

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:
 - very-low-risk (≤ 2 positive biopsy cores and $\leq 50\%$ core involvement, **N = 212**)
 - low-risk (> 2 positive biopsy cores or $> 50\%$ core involvement, **N = 237**)
- based on number of prior biopsies:
 - ≤ 2 biopsies (**N = 220**)
 - > 5 biopsies (**N = 129**)
- Upgrading to GG ≥ 2 (Gleason score $\geq 3+4$) 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

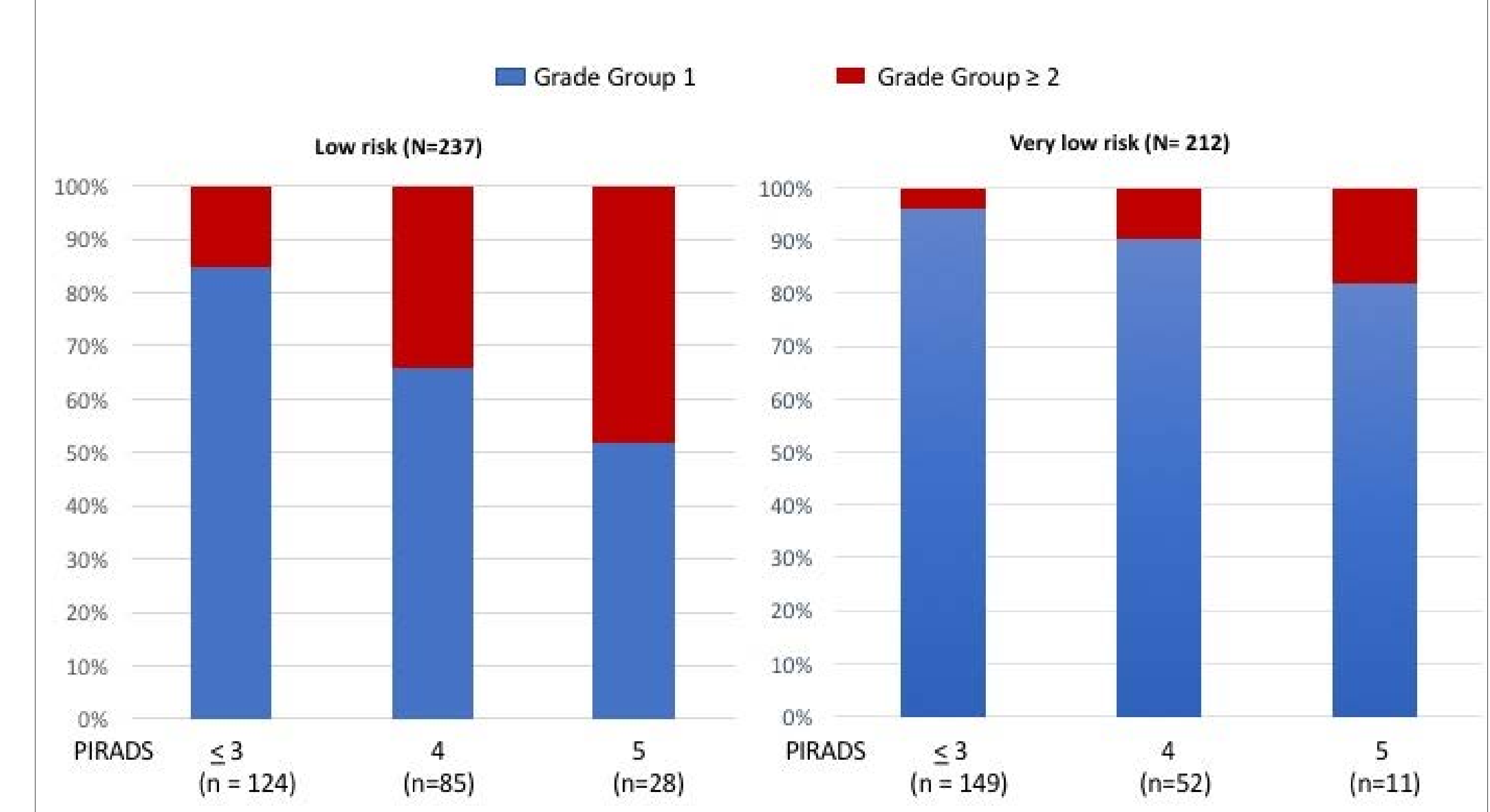


Figure 1 a. Distribution of biopsy results across PI-RADS category stratified by cancer volume

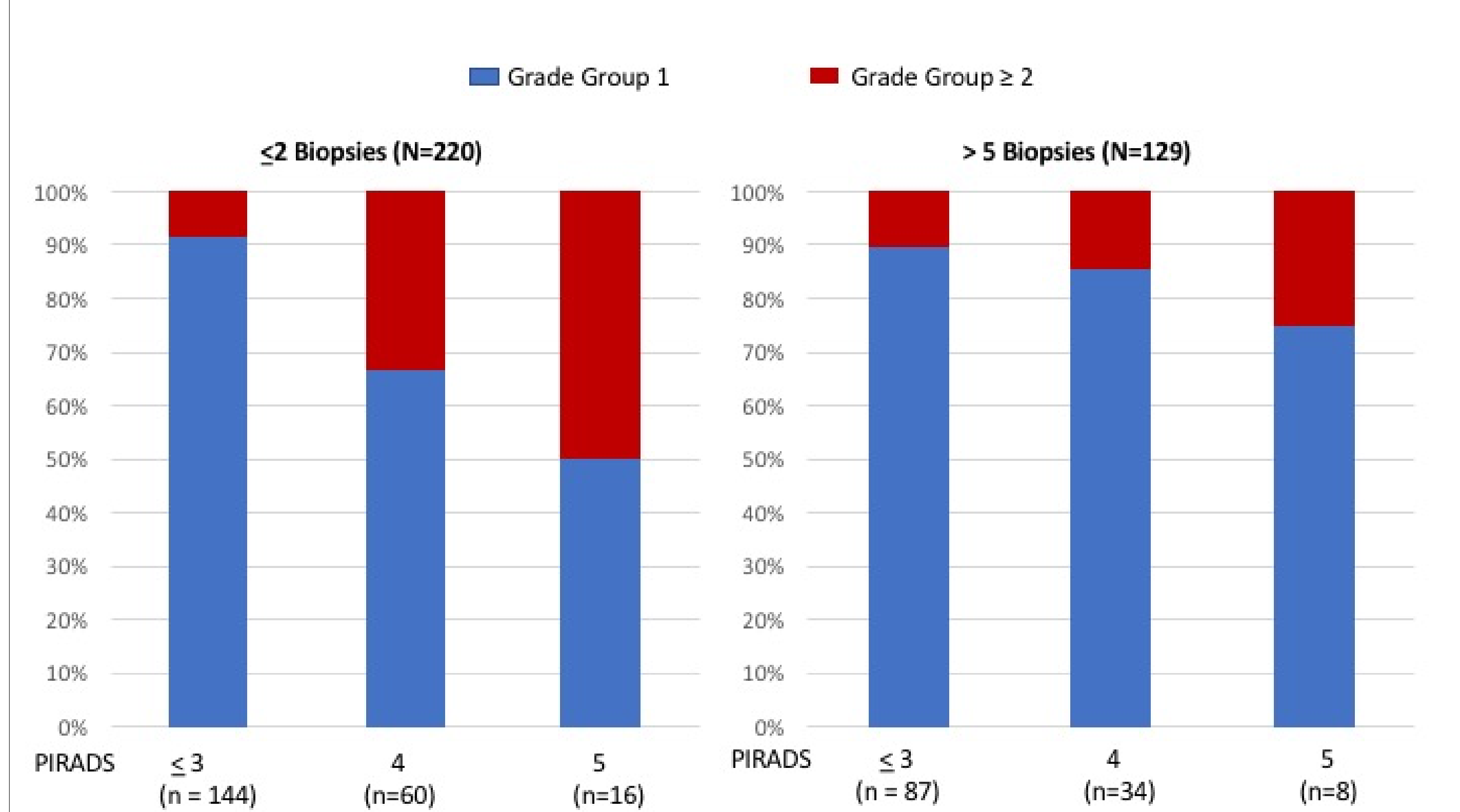


Figure 1 b. Distribution of biopsy results across PI-RADS category stratified by prior number of biopsies

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