Kim, Kate Jung, Gordon Shulman, Maurizio Corbetta and Eric Leuthardt

OBJECTIVES/SPECIFIC AIMS: Attention is a cognitive function that binds perception and behavior. Recent evidence suggests that attention involves phase-amplitude coupling (PAC) of neural signals. PAC occurs when the amplitude of one frequency (frequency for amplitude) is maximal at particular phases of another frequency (frequency for phase). However, some studies suggest PAC improves attention, while others maintain that PAC inhibits attention. The present study seeks to determine whether PAC promotes or inhibits neural signals that underlie attention. METHODS/STUDY POPULATION: Six adult epilepsy patients with implanted electrodes participated in a cued attention task. Subjects participated in a cued attention task where they oriented attention to one side of the screen at a time and discriminated between stimuli as fast as possible with mouse clicks. Perception-related electrodes discriminated the location and/or shape of the target. These were determined with a cluster-based permutation test. Behavior-related electrodes predicted reaction time (RT) with neural activity prior to target appearance. These were determined with correlations between PAC and RT. PAC was calculated using the modulation index (MI). RESULTS/ANTICIPATED RESULTS: We found 47 perception-related electrodes that discriminated location and/or shape of target ($p < 0.05$, FDR corrected). We found 27 behavior-related electrodes where PAC prior to the target predicted RT ($p < 0.05$ FDR corrected). There was little overlap between the perception-related and behavior-related electrodes (3%). PAC also did not discriminate left-sided and right-sided cues. In addition, behavior-related electrodes had less local neural activity and higher PAC during the period of cued attention than perception-related electrodes. DISCUSSION/SIGNIFICANCE OF IMPACT: PAC minimally facilitates perceptual aspect of visual attention. However, PAC facilitate response speed. We suggest that PAC might improve response speed by "quieting" task irrelevant neural activity. For the same reason, PAC is absent in electrodes that are actively processing meaningful streams of visual data. These findings highlight separable aspects of the human attention system and how PAC contributes to both. Future directions include determining differences in PAC for attentional disorders like ADHD and neurological neglect.

2372

Metabolite and biomarker predictors of WTC-lung injury: An integrated multiplatform pilot analysis

George Crowley, Sophia Kwon, Syed Hissam Haider, Liqun Zhang, Rachel Lam, Daniel Kim, Mengling Liu, David Prezant and Anna Nolan

NYU School of Medicine, New York, NY, USA

OBJECTIVES/SPECIFIC AIMS: In this pilot case-control study, the metabolome was quantified in subjects with previously measured serum and clinical biomarkers. The serum metabolome was then integrated with existing serum and clinical biomarkers of WTC-exposed firefighters to identify pathways significant to loss of lung function following acute PM-exposure. This robust subset of metabolite and serum biomarkers may be clinically relevant to predicting progression to lung disease in a larger cohort. METHODS/STUDY POPULATION: Serum drawn within 6 months of 9/11 was analyzed in this pilot. Clinical measures were obtained from electronic medical records. Never-smoking, male, WTC-exposed firefighters with normal pre-9/11 lung function were segregated based on FEV1 percent predicted (FEV1 %Pred) at symptomatic presentation. Cases of WTC-LI (FEV1 %Pred < LLN, n = 15) and controls (n = 15) were identified from previous cohorts. Ultrahigh performance liquid chromatography tandem mass spectroscopy quantified the metabolomic fingerprints of a group with previously assessed (by multiplex panels; ELISA and Luminex) serum chemokines and cytokines. High-dimensional data analysis and dimension reduction techniques integrated metabolites, cytokines, chemokines, and clinical data to identify pathways of

https://doi.org/10.1017/cts.2017.225 Published online by Cambridge University Press