200 patients under 3 dimensional transrectal ultrasound prostate biopsy: USC experience

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Introduction

- Contemporary transrectal ultrasound (TRUS) prostate biopsy can be guided by magnetic resonance imaging (MRI) using MR/US fusion. The aim of this study is to compare the characteristics of the biopsy-proven cancer between MR-fusion-guided targeted biopsy and systematic biopsy.

Patients and Methods

- Between January 2010 and September 2012, 200 consecutive patients underwent outpatient TRUS biopsy using the real-time 3D TRUS-tracking system (Urostation®, Koelis, France),
- Multi-parametric prostate MRI for 99 patients was performed prior to TRUS biopsy. If MRI suggested a focal lesion, 3D volume data of the MRI was elastically fused with TRUS at the time of biopsy.
- The MRI suggested concerned focal area in 83 of the 99 patients (83%)
- Overall 2327 systematic biopsies (SB) and 161 MRI fusion targeted biopsies (MR-TB) were performed.
- The mean number of cores per patients was 11.6 for SB and 1.6 for MR-TB

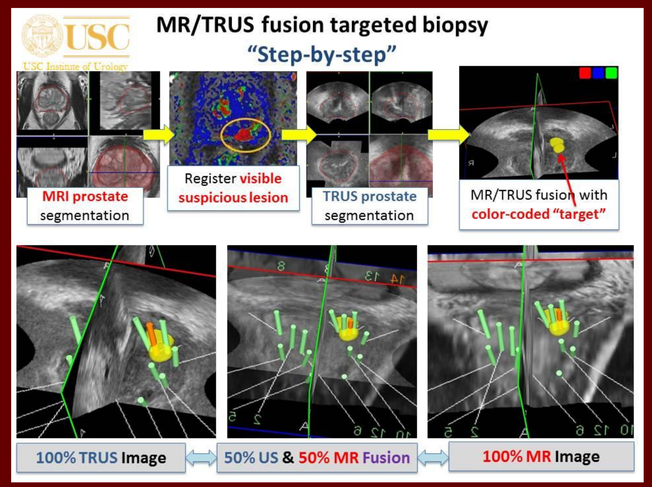
Results

- Of the 200 patients the mean age was 65 years, mean PSA was 7.9ng/ml, and mean prostate volume was 45 ml. 107 of the 200 patients had a positive biopsy (53.5%): 41% for SB and 61% for MR-TB ($p<0.05$).
- The median cancer core length (CCL) and the primary Gleason grade (PGG) was higher in patients with MR-TB: CCL=7.6mm [0.8-18] and PGG=3.65 and only CCL=4.58mm [07-10.5] and PGG=3.48 for SB.
- Spatial location of each biopsy was documented using 3D TRUS-tracking, to document accurate localization of the biopsy-proven cancer, allowing per-lesion based follow-up

	Systematic biopsy	Targeted biopsy	P value
Positive biopsy	10.9% (253/2253)	41% (161/415)	p=0.002
Primary Gleason grade	3.48	3.65	p<0.001
Median cancer core length	4.58[0.7-10.5]	7.6[0.8-18]	p=0.0002
Significant cancer	47%	69%	p<0.001

Table1: Comparison between systematic biopsy and targeted biopsy

Figure 1 & 2 : 3D TRUS-based MRI-fusion Mapping Biopsy



Biopsy-trajectories of the targeted biopsies (orange), hit through MR-suspicious focal lesion (yellow sphere), were documented.

3D image-based mapping can be confirmed in either 3D MR or 3D TRUS data.

Fig 3a
Posterior
PZ cancer

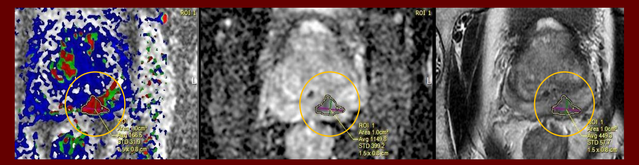


Fig 3b
Anterior
TZ cancer

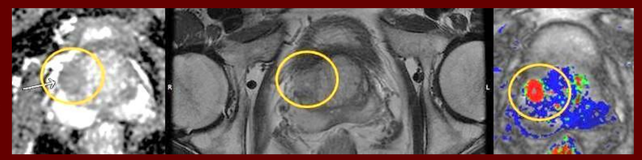


Figure 3 a & 3b : ***Suspicious focal lesion in prior-biopsy MRI***

(T2-w, ADC-map, and contrast MRI using i-CAD analysis)

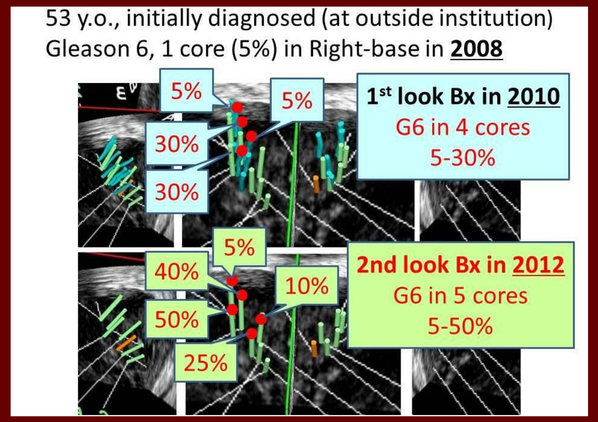


Figure 4: ***Per-lesion based follow-up on Active Surveillance*** : 1st-look biopsy in blue/curved trajectories, and 2nd look biopsy in green/strait trajectories and single orange one which was the last biopsy of 2nd look session

Conclusions

- **MR-fusion-guided targeted prostate biopsy identifies greater cancer core involvement and higher Gleason grade.**
- **Image-based biopsy with documentation of cancer location would enhance per-lesion based management of prostate cancer.**