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The Impact of Multiparametric Ultrasound in the Detection of Gleason 7 or Greater Cancer During MRI Fusion Biopsy

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Introduction and objectives

Transrectal Ultrasound Guided biopsy (TRUS BX) is standard of care for prostate cancer (CAP) diagnosis. [1]

MRI fusion biopsy (MRIF) is now recommended to improve identification of CAP. [2]

We hypothesize that TRUS BX has significant benefit in CAP diagnosis in patients undergoing MRIF.

Background

Precision trial [3]

- MRIF vs 10 or 12 core TRUS BX
- 38% of the MRI cohort had clinically significant cancer while only 26% of the TRUS BX group had clinically significant cancer.
- Use of a PIRADS score of greater than or equal to 3 as an indication to biopsy saved 28% of the cohort a prostate biopsy.
- This suggests that the MRIF performs better than a TRUS BX, however it is unclear from this study if there is complete overlap in regards to who might have been missed.

Background

MRI-FIRST [4]

- 53 (21%) of patients had a normal MRI.
- At biopsy 5/53 had clinically significant prostate cancer.
- 5.2% of men would have been missed if systematic biopsy was skipped
- 7.6% of men would have been missed if MRIF were to have been skipped.
- This study defined systematic biopsy as including up to two hypoechoic lesions identified on TRUS.

Background

Hypoechoic lesions on ultrasound may be related to PCA.[5]

Taking specifically targeted cores in addition to a systematic biopsy may increase yield of the biopsy.[6]

The addition of ultrasound targeted lesions during MRIF resulted in slight increase in clinically significant finding of CAP.[7]

Background

Other studies have looked at the value added when lesions seen on ultrasound alone have been targeted.

This data agrees that there is added benefit to performing additional biopsies of hypoechoic areas seen only on ultrasound.

The ROC AUC to detect clinically significant prostate cancer of targeted lesions in this study was 0.85 for both MRI and Ultrasound targeted lesions vs 0.80 and 0.83 for ultrasound and MRI alone.[8]

Methods

We reviewed our prospectively maintained, IRB approved, database to evaluate the impact of US abnormalities on MRIF BX outcomes.

MRIF biopsy was performed by one Urologist (CP) using multiparameteric mpMRI (endorectal coil, 1.5T) read by 2 radiologist specializing in prostate MRI.

MRI positivity (pos) was defined as PIRADS 3 or greater.

Multiparametric Ultrasound (mpUS) positivity was defined as the presence of calcifications, and/or significant hypoechoic areas, power Doppler or color Doppler.

Correlation was identified when lesion location and positive biopsy (any histology) were in the same sextant.

Results

- The demographics in 82 consecutive men undergoing BX demonstrated no statistical difference in age or PSA was noted between groups (p>0.1).
- 38 men (46%) had CAP. Multiparametric US was positive in 15/52 (29%) of men with CAP, and 11/15 (73%) had >/= Gleason (GL) 7.
- In men with mpMRI PIRADS >/= 3 CAP was detected in 24/68 (35%) and 15/24 (62%) had >/= Gl 7. Ultrasound targeted biopsies alone would have missed cancer in 23/38 (60%) patients and Gleason 7 or greater would have been missed in 11/22 (50%).

Results

- MRI targeted biopsies alone would have missed cancer in 14/38 (37%) patients and Gleason 7 or greater in 7/22 (32%).
- In men with both positive mpUS and positive mpMRI CAP would have been missed in 10/38 (26%) and Gleason >/= 7 disease 5/22 (23%).
- MRI had a sensitivity and specificity for CAP in our cohort of 85% and 18% respectively. For Gleason >/= 7 lesions MRI had a sensitivity and specificity of 68% and 20% respectively.
- Ultrasound had a sensitivity and specificity of 53% and 31% for CAP and for Gleason >/= 7 disease 52% and 42% respectively.

Conclusion

- Our analysis in an experienced center indicates that both mpMRI and mpUS are important in the site specific detection of Gleason Grade >/= 7 disease.
- Our data is limited by an inability to separated the value added by biopsies of calcifications, power and color doppler from the biopsy of hypoechoic lesions only.
- These findings will require corroboration in other centers. Given our findings regarding the importance of mpUS, we believe both mpUS and mpMRI should be used during MRIFBX to improve the diagnosis of GL >/=7 CAP.

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