Biopsia Prostatica Fusion
ruolo attuale nella pratica clinica

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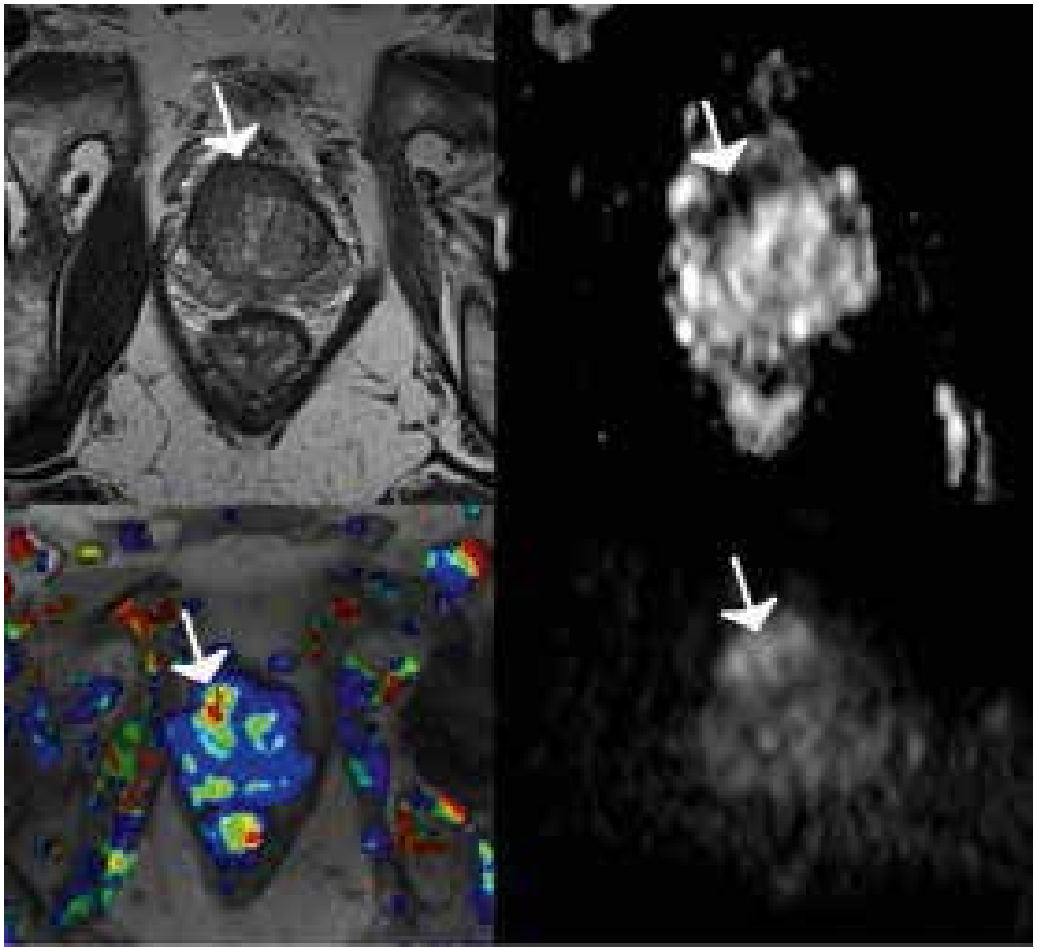
multiparametric MRI

T2 weighted



diffusion coefficient map

dynamic contrast enhanced map

diffusion-weighted image map

Cognitive TRUS-guided biopsy

Urologist reviews MRI images, correlates this with real-time TRUS images and performs a ‘free-hand’ TRUS-guided biopsy of the MRI suspicious region

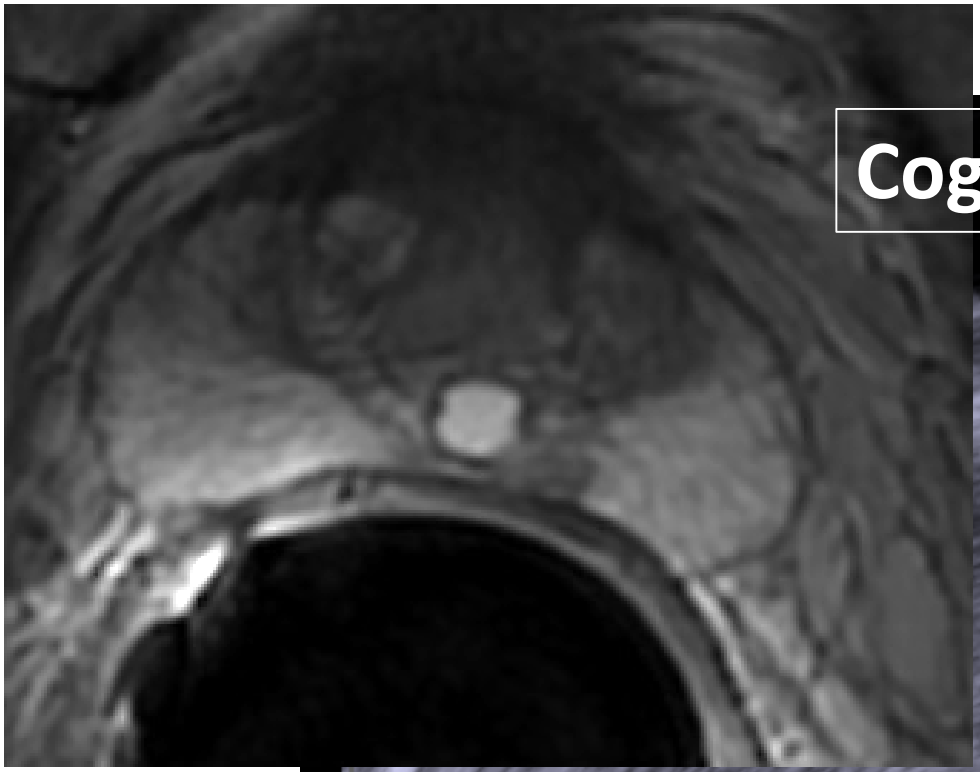
Advantages:

- Simple
- No speciailised, expensive equipment required
- Uses standard biopsy technique

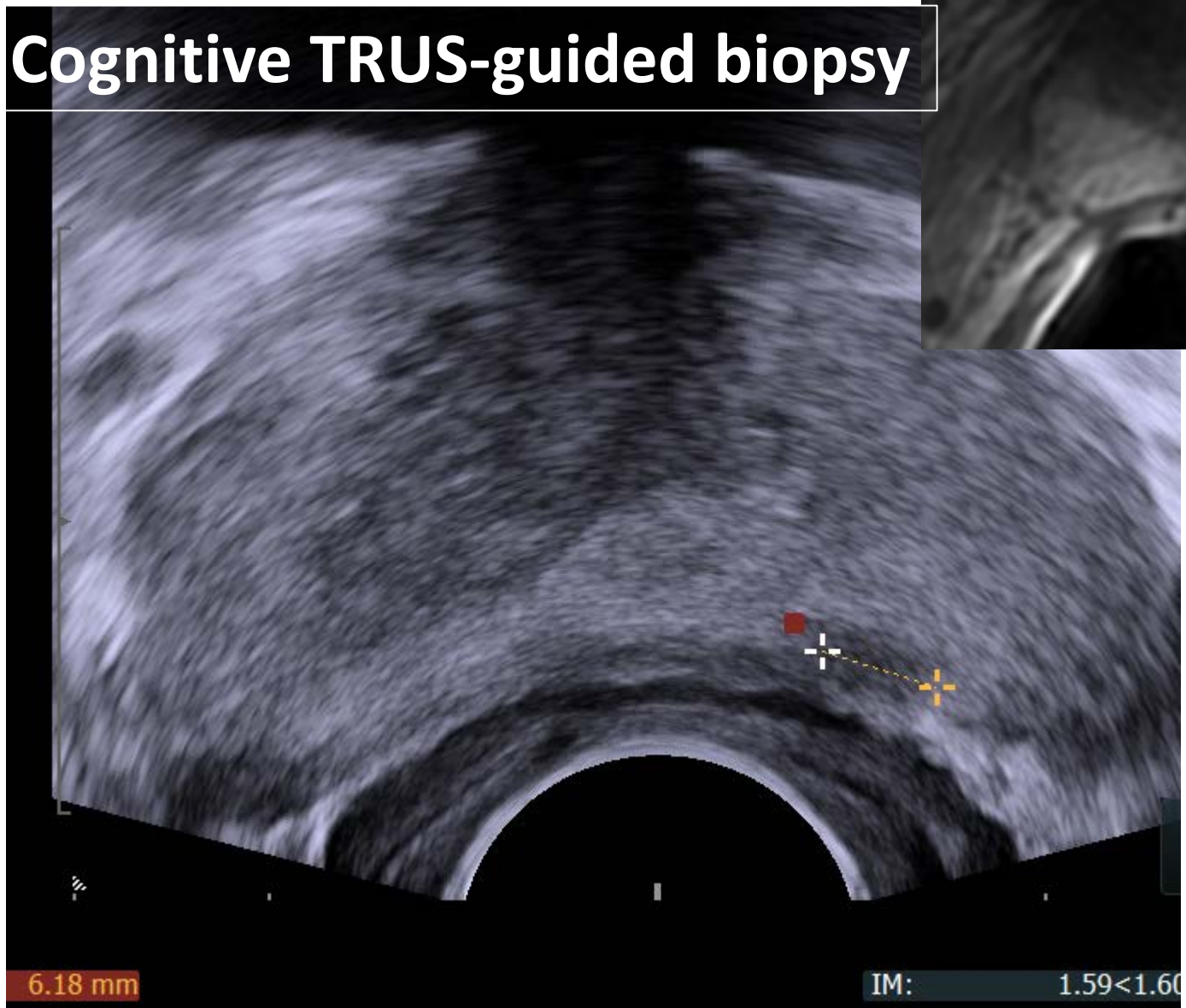
Disadvantages:

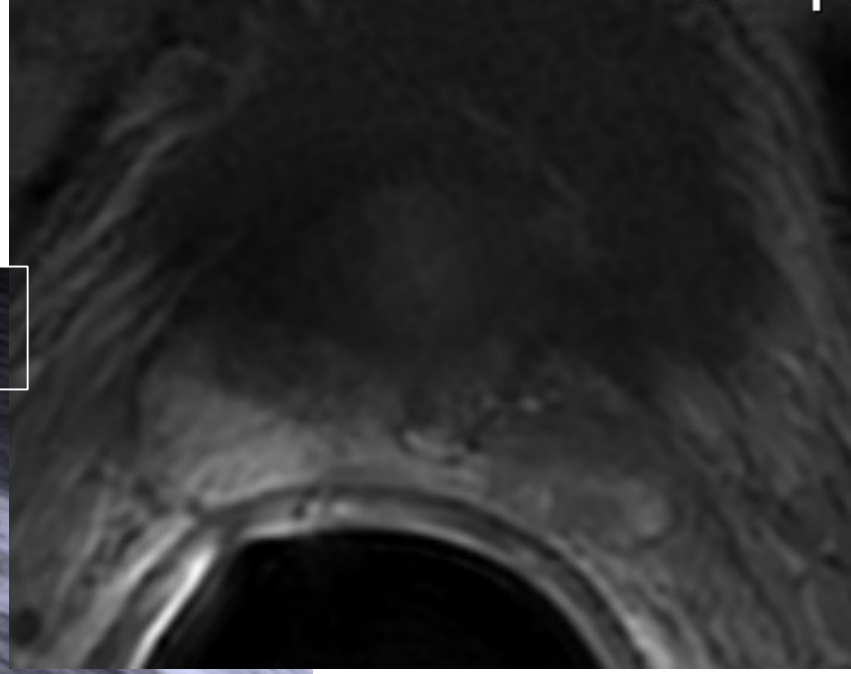
- Larger margin of error
- No guarantee the manual biopsy will sample the MRI-suspicious region

Cognitive TRUS-guided biopsy

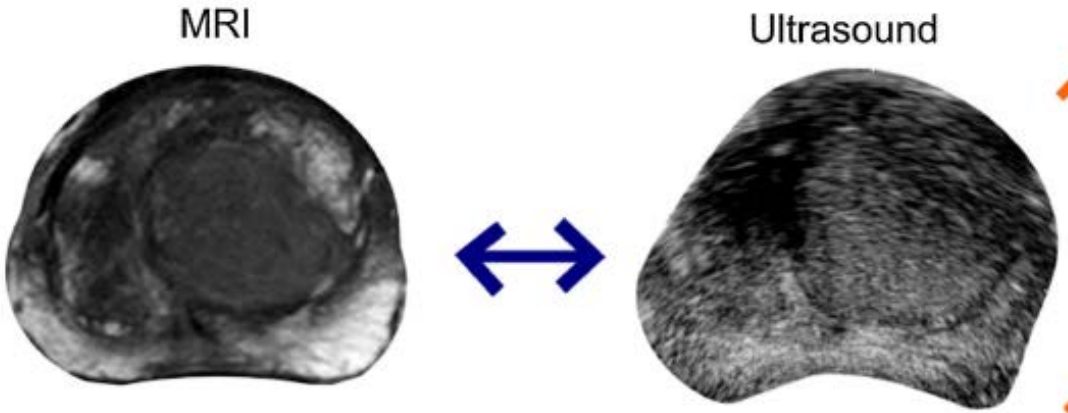


Cognitive TRUS-guided biopsy





MRI-TRUS fusion-guided biopsy



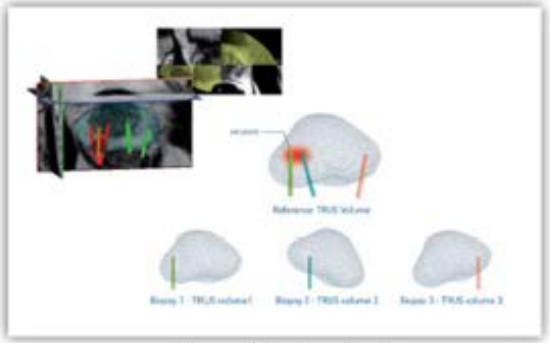
Electromagnetic tracking w/ freehand TRUS probe
(UroNav, HI-RVS, Virtual Navigator)

with permission from InVivo

Articulated approach w/ mechanical arm
(Artemis and BiopSee)

with permission from Eigen

Image-based w/ TRUS-TRUS registration
(Urostation)



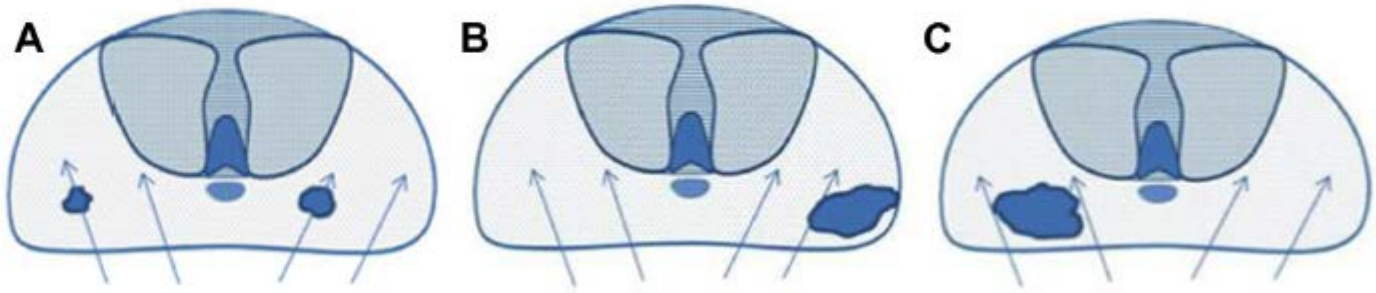
with permission from Koelis

MRI images downloaded onto an ultrasound machine with special software. Ultrasound images are acquired and the software fuses the MRI onto corresponding USS images and coordinates the biopsy template to guide biopsy of the suspicious region

Advantages:

Fairly accurate sampling

LIMITATIONS OF RANDOM PROSTATE BIOPSIES



A. Oversampling
B. Undersampling
C: Undersampling- missing

Controversies: different aims

1. Do we want to detect all the prostate cancers?
2. Do we want to detect and, at the same time, characterize all the prostate cancers?
3. Do we want to detect and characterize only the significant prostate cancers?

Optimization of Prostate Biopsy: the Role of Magnetic Resonance Imaging Targeted Biopsy in Detection, Localization and Risk Assessment

Marc A. Bjurlin,* Xiaosong Meng,* Julien Le Nobin,* James S. Wysock,* Herbert Lepor,† Andrew B. Rosenkrantz* and Samir S. Taneja‡,§

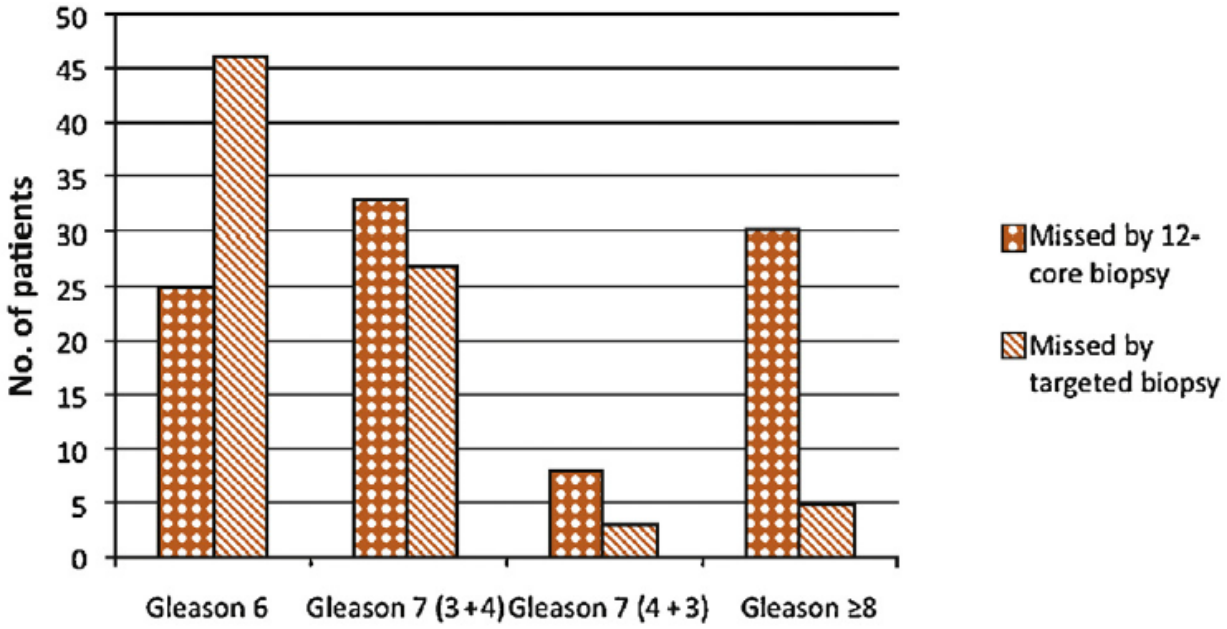
Potential tools of T-PBx

- Initial biopsy (poorly defined)
  - Reduce false negatives
  - Improve risk classification
  - Reduce repeat biopsies
  - Reduce overdetection
- Repeated biopsy
  - Increase cancer detection
  - Reduce further repeat biopsy
- In AS
  - Improve risk stratification
  - Reduce need for repeat biopsy

Platinum Priority – Prostate Cancer
Editorial by Mark Emberton on pp. 720–721 of this issue

Magnetic Resonance Imaging/Ultrasound–Fusion Biopsy Significantly Upgrades Prostate Cancer Versus Systematic 12-core Transrectal Ultrasound Biopsy

M. Minhaj Siddiqui[a], Soroush Rais-Bahrami[a], Hong Truong[a], Lambros Stamatakis[a], Srinivas Vourganti[a], Jeffrey Nix[a], Anthony N. Hoang[a], Annerleim Walton-Diaz[a], Brian Shuch[a], Michael Weintraub[a], Jochen Kruecker[d], Hayet Amalou[c], Baris Turkbey[b], Maria J. Merino[e], Peter L. Choyke[b], Bradford J. Wood[c], Peter A. Pinto[a,c,]*



Conclusions: MRI/US-fusion-guided biopsy upgrades and detects PCa of higher Gleason score in 32% of patients compared with traditional 12-core biopsy alone. Targeted biopsy technique preferentially detects higher-grade PCa while missing lower-grade tumors.

Original Investigation

Comparison of MR/Ultrasound Fusion–Guided Biopsy With Ultrasound-Guided Biopsy for the Diagnosis of Prostate Cancer

M. Minhaj Siddiqui, MD; Soroush Rais-Bahrami, MD; Baris Turkbey, MD; Arvin K. George, MD; Jason Rothwax, BS; Nabeel Shakir, BS; Chinonyerem Okoro, BS; Dima Raskolnikov, BS; Howard L. Parnes, MD; W. Marston Linehan, MD; Maria J. Merino, MD; Richard M. Simon, DSc; Peter L. Choyke, MD; Bradford J. Wood, MD; Peter A. Pinto, MD

- Agreement TBx and SBx: 69%
- TBX missed 22% all cancers
  - 83% low risk
  - 12% intermediate risk
  - 5% high risk

Table 2. Perf… …to High-Risk Prostate Cancer on W…

			Combined Biopsy
Sensitivity, %			85 (76-91)
Specificity, %			49 (37-60)
Negative pred			73 (58-84)
Positive pred			67 (58-75)
Accuracy, % (95% CI)	73 (70-76)	59 (55-63)	69 (65-72)
AUC (95% CI)	0.73 (0.66-0.79)	0.59 (0.52-0.67)	0.67 (0.60-0.74)
P value of comparison with targeted MR/ultrasound biopsy		.005	.04

JAMA. 2015;313(4):390-397. doi:10.1001/jama.2014.17942

Comparative Analysis of Transperineal Template Saturation Prostate Biopsy Versus Magnetic Resonance Imaging Targeted Biopsy with Magnetic Resonance Imaging-Ultrasound Fusion Guidance

Jan P. Radtke,*,† Timur H. Kuru,† Silvan Boxler, Celine D. Alt, Ionel V. Popeneciu, Clemens Huettenbrink, Tilman Klein, Sarah Steinemann, Claudia Bergstraesser, Matthias Roethke, Wilfr[illegible]arkus Hohenfellner and Boris A. Hadaschik

TBX missed
- 13% GS>=7
- 26% all cancers

SBx missed
- 26% GS>=7
- 14% all cancers

Table 2. *Sensitivity, specificity[illegible]S scores*

			GS 7 or Greater (Prevalence 29.3%)	
			%	95% CI
PI-RADS 2 or greater (196 pts):				
Sensitivity			91.9	83.9–96.7
Specificity			43.8	36.9–50.8
PPV			40.3	33.4–47.5
NPV			92.9	85.8–97.1
Accuracy			57.8	
PI-RADS 3 or greater (153 pts):				
Sensitivity			80.2	70.3–88.0
Specificity			59.6	52.6–66.3
PPV			45.1	37.1–53.3
NPV			87.9	81.4–92.8
Accuracy			65.7	
PI-RADS 4 or greater (78 pts):				
Sensitivity			61.6	50.5–71.9
Specificity			88.0	82.8–92.1
PPV			68.0	56.4–78.1
NPV			84.7	79.2–89.3
Accuracy	71.4		80.3	
PI-RADS 5 (26 pts):				
Sensitivity	16.0	10.5–22.9	24.4	15.8–34.9
Specificity	98.6	95.1–99.8	97.6	97.6–99.2
PPV	92.3	74.8–98.8	80.7	60.6–93.4
NPV	53.0	46.8–59.1	75.8	70.2–80.8
Accuracy	56.5		76.2	

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available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Platinum Priority – Prostate Cancer
Editorial by XXX on pp. x–y of this issue

Prebiopsy Multiparametric Magnetic Resonance Imaging for Prostate Cancer Diagnosis in Biopsy-naive Men with Suspected Prostate Cancer Based on Elevated Prostate-specific Antigen Values: Results from a Randomized Prospective Blinded Controlled Trial

Panu P. Tonttila, Juha Lantto, Eija Pääkkö, Ulla Piippo, Saila Kauppila, Eveliina Lammentausta, Pasi Ohtonen, Markku H. Vaarala *

Medical Research Center Oulu, Oulu University Hospital and University of Oulu, Oulu, Finland

Conclusions: MP-MRI/TRUS-fusion targeted biopsy did not improve PCa detection rate compared with TRUS-guided biopsy alone in patients with suspected PCa based on PSA values.
Patient summary: In this randomized clinical trial, additional prostate magnetic resonance imaging (MRI) before prostate biopsy appeared to offer similar diagnostic accuracy compared with routine transrectal ultrasound–guided random biopsy in the diagnosis of prostate cancer. Similar numbers of cancers were detected with and without MRI.

PROSTATE mpMRI AND MRI-TARGETED BIOPSY IN PATIENTS WITH PRIOR NEGATIVE BIOPSY

Table 1-Literature summary regarding detection rate of clinically significant cancer on repeat biopsy using MRI targeting

First author	Year	Study size	Type of MRI targeting	Definition of CS	SB CS+	TB CS+	Comments
Mendhiratta (25)	2015	210	Fusion	GS≥7	9%	16%	Among GS≥7 tumors, TB detected 90% and SB detected 52%
Arsov(26)	2015	104	Fusion	GS≥7	25%	26%	Data from "arm B" what is arm B?
Abdi(27)	2015	86	Cognitive (32) and fusion (54)	GS≥7, or >2 cores of >50% any core with cancer	24%	28%	29/30 CS tumors due to GS≥7. In 10% of patients, only TB + for CS tumor. CS tumor in 35% of patients undergoing SB+TB, compared with 16% of matched cohort undergoing only SB.
Salami(28)	2015	140	Fusion	Epstein's criteria	31%	48%	
Hambrock (29)	2010	68	In-bore	GS and either stage and volume in patients undergoing RP or PSA and PSA density in remaining patients		54%	≥2 prior negative biopsies
Sonn(30)	2014	105	Fusion	GS≥7 or GS6 with CCL≥4 mm	15%	21%	Not all patients underwent both SB and TB. 9 patients with CS cancer on TB were benign/ insignificant on SB.

PROSTATE mpMRI AND MRI-TARGETED BIOPSY IN PATIENTS WITH PRIOR NEGATIVE BIOPSY

- Overall there was a 42% cancer detection rate, including 81% on anterior MRI lesions.
- Overall cancer detection rate improved to 81-96% when only considering PIRADS 4 and 5 lesions, and 68-86% for clinically significant disease.

PROSTATE mpMRI AND MRI-TARGETED BIOPSY IN ACTIVE SURVEILLANCE

Confirmatory MR/TRUS fusion biopsy can reclassify up to 1/3 of patients who initially met criteria for AS

The ability of mpMRI to detect intermediate and high-risk cancers may aid in the selection of patients who can safely pursue active surveillance

MRI may also have a role in monitoring patients, although further data are required before mpMRI can replace the regular biopsies recommended in active surveillance protocols

Porten SP et al. Changes in prostate cancer grade on serial biopsy in men undergoing active surveillance. J Clin Oncol 2011;29:2795–800.

Recabal P et al. The Efficacy of Multiparametric Magnetic Resonance Imaging and Magnetic Resonance Imaging Targeted Biopsy in Risk Classification for Patients with Prostate Cancer on Active Surveillance. J Urol 2016; 196:374-381.

DOES NEGATIVE MRI (ABSENCE OF ANY TARGET) ACTUALLY MEAN NO (SIGNIFICANT) TUMOR AT BIOPSY?

F Bertolotto et al ABS 140 SIURO 2015

80 pts with negative mpMRI (1.5 T endorectal Coil)

16 mo 2013-14, KEOLIS UROSTATION, Average age 63.7 years. No history of previous biopsy. Saturation bx: 20 samples (10/lobe) stereotactic mapping

Group 1 (any PSA): 43 pts

- **12 / 43 cases (false-negative ratio 28%).**
- **10 pts Gleason score was 6 (83%)**
- **2 pts was >6.**

Group 2 (PSA <10 ng/ml): 37 pts

- **positive in 11/37 cases, (false-negative ratio 30%)**
- **10 pts, Gleason score was 6 (91%)**
- **in only 1 was >6 (9%)**

mMRI NPV around 70%
Aggressive tumors (>6) the NPV is around 85 %.
PSA <10, the negative predictive value is 91 %.
Risk of missing an aggressive cancer 9%.

Reproductive System & Sexual Disorders: Current Research

Quaresima et al., Reprod Syst Sex Disord 2016, 5:3
http://dx.doi.org/10.4172/2161-038X.1000180

Research Article Open Access

New Onset of Erectile Dysfunction in a Cohort of Patients Enrolled in Active Surveillance for Low Risk Prostate Cancer: A Preliminary Study to Evaluate Incidence and Prognostic Factors

Luigi Quaresima, Massimo Polito, Camilla Capretti, Matteo Cevenini, Marco Tiroli and Andrea Benedetto Galosi*

Department of Clinical and Specialist Sciences-Institute of Urology, Polytechnic University of the Marche Region, Az. Ospedaliera Universitaria United Hospitals, Ancona, Italy

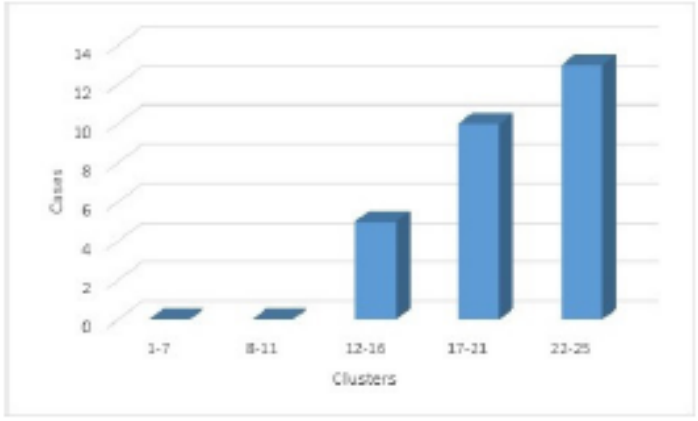

Figure 1: Patients IIEF-5 at 24 months follow up.

After 24 months from diagnosis 54% of patients developed ED of different degrees

Conclusions

- mpMRI is changing the indication and the approaches in prostate cancer diagnosis and surveillance
- Fusion biopsy has the potential to reduce overdiagnosis
- mpMRI and fusion biopsy are potential useful to improve selection of low risk prostate cancer and suitable for AS
- The role of mpMRI and fusion biopsy in monitoring patients in AS is still undefined
- Unless we do not change philosophy in prostate cancer diagnosis, randomized prostate biopsy cannot be omitted in favor to target biopsy only.
- To maximize prostate cancer detection it is necessary to combine both random e saturation biopsy