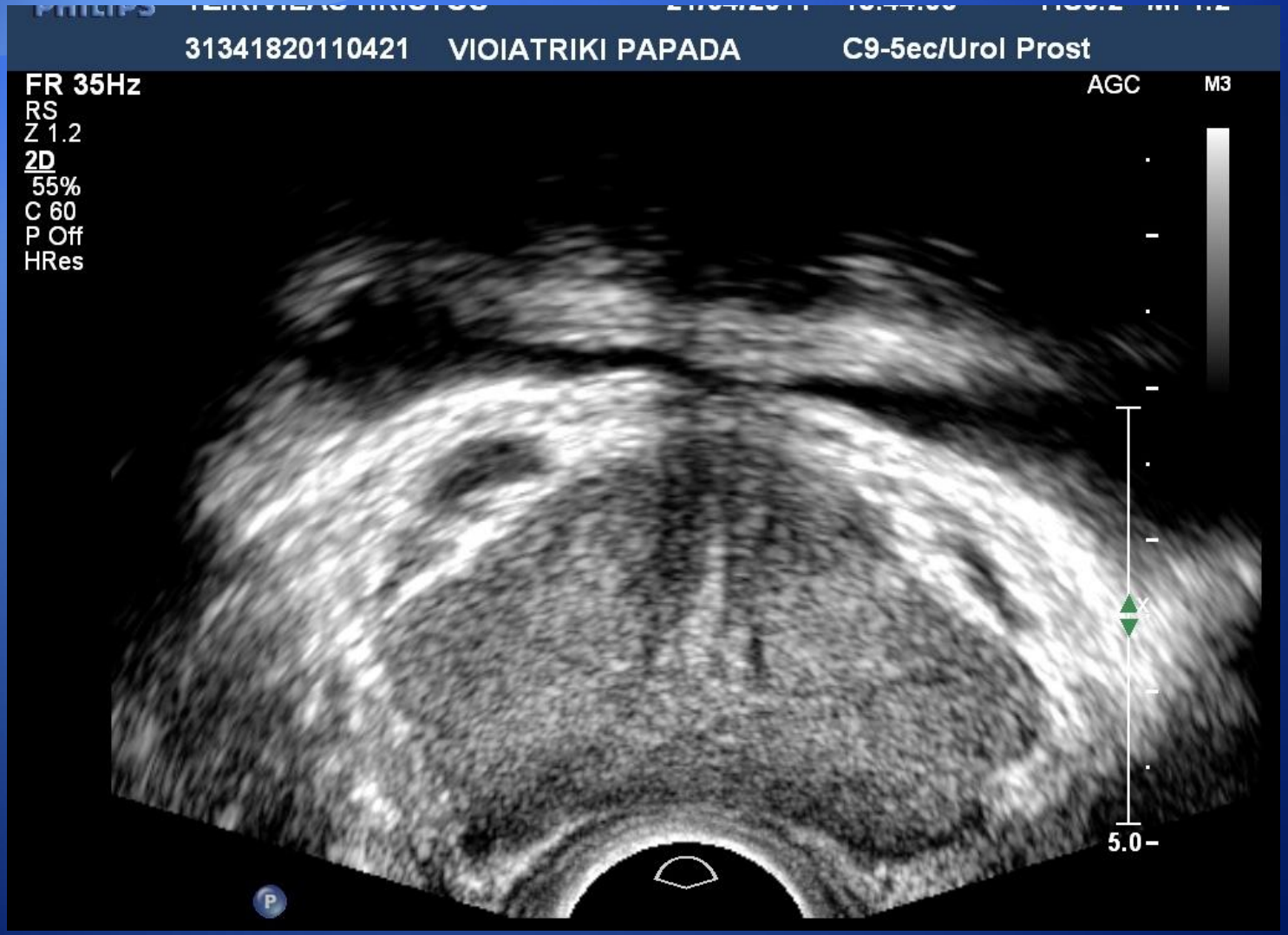
FUSION
ΒΙΟΨΙΑ ΤΟΥ ΠΡΟΣΤΑΤΗ

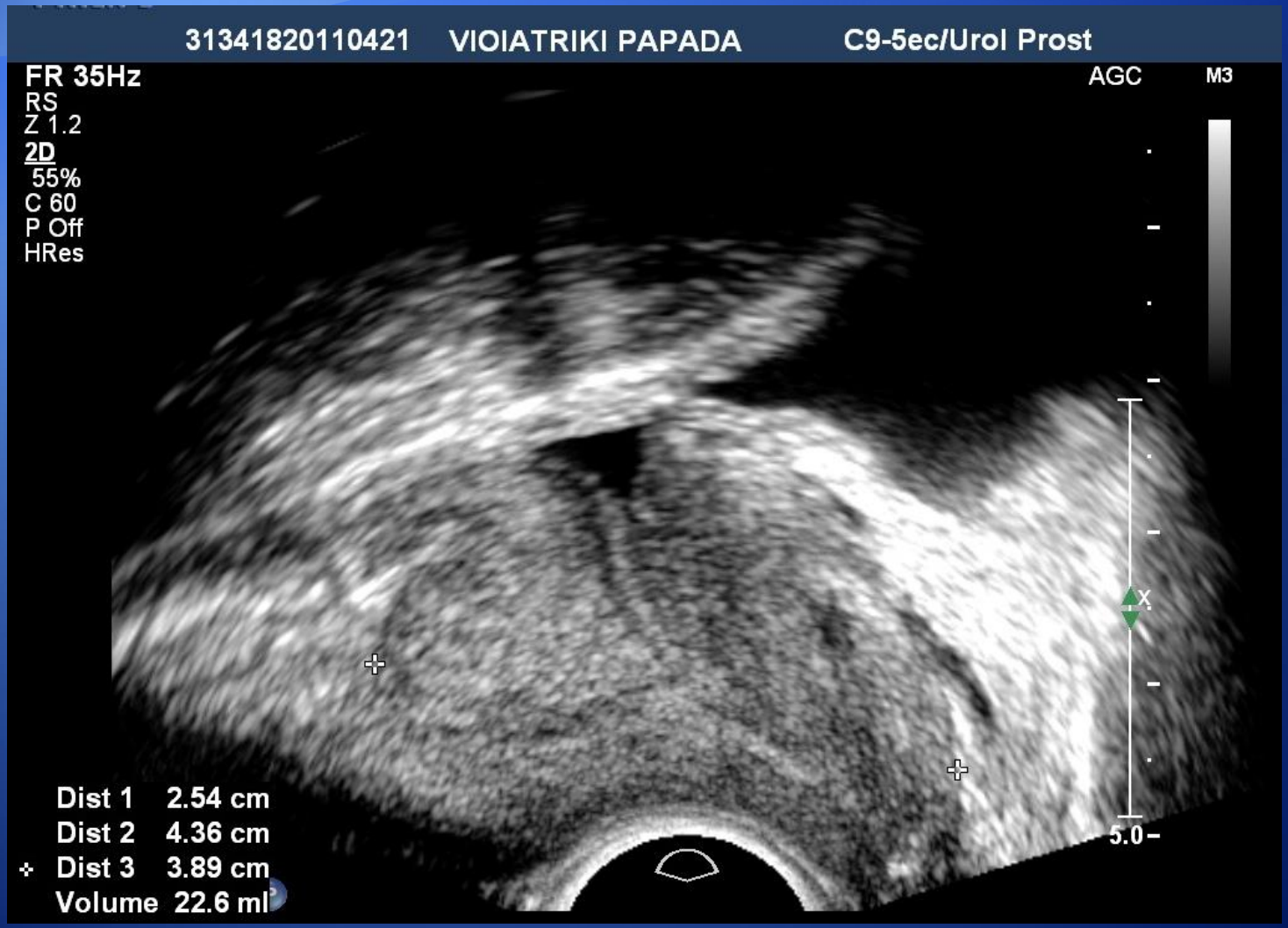
ΠΕΤΡΟΠΟΥΛΟΣ Σ. ΕΜΜΑΝΟΥΗΛ
ΤΜΗΜΑ ΔΙΑΓΝΩΣΤΙΚΗΣ – ΕΠΕΜΒΑΤΙΚΗΣ ΥΠΕΡΗΧΟΓΡΑΦΙΑΣ
ΒΙΟΪΑΤΡΙΚΗ , ΑΘΗΝΑ

BioMed Βιοιατρική

Transrectal Ultrasonography (TRUS)



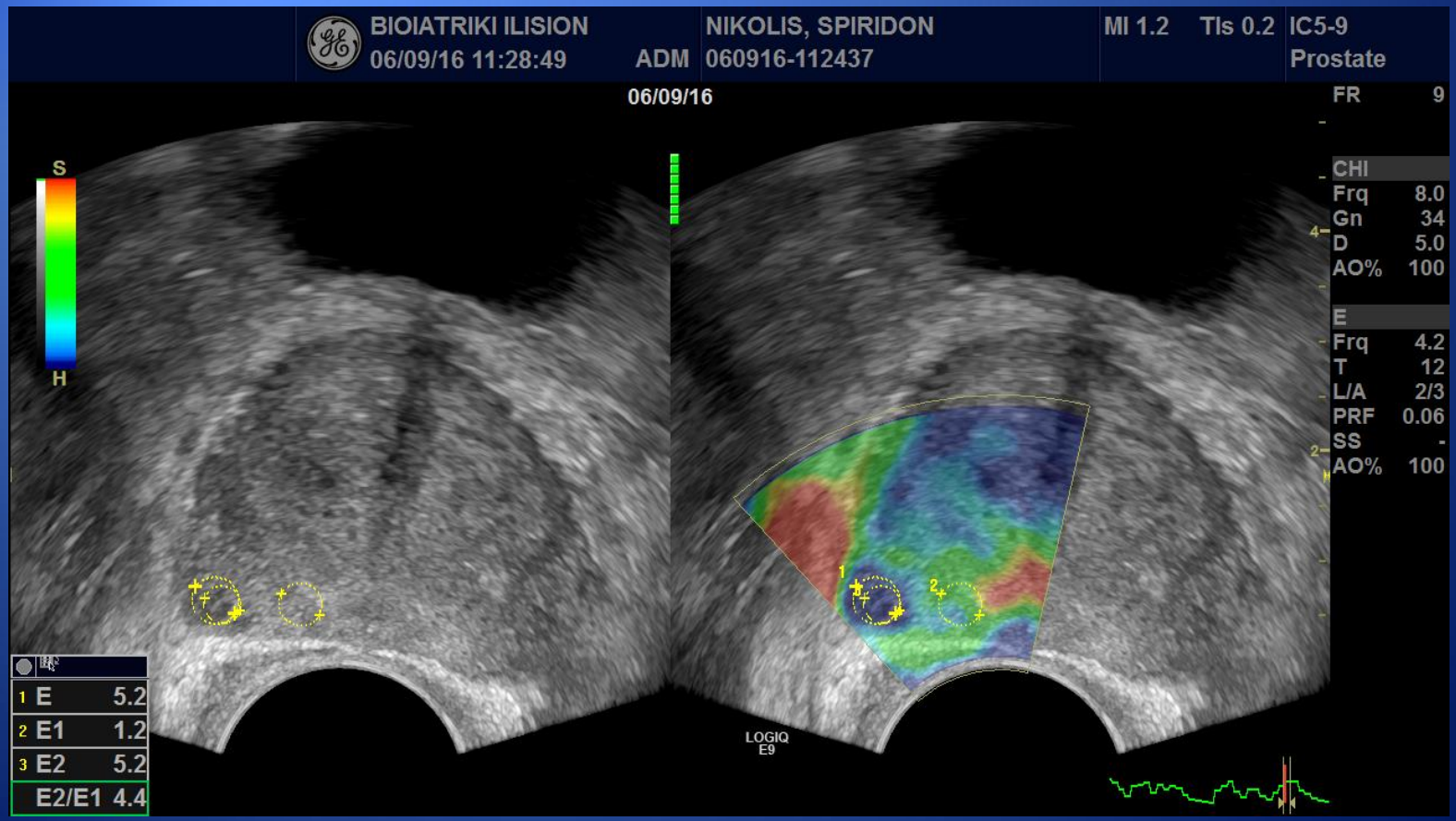
Transrectal Ultrasonography (TRUS)



ΥΠΕΡΗΧΟΓΡΑΦΙΚΗ ΕΙΚΟΝΑ
Ca ΠΡΟΣΤΑΤΟΥ
ΥΠΟΗΧΟΓΕΝΗΣ ΕΣΤΙΑ

ΥΠΕΡΗΧΟΓΡΑΦΙΚΗ ΕΙΚΟΝΑ Ca ΠΡΟΣΤΑΤΟΥ

ΣΚΛΗΡΗ ΠΕΡΙΟΧΗ ΣΤΗΝ ΕΛΑΣΤΟΓΡΑΦΙΑ



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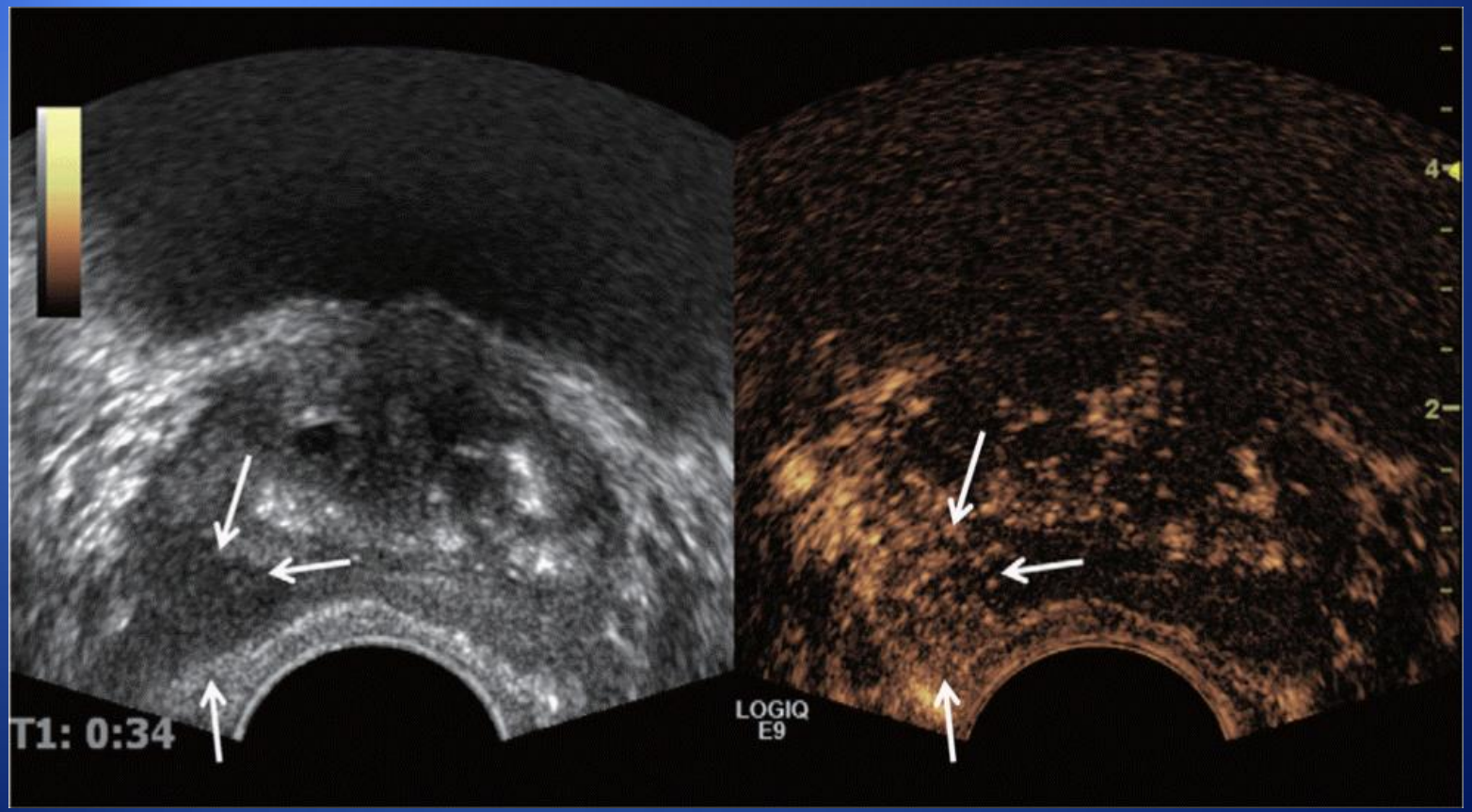
ΑΥΞΗΜΕΝΗ ΠΡΟΣΛΗΨΗ ΣΚΙΑΓΡΑΦΙΚΟΥ



ΥΠΕΡΗΧΟΓΡΑΦΙΚΗ ΕΙΚΟΝΑ Ca ΠΡΟΣΤΑΤΟΥ

	Ευαισθησια	Ειδικότητα	Διαγν. Ακρίβεια
TRUS	15	92,3	24- 39,4
Power Doppler	69	61	66%
Elastography	60,8	68,4	51,1 – 66,4

1 The impact of real-time elastography guiding a systematic prostate biopsy to improve cancer detection rate: a prospective study of 353 patients. Marko Brock et Al , J Urol 2012; 187: 2039-2043

2. Comparison of real-time elastography with grey-scale ultrasonography for detection of organ-confined prostate cancer and extra capsular extension: a prospective analysis using whole mount sections after radical prostatectomy
Marko Brock et Al , BJU Int 2012; 108: E217-222

3. Visualization of prostate cancer using dynamic contrast-enhanced MRI: comparison with transrectal power Doppler ultrasound H. Ito et Al , BJR 2014

ΚΑΤΕΥΘΥΝΟΜΕΝΗ ΥΠΟ U/S ΒΙΟΨΙΑ ΠΡΟΣΤΑΤΟΥ

TRUS ΚΑΤΕΥΘΥΝΟΜΕΝΗ ΒΙΟΨΙΑ

Figure 1: Systematic Sextant Prostate Biopsy Using the Hodge Biopsy Protocol

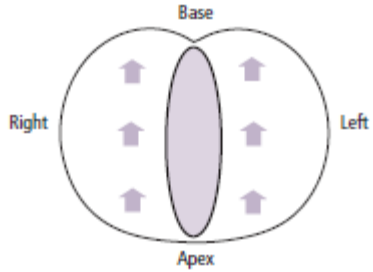


Figure 2: Systematic Sextant Prostate Biopsy Using a Lateral Biopsy Technique

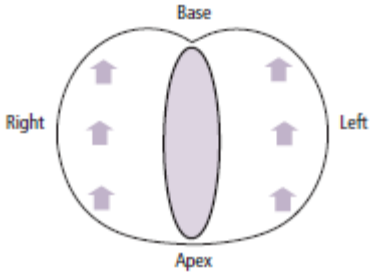
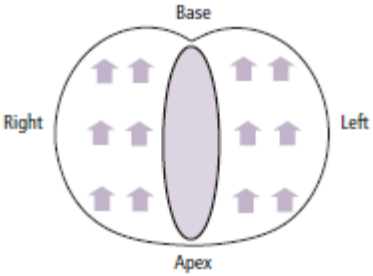
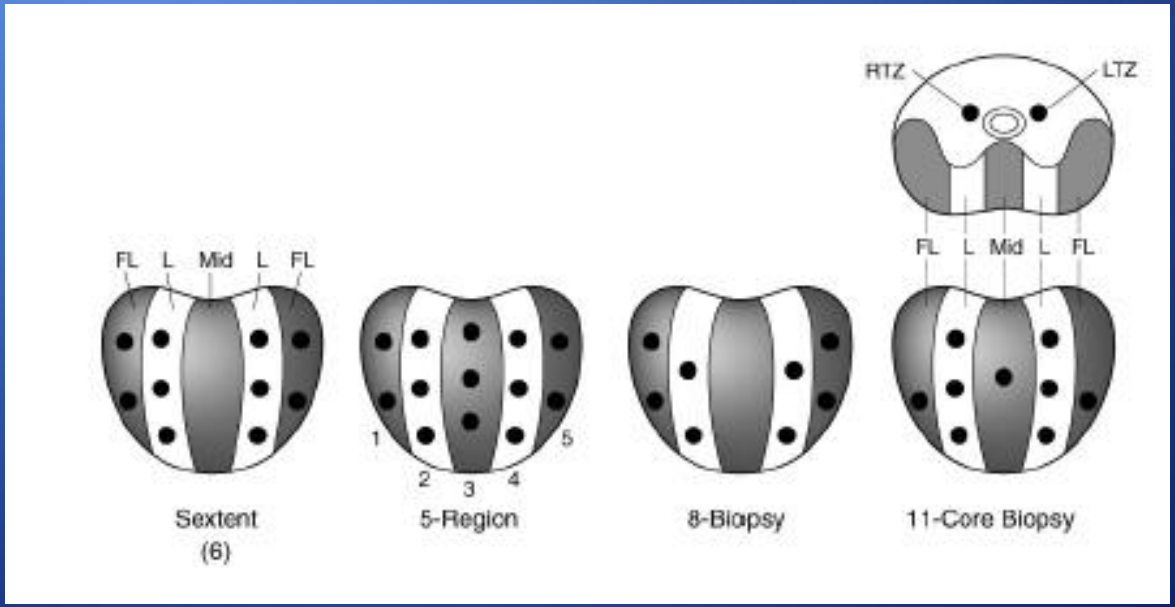


Figure 3: Systematic 12-core Prostate Biopsy

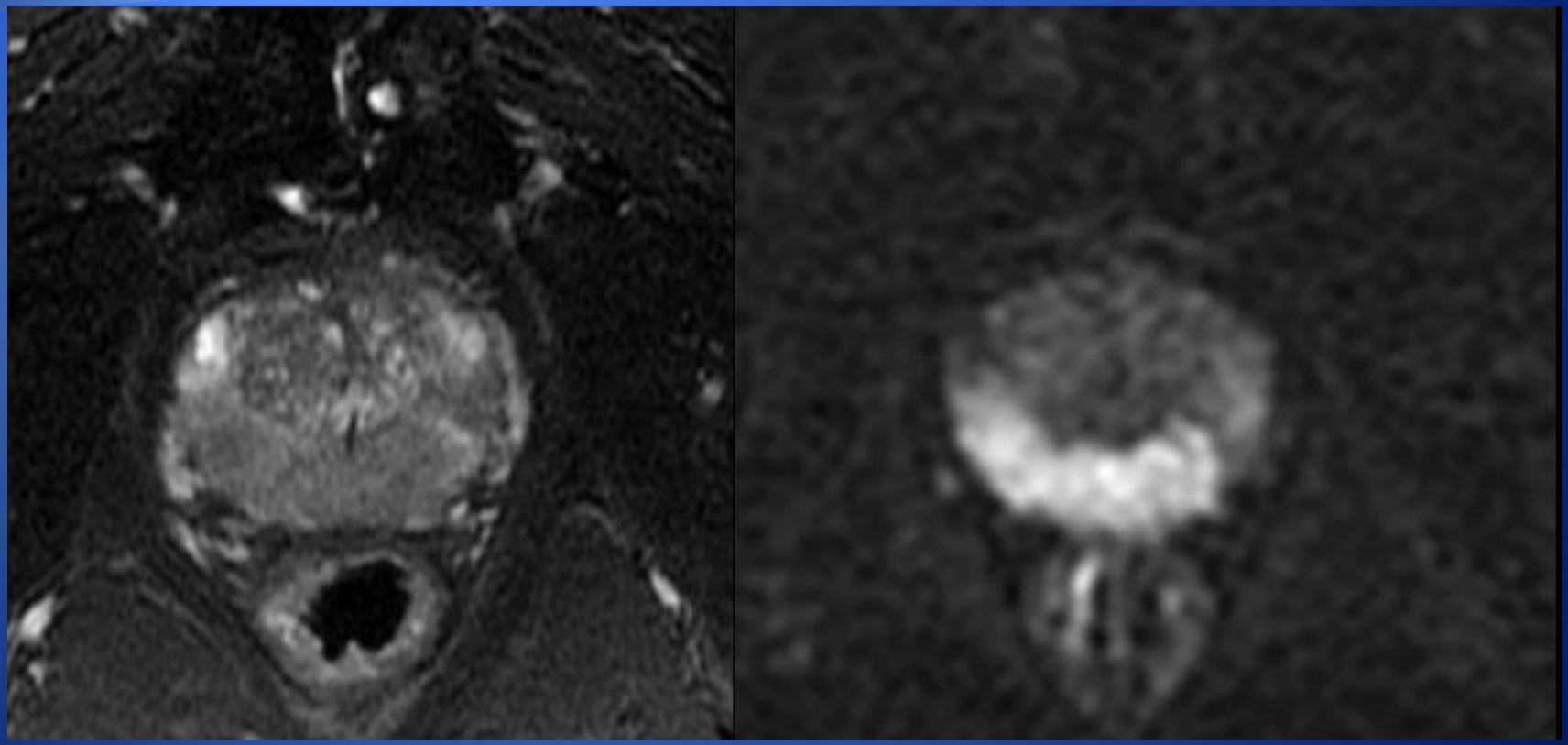




TRUS Biopsy : Διαγνωστική ακρίβεια

- Τουλάχιστον 10 ιστοτεμάχια (Vienna Nomograms)
- 1η Βιοψία : 27% - 43 %
- 2η Βιοψία : 10 – 35 % επιπλέον

EAU Guidelines on Prostate Cancer
European Urology 53(2008) 68-80



PROMIS Trial : MRI – Fusion vs TRUS – Guided Biopsies

576 men at 11 UK Centers (academic and community)

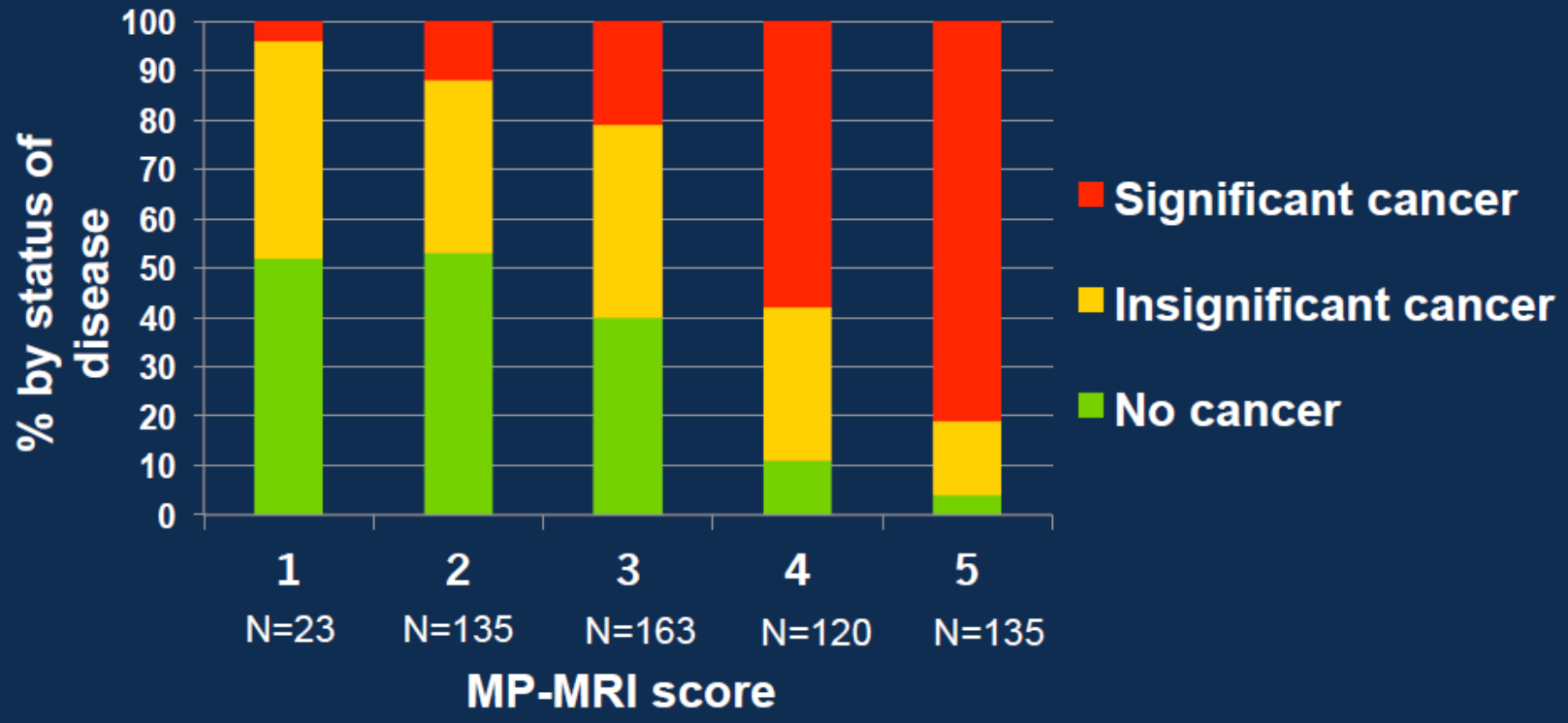
- Inclusion: PSA < 15 ng/ml and normal DRE

- All had:
  - 1.5T MRI (no endorectal coil)
  - 12 core TRUS
  - Transperineal mapping (reference standard)

- Primary endpoint: – Gleason ≥ 4+3 and/or maximum cancer core length ≥6mm

Ahmed, www.thelancet.com Vol 389 February 25, 2017

MP-MRI scores and disease severity



PROMIS
Prostate MRI Imaging Study

MP-MRI compared to TRUS-biopsy

Test attribute	TRUS-biopsy	MP-MRI	Odds ratio* [95% CI]	*p-value*
Sensitivity	**48%**	**93%**	0.06 [0.02-0.12]	*p<0.0001*
Specificity	**96%**	**41%**	0.02 [0.003-0.05]	*p<0.0001*
PPV	**90%**	**51%**	8.2 [4.7-14.3]	*p<0.0001*
NPV	**74%**	**89%**	0.34 [0.21-0.55]	*p<0.0001*

PROMIS
Prostate MRI Imaging Study

Clinically significant cancers missed by TRUS-biopsy and MP-MRI

		TRUS-biopsy Total = 119	MP-MRI Total = 17
Number and cancer core length (mm)	Gleason 3+3	**7** (6-11mm)	**1** (8mm)
	Gleason 3+4	**99** (6-14mm)	**16** (6-12mm)
	Gleason >/=4+3	**13** (3-16mm)	**0**

PROMIS
Prostate MRI Imaging Study

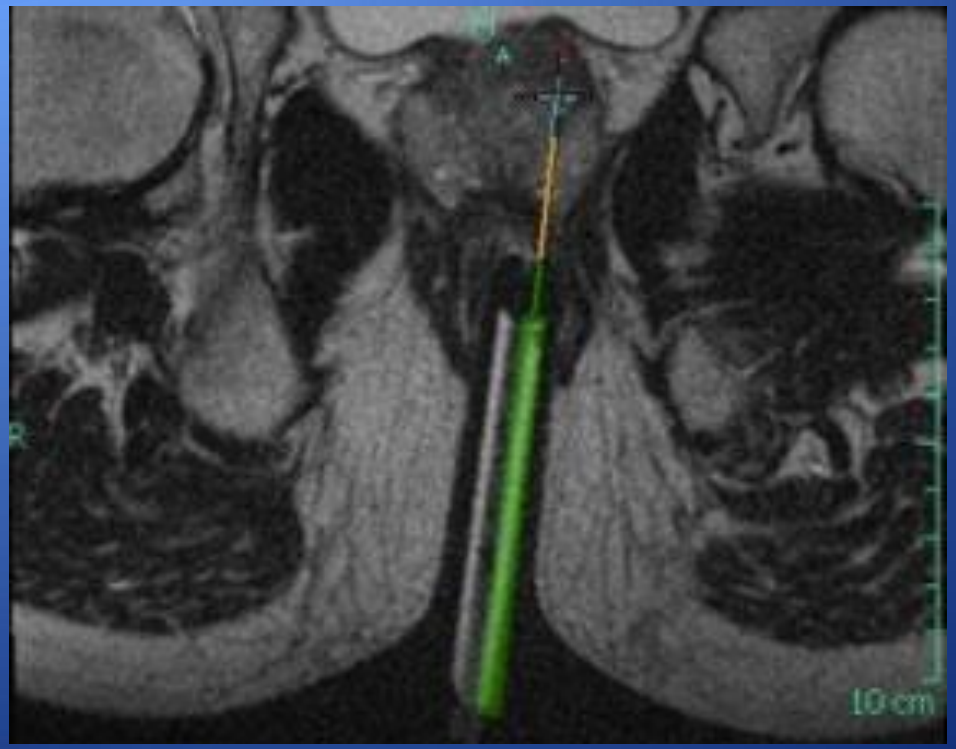
PROMIS Trial : MRI – Fusion vs TRUS – Guided Biopsies

- ‘Negative’ MRI as a triage test would avoid a biopsy in 27% men with 2% fewer Cases of clinically significant cancer detected

- ‘Positive’ MRI with only targeted biopsies would detect 3% more clinically significant cancers compared to TRUS-biopsy

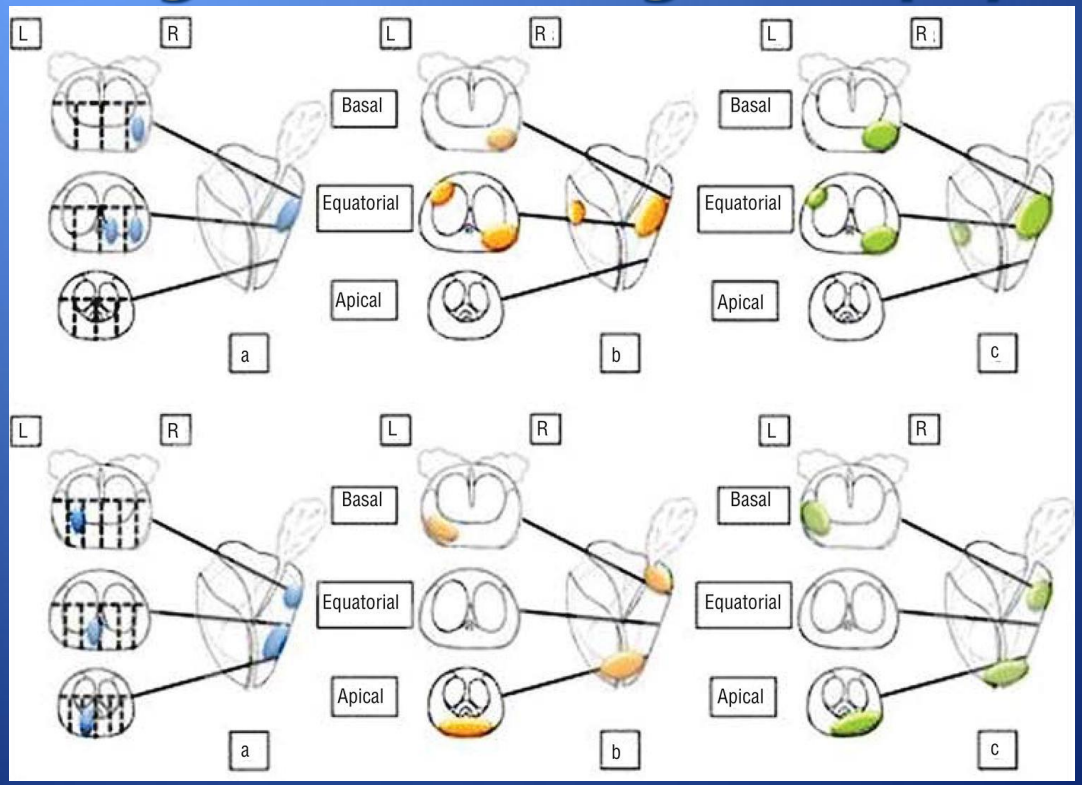
MRI κατευθυνόμενη βιοψία

- in bore MRI target biopsy (MRI-TB)



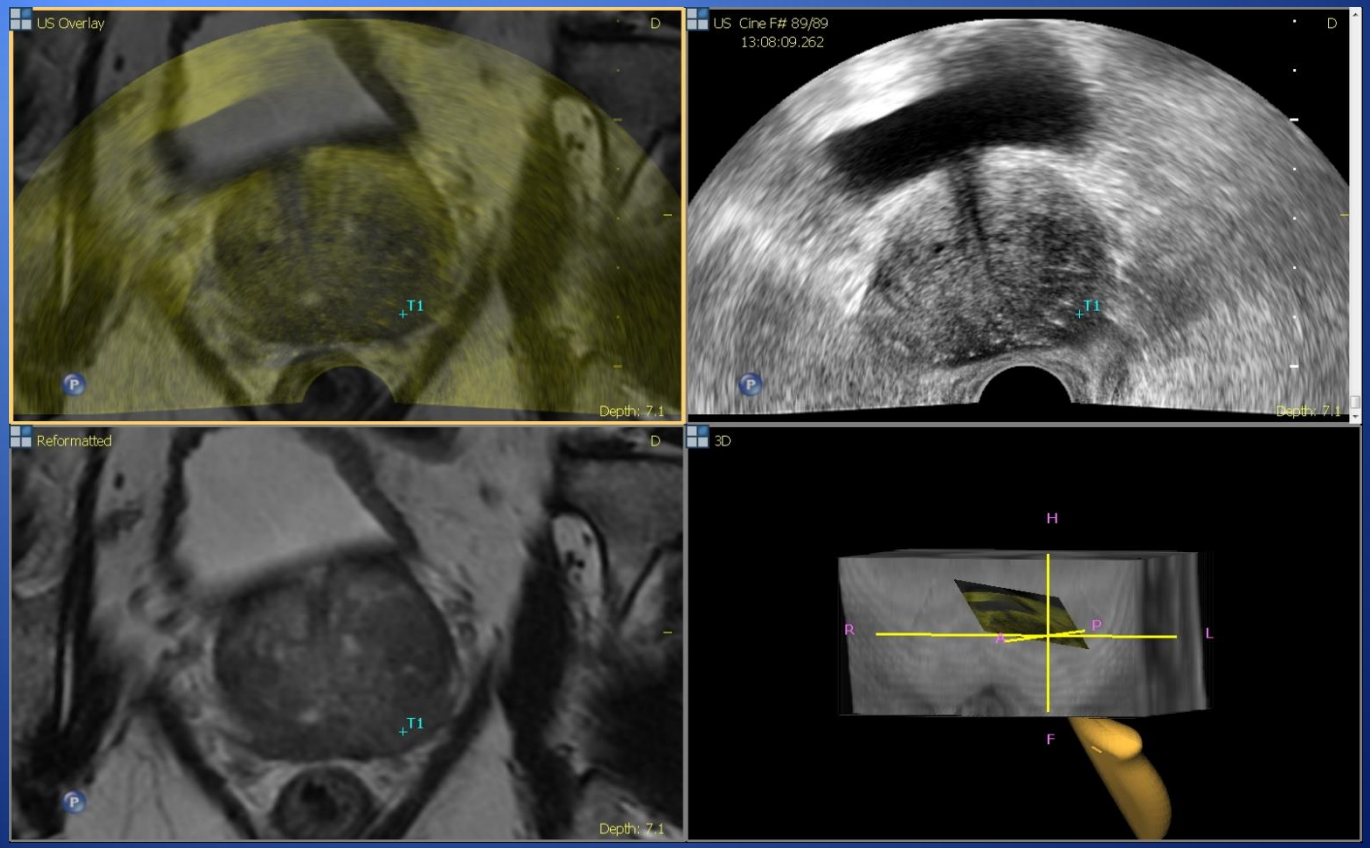
MRI κατευθυνόμενη βιοψία

- Cognitive registration target biopsy (COG – TB)



MRI κατευθυνόμενη βιοψία

- MRI / US fusion target biopsy (FUS – TB)

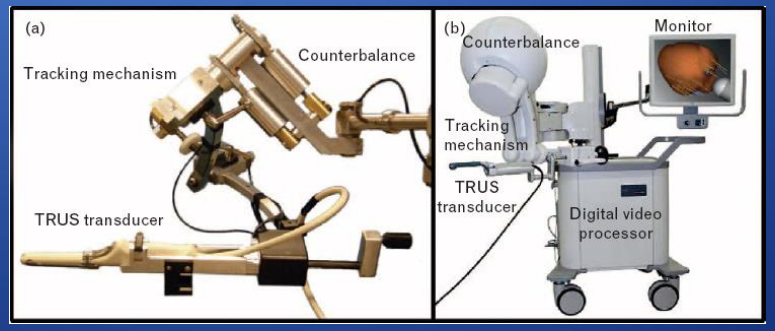


Τεχνολογίες παρακολούθησης – εντοπισμού Tracking Modalities

Electro Magnetic - GPS

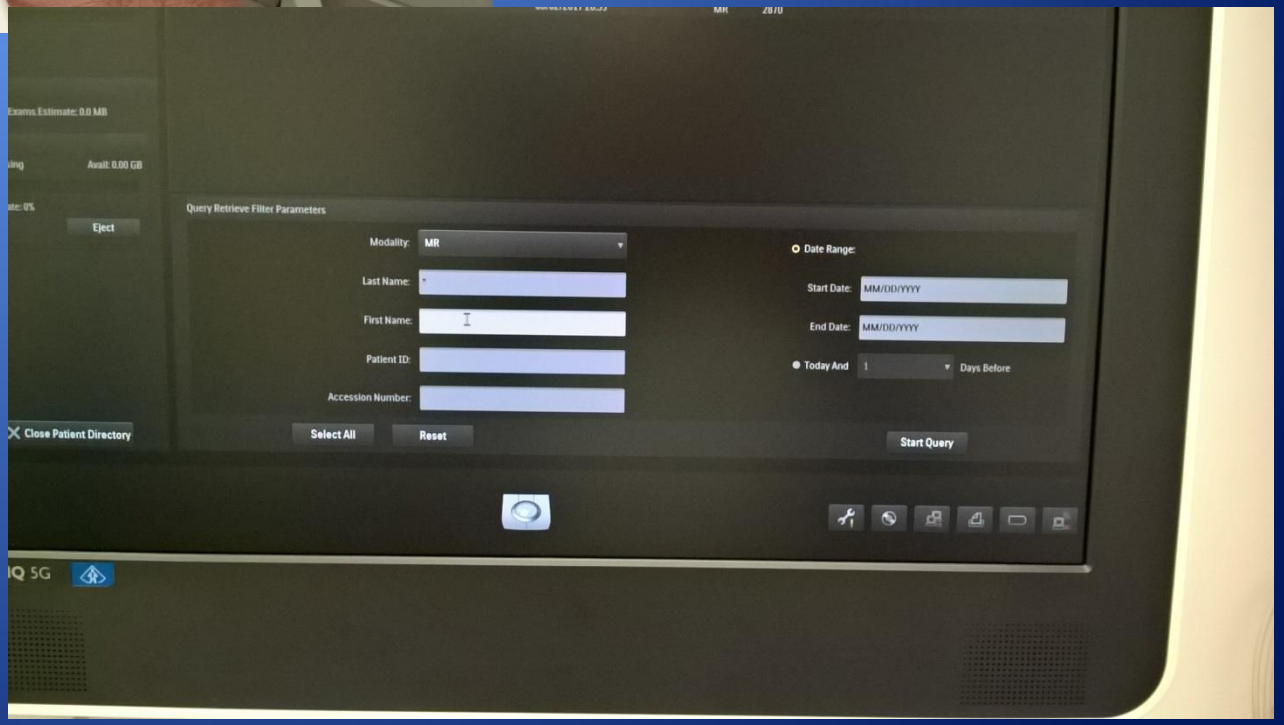
Image Based(Koelis)

Position Encoded Joints




PHILIPS


biotronik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Avail: 0.00 GB
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Query Retrieve Filter Parameters
Modality:
MR
Last Name:
First Name:
Patient ID:
Accession Number:
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MM/DD/YYYY
End Date:
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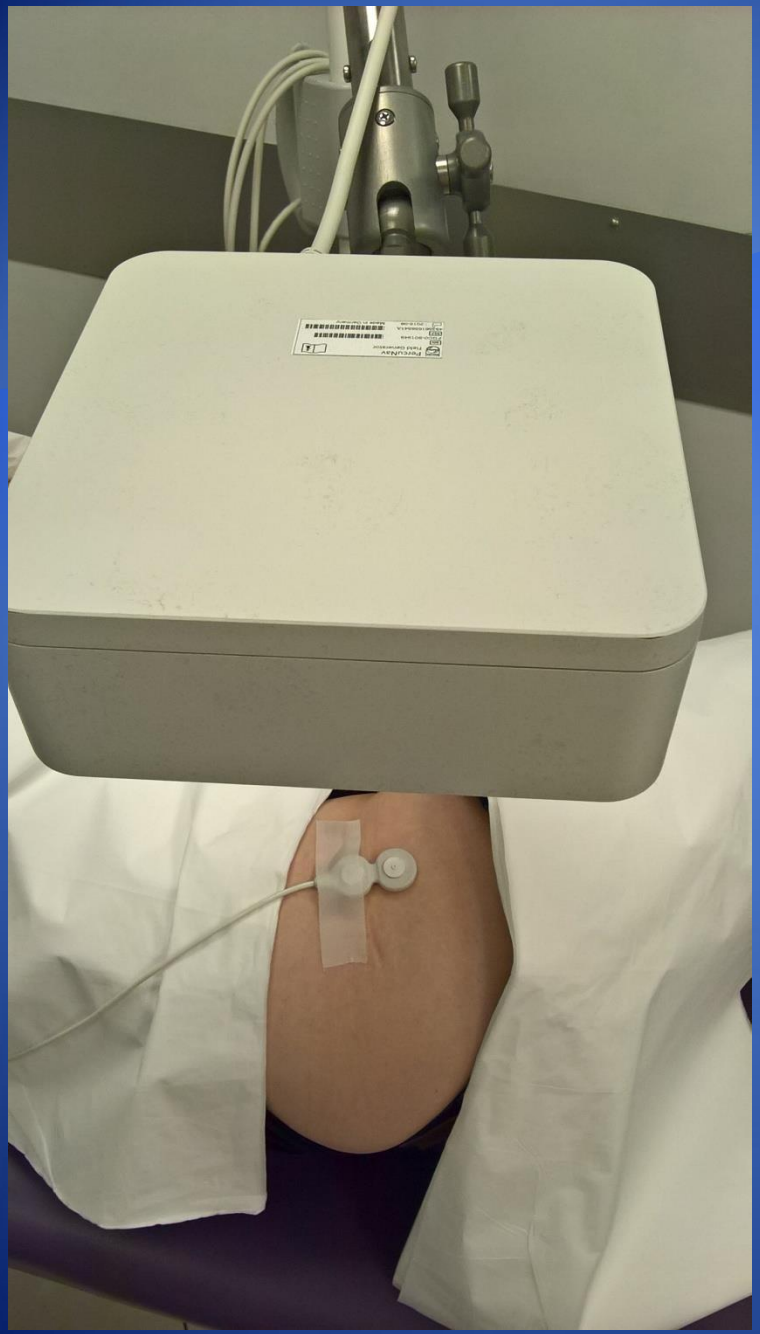
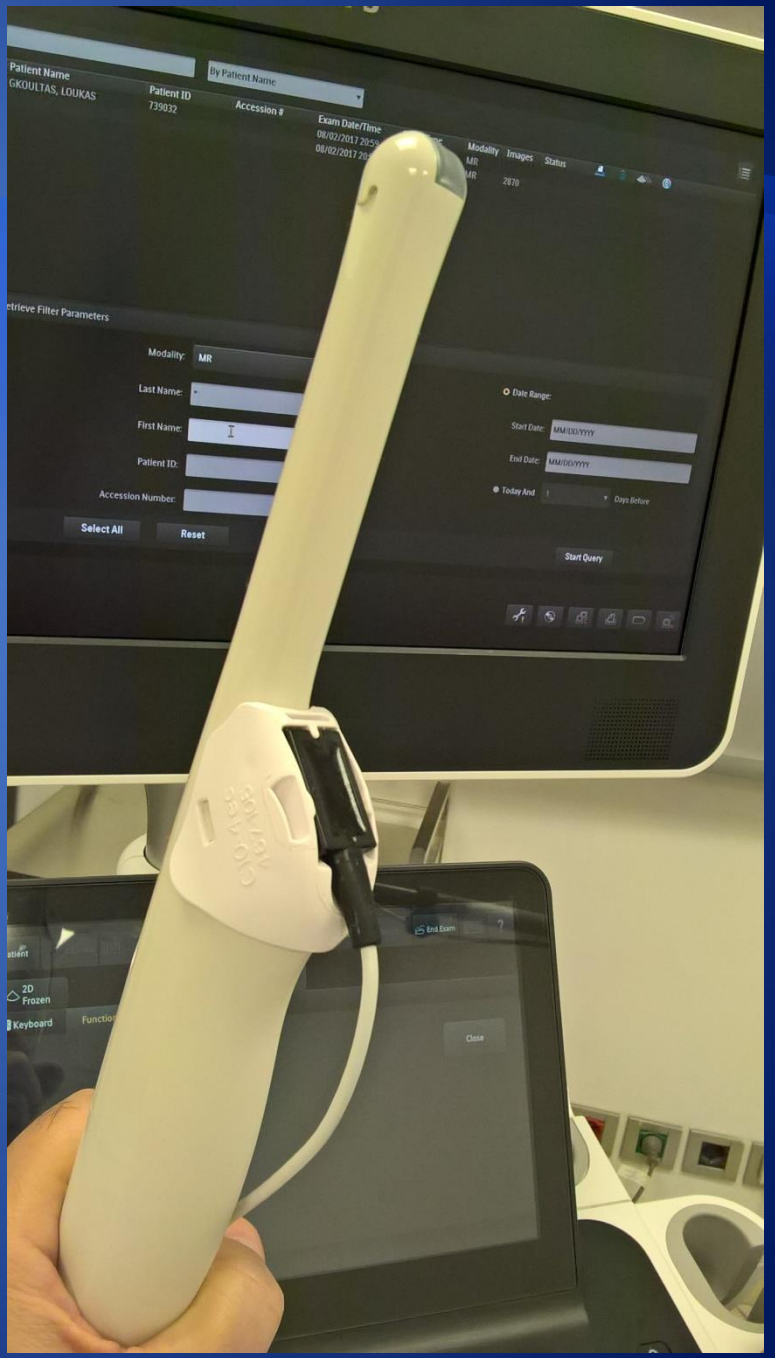
1
Days Before
Close Patient Directory
Select All
Reset
Start Query

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GKOULTAS, LOUKAS
Patient ID
739032
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By Patient Name
Exam Date/Time
Modality
Images
Status
MR
2870
Modality:
MR
Last Name:
First Name:
Patient ID:
Accession Number:
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Days Before
Start Query
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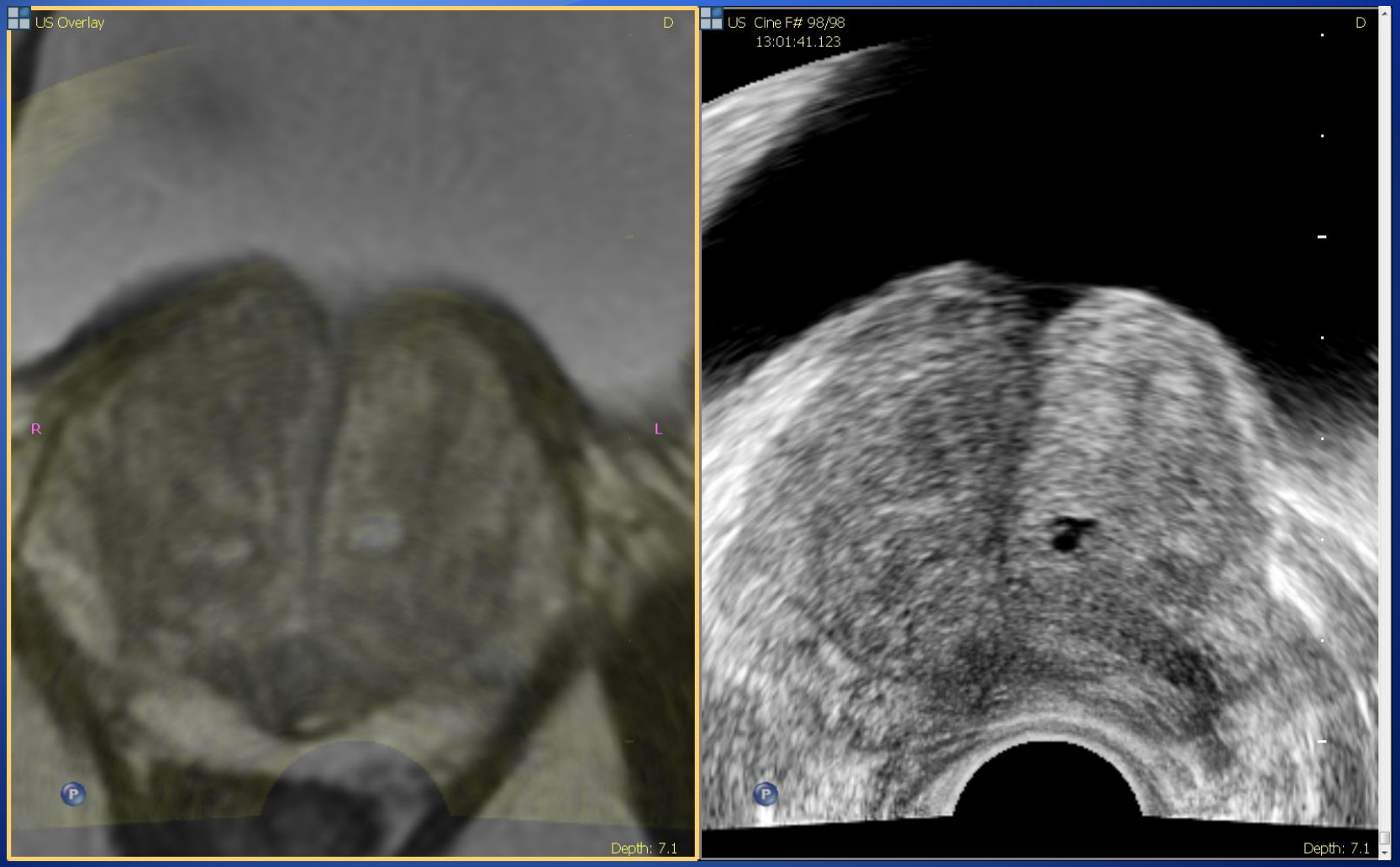
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D
R
L
Depth: 7.1
US Cine F# 98/98
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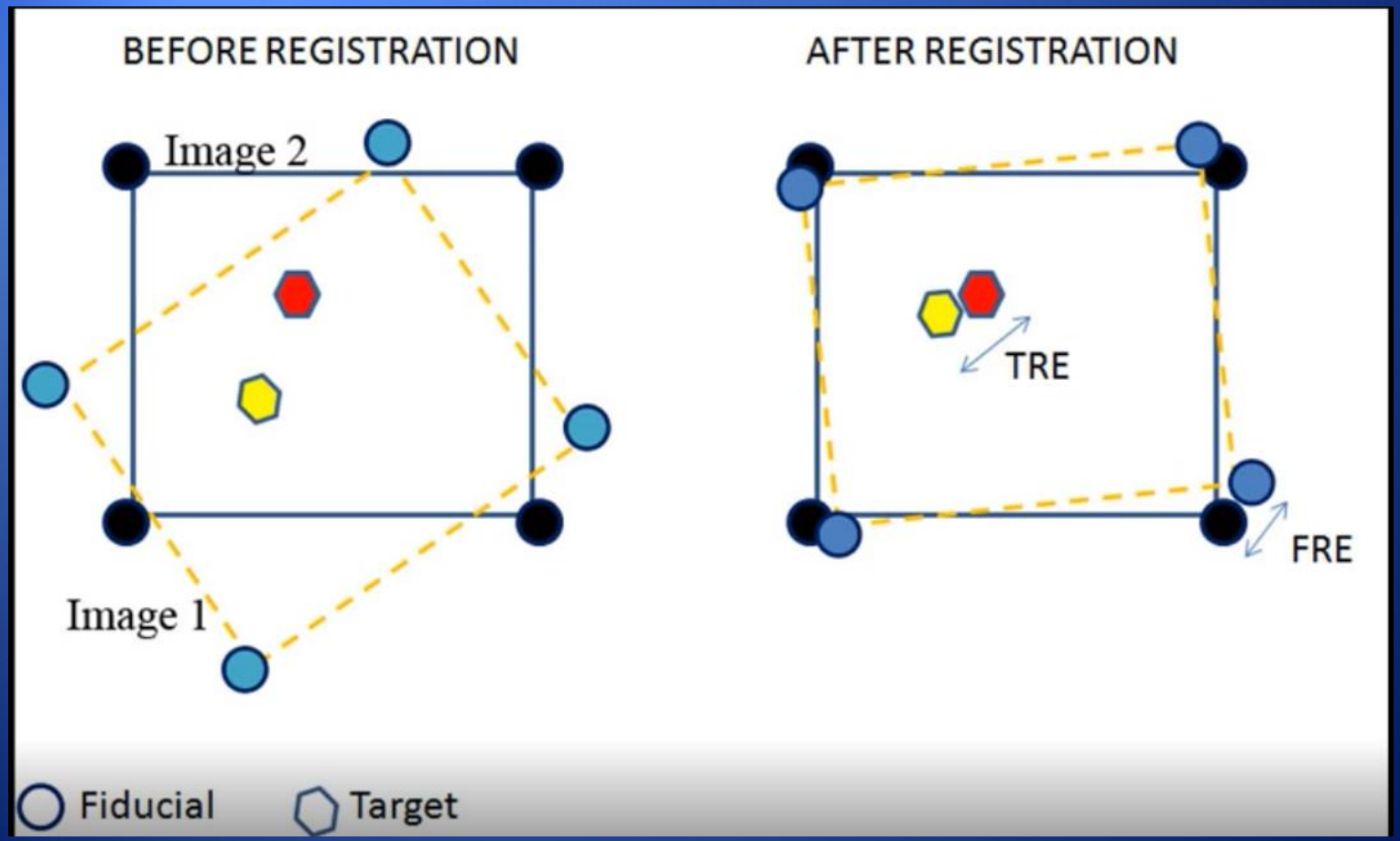
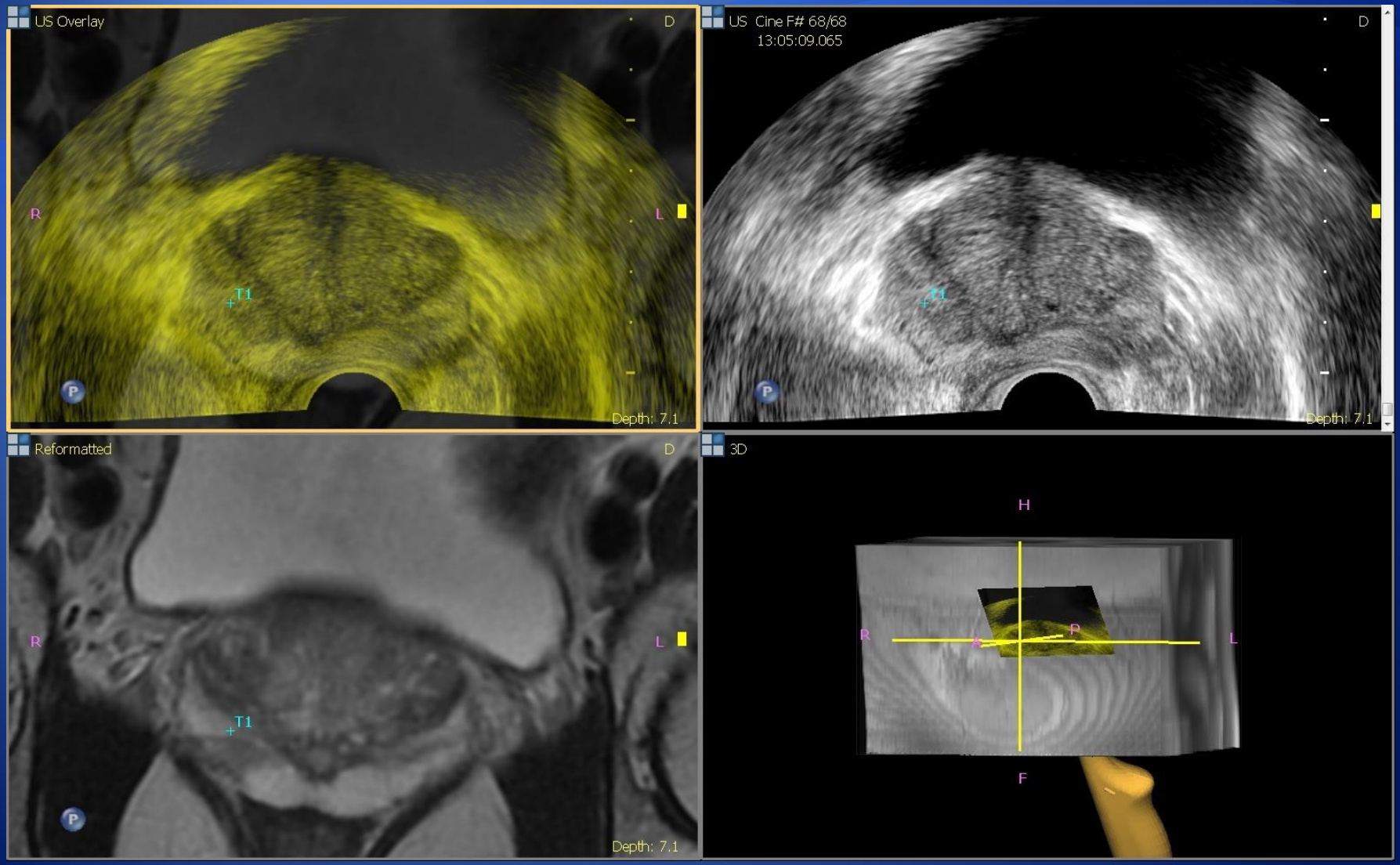
D
Depth: 7.1

MRI κατευθυνόμενη βιοψία

- MRI / US fusion target biopsy (FUS – TB)

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L
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P
Depth: 7.1
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D
T1
P
Depth: 7.1
Reformatted
D
R
L
T1
P
Depth: 7.1
3D
H
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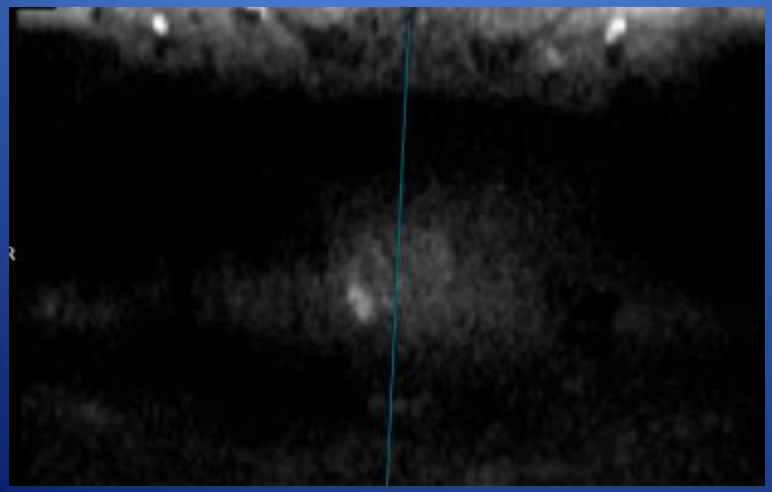
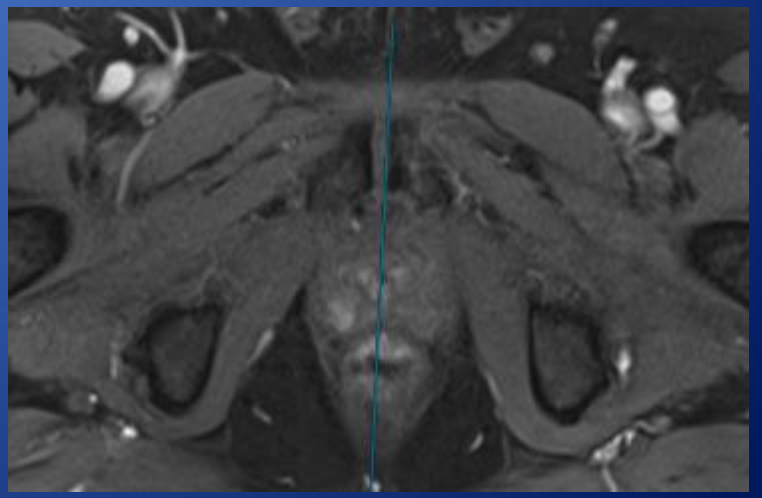
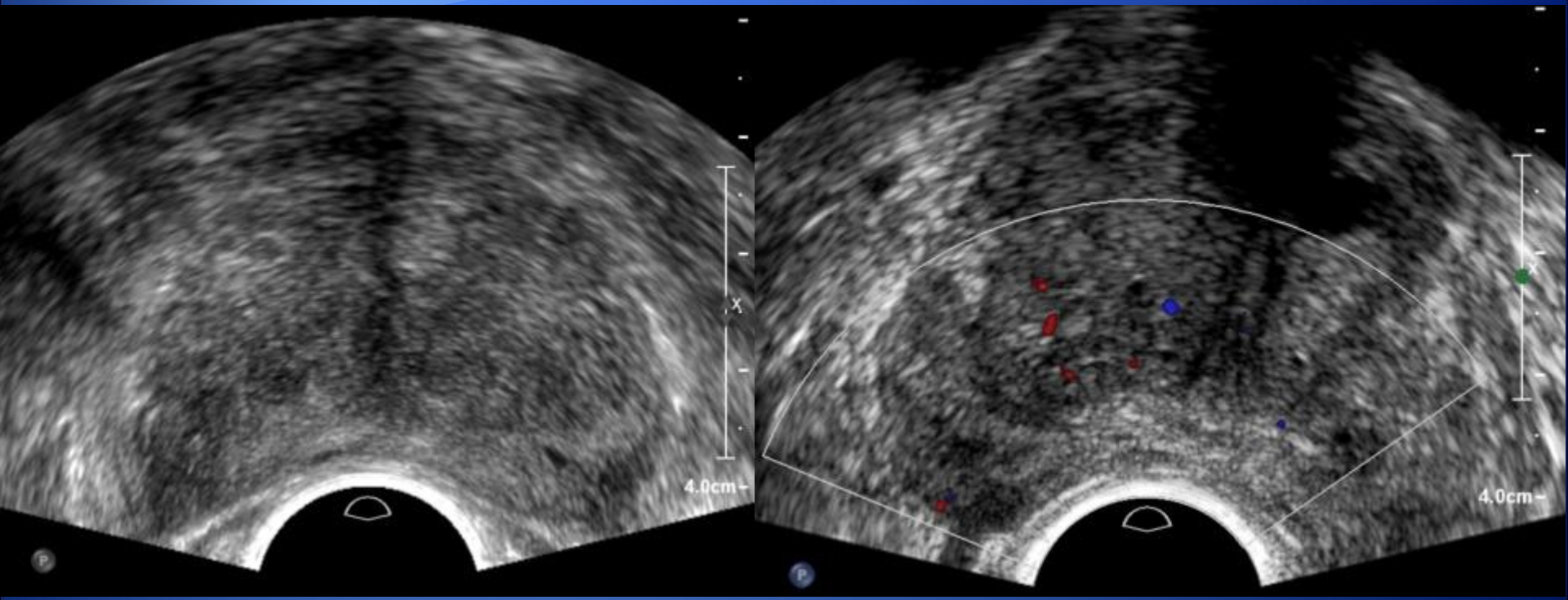
F

73 ετών ● PSA 6.9 ● DRE ΔΕ οζίδιο ● Pi-RADS 4



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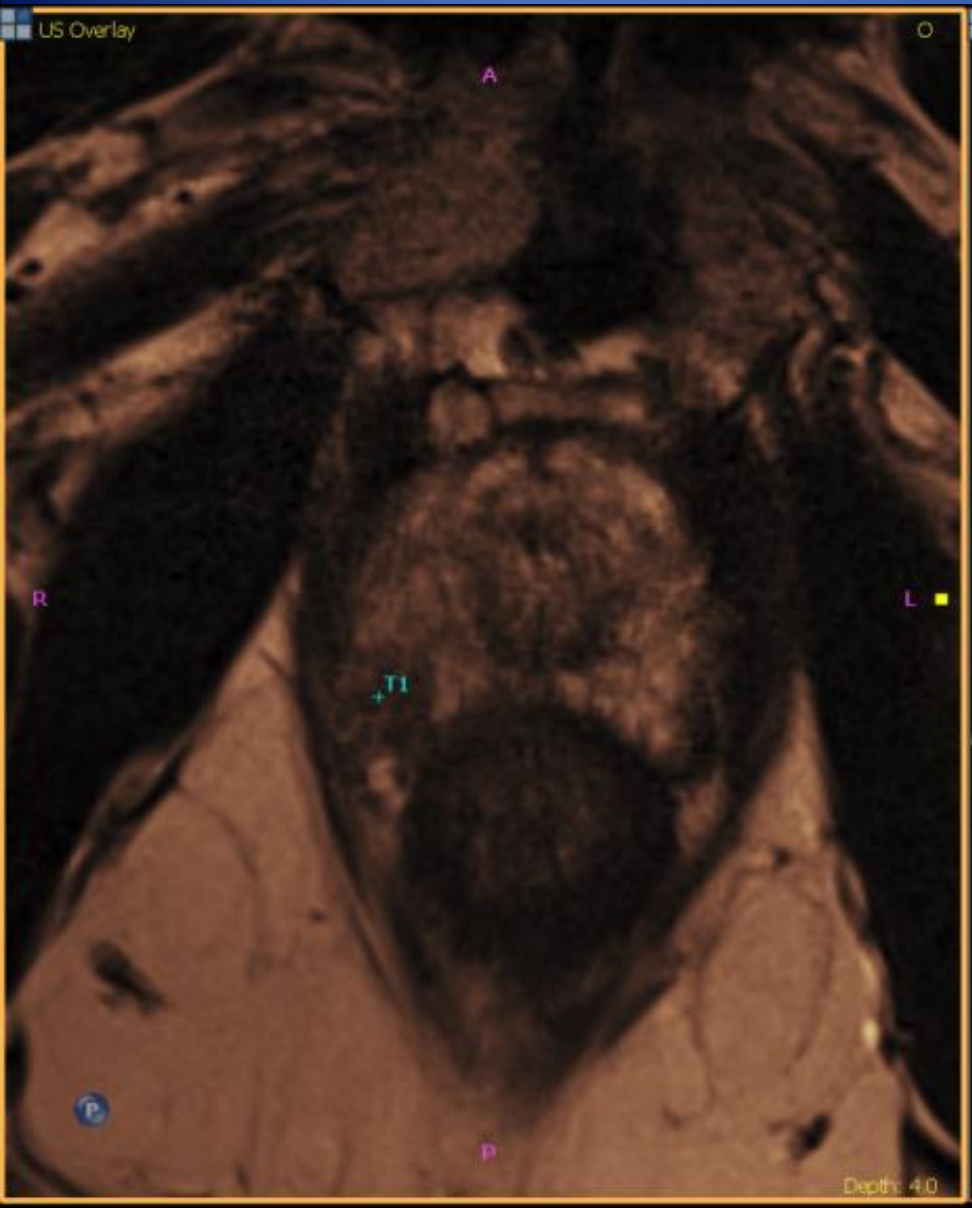
4.0cm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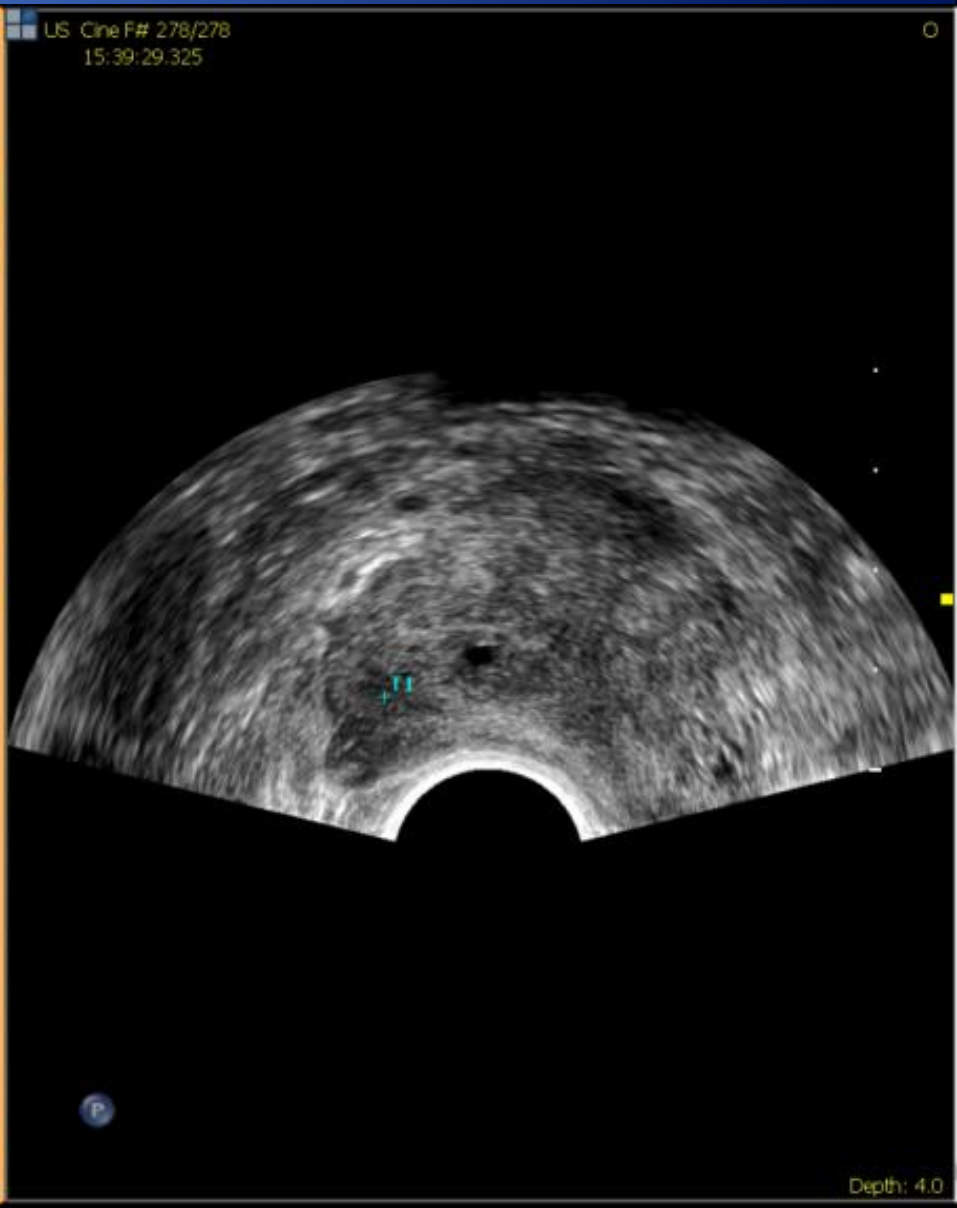
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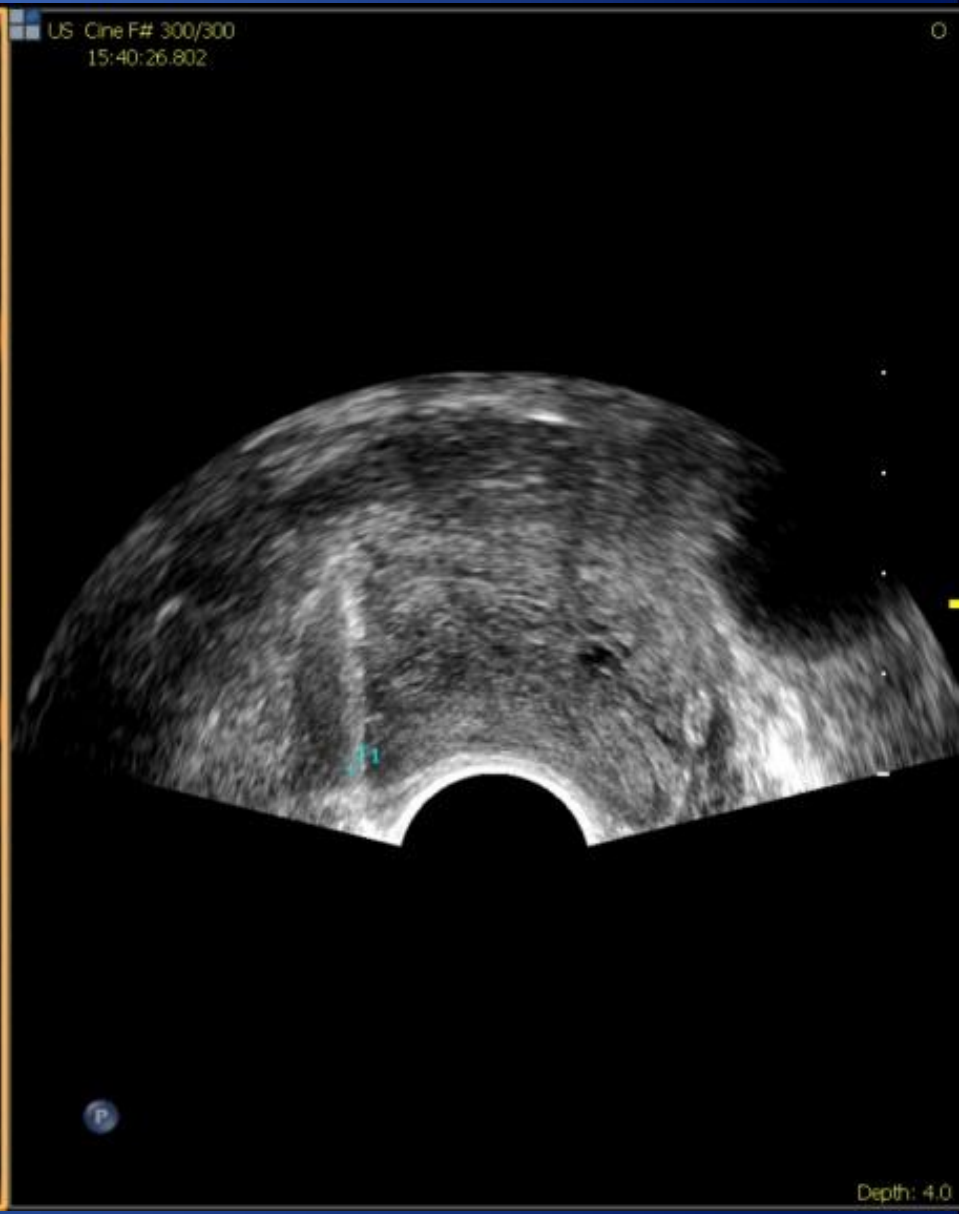
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ΑΠΟΤΕΛΕΣΜΑ ΙΣΤΟΛΟΓΙΚΗΣ ΕΞΕΤΑΣΗΣ

ΑΠΟΤΕΛΕΣΜΑ : ΑΔΕΝΟΚΑΡΚΙΝΩΜΑ

GLEASON SCORE : 3 + 4

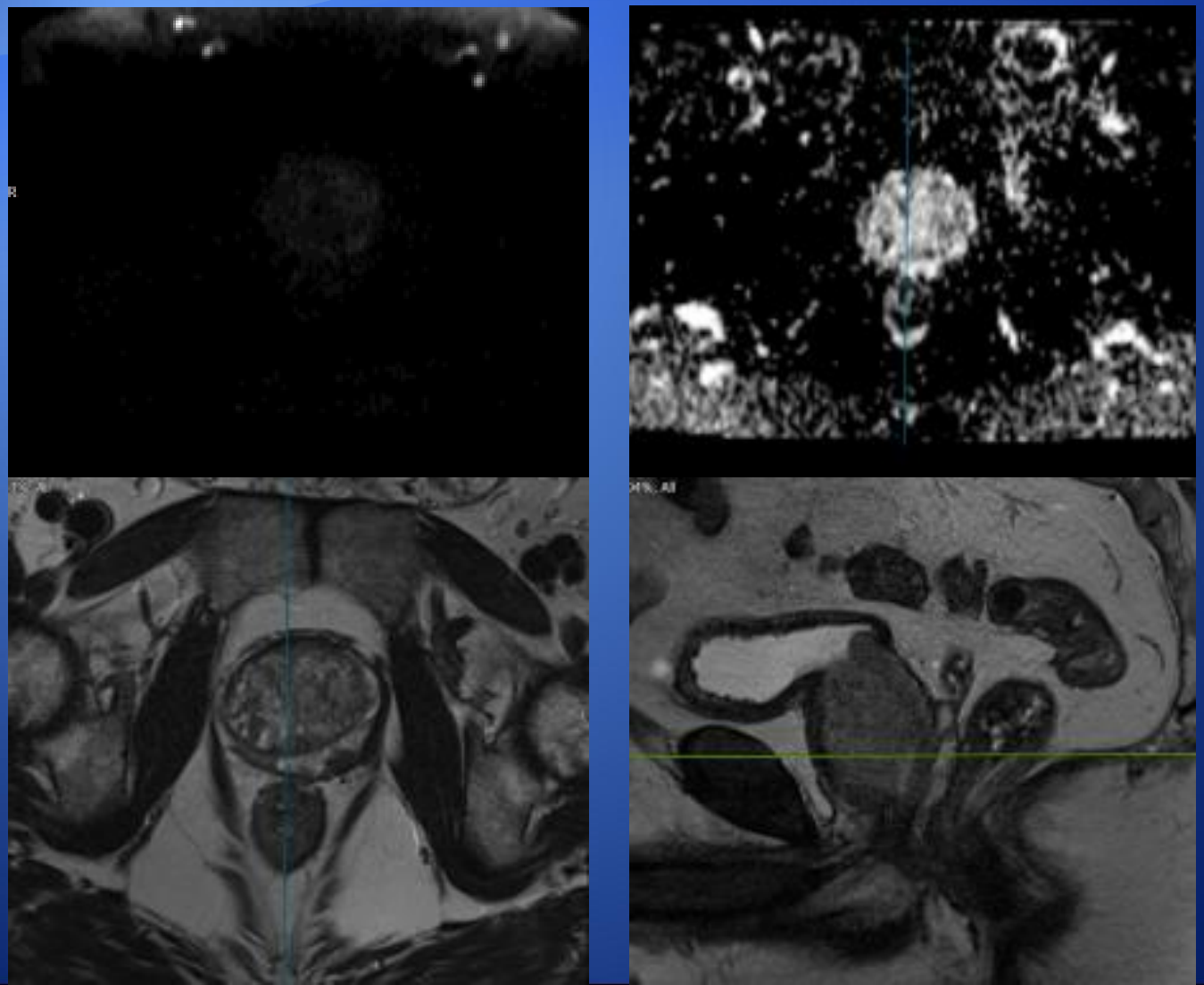
ΑΡΙΘΜΟΣ ΔΙΗΘΗΜΕΝΩΝ ΙΣΤΟΤΕΜΑΧΙΩΝ / ΣΥΝΟΛΟ
ΔΕ : 2/6
ΑΡ : 2/6
ΣΤΟΧΟΣ : 3/4

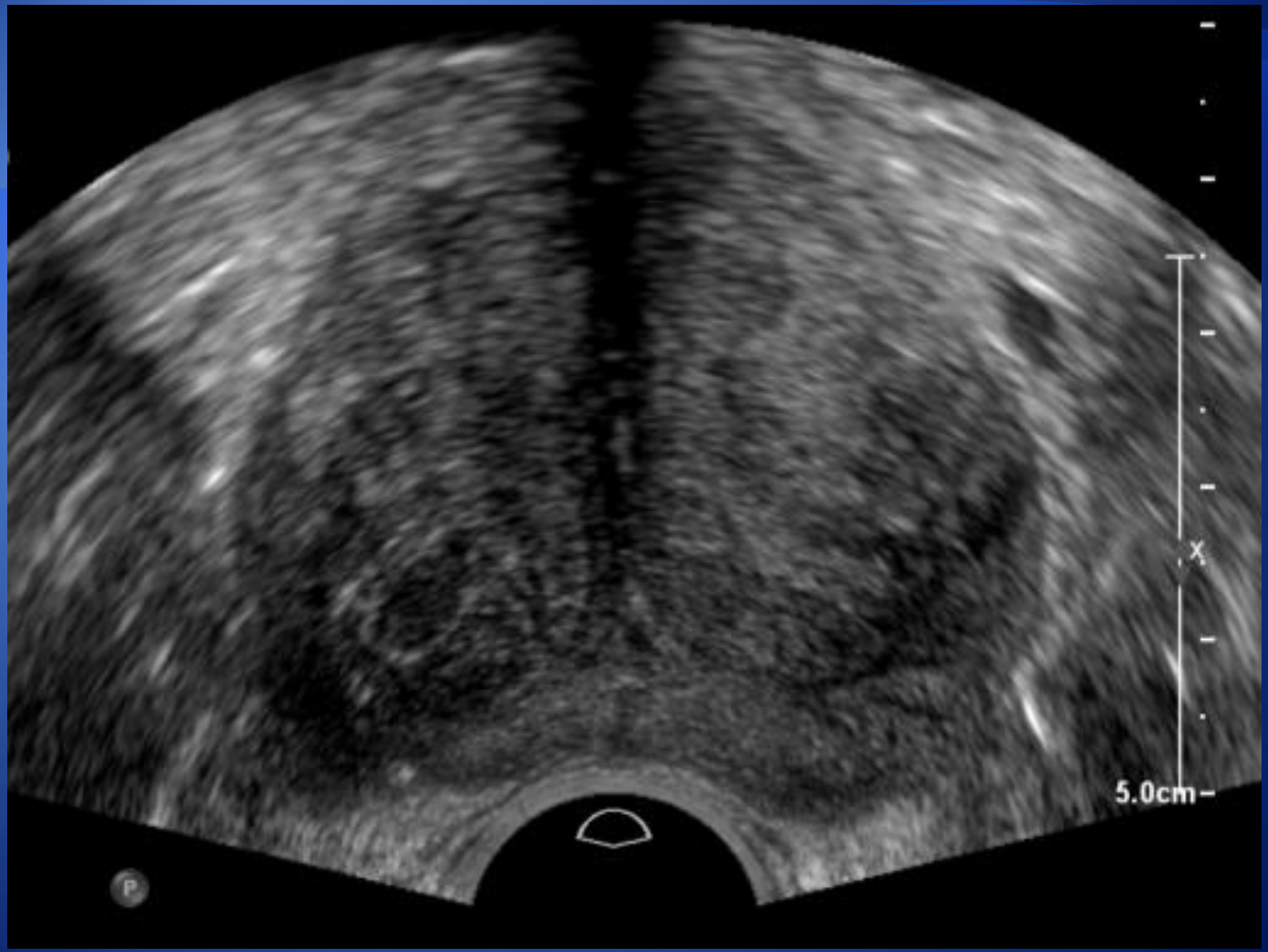
ΜΕΓΕΘΟΣ ΟΓΚΟΥ
ΔΕ : 15 %
ΑΡ : 1 %
ΣΤΟΧΟΣ : 25 %

Πλεονεκτήματα της Βιοψίας με US / MRI Fusion

1. Απεικόνιση δυσδιάκριτων εστιών στο US
2. Η απεικόνιση σε διάφορες US τομές αυξάνει την βεβαιότητα της ανίχνευσης της βλάβης

60 yrs ● DRE μαλακός ● PSA 17.2 ● Pi-RADS 4

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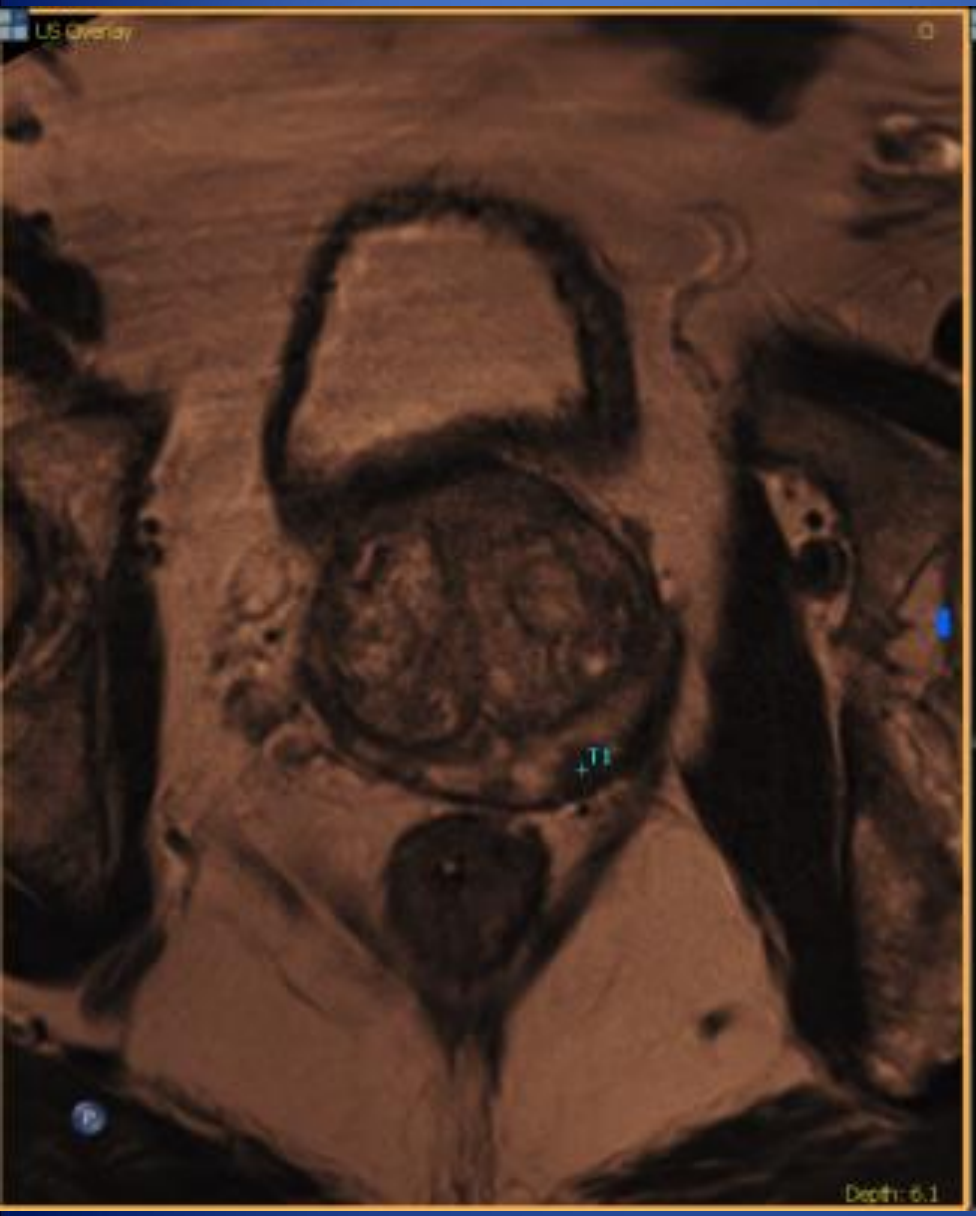
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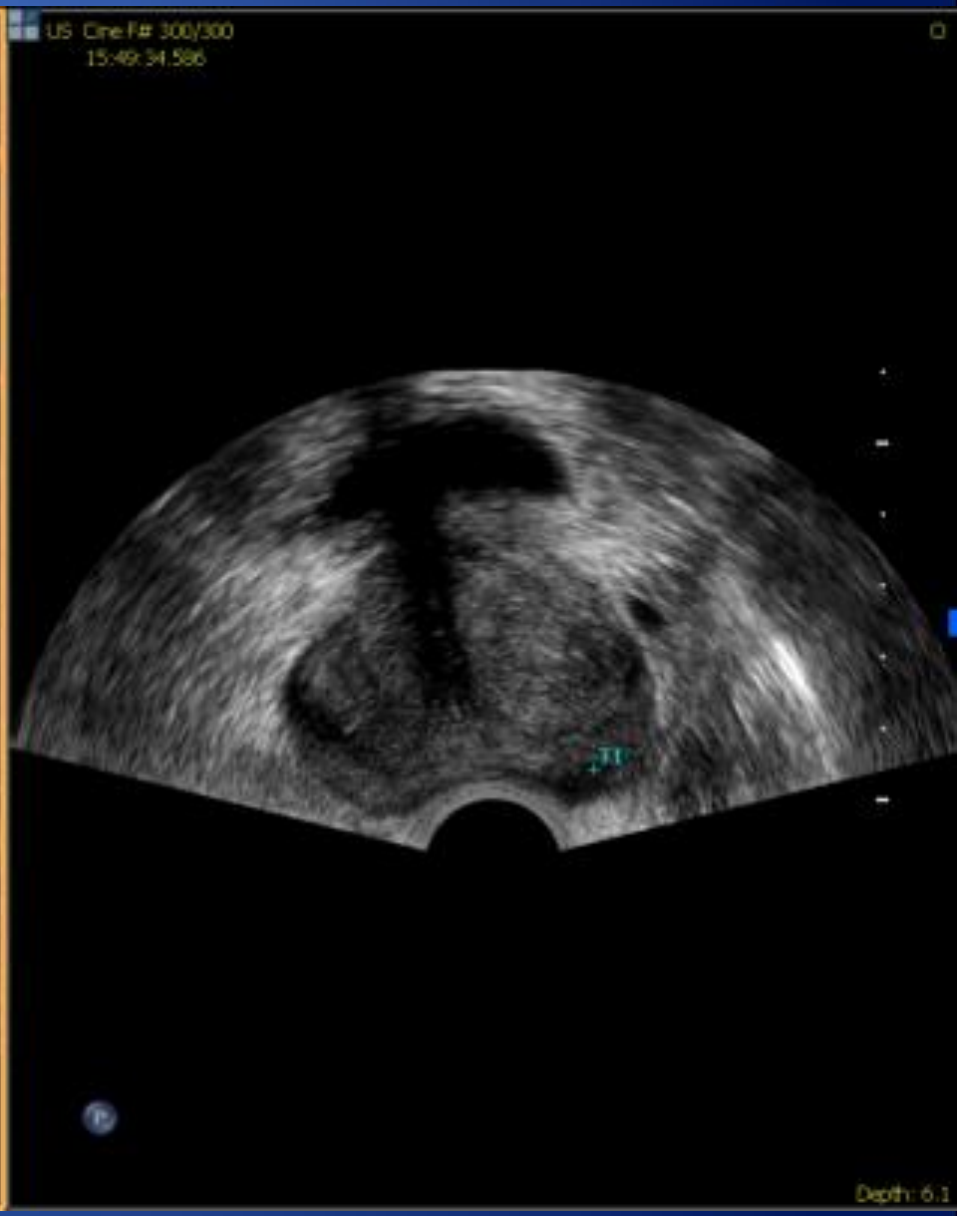
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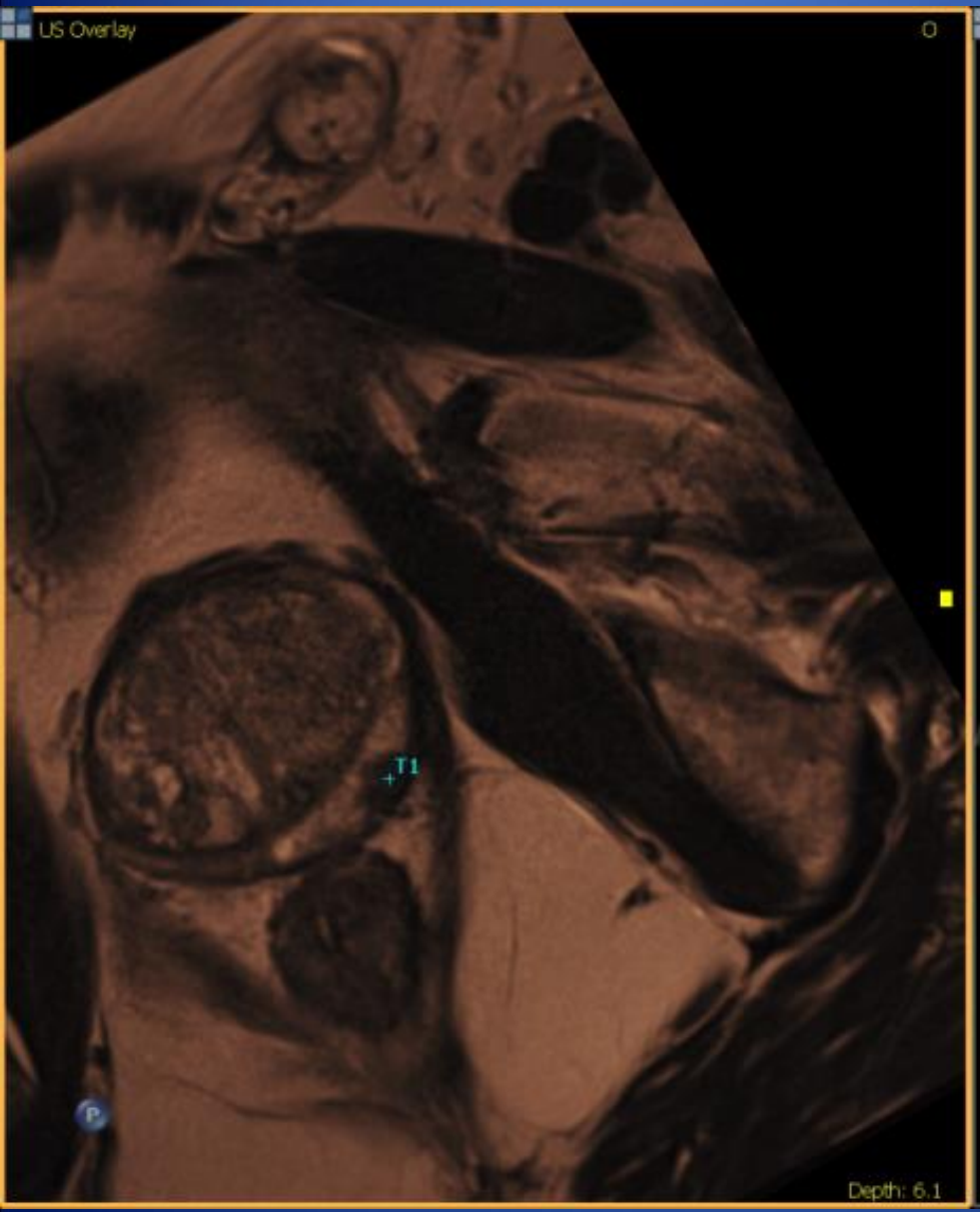
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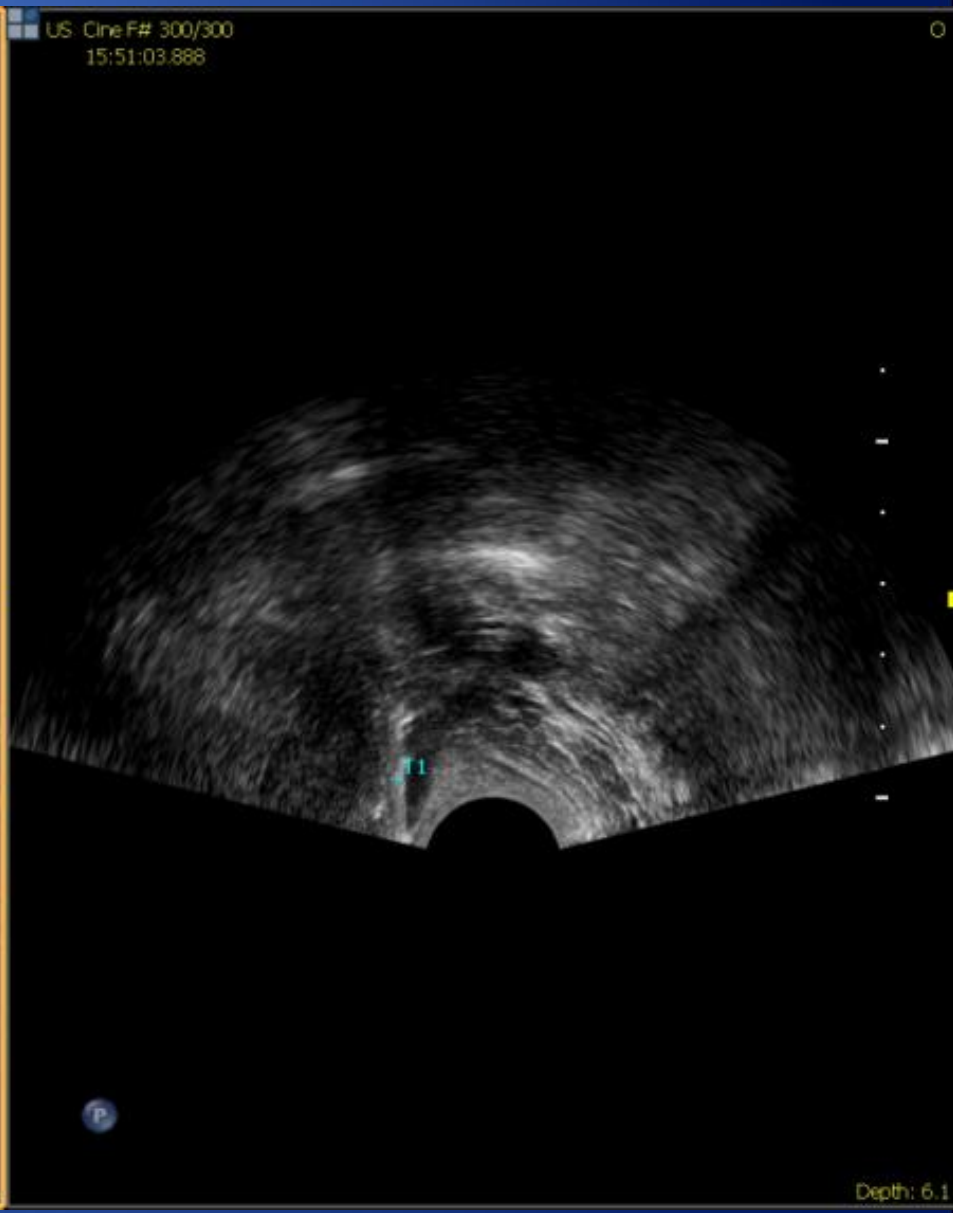
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ΑΠΟΤΕΛΕΣΜΑ ΙΣΤΟΛΟΓΙΚΗΣ ΕΞΕΤΑΣΗΣ

ΑΠΟΤΕΛΕΣΜΑ : ΑΔΕΝΟΚΑΡΚΙΝΩΜΑ

GLEASON SCORE : 3 + 4

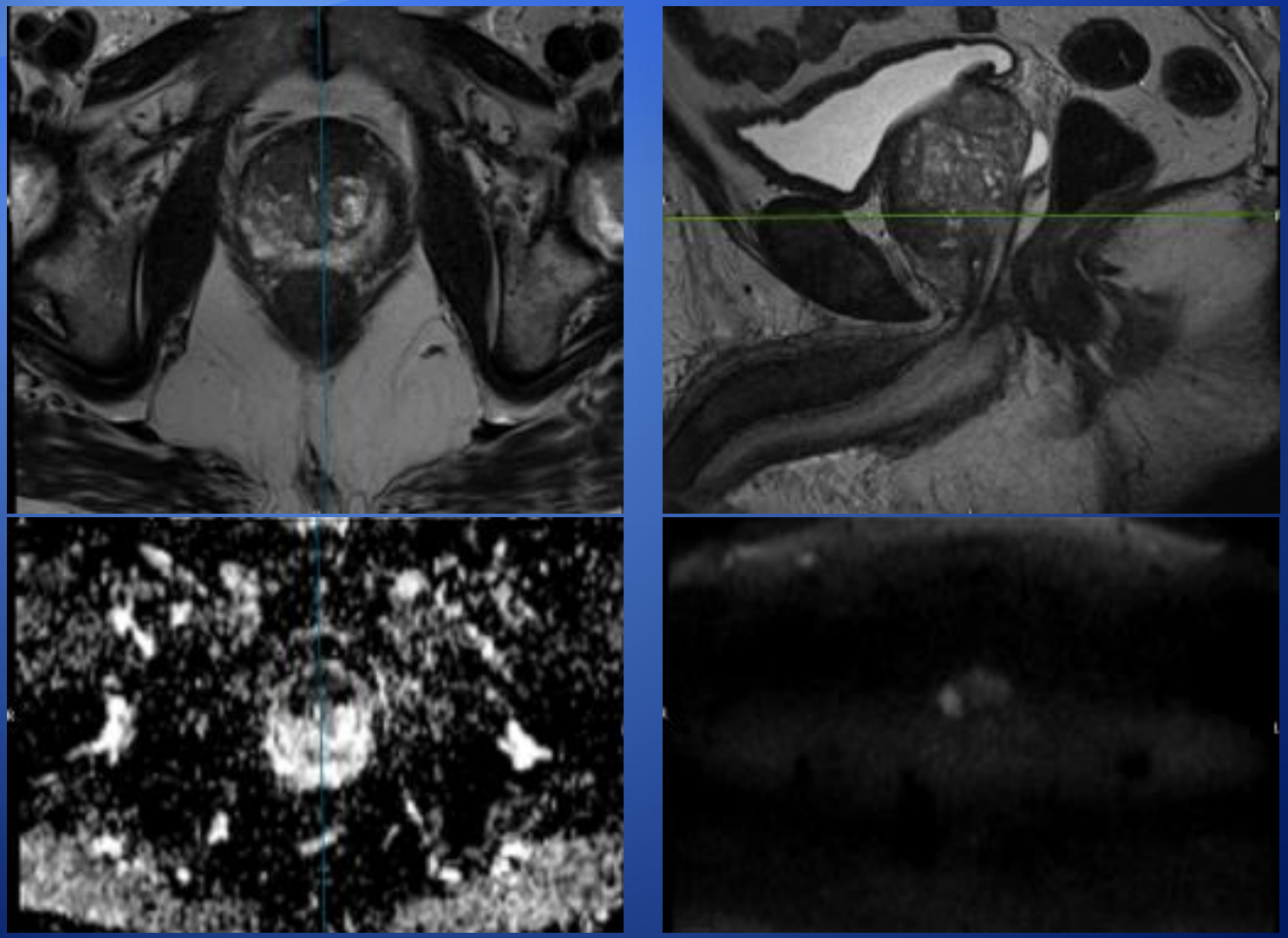
ΑΡΙΘΜΟΣ ΔΙΗΘΗΜΕΝΩΝ ΙΣΤΟΤΕΜΑΧΙΩΝ / ΣΥΝΟΛΟ
ΔΕ : 0/6
ΑΡ : 2/6
ΣΤΟΧΟΣ : 4/4

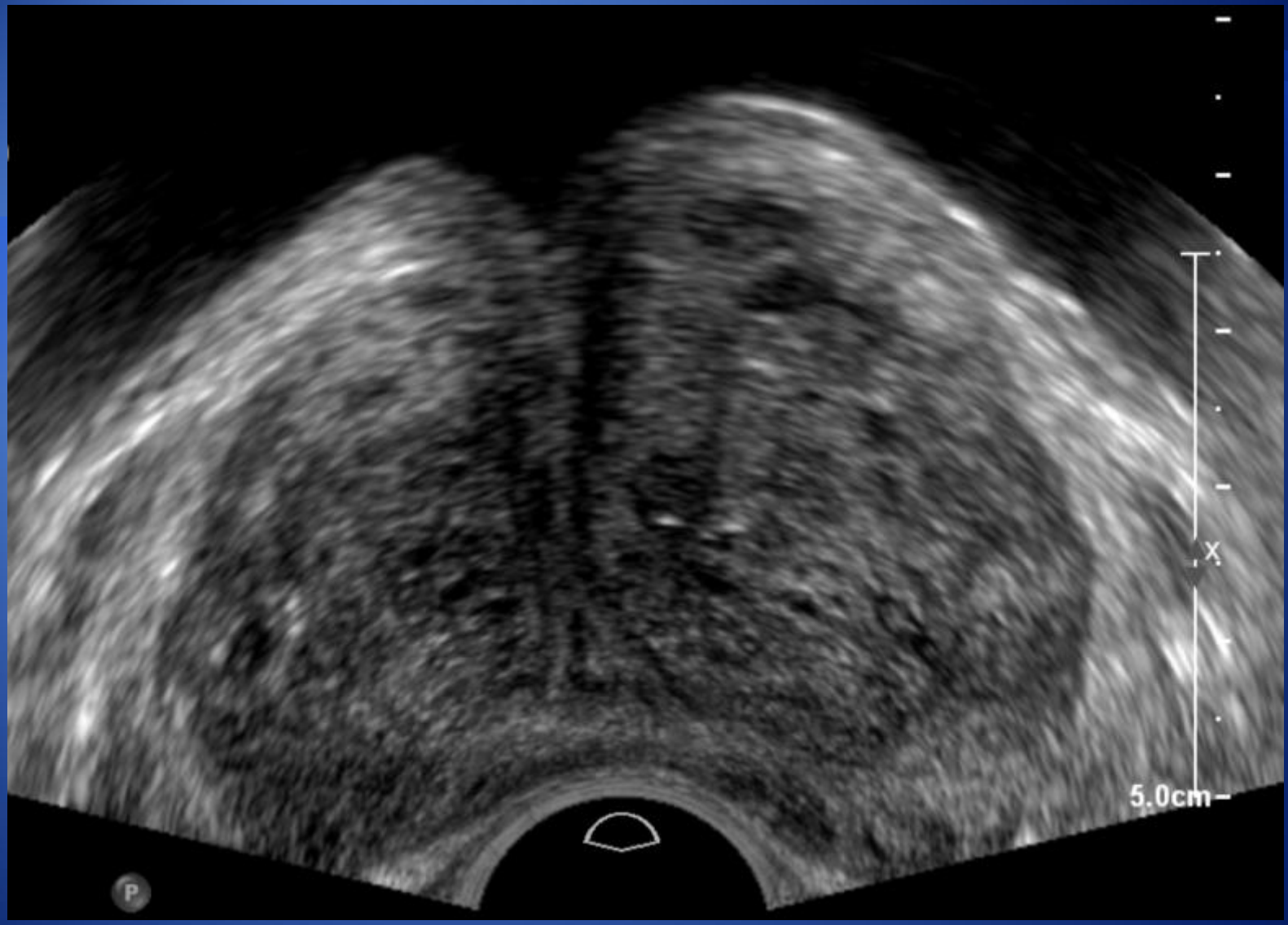
ΜΕΓΕΘΟΣ ΟΓΚΟΥ
ΔΕ : 0 %
ΑΡ : 15 %
ΣΤΟΧΟΣ : 50 %

Πλεονεκτήματα της Βιοψίας με US / MRI Fusion

1. Απεικόνιση μη ορατών εστιών στο US
2. Βεβαιότητα λήψης υλικού από την βλάβη

75 ετών ● DRE υπερτροφία ● PSA 7.2 ● Pi-RADS 5

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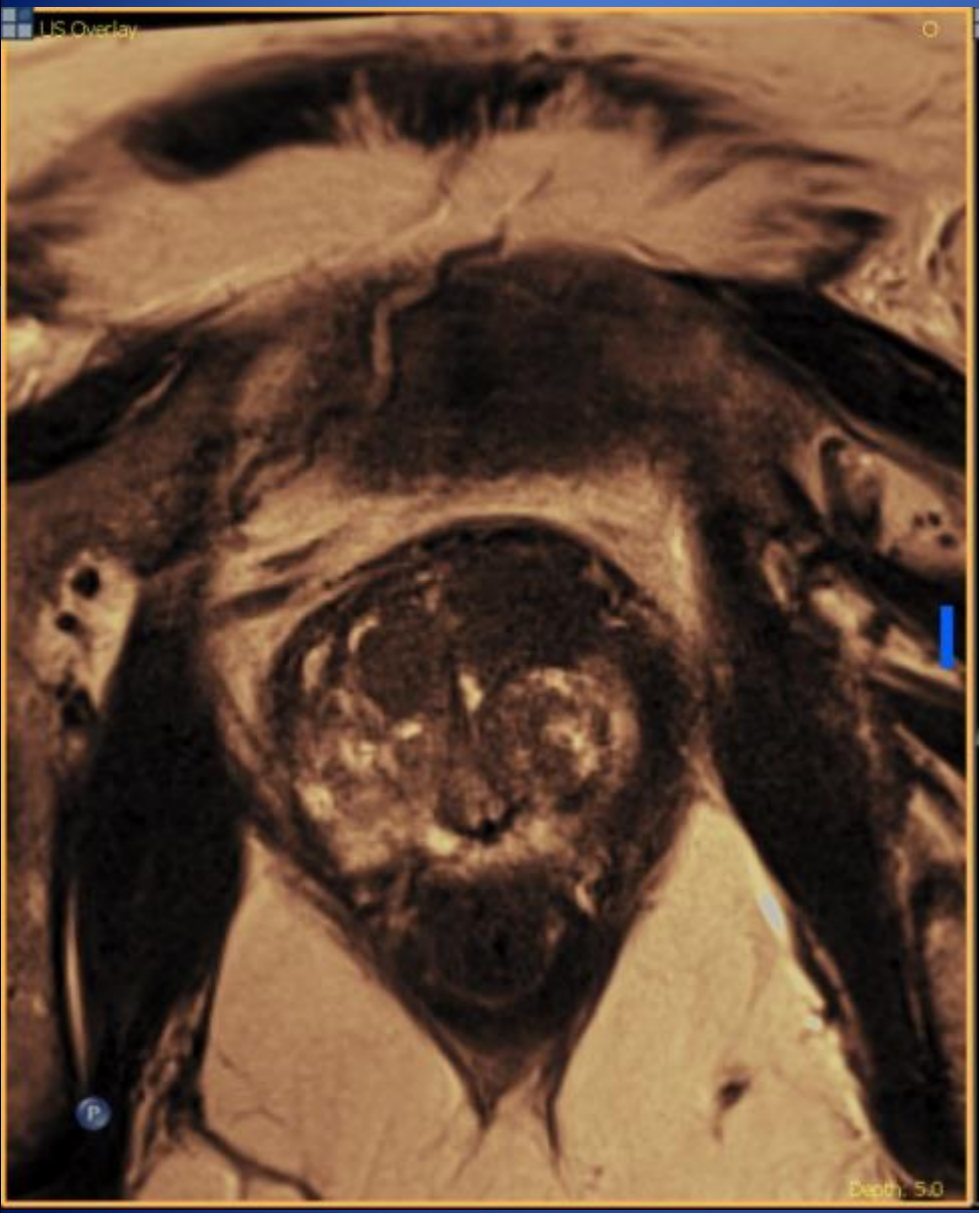
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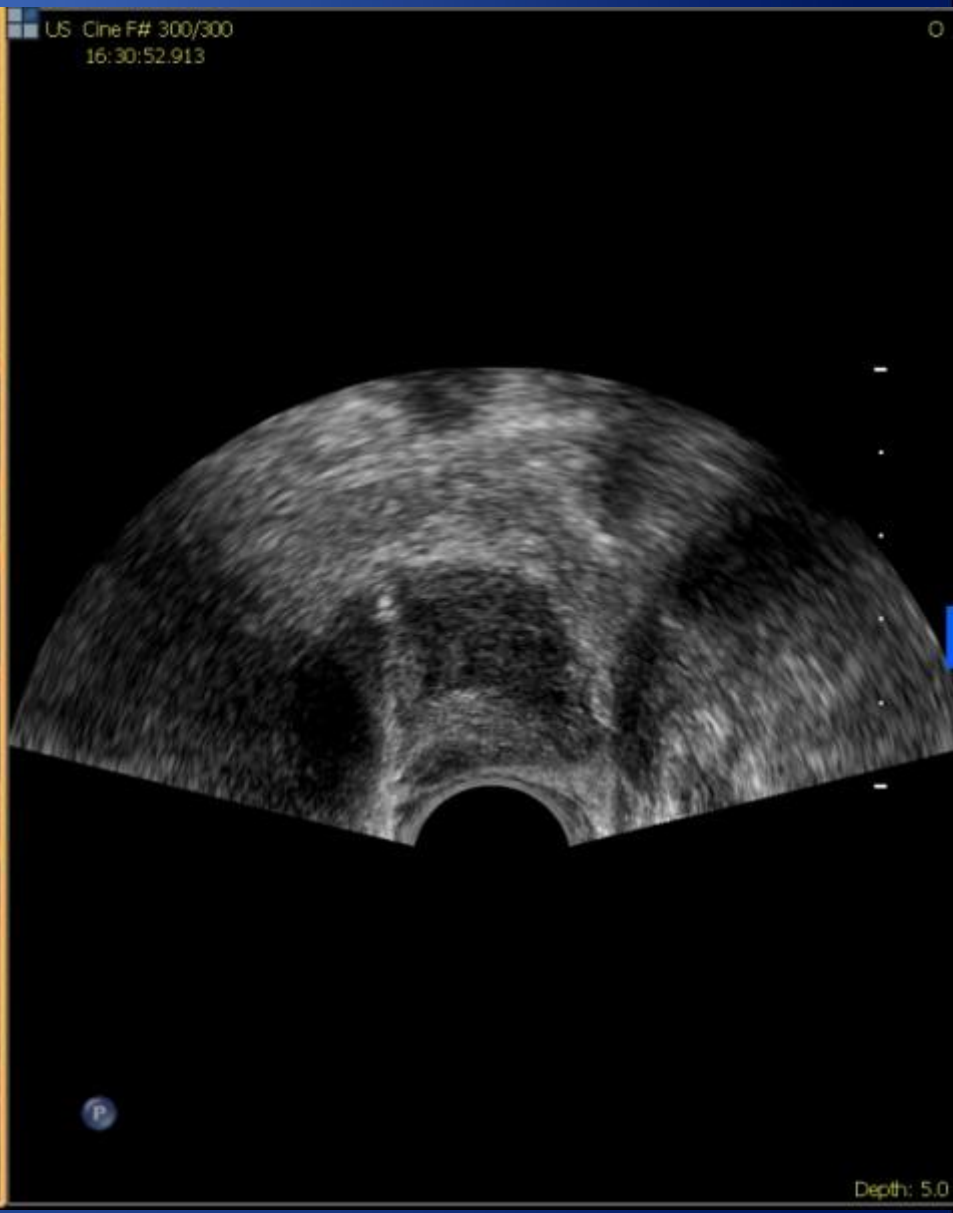
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ΑΠΟΤΕΛΕΣΜΑ ΙΣΤΟΛΟΓΙΚΗΣ ΕΞΕΤΑΣΗΣ

ΑΠΟΤΕΛΕΣΜΑ : ΑΔΕΝΟΚΑΡΚΙΝΩΜΑ

GLEASON SCORE : 3 + 4

ΑΡΙΘΜΟΣ ΔΙΗΘΗΜΕΝΩΝ ΙΣΤΟΤΕΜΑΧΙΩΝ / ΣΥΝΟΛΟ
ΔΕ : 2/6
ΑΡ : 2/6
ΣΤΟΧΟΣ : 4/4

ΜΕΓΕΘΟΣ ΟΓΚΟΥ
ΔΕ : 5 %
ΑΡ : 8 %
ΣΤΟΧΟΣ : 70 %

Πλεονεκτήματα της Βιοψίας με US / MRI Fusion

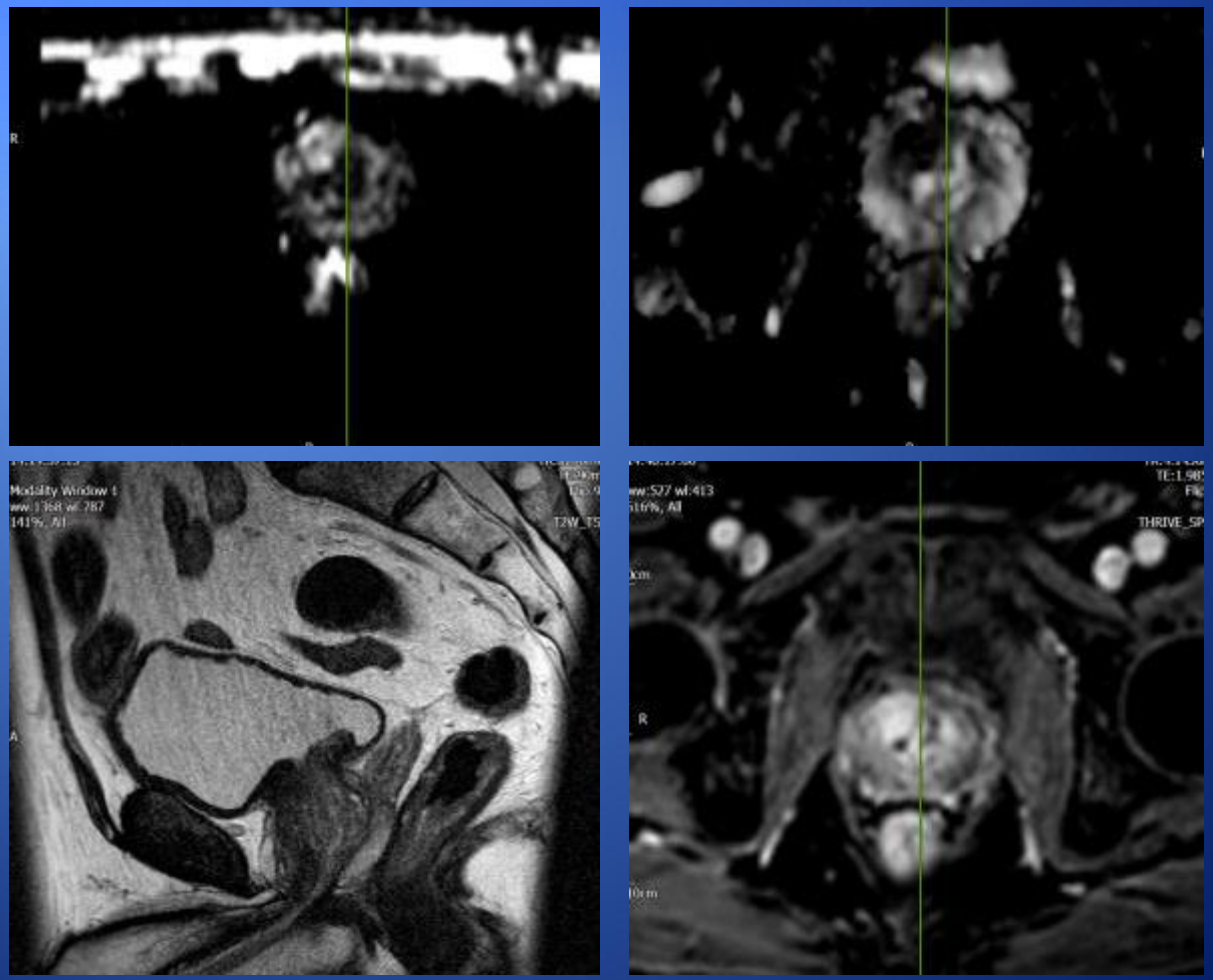
1

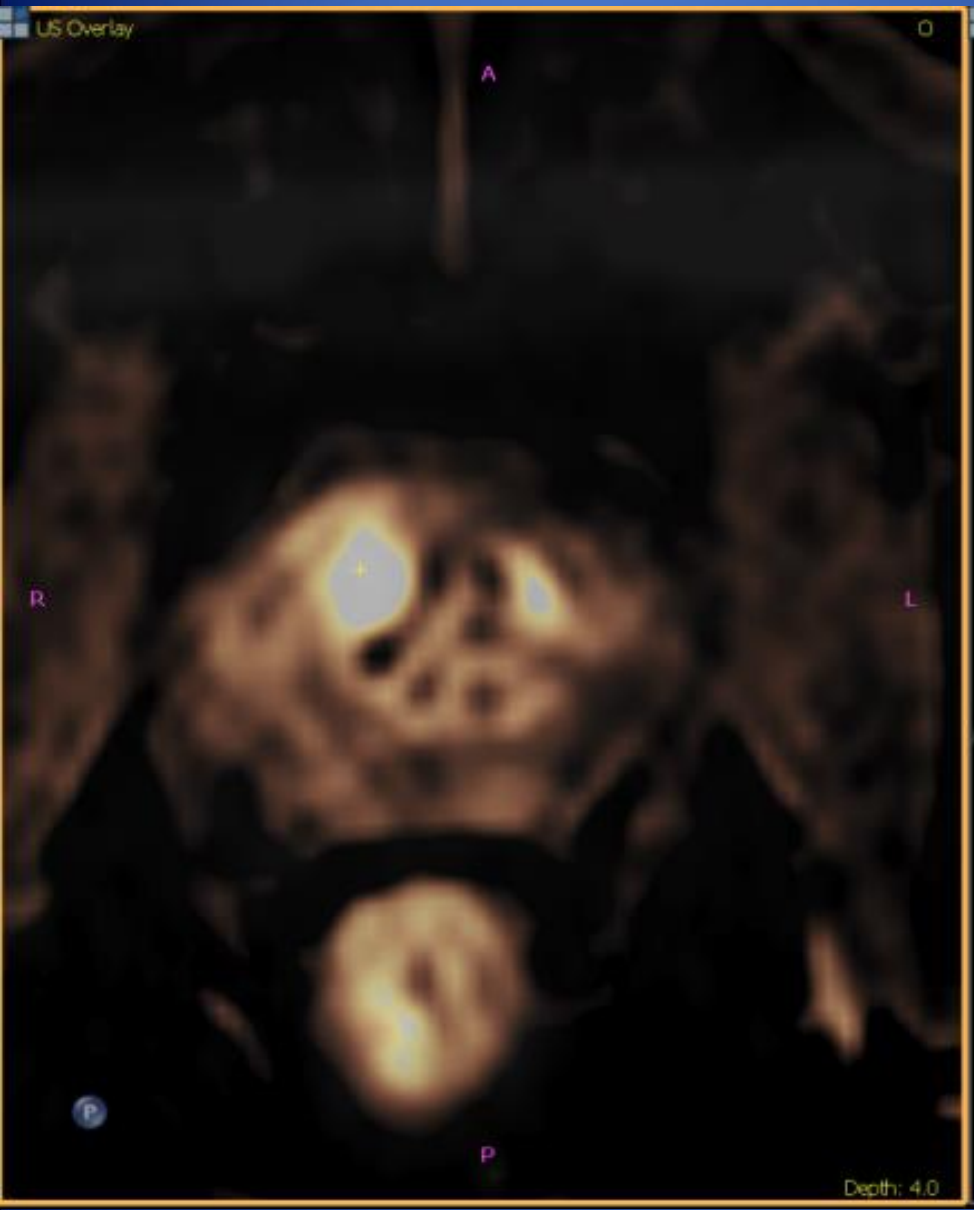
- TRUS :Αδυναμία απεικόνισης εστιών στα πρόσθια τμήματα

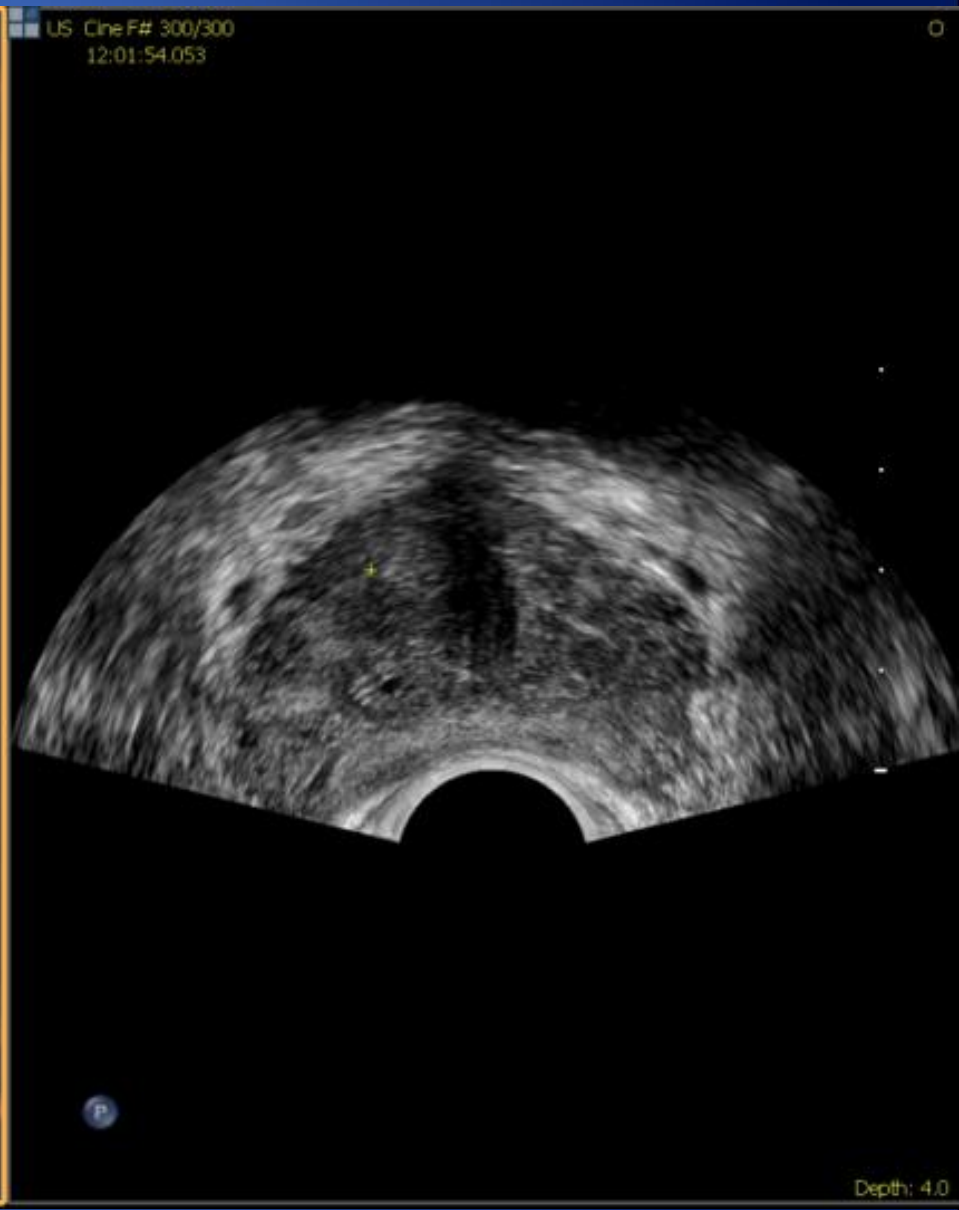
2

- Fusion : Δυνατότητα απεικόνισης εστιών στα πρόσθια τμήματα

73 ετών ● DRE μαλακός ● PSA 6.4 ● Pi-RADS 5




US Overlay
A
R
L
P
Depth: 4.0


US Cine F# 300/300
12:01:54.053
P
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US Overlay
A
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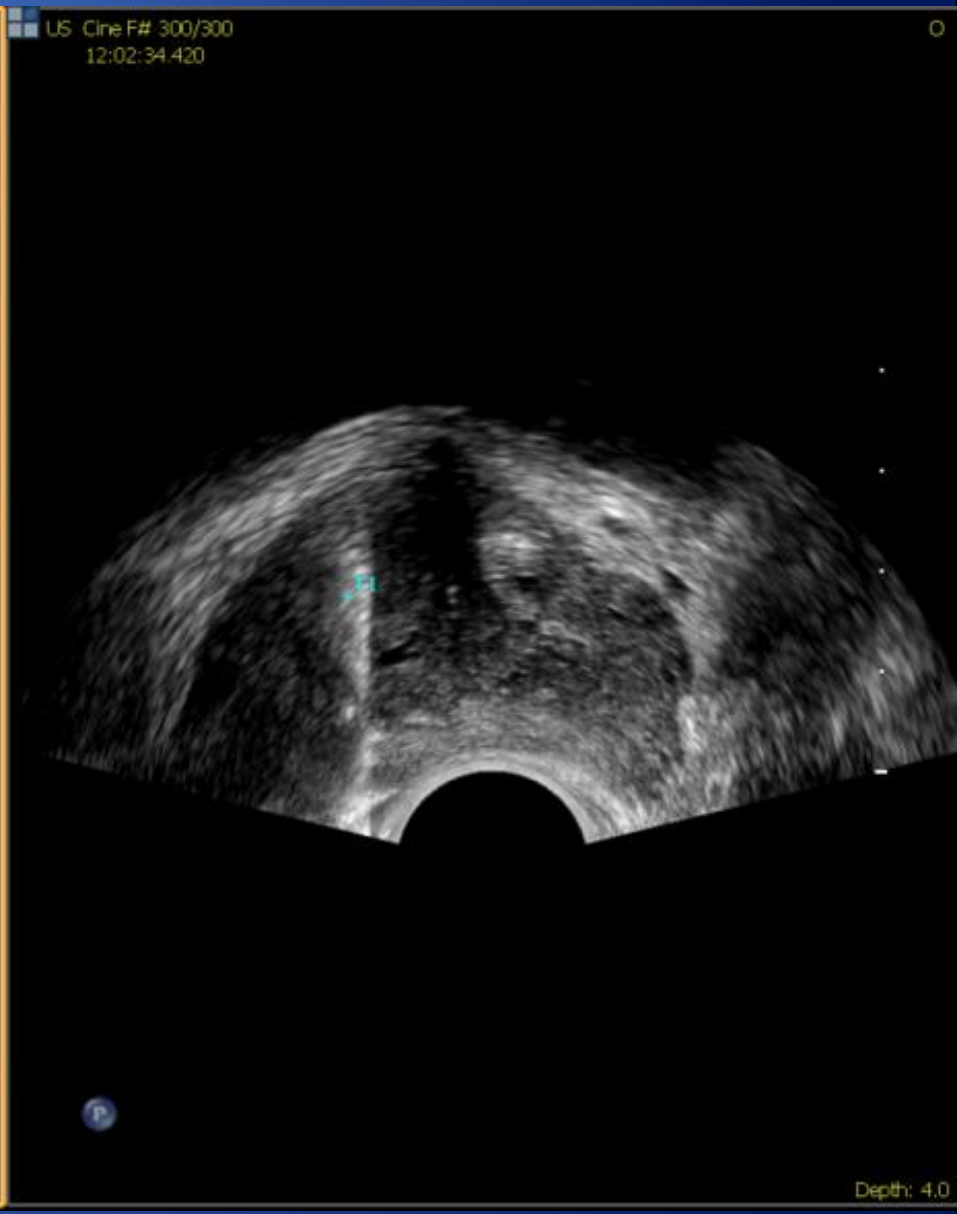

US Cine F# 300/300
12:02:34.420
Depth: 4.0

ΑΠΟΤΕΛΕΣΜΑ ΙΣΤΟΛΟΓΙΚΗΣ ΕΞΕΤΑΣΗΣ

ΑΠΟΤΕΛΕΣΜΑ : ΑΔΕΝΟΚΑΡΚΙΝΩΜΑ

GLEASON SCORE : 3 + 4

ΑΡΙΘΜΟΣ ΔΙΗΘΗΜΕΝΩΝ ΙΣΤΟΤΕΜΑΧΙΩΝ / ΣΥΝΟΛΟ
ΔΕ : 2/6
ΑΡ : 1/6
ΣΤΟΧΟΣ : 3/4

ΜΕΓΕΘΟΣ ΟΓΚΟΥ
ΔΕ : 20 %
ΑΡ : 10 %
ΣΤΟΧΟΣ : 35 %

Πλεονεκτήματα της Βιοψίας με US / MRI Fusion

1

- Δυνατότητα χρήσης όλων των δυνατών ακολουθιών (T1, T2, DWI, DCE) για απεικόνιση του στόχου

1

- US / MRI Fusion Targeted Biopsy vs 12-core Standard Biopsy

Magnetic Resonance Imaging/Ultrasound Fusion Guided Prostate Biopsy Improves Cancer Detection Following Transrectal Ultrasound Biopsy and Correlates With Multiparametric Magnetic Resonance Imaging

Μέθοδοι : 101 Ασθενείς υποβλήθηκαν σε 3.0 T MRI με ERC και κατόπιν σε US /MRI Fusion βιοψία , + 12 core βιοψία

Patient and biopsy characteristics

Mean pt age (range)	63	(41–82)
Mean ng/ml PSA (range)	8.3	(0.2–103)
Median ng/ml PSA	5.8	
No. biopsy history:		
No prior	36	
Prior neg	29	
Prior pos	36	
Mean lesions suspicious for Ca on MRI (range)	2.6	(1–7)
Mean biopsies/lesion (range)	2.2	(1–8)

Pinto Peter et Al , J Urol, 2011

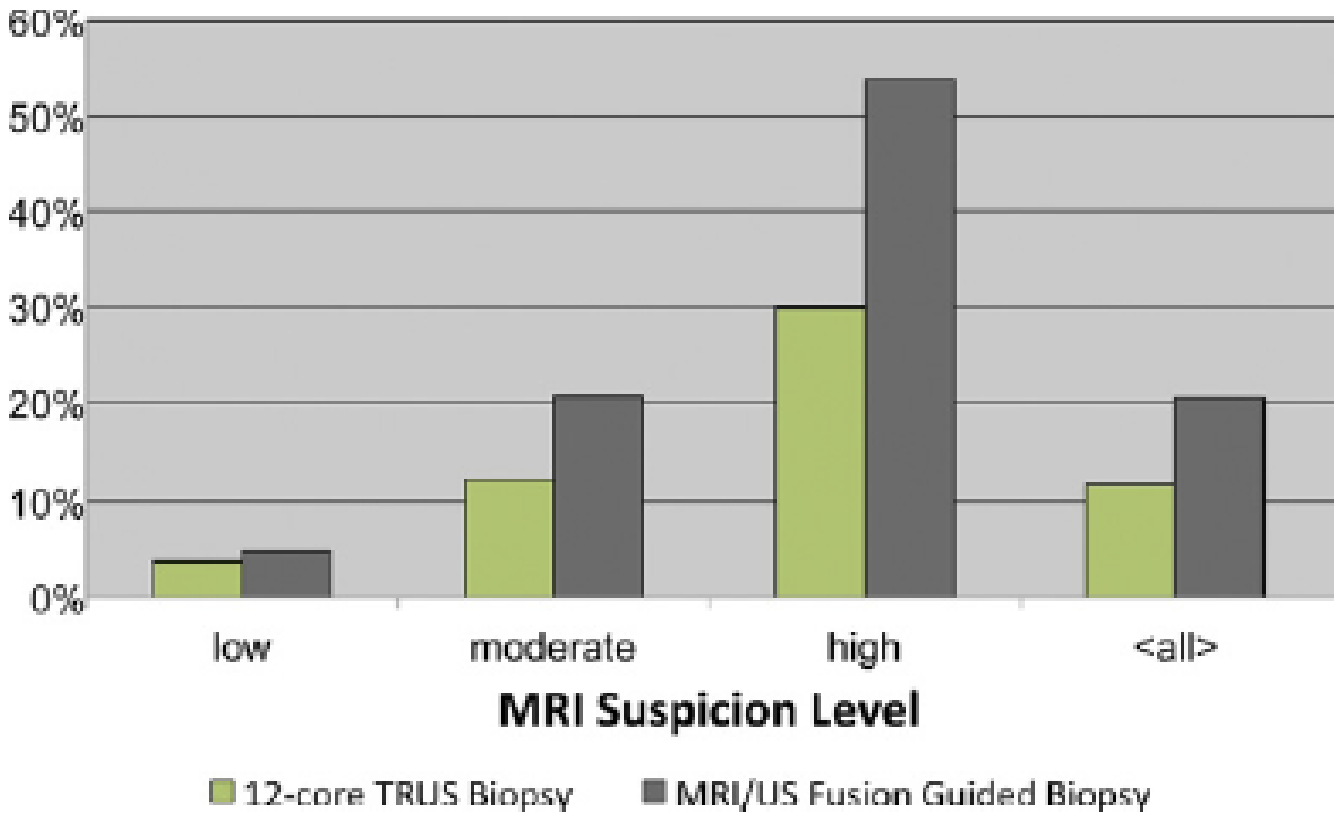


Figure 2. Cancer detection rates for biopsy cores were compared between standard 12-core TRUS biopsy alone and MRI/US fusion guided biopsy alone.

Pinto Peter et Al , J Urol, 2011

2

- mMRI Targeted Biopsy : In Board , Cognitive ή US/mMRI Fusion τεχνική ;

Platinum Priority – Review – Prostate Cancer
Editorial by Matthew R. Cooperberg on pp. 532–533 of this issue

Comparing Three Different Techniques for Magnetic Resonance Imaging-targeted Prostate Biopsies: A Systematic Review of In-bore versus Magnetic Resonance Imaging-transrectal Ultrasound fusion versus Cognitive Registration. Is There a Preferred Technique?

Olivier Wegelin [a,], Harm H.E. van Melick [a], Lotty Hooft [b], J.L.H. Ruud Bosch [c], Hans B. Reitsma [d], Jelle O. Barentsz [e], Diederik M. Somford [f]*

4. Conclusions

In men at risk for PCa who have tumour suspicious lesions on MRI, subsequent MRI-GB of these lesions demonstrates similar overall tumour detection rates compared with systematic TRUS-GB, although the incidence of PCa is increased in targeted cores when compared with systematic cores. Moreover, the sensitivity of MRI-GB is increased for the detection of csPCa, and decreased for clinically insignificant PCa when compared with TRUS-GB.

Based on the studies included in this meta-analysis MRI-TB demonstrates a superior performance in overall PCa detection when compared with COG-TB. For overall PCa detection and detection of csPCa, FUS-TB has a similar performance compared with MRI-TB. The current number of randomised controlled trials performing a head-to-head comparison of the various techniques for MRI-GB is limited and comparative analysis is restricted by the absence of data on lesion characteristics.

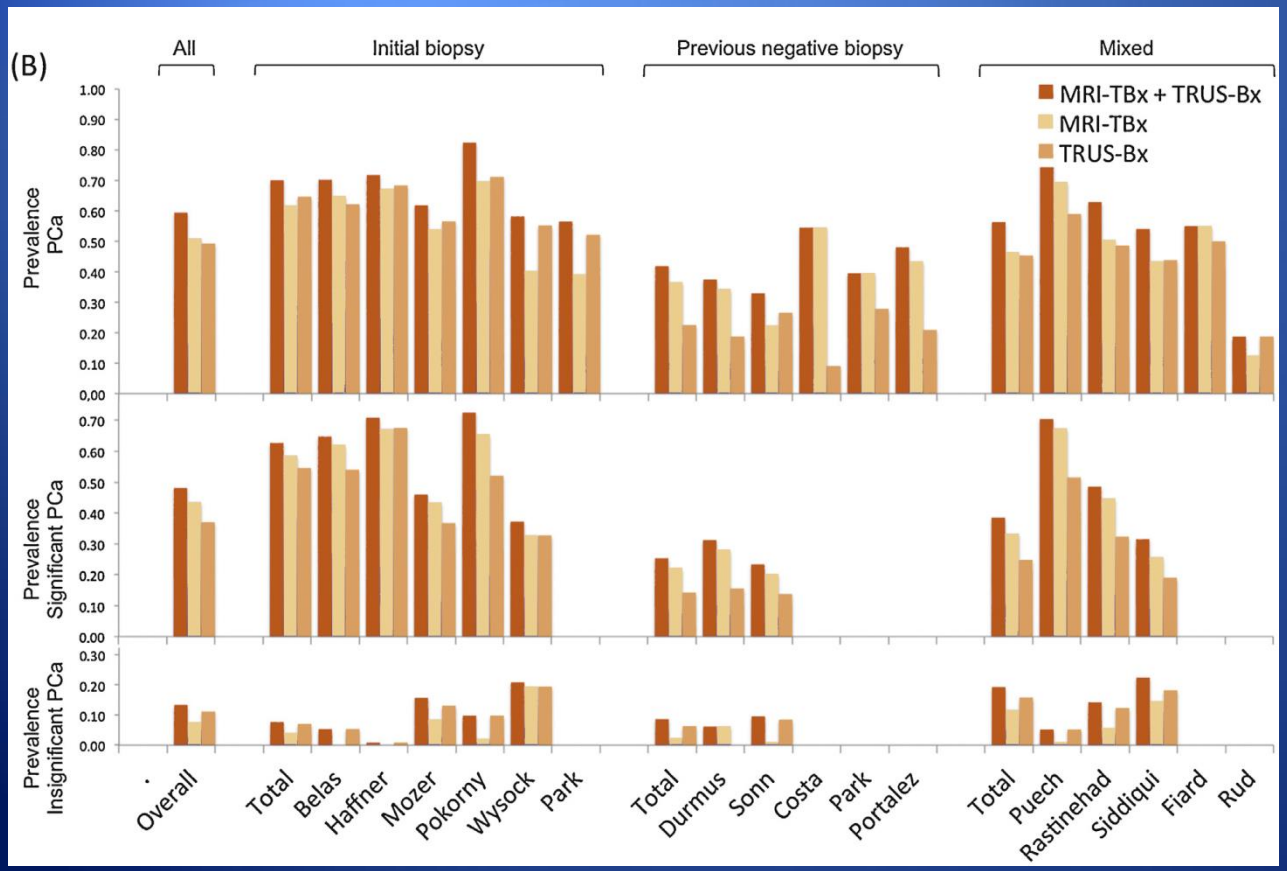
EUROPEAN UROLOGY 71 (2017) 517–531

3

- mMRI Targeted Biopsy : Πρώτη ή επόμενη βιοψία;

Magnetic Resonance Imaging–targeted Biopsy May Enhance the Diagnostic Accuracy of Significant Prostate Cancer Detection Compared to Standard Transrectal Ultrasound-guided Biopsy: A Systematic Review and Meta-analysis

Ivo G. Schoots [a,*], *Monique J. Roobol* [b], *Daan Nieboer* [c], *Chris H. Bangma* [b], *Ewout W. Steyerberg* [c], *M.G. Myriam Hunink* [a,d,e]



EUROPEAN UROLOGY 68 (2015) 438–450

INDICATIONS FOR BIOPSY

PSA >3.0 ng/mL[f] → • Repeat PSA • DRE • Workup for benign disease →

- TRUS-guided biopsy[g] → See Management of Biopsy Results (PROSD-4)
- or
- Follow up in 6–12 mo with PSA/DRE[h]
- or
- Percent free PSA, 4Kscore, or PHI[h]

TRUS-GUIDED BIOPSY
Initial and Repeat
Extended-pattern biopsy (12 cores)

- Number of cores:
  - Sextant (6),
  - Lateral peripheral zone (6), and
  - Lesion-directed at palpable nodule or suspicious image
- Anteriorly directed biopsy is not supported in routine biopsy. However, the addition of a transition zone biopsy to an extended biopsy protocol may be considered in a repeat biopsy if PSA is persistently elevated.
- Multiparametric MRI followed by lesion targeting may maximize the detection of higher risk disease and limit the detection of lower risk disease.[i]
- Local anesthesia can decrease pain/discomfort associated with prostate biopsy and should be offered to all patients.

[f]The level of PSA correlates with the risk of prostate cancer. The Prostate Cancer Prevention Trial (PCPT) demonstrated that 15% of men with a PSA level of ≤4.0 ng/mL and a normal DRE had prostate cancer diagnosed on end-of-study biopsies. Approximately 30% to 35% of men with serum PSA between 4 to 10 ng/mL will be found to have cancer. Total PSA levels >10 ng/mL confer a greater than 67% likelihood of prostate cancer.

[g]For patients with abnormal DRE, biopsy or additional testing should be considered based on concern for cancer.

[h]Biomarkers that improve the specificity of detection are not recommended as firstline screening tests. However, there may be some patients who meet PSA standards for consideration of prostate biopsy, but for whom the patient and/or the physician wish to further define the probability of high-grade cancer. A percent free PSA <10%, PHI >35 or 4Kscore (which provides an estimate of the probability of high-grade prostate cancer) are potentially informative in patients who have never undergone biopsy or after a negative biopsy; a PCA3 score >35 is potentially informative after a negative biopsy.

[i]MRI is not recommended routinely prior to initial prostate biopsy, but emerging data suggest that, in men undergoing initial biopsy, targeting using MRI/ultrasound fusion may increase the detection of clinically significant, higher-risk (Gleason grade ≥ 4+3=7) disease while lowering the detection of lower-risk (Gleason sum 6 or lower-volume Gleason grade 3+4=7) disease. Siddiqui M, Rais-Bahrami S, Turkbey B, et al. Comparison of MRI/Ultrasound Fusion–Guided Biopsy With Ultrasound-Guided Biopsy for the Diagnosis of Prostate Cancer. JAMA 2015;313:390-7.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any cancer patient is in a clinical trial. Participation in clinical trials is especially encouraged.

4

- mMRI Targeted Biopsy : Ρόλος σε Active surveillance

Magnetic Resonance Imaging-Transrectal Ultrasound Guided Fusion Biopsy to Detect Progression in Patients with Existing Lesions on Active Surveillance for Low and Intermediate Risk Prostate Cancer

Thomas P. Frye, Arvin K. George, Amichai Kilchevsky, Mahir Maruf, M. Minhaj Siddiqui, Michael Kongnyuy, Akhil Muthigi, Hui Han, Howard L. Parnes, Maria Merino, Peter L. Choyke, Baris Turkbey, Brad Wood* and Peter A. Pinto†

From the Department of Urology, University of Rochester (TPF), Rochester, New York, Department of Urology, University of Michigan (AKG), Ann Arbor, Michigan, and Urologic Oncology Branch (TPF, AKG, AK, MMa, MK, AM, HH, PAP), Surgical Pathology (MMe), Molecular Imaging Program (PLC, BT), Interventional Oncology (BW, PAP) and Division of Cancer Prevention (HLP), National Cancer Institute, National Institutes of Health, Bethesda and Division of Urology, University of Maryland, Baltimore, Maryland

Conclusions: Multiparametric magnetic resonance imaging progression predicts the risk of pathological progression. Patients with stable multiparametric magnetic resonance imaging findings have a low rate of progression. Incorporating fusion guided biopsy in active surveillance nearly doubled our detection of pathological progression compared to systematic 12-core biopsy.

- Αξιόπιστη παρακολούθηση εστιών σε ασθενείς σε active surveillance

Θεωρητικά Πλεονεκτήματα / Μειονεκτήματα της Βιοψίας με US / MRI Fusion

Πλεονεκτήματα

- Αυξημένη διαγνωστική ακρίβεια
- Λιγότερες Λήψεις
- Διάγνωση σημαντικών καρκίνων
- Αυξηση της αξιοπιστία σε ασθενείς σε προσεκτική στενή παρακολούθηση

Μειονεκτήματα

- Αυξημένο κόστος mMRI

ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ