accurately capture cell shape. We postulated that this might be important as T cells adopt different shapes when scanning for antigen and after recognizing MHC class II-restricted peptides.

Methods We implemented a deep convolutional neural network (DCNN) that accurately identified both cell position and shape. The DCNN output was then analyzed with a tuned convolutional neural network (TNN) to identify distance and cell shape features that best discriminated between different T cell populations relative to dendritic cells (DCs). We refer to this analysis pipeline as CDM³.

Results In mice, CDM³ discriminated between cognate and non-cognate T cell interactions with DCs with a sensitivity and specificity similar to most TPDM measures. In human lupus nephritis, CDM³ both confirmed that myeloid DCs present antigen to CD4⁺ T cells *in situ* and identified plasmacytoid DCs as an important antigen presenting cell in severe inflammation.

Conclusions CDM³ provides a novel tool for quantifying *in situ* adaptive immune cell networks broadly applicable to the study of human diseases including autoimmunity and cancer.

Acknowledgements Funded by the NIH including the Autoimmunity Centers of Excellence.

TD-04 PLAQUENIL DISCONTINUATION IS ASSOCIATED WITH INCREASED DAMAGE ACCUMULATION IN SLE

¹Caroline Siegel, ¹Jennifer Grossman, ¹Sarah Chen, ¹Lori Sahakian, ²Michael Gorin, ¹Maureen McMahon*. ¹Divisions of Rheumatology, UCLA David Geffen School of Medicine, Los Angeles, CA, USA; ²Ophthalmology, UCLA David Geffen School of Medicine, Los Angeles, CA, USA

10.1136/lupus-2018-lsm.123

Background There is ample evidence demonstrating that hydroxychloroquine (HCQ) prevents lupus flares, increases long-term survival, and protects against irreversible organ damage in SLE (Pons-Estel Arth Care Res 2010). However, in recent years, ophthalmology guidelines have encouraged providers to limit cumulative HCQ exposure to prevent ocular toxicity. We examined whether a) HCQ use in our UCLA cohort has changed over time and b) whether patients who discontinue HCQ accumulate damage at a different rate than continuous or never users.

Methods SLE subjects participating in our longitudinal 'Biomarkers of Atherosclerosis' carotid ultrasound cohort were evaluated. Medication use (and reasons for disuse) were recorded at cohort entry, and at each subsequent study visit.

303 SLE subjects participated in the baseline study (2004–2006), 229 in the 2nd follow-up (2008–2010), and 102 in the 3rd follow-up exam (2015–present).

For continuity, SLICC Damage Index (SDI) was measured at baseline, 3 years, and 5 years after cohort entry.

Results At baseline, 69.8% of patients were taking HCQ, 62.1% at first follow-up, and 58.6% at second follow-up ($p=ns$). Patient preference and physician preference were the most common reasons for HCQ non-use. Less than 3% of subjects who discontinued HCQ did so due to concern for eye toxicity at baseline and first follow-up, but this increased to 7.4% at second follow-up.

We compared SDI at baseline in patients who were never HCQ users ($n=29$), vs previous users ($n=93$), vs continuously users ($n=181$). We found evidence of SLE-related damage ($SDI \geq 1$) in 75.9% of never HCQ users, 74.1% of previous users, and 52.4% of subjects on HCQ at baseline ($p=0.001$, Chi-Square). At 5 years, we found $SDI \geq 1$ in 94.7% of never HCQ users, 82.7% of previous users vs 68.2% of subjects on HCQ at baseline ($p=0.004$, Chi-Square).

Conclusions Although the frequency HCQ use in our longitudinal SLE cohort has decreased slightly over the last 13 years, the percentage of subjects who discontinued HCQ due to eye-related eye toxicity has increased recently. Further studies will be required to determine whether this increase is due solely to cumulative HCQ dose vs more frequent detection because of adherence to ophthalmology testing guidelines vs earlier detection due to more sensitive testing modalities. Our data also demonstrate that damage accumulation is similar in subjects who previously used HCQ and those who never used, and higher compared to continuous users, suggesting continuous HCQ use may be important for damage prevention in SLE.

TD-05 DYNAMIC CONTRAST ENHANCED MRI (DCE-MRI) DEMONSTRATES HIPPOCAMPUS PERMEABILITY IN SLE

¹Meggan Mackay*, ²Joan M Chi, ²Angela Hoang, ²Katherine Cheng, ³Jana Ivanidze, ¹Bruce Volpe, ¹Cynthia Aranow, ¹Betty Diamond, ⁴Pina C Sanelli. ¹Feinstein Institute for Medical Research, Center for Autoimmune, Musculoskeletal and Hematopoietic Diseases, Manhasset, NY; ²Department of Radiology, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Manhasset, NY; ³Department of Radiology, Weill Cornell Medical College, New York, NY; ⁴Feinstein Institute for Medical Research, The Center for Health Innovations and Outcomes Research, Manhasset, NY

10.1136/lupus-2018-lsm.124

Background Cross-reactive, anti-dsDNA/N-methyl D-aspartate receptor antibodies (DNRAb) have been associated with cognitive impairment in SLE. The mouse model demonstrates selective effects of DNRAb on hippocampal neurons following blood brain barrier (BBB) breach.¹ We previously identified abnormal hippocampal glucose hypermetabolism in SLE patients that correlated with serum DNRAb titers and poor performance on neuropsychological (NP) testing.² However, little is known about how antibodies access brain in humans. We evaluated BBB permeability (BBBP) in SLE and healthy control (HC) subjects with DCE-MRI and hypothesized that regions with abnormal hypermetabolism would also demonstrate altered BBBP.

Methods 6 SLE subjects with no history of NP symptoms and 6 age and gender matched HCs underwent NP testing using the Automated Neuropsychological Assessment Metric (ANAM) computerized battery and DCE-MRI on a 3.0 tesla magnet. MRI sequences were acquired according to standard protocols; permeability imaging used DCE technique with axial 3D-SPGR T1-WI sequences and 80 cine phases using TR=25 ms, TE=3.8 ms, FOV=24 mm, and matrix size of 128 × 256. Magnevist Gadolinium contrast, 0.1 mmol/kg IV, was dosed at 5 cc/sec following a 5 sec delay. Post-processing of images into BBBP parameters of K-trans (mL/100 gm/min) and VE (mL/100 gm) was performed using Olea Sphere 2.2 and 2.3 with the Tofts extended permeability model. This

technique was standardized with the arterial input function centered in the cavernous ICA segment for all subjects.

Analyses: Regions-of-interest (ROI) from previously identified hypermetabolic regions (hippocampus, orbitofrontal cortex, posterior putamen/globus pallidus/thalamus) were selected. Mirror ROIs were placed in bilateral MRI cerebral hemispheres for sampling at same brain levels. Regional DCE curves were generated to compare permeability phases. T-tests were used to evaluate demographic and NP testing differences.

Results SLE subjects performed significantly worse than HCs on 3 ANAM tests (matching grids, match to sample and continuous processing). Mean DCE curves (figure 1) show perfusion (initial spike) and permeability phases of contrast in the sampled tissues. Compared to HCs, SLE subjects demonstrate significantly increased signal in the permeability phase in the hippocampus, indicating leakage into the extravascular space.

Conclusion This is the first report of increased BBBP in SLE subjects that is specific to the hippocampus; a region previously reported to have abnormally increased resting metabolism in SLE subjects. These data, including the abnormal NP testing, support the murine model of autoantibody-mediated cognitive impairment following disruption of the BBB. The results also suggest that DCE-MRI is an effective tool to measure BBBP and its role in NPSLE pending confirmatory studies with increased sample size.

REFERENCES

1. Kowal C, DeGiorgio LA, Nakaoka T, et al. Cognition and immunity; Antibody impairs memory. *Immunity* 2004;**21**:179–88.
2. Mackay M, Tang CC, Volpe BT, et al. Brain metabolism and autoantibody titres predict functional impairment in systemic lupus erythematosus. *Lupus Sci Med* 2015;**2**:e000074.

TD-06

BLOCKADE OF INTERFERON ALPHA RECEPTOR IN LUPUS MICE PROTECTS AGAINST NEUROLOGICAL SYMPTOMS

¹Lea Simoni, ^{1,2}Michael C Carroll*. ¹Program in Cellular and Molecular Medicine, Boston Children's Hospital; ²Department of Pediatrics, Harvard Medical School, Boston, MA 02115, USA

10.1136/lupus-2018-lsm.125

Background Systemic lupus erythematosus (SLE) is an incurable autoimmune disease characterized by autoantibody deposition in tissues such as kidney, skin and lungs. Although less well understood, many patients with SLE experience neuropsychiatric symptoms that range from anxiety, depression and cognitive impairment to seizures and, in rare cases, psychosis. Collectively, these symptoms are referred to as central nervous system (CNS) lupus. In some cases, autoantibodies, such as anti-NMDAR or anti-phospholipid antibodies, promote CNS lupus. However, in many patients, CNS symptoms appear prior to serum autoantibody.

Methods Lupus strains of mice used in the project: 564Igi, NZB/W, and MRL/lpr. Behavior testing was performed at the Harvard Behavior core. RNA sequencing of microglia was performed at the MIT sequencing core.

Results We found that lupus-prone mice develop a distinct behavioral phenotype such as impaired learning and memory, anxiety and altered social behavior in which onset is age dependent. Examination of the brains of the lupus mice identified excess microglia engulfment of synapse material and a reduction in synapse density in the frontal cortex and hippocampus that correlates with the behavior phenotype. Comparison of RNA sequences of bulk sorted frontal cortex microglia

Abstract TD-05 Figure 1 Dynamic contrast enhanced MRI curves show increased hippocampus permeability in SLE