2019 CAR ASM Radiologist-in-Training Research Project – 1st Place Winner

Abstract #169

Does the Prostate Mri Definition of Sextant Regions Adequately Correspond with Transrectal Ultrasound to Direct Non-Fusion TRUS Biopsy of Suspicious MRI Masses?

Timothy Miao, London Health Sciences Centre; Beatrice Lau, Western University; Aaron Fenster, Robarts Research Institute; Lori Gardi, Robarts Research Institute; Jonathan Izawa, London Health Sciences Centre-Victoria Hospital; Joseph Chin, London Health Sciences Centre-Victoria Hospital; Ashley Mercado, St. Joseph's Health Care; Derek Cool, London Health Sciences Centre-Victoria Hospital

---

OBJECTIVE: To determine if prostate sextant anatomical nomenclature is consistent between multiparametric MRI (MP-MRI) and transrectal ultrasound (TRUS) biopsy.

METHODS: 35 patients (age 60.9±7.3 years, prostate volume 53±27mL) underwent MR-TRUS fusion biopsy. Standard 12-core sextant biopsies were also performed purely under TRUS guidance and the biopsy core locations relative to the MP-MRI were recorded. A radiologist sectioned each MP-MRI into base, mid-gland and apex regions as defined by the Prostate Imaging Reporting and Data System version 2 (PI-RADS). Each TRUS-guided biopsy core location was compared to 3D reconstructions of the MP-MRI sextant regions to determine the length of the biopsy core located within each sector.

RESULTS: 411 biopsy cores were analyzed. Only 45% (61/137) of TRUS-cores targeting the base sampled any of the MP-MRI defined base, which was significantly less than TRUS-cores targeting the mid-gland (96%, 134/139) and apical (96%, 130/135) regions ($p < 0.0001$). Sampling percentages were not significantly different between right and left-sided TRUS-biopsies of base ($p=0.10$), mid-gland ($p=0.17$) and apical regions ($p=0.69$). Of the 45% of TRUScores targeting the base that did touch the MP-MRI defined base, only 26%±18% of the total core length was within the base region–significantly less than mean total core lengths of mid-gland (58%±24%) and apical (58%±27%) TRUS-targeted cores within their corresponding MP-MRI regions ($p < 0.0001$).

CONCLUSION: The PI-RADS MP-MRI definitions of apex, mid-gland and base do not match standard TRUS-biopsy, particularly in the prostate base. These results have implications for TRUS-guided biopsy of MP-MRI prostate lesions without software fusion assistance, and may lead to inaccurate targeting.

2019 CAR ASM Radiologist-in-Training Research Project – 2nd Place Winner

Abstract #115

Susceptibility-Sensitive MRI to Distinguish MS-Related White Matter FLAIR-Lesions from Hyperintensities Due to CIS, Dementia and Concussion

---

Craig Stewart, Queen's University; David Li, UBC; Anthony Traboulsee, UBC; Vanessa Wiggermann, Department of Physics and Astronomy, University of British Columbia; Alexander Rauscher, UBC; G.Y. Robin Hsiung, UBC; Luanne Metz, University of Calgary

---

OBJECTIVES: T2/FLAIR MRI identified white matter hyperintensities (WMHs) are pathologically non-specific and can appear without demyelination. Quantitative MRI may allow for the differentiation of demyelinating lesions from other WMHs. We performed quantitative comparisons between multiple sclerosis (MS) WMHs and WMHs seen in clinically isolated syndrome (CIS), mixed dementia (DEM) and hockey players (HCP) with previous concussions.

METHODS: FLAIR or T2, along with susceptibility-sensitive MRI data, were acquired at 3T in all cohorts. QSM and R2* were computed from the susceptibilitysensitive MRI data and WMHs were outlined on FLAIR or T2-weighted MRI. 21/15/38/38 subjects in the HCP/DEM/CIS/MS cohorts had WMH, respectively. Median DQSM and DR2* values were computed for each WMH and lesion contrast (iso/hypo/hyper-intensity) was established compared to perilesional WM.

RESULTS: 101/826/679/1353 WMHs were identified in HCP/DEM/CIS/MS, respectively. CIS and MS WMHs were frequently QSM-hyperintense (58.4%/43.8%), consistent with myelin degradation and loss. HCPs had more QSM-isointense WMHs (54.2%,p < 0 .002), representing inflammation, while DEM-WMHs were equally QSM-iso/hypo/hyperintense. R2*-hyperintensities were rare in all cohorts (< 2 .4%), indicating QSM-hyperintensities are not driven by iron accumulation. MS-WHMs were more often QSM-hypointense, representing iron loss, than CIS-WHMs (p=0.0001). R2*-hypointensities dominated in MS and DEM (87.6%/74.8%), representing significant tissue damage (MS-HCP,MS-CIS,DEM-HCP all p < 1 0-5). HCPs had more R2*-isointense WMHs than other cohorts (p < 0 .0014), and were also more frequent in CIS than MS (46.4%/10.5%;p=3.8*10-5), suggesting less damage and/or a greater for repair.

CONCLUSIONS: Given its sensitivity to myelin, iron, and tissue microstructure, susceptibility-sensitive imaging allows us to gain insight into the heterogeneous pathology of WMHs. MS lesions exhibit distinct QSM and R2* patterns different from HCP/DEM/CIS.