

Initial Results Comparing High-Resolution Micro-Ultrasound with Multiparametric Magnetic Resonance Imaging for Prostate Cancer Detection

BACKGROUND:

Multiparametric Magnetic resonance imaging (mpMRI) of the prostate has recently been recommended in the French guidelines for men suspected of harboring prostate cancer. However, MRI quality is inconsistent outside of large expert centers, and adds significant cost and complexity due to the multi-specialty, multi-visit nature of the pathway. A novel high-resolution **29 MHz micro-ultrasound** offers real time targeting of biopsies of suspicious areas and enables the detailed visualization of cancer related prostate tissue characteristics. This study compares the performance of mpMRI and micro-ultrasound for the detection of prostate cancer.

METHODS:

- 43 consecutive patients from our prospective biopsy database presenting with elevated PSA levels and an mpMRI prostate study were included
- All biopsies were performed using the **ExactVu™** (Exact Imaging, Markham, Canada) **Micro-Ultrasound System**
- Each biopsy included micro-ultrasound targeted, mpMRI targeted, and systematic biopsy samples
 - mpMRI targets were cognitively sampled.
- The **PRI-MUS™** (prostate risk identification using micro-ultrasound) evidence-based protocol was used to characterize suspicious tissue under micro-ultrasound for targeting

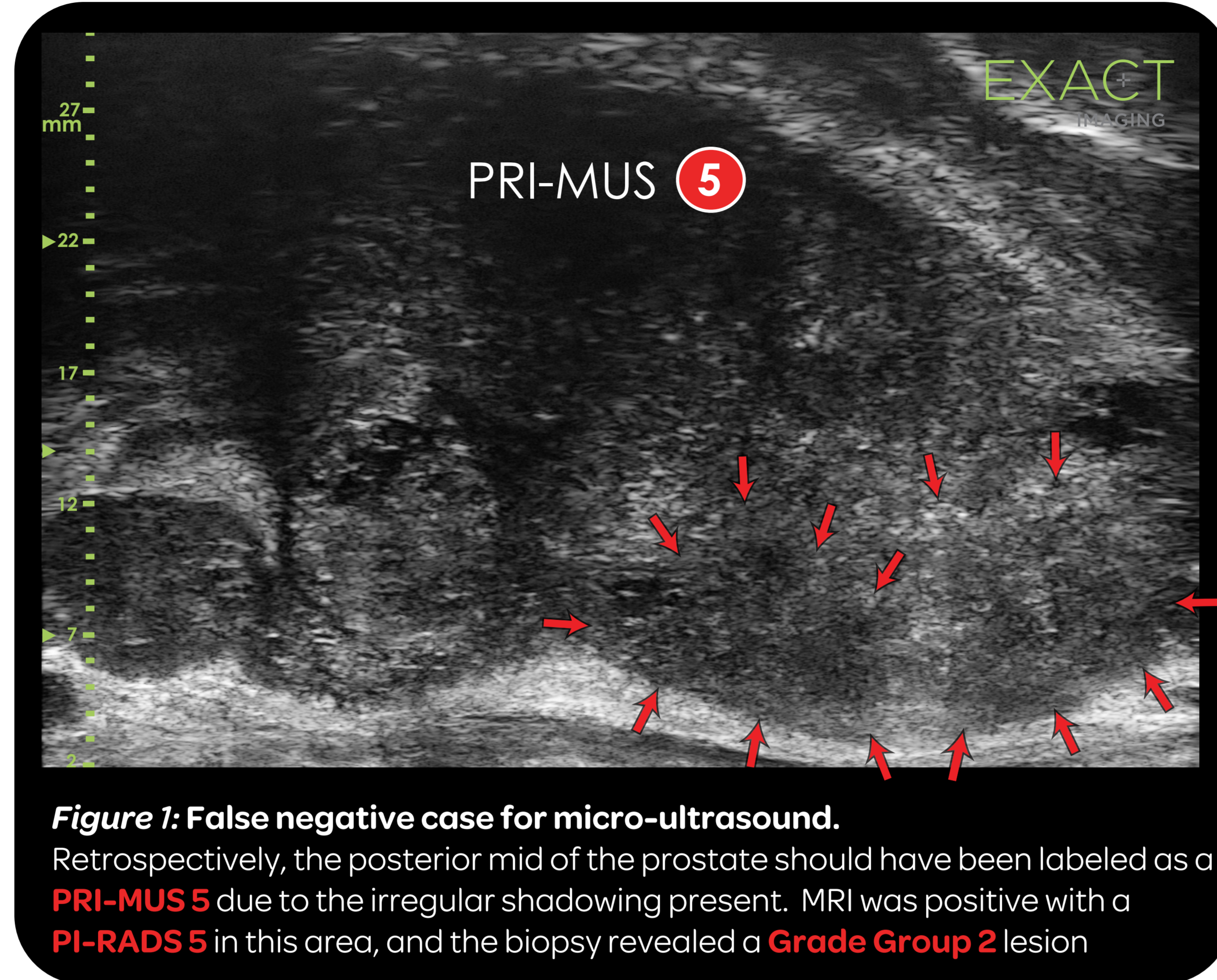


Figure 1: False negative case for micro-ultrasound. Retrospectively, the posterior mid of the prostate should have been labeled as a **PRI-MUS 5** due to the irregular shadowing present. MRI was positive with a **PI-RADS 5** in this area, and the biopsy revealed a **Grade Group 2** lesion

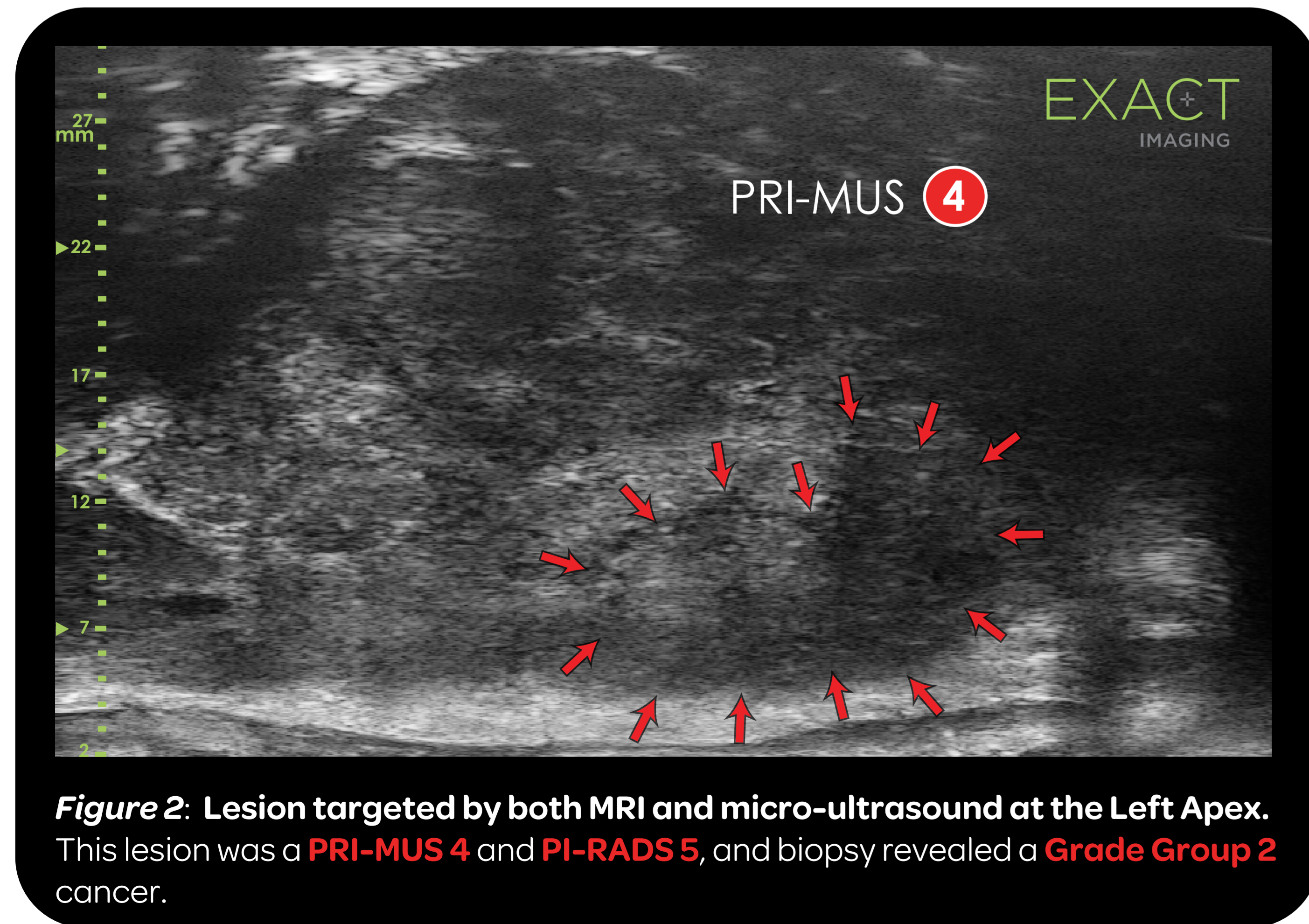


Figure 2: Lesion targeted by both MRI and micro-ultrasound at the Left Apex. This lesion was a **PRI-MUS 4** and **PI-RADS 5**, and biopsy revealed a **Grade Group 2** cancer.

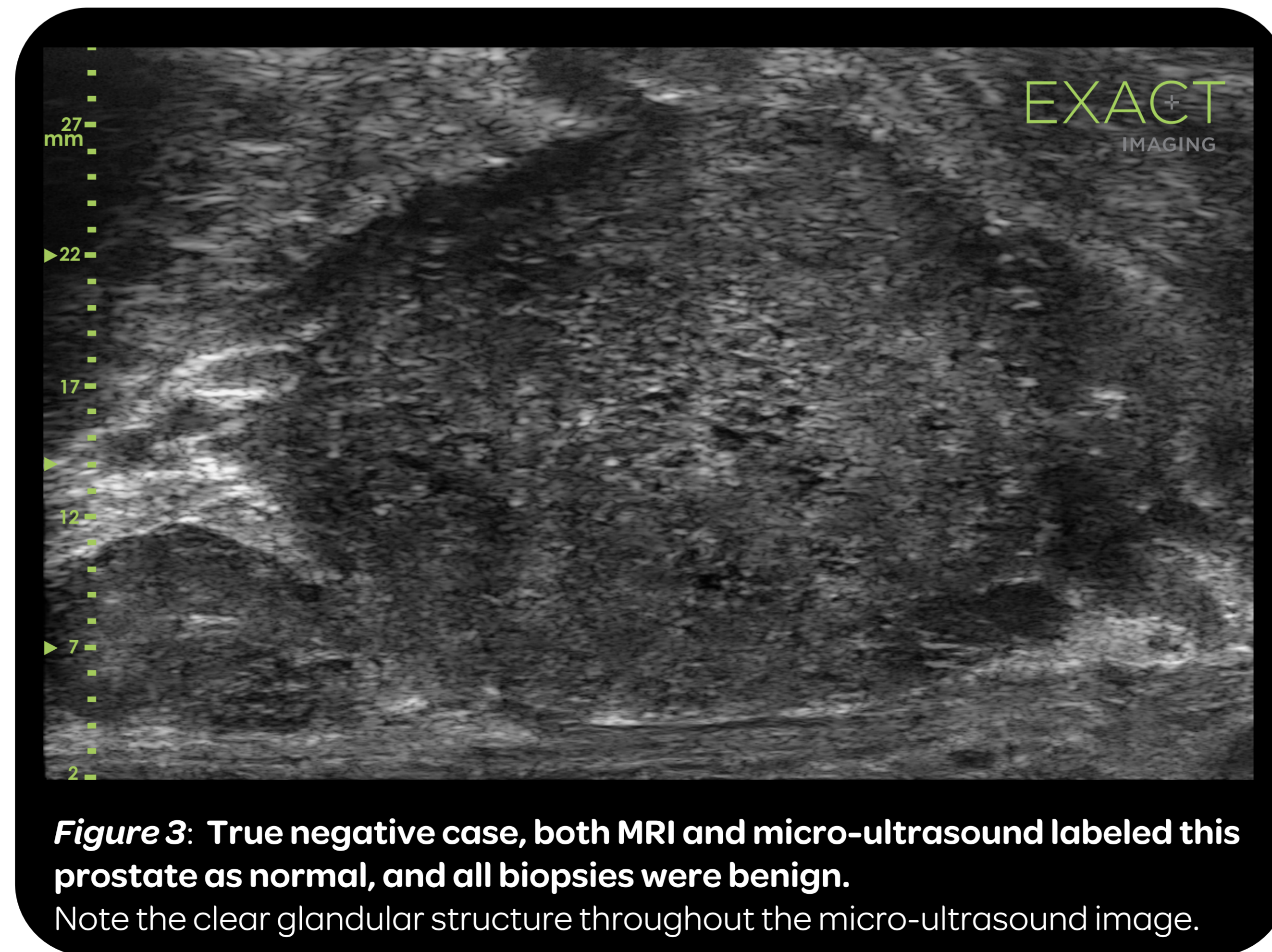


Figure 3: True negative case, both MRI and micro-ultrasound labeled this prostate as normal, and all biopsies were benign. Note the clear glandular structure throughout the micro-ultrasound image.

RESULTS:

- Biopsy histopathology confirmed cancer in 21 out of 43 patients with 9/21 (43%) diagnosed with clinically significant cancer (csPCa, Grade Group >1)
- Micro-ultrasound and mpMRI sensitivities were both 6/9 (67%) to csPCa
- Negative Predictive Values for Micro-ultrasound and mpMRI to csPCa were 18/20 (90%) and 15/16 (94%) respectively

PSA (ng/mL)	9.2 [6.7-12.0]
Age (years)	67 [62-69]
Prior biopsy	9 (21%), 4 positive
Abnormal DRE	17 (40%)

Table 1: Patient demographics, values are median [25th percentile – 75th percentile] for continuous variables

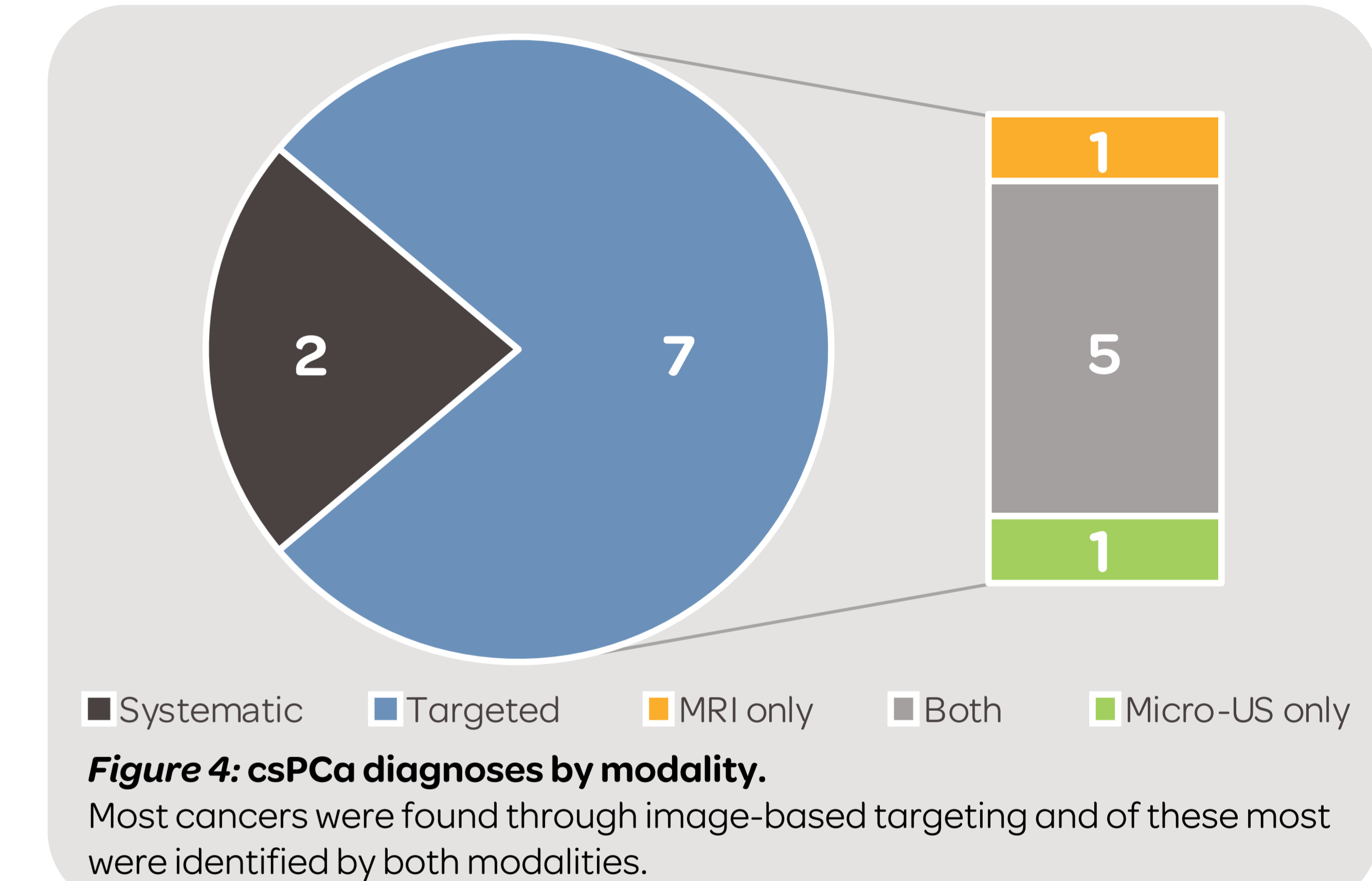


Figure 4: csPCa diagnoses by modality. Most cancers were found through image-based targeting and of these most were identified by both modalities.

		Sensitivity	Specificity	PPV	NPV
csPCa	mpMRI	6/9 (67%)	11/34 (32%)	6/28 (21%)	15/16 (94%)
	Micro-Ultrasound	6/9 (67%)	18/34 (53%)	6/23 (26%)	18/20 (90%)
All PCa	mpMRI	10/21 (48%)	9/22 (41%)	10/28 (36%)	9/16 (56%)
	Micro-Ultrasound	10/21 (48%)	13/22 (59%)	10/23 (43%)	13/20 (65%)

Table 2: Patient level results for detection of all prostate cancers and clinically significant (Grade Group > 1) cancers. Micro-ultrasound and mpMRI demonstrated the same sensitivity (67%), while micro-ultrasound was superior in specificity. Both modalities performed well in negative predictive value, although the mpMRI result was marginally higher.

CONCLUSIONS:

- Micro-ultrasound provided equivalent sensitivity to mpMRI for csPCa, suggesting it may be a more **cost-effective**, single specialty, diagnostic pathway for **guiding prostate biopsies**
- Improved sensitivity to smaller and lower-risk disease suggests opportunities for micro-ultrasound in active surveillance and imaging-based monitoring of prostate cancer

REFERENCES

- Ghai S, Eure G, Fradet V, et al: **Assessing Cancer Risk on Novel 29 MHz Micro-Ultrasound Images of the Prostate: Creation of the Micro-Ultrasound Protocol for Prostate Risk Identification.** J. Urol. 2016; 196: 562–569.