Heterogeneity in detection rates of higher grade prostate cancer by multiparametric MRI in an active surveillance cohort

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Background
• Multiparametric magnetic resonance imaging (mpMRI) improves the detection of higher grade prostate cancer
• However, its utility in monitoring men on active surveillance (AS) is unclear
• We hypothesized that the utility of mpMRI is discordant across different risk strata of men enrolled in an AS study

Methods
• Between 2014 – 2017 we identified 449 men with Grade Group (GG) 1 (Gleason score 6) cancer (median AS follow-up 3 yrs., IQR 2 - 6 yrs.) from the Johns Hopkins AS registry with a mpMRI showing lesion(s) scored in PI-RADS v2.0 and a follow-up targeted and/or systematic biopsy within a year
• Study cohort was stratified into 4 sub-groups; based on biopsy results prior to mpMRI:
  1) very-low-risk (<2 positive biopsy cores and ≤50% core involvement, N = 212)
  2) low-risk (> 2 positive biopsy cores or > 50% core involvement, N = 237)
  based on number of prior biopsies:
  3) <2 biopsies (N = 220)
  4) >5 biopsies (N = 129)
• Upgrading to GG ≥2 (Gleason score ≥3+4) on follow-up biopsy was compared across PI-RADS scores between each respective risk-subgroup

Results
• In the study cohort, 26% of low-risk (LR) men upgraded to GG ≥2 compared to 6% of very-low-risk (VLR) men (p = <0.001), whereas 18% of men with ≤2 biopsies upgraded compared to 11% of men with >5 biopsies (p = 0.045)
• Within each of the 4 sub-groups there was a trend of significant increase in GG ≥2 detection with increasing PI-RADS score (all p <0.05)
• In each PI-RADS category, men with LR disease had higher rates of GG ≥2 detection on follow-up biopsy than men with VLR disease: 15% PI-RADS ≤ 3, 34% PI-RADS 4, 48% PI-RADS 5 vs. 4% PI-RADS ≤ 3, 10% PI-RADS 4, 18% PI-RADS 5, respectively; p<0.001 (Figure 1 a)
• In each PI-RADS category men with ≤2 prostate biopsies had higher rates of GG ≥2 detection on follow-up biopsy than men with >5 biopsies: 8.0% PI-RADS ≤ 3, 33% PI-RADS 4, 50% PI-RADS 5 vs. 10% PI-RADS ≤ 3, 13% PI-RADS 4, 25% PI-RADS 5, respectively; p = 0.03 (Figure 1 b)
• Overall, PI-RADS 4/5 had significantly higher detection rates of GG ≥2 in men with LR disease than in men with VLR disease (38% vs. 11%, p <0.001) and also in men with fewer number of biopsies compared to men with numerous biopsies (37% vs. 17%, p =0.02)
• Adjusting for age, cancer volume, PSA density and prior prostate biopsies; higher PI-RADS score (4 vs. < 3 odds ratio [OR] 2.37, p = 0.03; 5 vs. ≤ 3, OR = 5.12, p = <0.001), higher cancer volume (LR vs. VLR, OR = 5.95, p = <0.001), and lower no. of prostate biopsies (OR = 0.78, p = 0.04) were significantly associated with finding GG ≥2 cancer on follow-up biopsy

Limitations
• Results may not be generalizable to other cohorts given our strict AS enrollment criteria
• Limited follow-up of the study cohort subsequent to mpMRI
• Not all men in AS underwent mpMRI during the study period
• Underestimation of higher-grade cancer detection at biopsy, compared to that of final surgical pathology

Conclusions
• These data suggest heterogeneity in detection of GG≥1 with mpMRI in AS is contingent upon patient characteristics of cancer volume (low-risk vs. very low-risk) and extent of under-sampling (prior number of prostate biopsies)
• Further evaluation is needed to identify appropriate sub-groups of men in AS who would benefit most from mpMRI

Figure 1 a. Distribution of biopsy results across PI-RADS category stratified by cancer volume
Figure 1 b. Distribution of biopsy results across PI-RADS category stratified by prior number of biopsies