

Trans-rectally Delivered, MRI-Guided Laser Focal Therapy of Prostate Cancer: How We Do It

The Prostate Cancer Support Association of New Mexico
Albuquerque, NM
September 19, 2015

Bernadette Greenwood, BSRS, RT (R) (MR)



Disclosures:

Ms. Greenwood has nothing to disclose

STATE of WISCONSIN



OFFICE of the GOVERNOR

Proclamation

WHEREAS, on Thursday, June 4, 2015, Milwaukee Area Technical College is hosting a "Wake up and Smell the Coffee – Prostate Cancer Update 2015" session from 11 a.m. – 2 p.m., that is open to the public; and

WHEREAS, in the United States alone, new prostate cancer cases for 2014 were estimated at 233,000 and deaths at more than 29,000; and

WHEREAS, screening can help diagnose the disease in its early stages, increasing the chances of survival; and

WHEREAS, there are no noticeable symptoms of prostate cancer while it is still in the early stages, making screening critical; and

WHEREAS, ongoing research promises further improvements in prostate cancer prevention, early detection, and treatments; and

WHEREAS, educating everyone about prostate cancer and early detection strategies is crucial to saving lives, and preserving and protecting families;

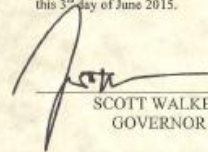
NOW, THEREFORE, I, Scott Walker, Governor of the State of Wisconsin,
do hereby proclaim Thursday, June 4, 2015, as

PROSTATE CANCER AWARENESS DAY

throughout the State of Wisconsin, and I commend this observance to all of our citizens.



IN TESTIMONY WHEREOF, I have
hereto set my hand and caused the Great
Seal of the State of Wisconsin to be affixed.
Done at the Capitol in the City of Madison
this 3rd day of June 2015.


SCOTT WALKER
GOVERNOR

By the Governor:


DOUGLAS LA FOLLETTE
Secretary of State

1. History of Trial #NCT 02243033
2. Literature review
3. Procedure overview
4. Results and conclusions

ClinicalTrials.gov

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[Home](#) > [Find Studies](#) > Study Record Detail

Laser Interstitial Thermal Therapy of Prostate Cancer

This study is currently recruiting participants. (see [Contacts and Locations](#))

Verified August 2015 by Desert Medical Imaging

Sponsor:
Desert Medical Imaging

Information provided by (Responsible Party):
Desert Medical Imaging

ClinicalTrials.gov Identifier:
NCT02243033

First received: September 9, 2014

Last updated: August 14, 2015

Last verified: August 2015

[History of Changes](#)



BREAST MRI

- Complements Mammo / US
- Breast intervention (do a targeted biopsy under MR) per ACR practice guidelines
- Mastectomy vs. lumpectomy and focal treatment



PROSTATE MRI

- Complements PSA / DRE / TRUS
- Prostate intervention (targeted biopsy under MR-guidance)
- MR/US fusion biopsy
- Focal therapy vs. whole-gland, radical treatment (prostatectomy, XRT, ADT)



Breast vs. Prostate Cancer Research



	2007	2008	2009	2010	2011
Total NCI	\$4,792.6	\$4,827.6	\$4,966.9	\$5,098.1	\$5,058.1
AIDS	253.7	258.5	265.9	272.1	270.0
Brain & Central Nervous System	148.2	153.7	151.5	156.8	172.6
Breast Cancer	572.4	586.8	599.4	631.2	625.1
Cervical Cancer	82.4	76.8	70.8	77.0	81.4
Clinical Trials	843.7	853.2	882.8	852.3	877.8
Colorectal Cancer	258.4	273.7	264.1	270.4	265.1
Head and Neck	66.2	76.1	77.1	62.7	61.8
Hodgkin's Disease	16.5	17.5	18.2	14.6	13.4
Leukemia	205.5	216.4	220.5	239.7	227.0
Liver Cancer	67.7	74.2	69.0	72.6	66.2
Lung Cancer	226.9	247.6	246.7	281.9	296.8
Melanoma	97.7	110.8	103.7	102.3	115.6
Multiple Myeloma	32.3	41.5	45.2	48.5	54.9
Non Hodgkin's Lymphoma	113.0	122.6	131.3	122.4	126.4
Ovarian Cancer	96.9	100.0	110.1	112.3	110.8
Pancreatic Cancer	73.3	87.3	89.6	97.1	99.5
Prostate Cancer	296.1	285.4	285.1	300.5	288.3
Stomach Cancer	12.0	12.4	15.4	14.5	13.4
Uterine Cancer	16.6	17.1	18.0	14.2	15.9

How did I get here?

PSA

Sensitivity: 34.9%
Specificity: 63.1%

DRE

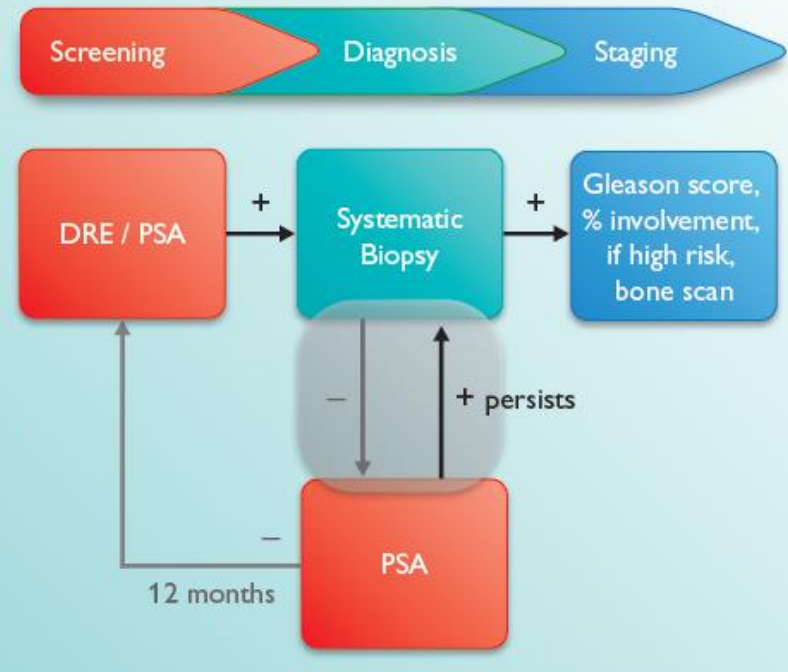
Sensitivity: 27.1%
Specificity: 49.0%

<http://www.jyi.org/research/re.php?id=931>

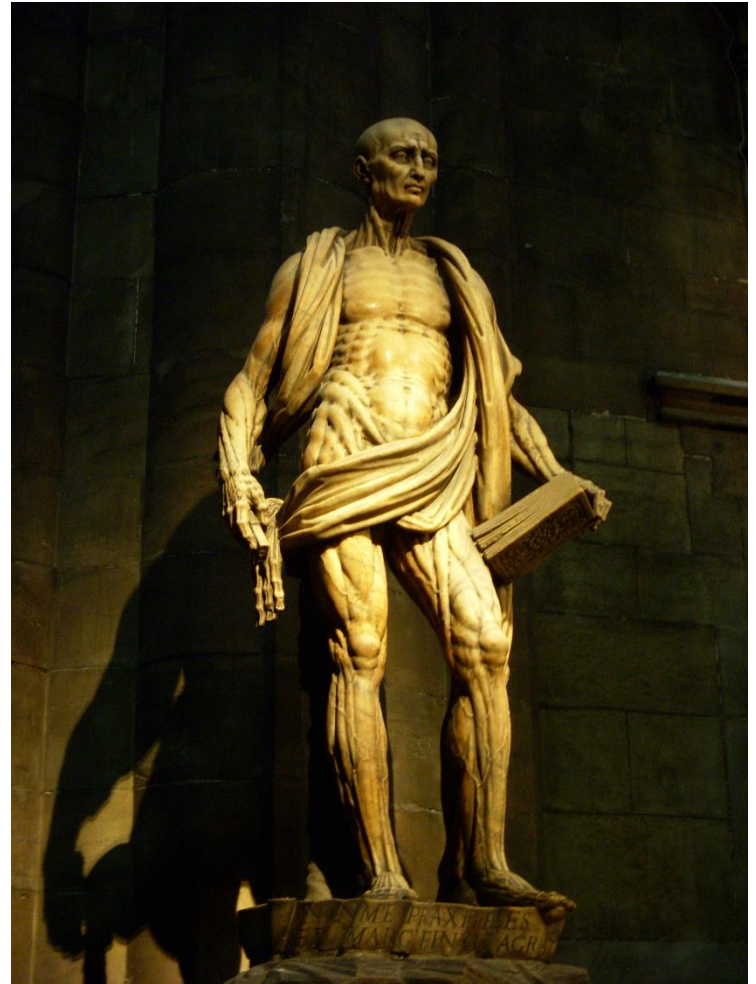


Current practice

biopsy negative, but high PSA persists – another systematic ultrasound-guided biopsy at urologist



Targeted, Focal or Precision Treatment



Literature Timeline 1920 - present

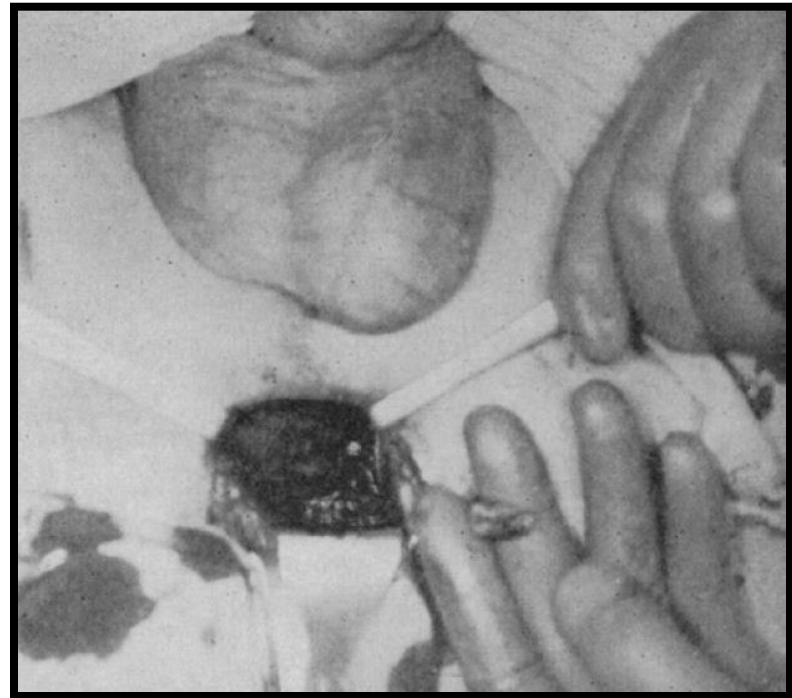
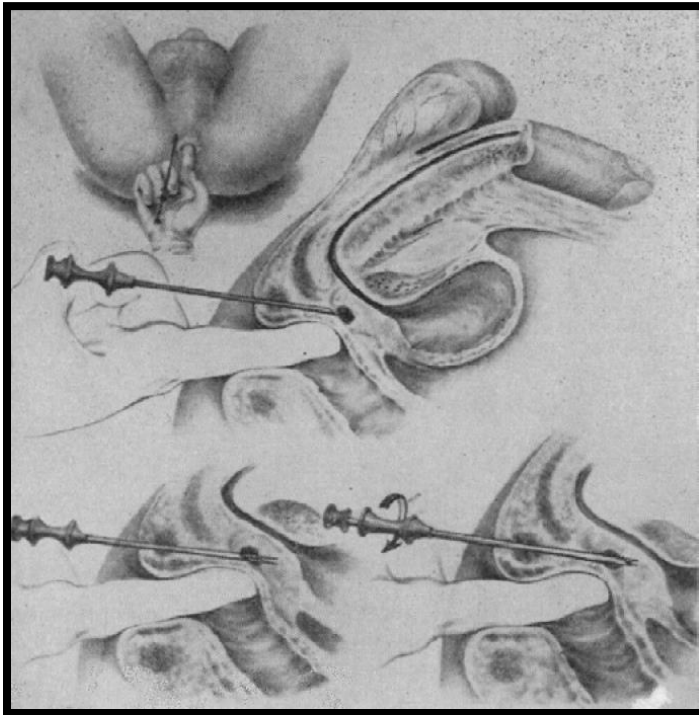
1920's	1922 – <u>Barringer</u>: Transperineal needle biopsy	1926 – Young: Open <u>perineal</u> biopsy	
1930's	1930 – Ferguson: First <u>perineal</u> needle aspiration biopsy	1937 – <u>Astraldi</u>: First <u>transrectal</u> biopsy	
1940's	-----	-----	-----
1950's	-----	-----	-----
1960's	1963 – Takahashi and <u>Ouchi</u>: TRUS to evaluate prostate	1968 – Watanabe et al.: First clinically useful TRUS images	1968 – McNeal: proposes three distinct glandular zones
1970's			
1980's	Mid-1980's – improvements in transducer technology and biopsy capability	1986 – PSA test introduced for prostate cancer screening	1989 – Hodge et al.: modern era of systematic prostate biopsy begins
1990's	1995 – <u>Stamey</u>: modified sextant technique to include laterally directed	1996 – Nash et al.: <u>peri-prostatic</u> nerve blockade used for biopsy pain management	1997 – <u>Eskew</u> et al.: systematic extended biopsy technique
2000's	2004 – <u>Beyersdorff</u> et al.: MRI-guided prostate biopsy at 1.5T		
2010's	2011 – Greenwood et al.: <u>Transrectal</u> MRI-guided laser interstitial thermal therapy of PCa	2011 – Pinto et al.: MRI/US fusion prostate biopsy	2012 – NCCN Guidelines include <u>Multiparametric</u> MRI
	2013 – Oto et al.: <u>Transperineal</u> MRI-guided laser interstitial thermal therapy of PCa	2013 – <u>Amalou</u> et al.: MRI/US fusion prostate biopsy and ablation	2013 – Greenwood et al.: <u>transperineal</u> MRI-guided <u>cryotherapy</u> of PCa

Prostate Biopsy in the 1920's

1920's

1922 – Barringer:
Transperineal needle
biopsy

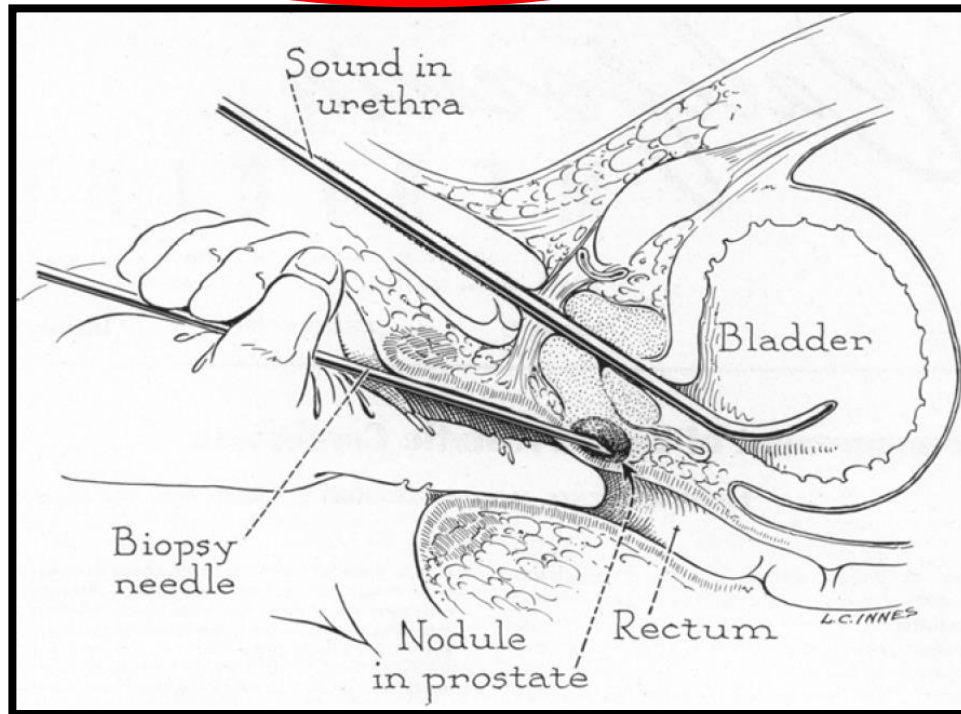
1926 – Young: Open perineal
biopsy



Kaufman, J.J., Rosenthal, M. and Goodwin, W.E.. Needle biopsy in diagnosis of prostate cancer. California Medicine. 1954; 81; 5: 308-313

Prostate Biopsy in the 1930's

1930's 1930 – Ferguson: First perineal needle aspiration biopsy 1937 – Astraldi: First transrectal biopsy



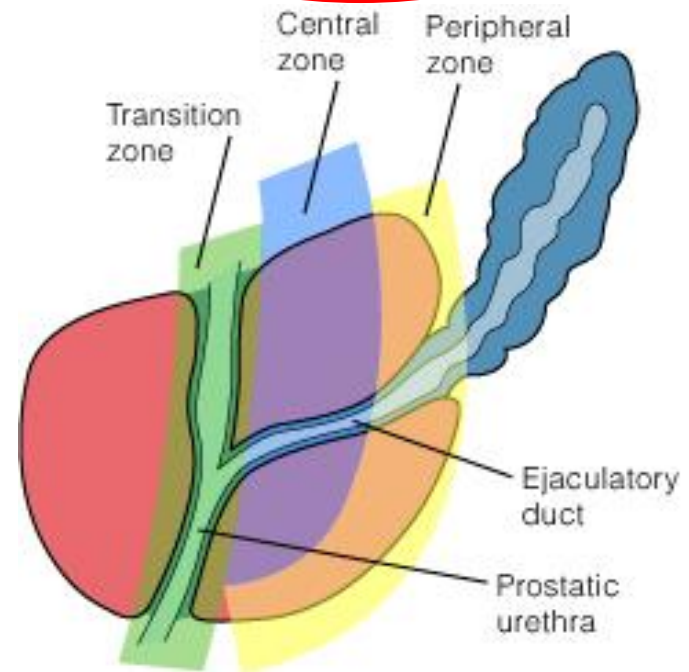
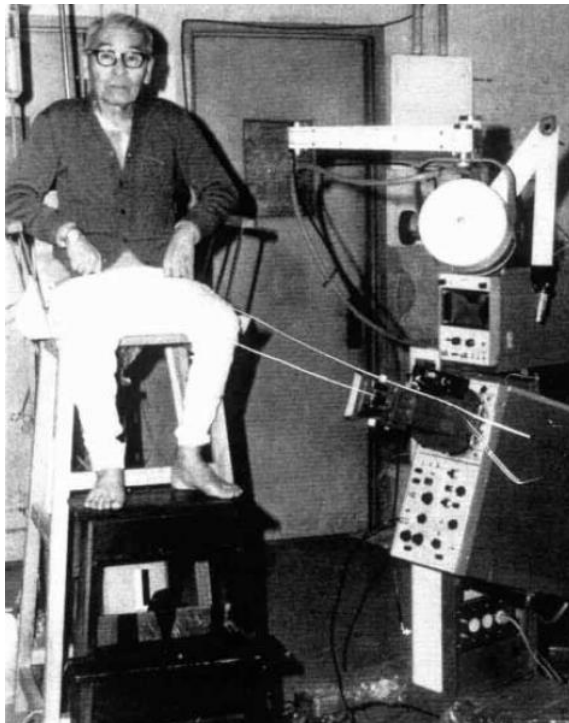
Astraldi, A. Diagnosis of cancer of the prostate: biopsy by rectal route. *Urol Cutan Rev.* 1937; 41: 421-427

Prostate Biopsy in the 1960's

1960's **1963 – Takahashi and
Quichi: TRUS to evaluate
prostate**

**1968 – Watanabe et al.: First
clinically useful TRUS images**

**1968 – McNeal: proposes
three distinct glandular
zones**



Am J Clin Pathol. 1968;49:347.

Prostate Biopsy in the 1980's

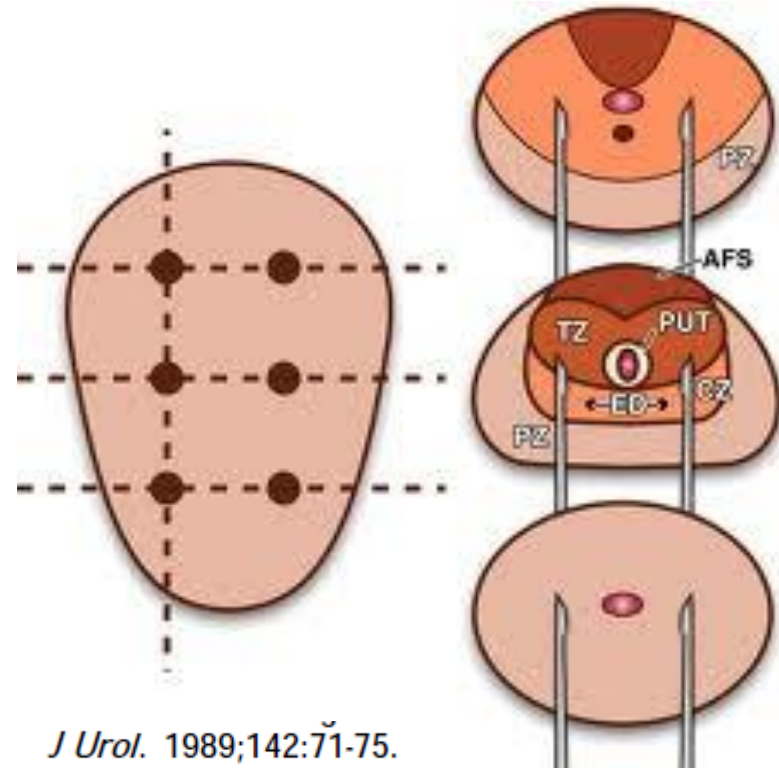
1980's **Mid-1980's – improvements in transducer technology and biopsy capability**



1986 – PSA test introduced for prostate cancer screening



1989 – Hodge et al.: modern era of systematic prostate biopsy begins



J Urol. 1989;142:71-75.

Prostate Biopsy in the 1990's

1990's

1995 – Stamey: modified sextant technique to include laterally directed

1996 – Nash et al.: peri-prostatic nerve blockade used for biopsy pain management

1997 – Eskew et al.: systematic extended biopsy technique

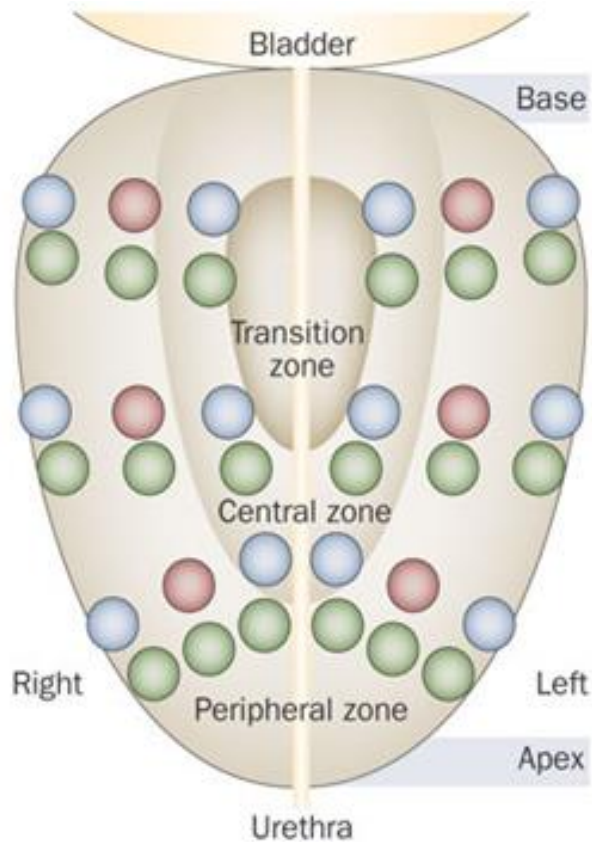
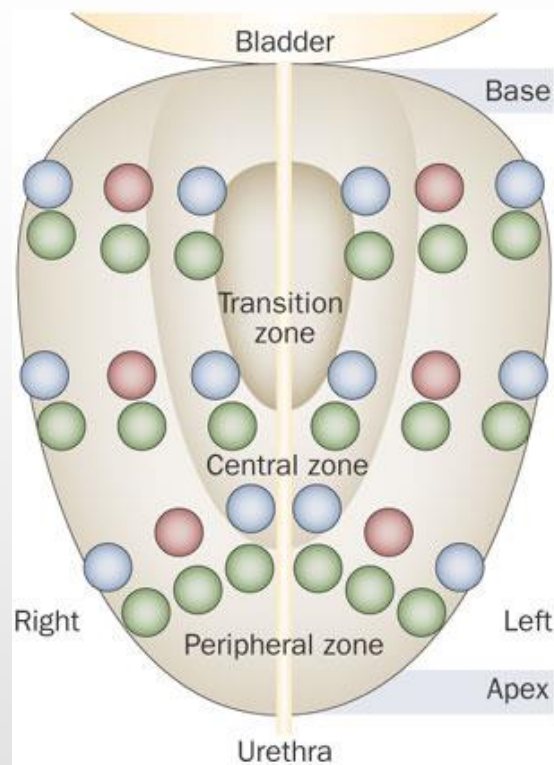


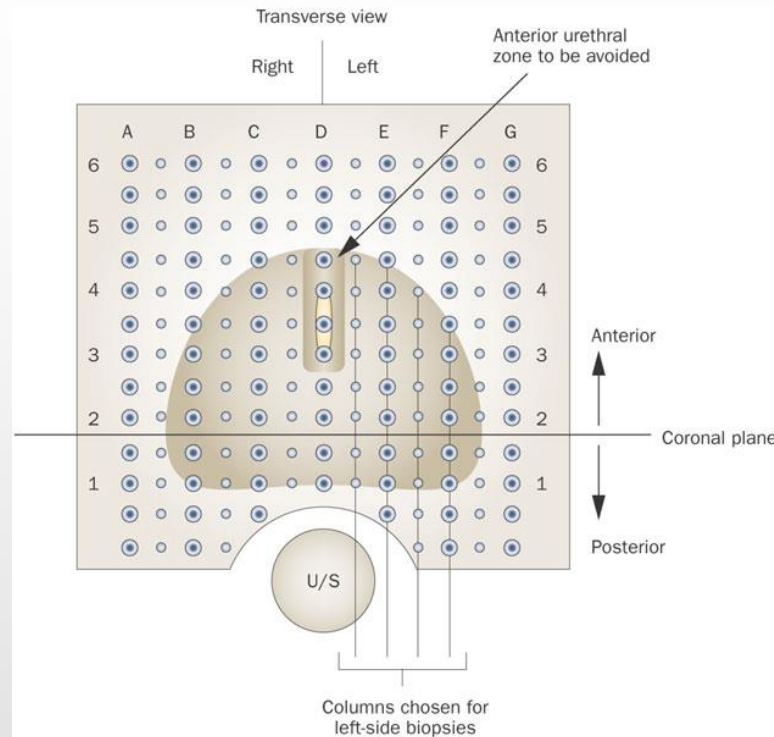
Figure 1 A 36-core saturation biopsy scheme, as used by Delongchamps *et al.*



Modified, with permission, from Delongchamps, N. B. *et al. Prostate Cancer Prostatic Dis.* doi:10.1038/pcan.2008.38 (2008) © Macmillan Publishers Ltd. All rights reserved.

Andriole GL (2009) The lottery of conventional prostate biopsy
Nat Rev Urol doi:10.1038/nrurol.2009.46

Figure 2 Prostate as seen on transrectal ultrasonography during saturation biopsy



Modified, with permission, from Whitmore, W. F. and Barzell, W. E. (2003) *Urology Times*, 1 May © Winston E. Barzell.

Andriole GL (2009) The lottery of conventional prostate biopsy
Nat Rev Urol doi:10.1038/nrurol.2009.46

Saturation Biopsy

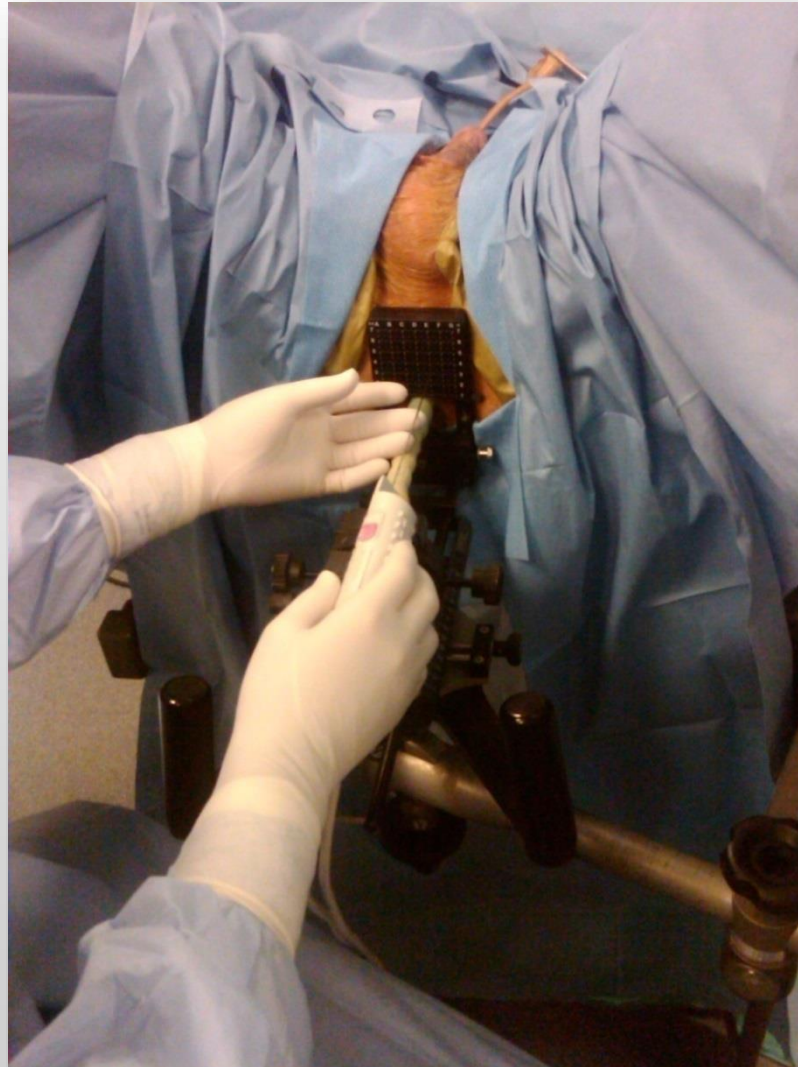


Photography courtesy of Thomas Polascik, M.D., Duke University

Saturation Biopsy



Saturation Biopsy

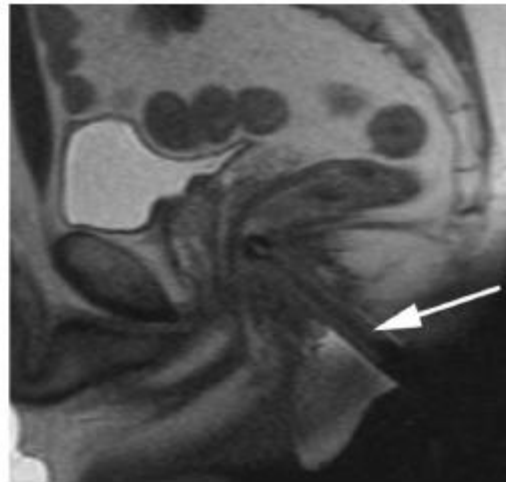
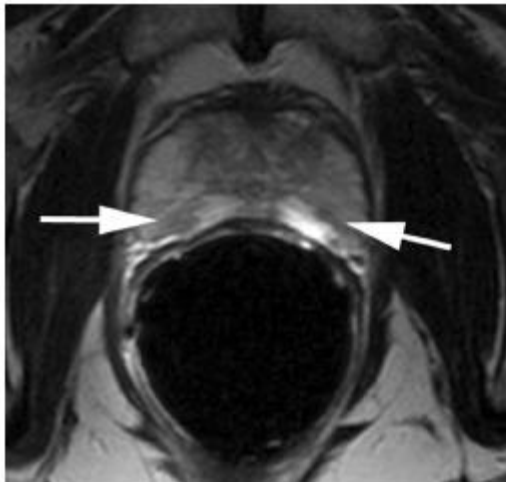
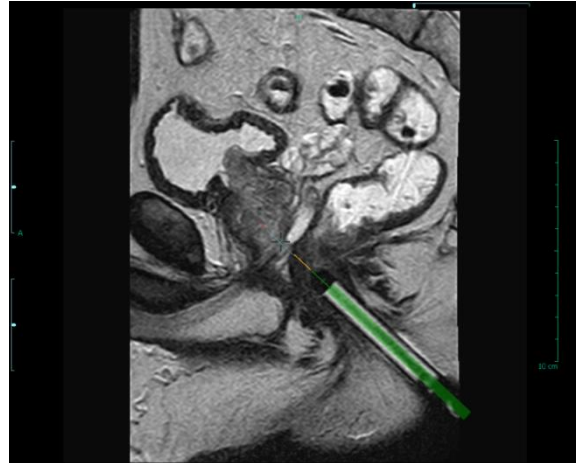


Saturation Biopsy



Prostate Biopsy in the 2000's

2000's **2004 – Beyersdorff et al.:
MRI-guided prostate
biopsy at 1.5T**



Beyersdorff D et al. MR Imaging-guided Prostate Biopsy with a Closed MR Unit at 1.5 T: Initial Results. Radiology 2005; 234:576–581.

Ultrasound vs. MRI

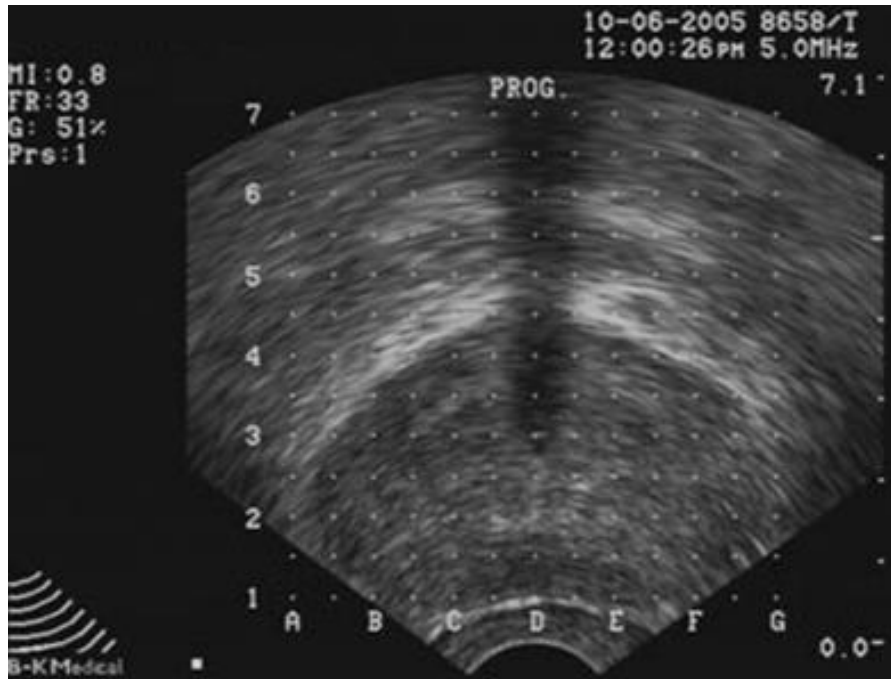


Figure 7: Ultrasound scan of the prostate gland

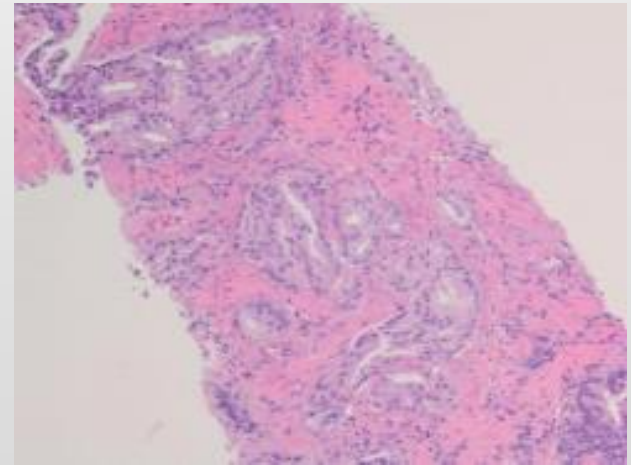


**“Fast is fine, but
accuracy is everything.”**

Wyatt Earp

Why MRI for the Prostate Today?

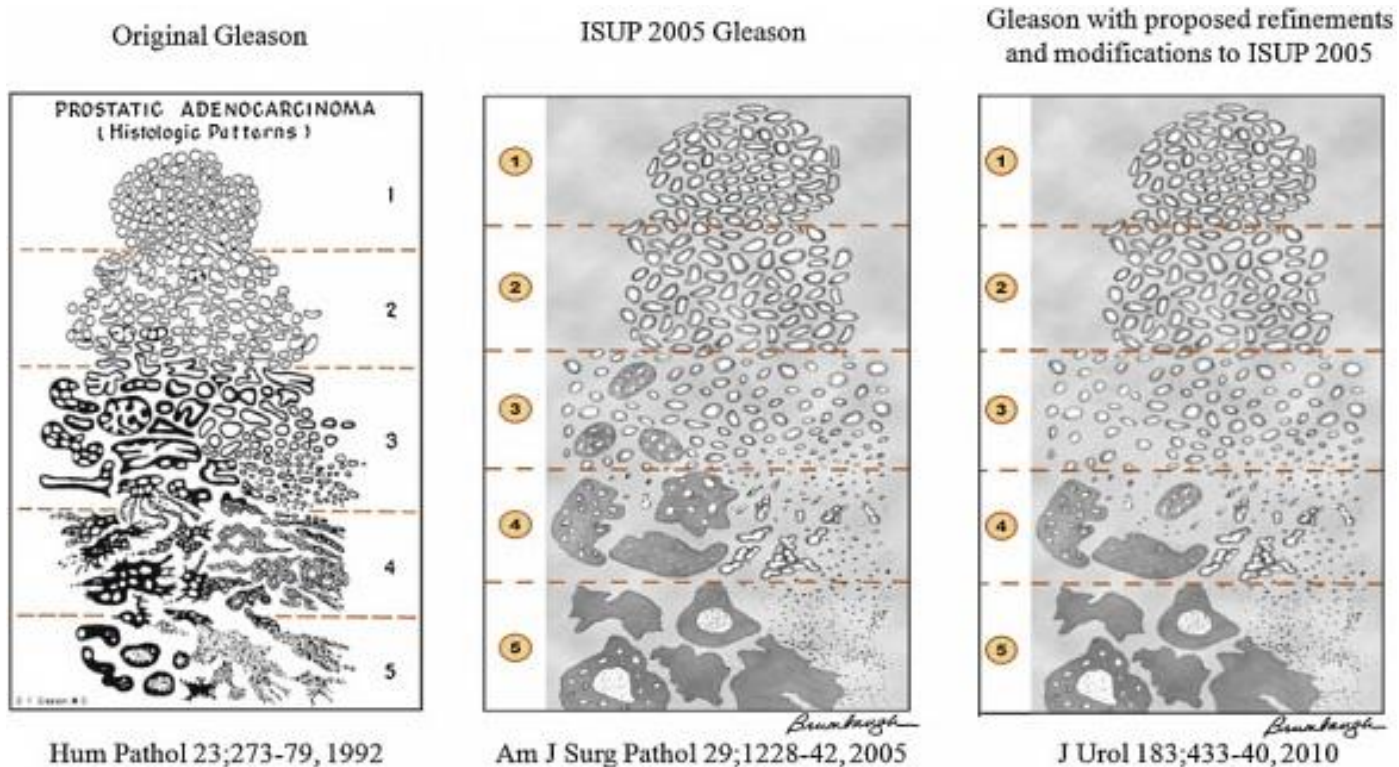
- ◆ Easy access to patient for biopsy



Gleason 4 + 3 = 7

What is it? Why does it matter?

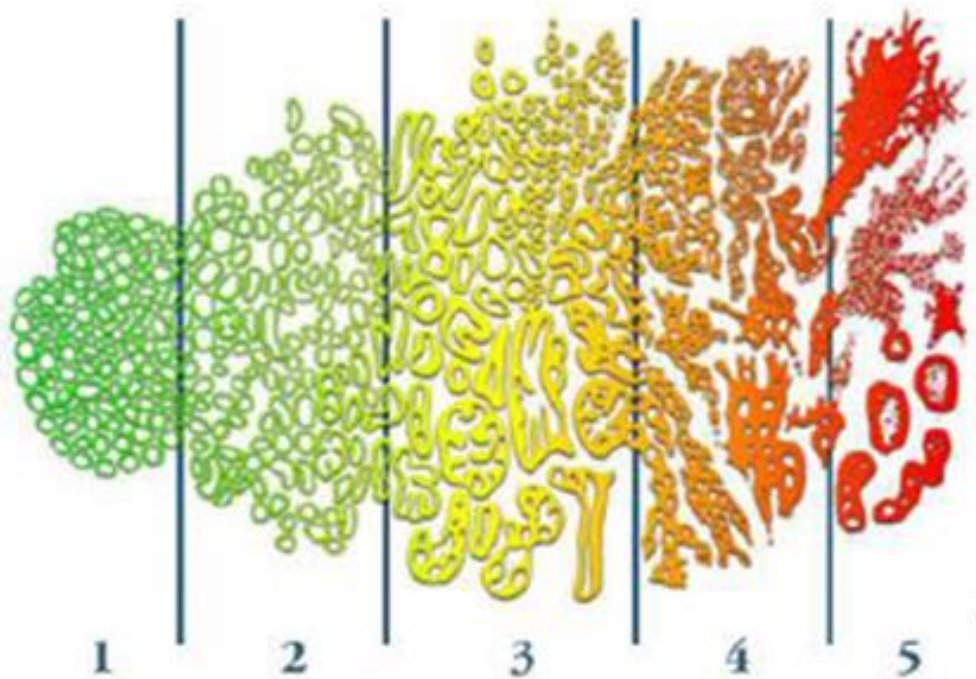
Gleason Grades Determine Gleason Score



[http://www.europeanurology.com/article/S0302-2838\(12\)01234-1/fulltext/contemporary-grading-for-prostate-cancer-implications-for-patient-care-img-src-manager-uploads-europeanurology-com-eur-articles-s0302-2838-12-01234-1-assets-eulogo1-jpg-alt-eulogo1](http://www.europeanurology.com/article/S0302-2838(12)01234-1/fulltext/contemporary-grading-for-prostate-cancer-implications-for-patient-care-img-src-manager-uploads-europeanurology-com-eur-articles-s0302-2838-12-01234-1-assets-eulogo1-jpg-alt-eulogo1)

What is it? Why does it matter?

Gleason Grades Determine Gleason Score



What is it? Why does it matter?

Gleason Grades Determine Gleason Score

Original Gleason System Versus 2005 ISUP Modified Gleason System: The Importance of Indicating Which System Is Used in the Patient's Pathology and Clinical Reports

By: Rodolfo Montironi^a * , Liang Cheng^b, Antonio Lopez-Beltran^c, Marina Scarpelli^a, Roberta Mazzucchelli^a, Gregor Mikuz^d, Ziya Kirkali^e and Francesco Montorsi^f

European Urology, **Volume 58 Issue 3**, September 2010, Pages 369-373

Published online: 01 September 2010

[http://www.europeanurology.com/article/S0302-2838\(10\)00422-7/fulltext/original-gleason-system-versus-2005-isup-modified-gleason-system-the-importance-of-indicating-which-system-is-used-in-the-patient-s-pathology-and-clinical-reports](http://www.europeanurology.com/article/S0302-2838(10)00422-7/fulltext/original-gleason-system-versus-2005-isup-modified-gleason-system-the-importance-of-indicating-which-system-is-used-in-the-patient-s-pathology-and-clinical-reports)

What is it? Why does it matter?

Genomic testing results



ProstaVysion



Prostate Intervention in the 2010's

2010's	2011 – Greenwood et al.: <u>Transrectal MRI-guided</u> <u>laser interstitial thermal</u> <u>therapy of PCa</u>	2011 – Pinto et al.: MRI/US fusion prostate biopsy	2012 – NCCN Guidelines include <u>Multiparametric</u> <u>MRI</u>
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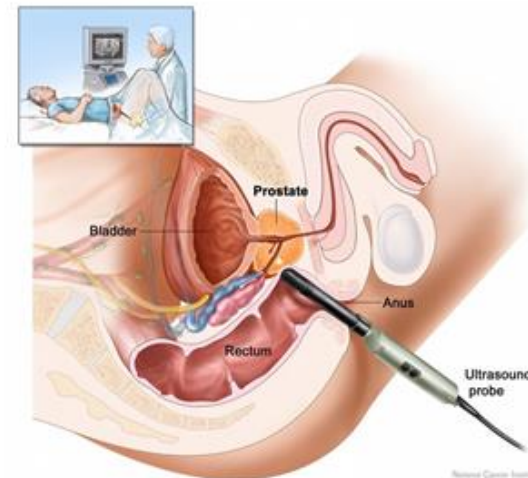


NCCN Guidelines Version 2.2012 Prostate Cancer Early Detection

[NCCN Guidelines Index](#)
[Prostate Early Detection TOC](#)
[Discussion](#)

Repeat Biopsy Technique

Patients with prior negative biopsies, yet persistently rising PSA values should undergo repeat biopsy. Important factors in predicting chance of cancer on repeat biopsy include PSAV and the adequacy of initial biopsy (number of cores, prostate size). Cancer detection rates are higher in men with prior negative sextant biopsies compared to those with prior negative extended biopsies. Yields are highest in the laterally directed cores and the apical cores.⁹⁰ Particular attention should be given to apical sampling including the anterior apical horn, which is comprised of peripheral zone.⁹¹ Transition zone biopsies can be considered in repeat biopsy patients. In patients with two negative extended biopsies, yet persistently rising PSA values, a saturation biopsy may be considered.⁹² Recent evidence showed that multiparametric MRI (T2 weighting plus functional techniques such as diffusion weighting) can aid in cancer detection in patients with persistent PSA elevation but negative TRUS-guided biopsy (reviewed by Pinto et al.⁹³). Additional MRI imaging can be considered in select cases.



Adoption of Prostate MRI

- MRI Volumes Reached 34.9M in 2014

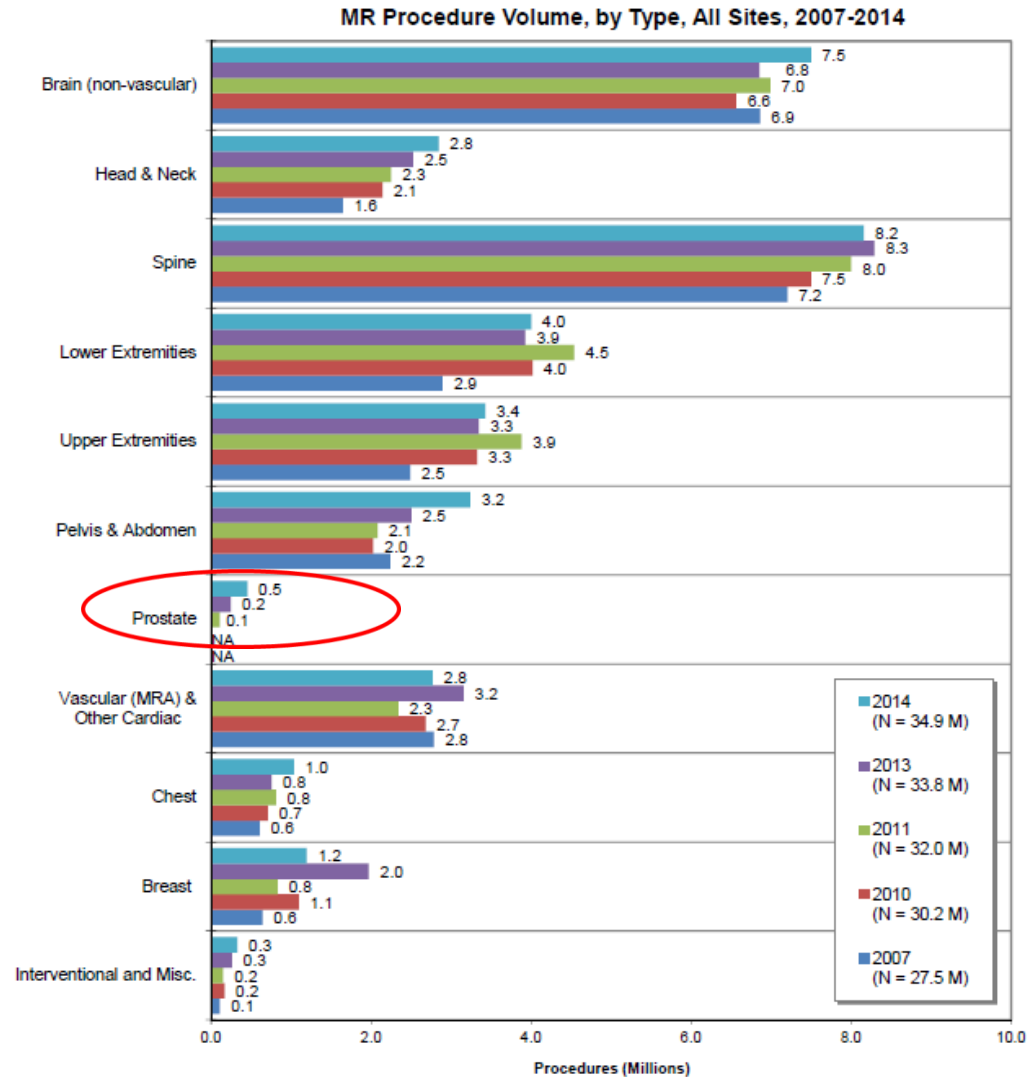
- The two highest volume categories of MRI imaging were Spine (23%) and Brain (22%) procedures.

- Prostate

- From 2013 to 2014, the biggest percentage increase in MR procedure volume is for prostate procedures which more than doubled from 0.2 to 0.5 million
- Though the volume of prostate procedures is only 1% of 2014 MR procedures, growth of 150% shows application adoption

- Other Growth Areas

- Pelvis & abdomen procedures grew 28% from 2.5 to 3.2 million
- Chest procedures grew ~ 25% from 0.8 to 1.0 million procedures.



New Standards in MRI: PI-RADSv2

Leading International Scientists Announce New Guidelines for Improved Prostate Cancer Diagnosis

Scientific Cooperation Aims to Accelerate Transfer of High Quality Prostate MRI from Laboratories to Clinics

- The Joint Steering Committee of the American College of Radiology (ACR), AdMeTech Foundation and the European Society of Urogenital Radiology (ESUR) today released new clinical imaging guidelines to assist early detection and treatment of prostate cancer. The new guidelines were announced at the meeting of AdMeTech's International Prostate MRI Working Group (AdMeTech's Group) held in conjunction with the Annual Meeting of the Radiologic Society of North America (RSNA).

The Joint Steering Committee developed Prostate Imaging Reporting and Data System Version-2, (PI-RADSv2) as global guidelines for high quality multi-parametric prostate MRI service. This work has built on the initial PI-RADS standardization, which was recommended by AdMeTech's Group in 2010 and created by ESUR in 2011. PI-RADSv2 has defined minimum technical requirements for creating images and in coordination with RSNA's Radiologic Lexicon Committee, set standards for communicating the risk and location of aggressive prostate cancer. These clinical guidelines were established in order to expedite wide-scale transfer of the high quality clinical service from the few leading research centers to the international medical community.

<h2>PI-RADS v2</h2>	
Prostate Imaging and Reporting and Data System: Version 2	
INTRODUCTION	
SECTION I	Clinical Considerations and Technical Specifications
SECTION II	Normal Anatomy and Benign Findings
SECTION III	Assessment and Reporting
SECTION IV	Multiparametric MRI (mpMRI)
SECTION V	Staging
APPENDIX I	Report Templates
APPENDIX II	Sector Map
APPENDIX III	Lexicon
APPENDIX IV	Sample Protocol
APPENDIX V	Atlas
REFERENCES	
INTRODUCTION	
Magnetic Resonance Imaging (MRI) has been used for noninvasive assessment of the prostate gland and surrounding structures since the 1980s. Initially, prostate MRI was based solely on morphologic assessment using T1-weighted (T1W) and T2-weighted (T2W) pulse sequences,	

National Guidelines - 2009

NCCN[®]

Practice Guidelines
in Oncology – v.2.2009

Prostate Cancer

INITIAL MANAGEMENT
OR PATHOLOGY

SURVEILLANCE

RECURRENCE

Active
surveillance^e

Life
expectancy
≥ 10 y

- PSA as often as every 3 mo but at least every 6 mo
- DRE as often as every 6 mo but at least every 12 mo
- Repeat prostate biopsy as often as annually

Life
expectancy
< 10 y

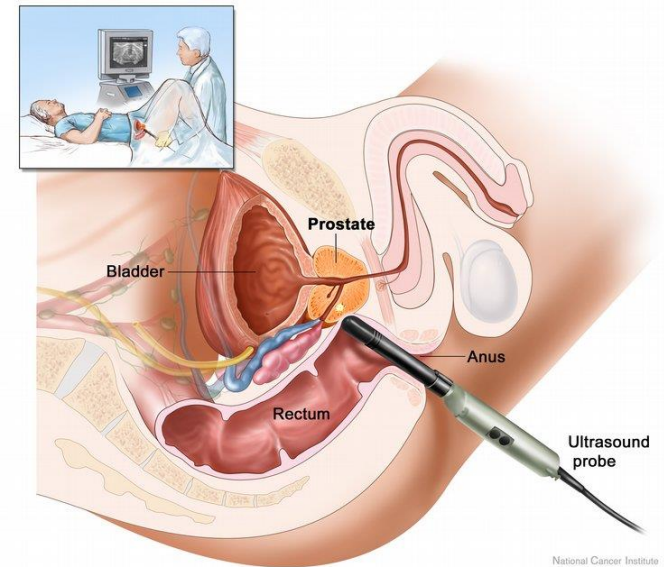
PSA, DRE, prostate biopsy may be done less frequently



National Guidelines - 2012

Repeat Biopsy Technique

Patients with prior negative biopsies, yet persistently rising PSA values should undergo repeat biopsy. Important factors in predicting chance of cancer on repeat biopsy include PSAV and the adequacy of initial biopsy (number of cores, prostate size). Cancer detection rates are higher in men with prior negative sextant biopsies compared to those with prior negative extended biopsies. Yields are highest in the laterally directed cores and the apical cores.⁹⁰ Particular attention should be given to apical sampling including the anterior apical horn, which is comprised of peripheral zone.⁹¹ Transition zone biopsies can be considered in repeat biopsy patients. In patients with two negative extended biopsies, yet persistently rising PSA values, a saturation biopsy may be considered.⁹² Recent evidence showed that multiparametric MRI (T2 weighting plus functional techniques such as diffusion weighting) can aid in cancer detection in patients with persistent PSA elevation but negative TRUS-guided biopsy (reviewed by Pinto et al.⁹³). Additional MRI imaging can be considered in select cases.



National Cancer Institute

European Guidelines - 2012

Eur Radiol (2012) 22:746–757
DOI 10.1007/s00330-011-2377-y

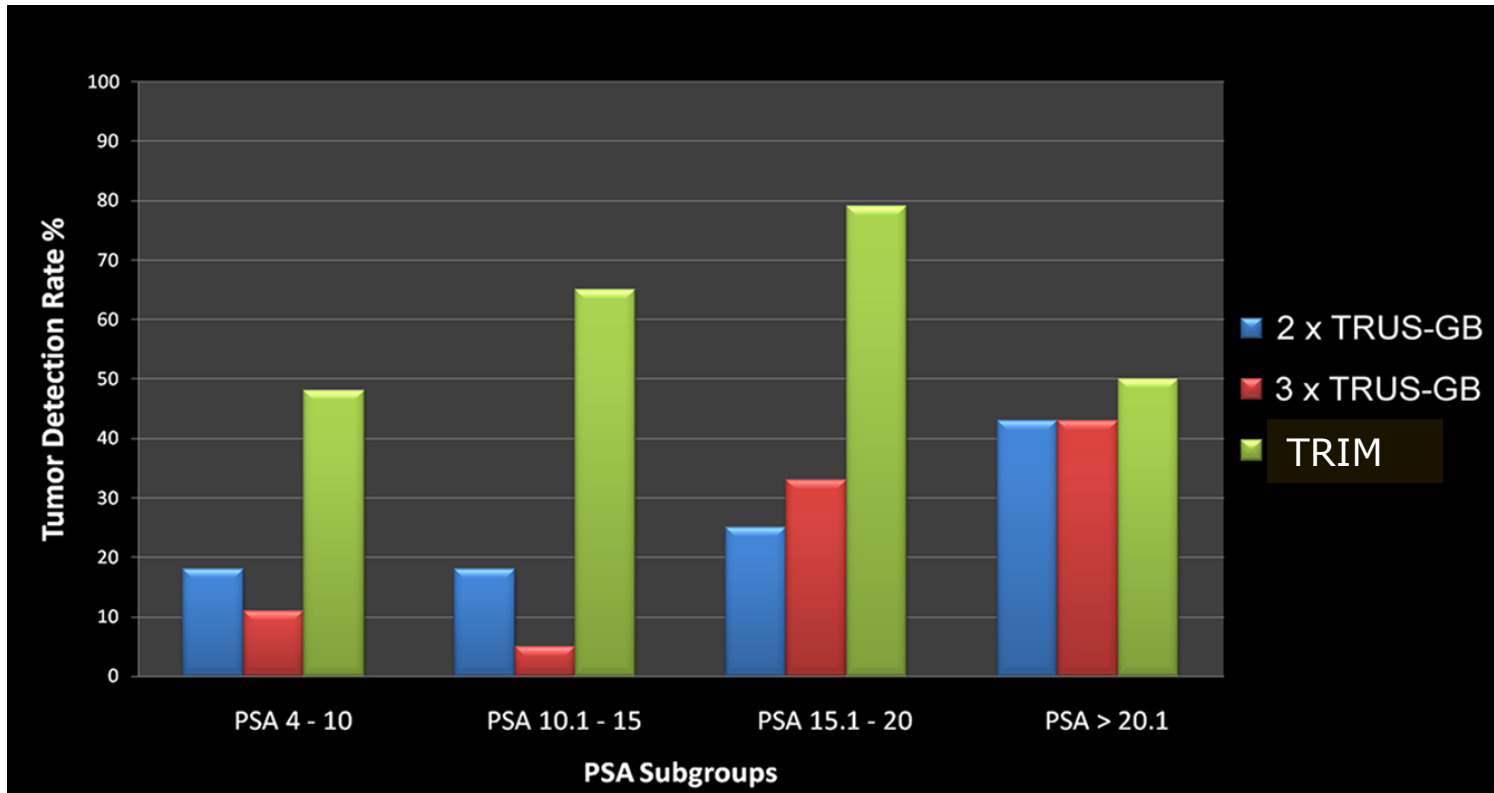
UROGENITAL

ESUR prostate MR guidelines 2012

Jelle O. Barentsz • Jonathan Richenberg •
Richard Clements • Peter Choyke • Sadhna Verma •
Geert Villeirs • Olivier Rouviere • Vibeke Logager •
Jurgen J. Fütterer

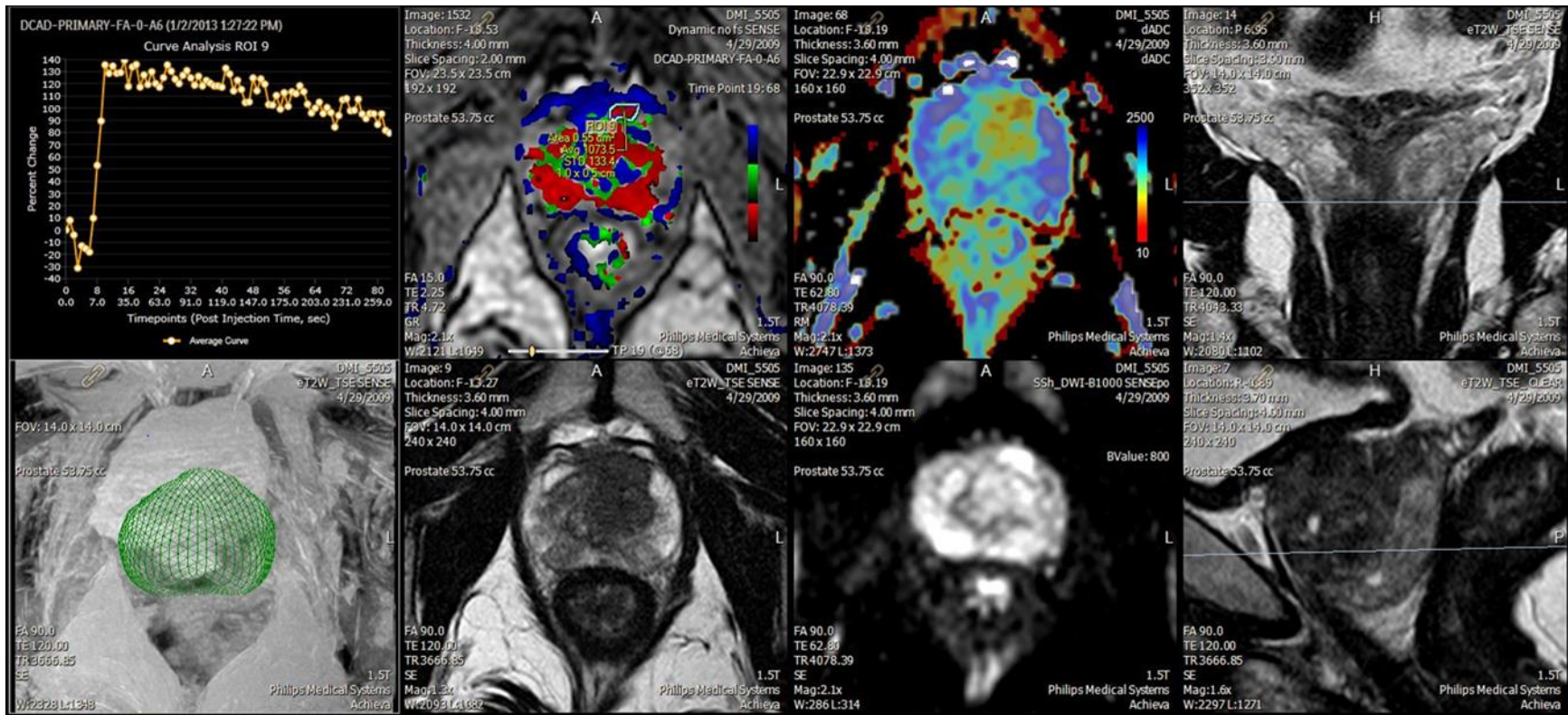


TRIM Compared to 2nd or 3rd TRUS Bx



*Based on 71 patients

Ultrasound vs. MRI



ACR Appropriateness Criteria[®]

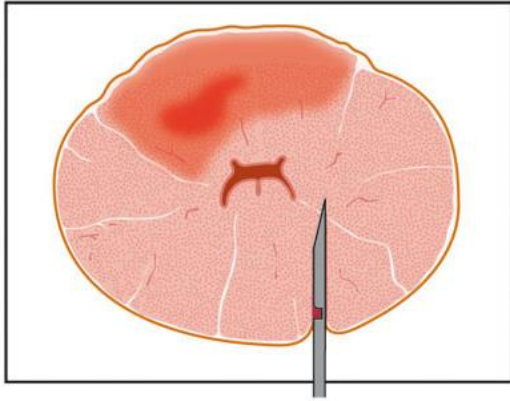
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Prostate Cancer — Pretreatment Detection

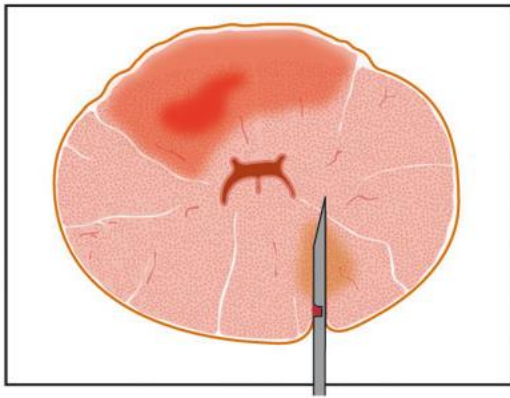
ACR PI-RADS V2, published 2014

<http://www.acr.org/~media/ACR/Documents/PDF/QualitySafety/Resources/PIRADS/PIRADS%20V2.pdf>
<https://acsearch.acr.org/docs/69371/Narrative/>

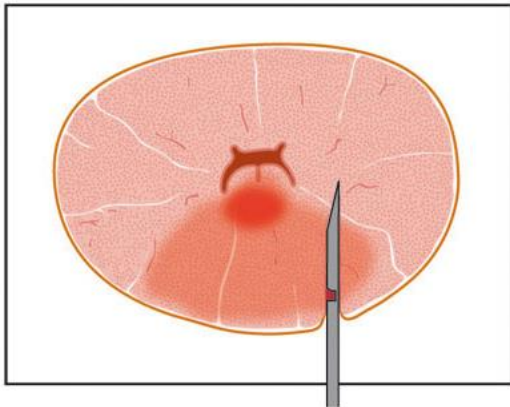
TRUS biopsy



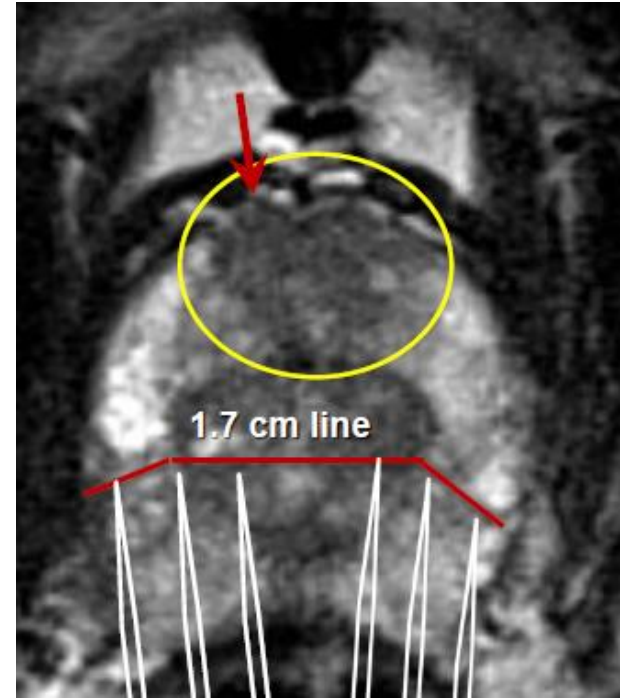
Needle penetrates next to the tumor or does not reach it



Less aggressive tumor is biopsied



Less aggressive part of the tumor is biopsied



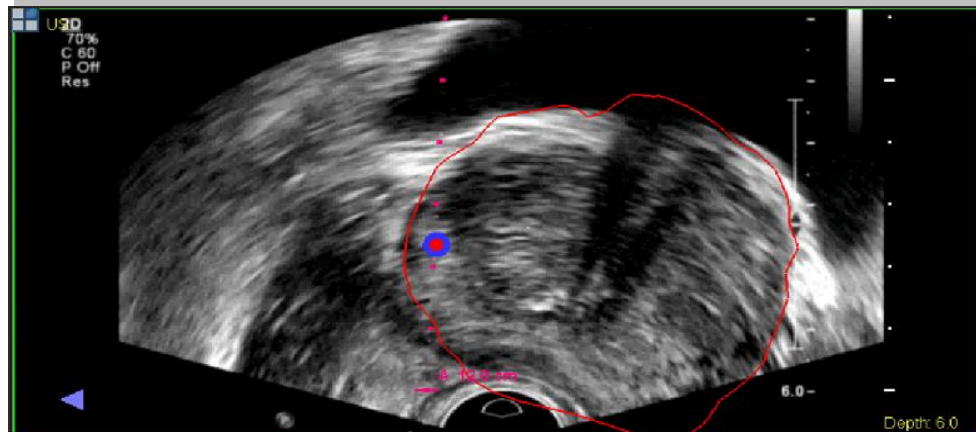
The patient can end up on active surveillance while harboring clinically significant disease

Prostate Intervention in the 2010's



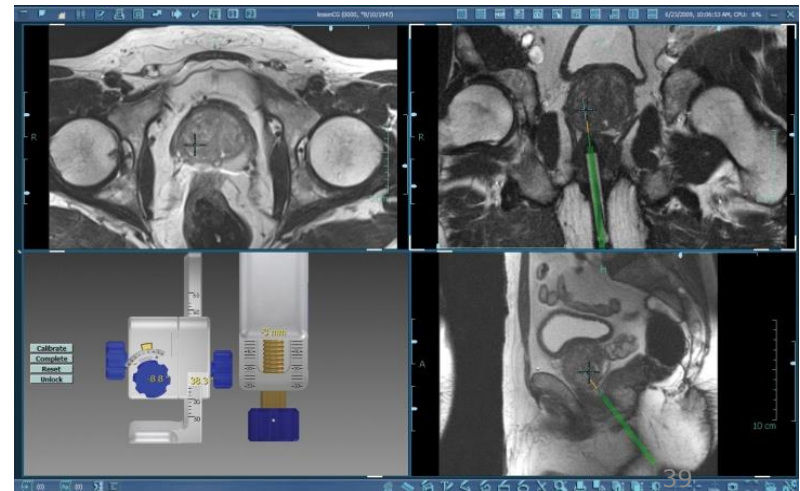
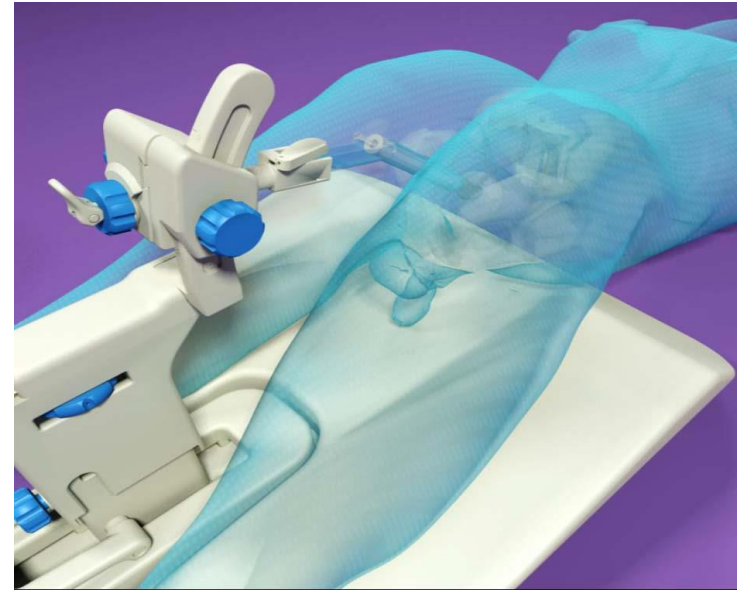
2011 – Pinto et al.: MRI/US fusion prostate biopsy

2012 – NCCN Guidelines include Multiparametric MRI



Rationale for Prostate MRI

- Ability to biopsy tumor suspicious regions in the prostate
- MRI guidance for biopsy planning to target tumor-suspicious regions (TSRs)



Transrectal Interventional MR Guidance Device



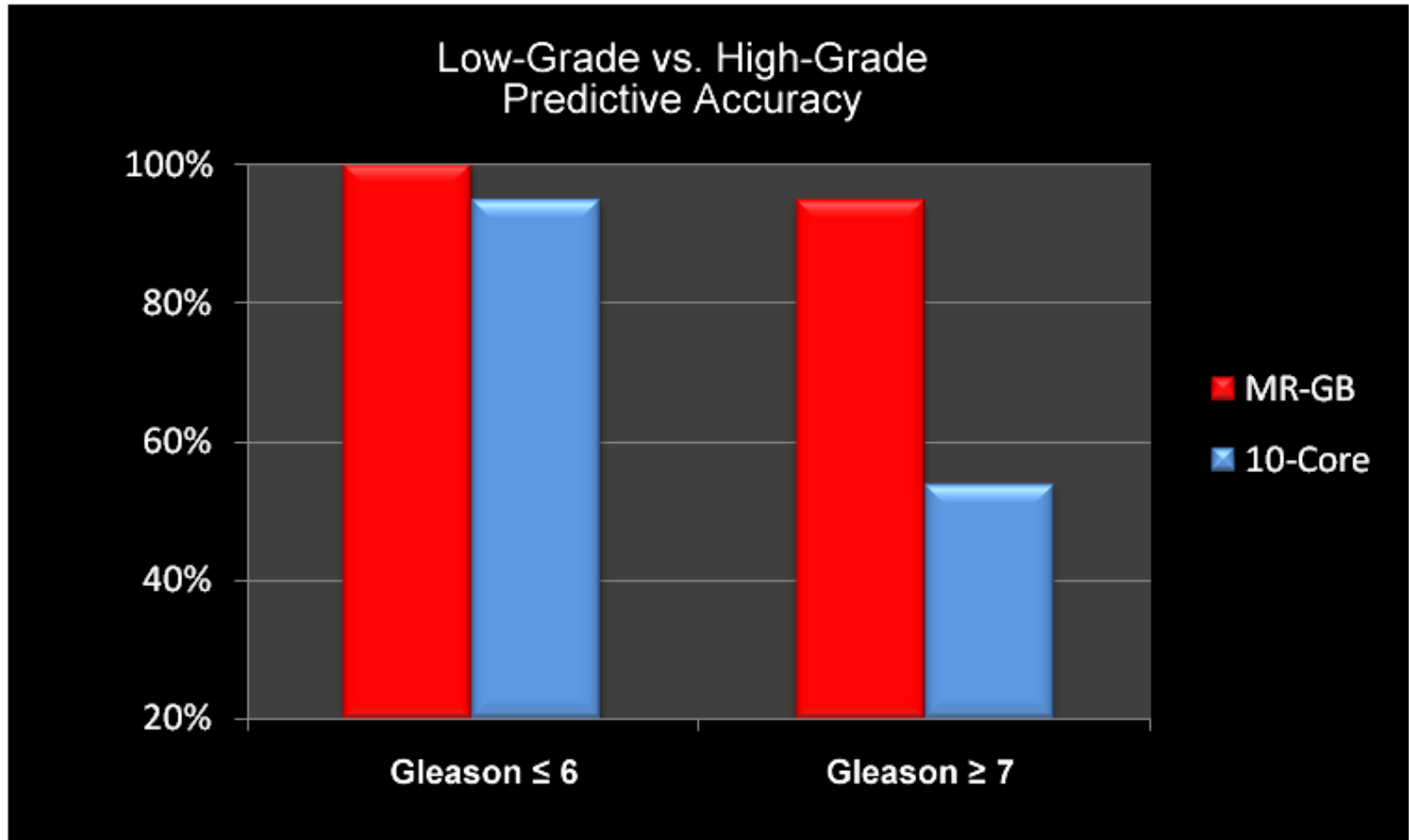
Interventional Device



***Interventional
Instruments***

18 G MR compatible

TRUS-Biopsy & MR-Biopsy vs. Prostatectomy

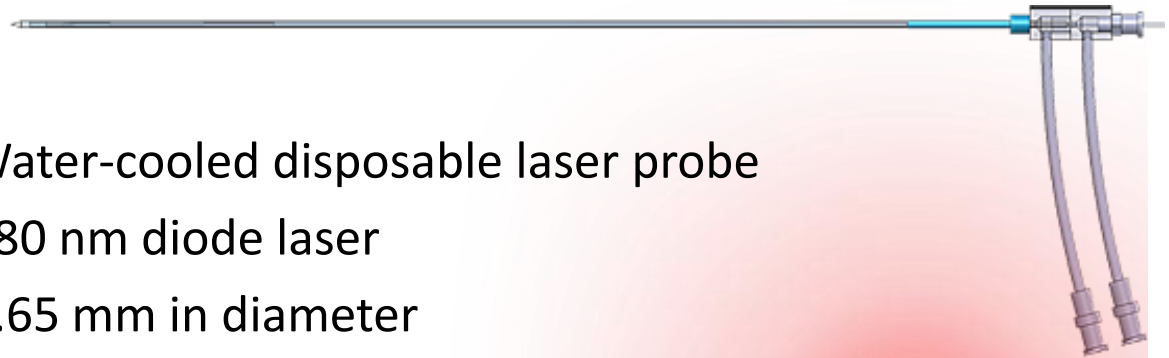


Hambrock 2010 SCBTMR “Lauterbur Award”

MR-guided Laser Focal Therapy

1

Water-cooled disposable laser probe
980 nm diode laser
1.65 mm in diameter



Endorectal needle guide

2



Heat-diffusing tip



3

14 G titanium coax needle

Laser Workstation



- 15 Watt laser (Fiberoptic)
- Standard power plug
- Integrated to MR (Ethernet)
- Software: real-time prediction model; MR thermometry; safety control features
- FDA 510(k) clearance Sept 10,2008

FDA cleared with broad, general indications

“for use to necrotize or coagulate soft tissue through interstitial irradiation or thermal therapy. . . in neurosurgery, general surgery, urology. . .” and multiple additional named specialties.

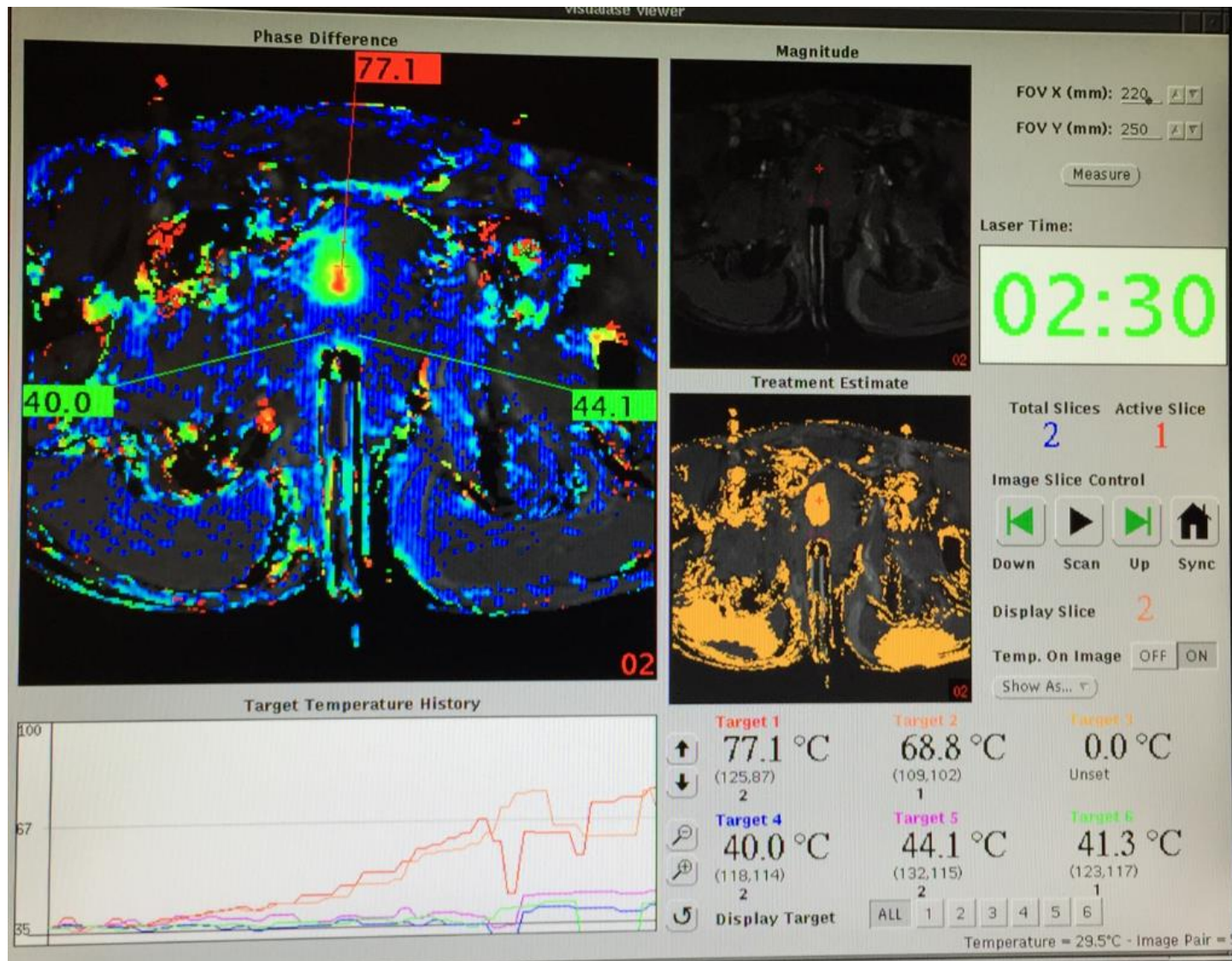
Technology is FDA cleared for commercialization in the US:

- Laser Applicator K053087 (March 2006)
- Laser System K060304 (March 2006)
- Workstation Software K063505 (December 2006)
- Visualase Thermal Therapy System K071328 (August 2007)
- Visualase Thermal Therapy System K081656 (September 2008)
- 30 W Laser System K092197 (November 2009)



30 Watt Diode Laser

Thermometry interface



MR Thermometry and Image Generation



Patient Information

Accession Number: 0000
 Patient ID: 0000
 Patient Name: [Blank]

Patient Protocols

Site: [Blank]
 Patient Position: Supine
 Patient Entry: Feet First
 Coil: CARDIAC
 Series Description: 3-plane localizer
 Plane: 3-Plane Mode: 2D
 Pulse Seq: Fiesta Grad Mode: [Blank]
 Seq: Fast
 Psd Name: [Blank]
 Protocol: [Blank]

Scan Timing

of TE(s) per scan: [Blank] Min. 1.0 Max. 2.0
 TE Minimum: 1.5 1.5
 TE2: 1.0 1.0
 TR: 5.0 6000.0
 Inv. Time: 0 100000
 T2: 50 4000
 Flip Angle: 60 1 90
 Echo Train Length: [Blank]
 Bandwidth: 125.00 2.0 250.0
 Bandwidth2: 0.0 250.0

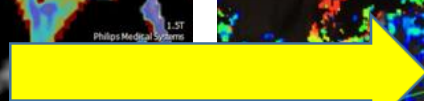
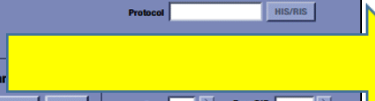
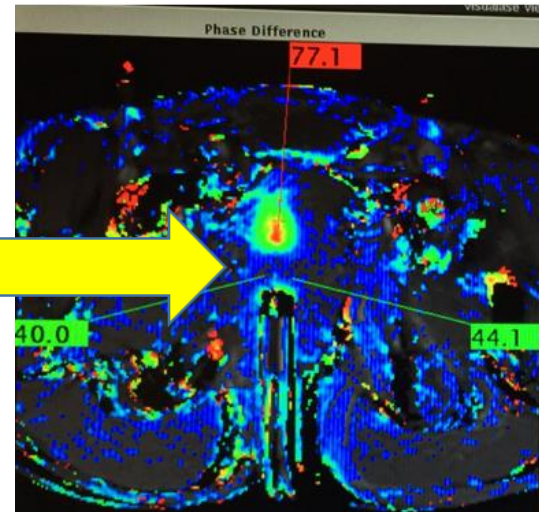
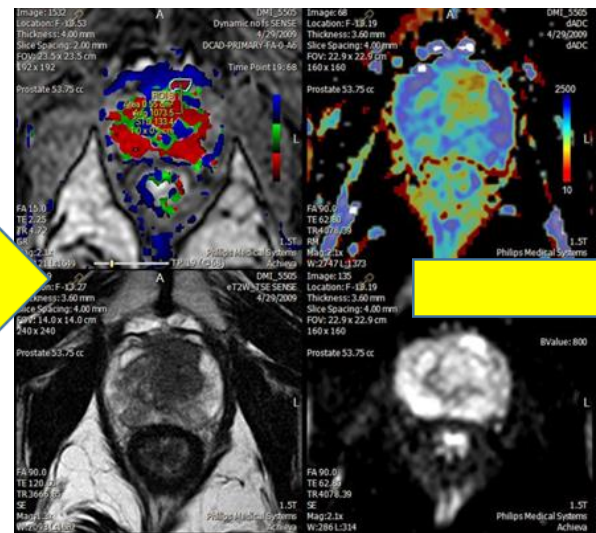
Additional Parameters

Graphic RX: OFF
 Image Enhance: [Blank]
 Users CTR Screen: [Blank]

Freq: 256 Freq DIR: Unswap
 Phase: 128 Flow Comp: [Blank]
 NEX: 1.00 Shim: Auto
 Phase FOV: 1.00 Phase Correct: [Blank]
 Acq: Before Pause: 0 Contrast: [Blank] ml
 Agent: [Blank]

Scanning Range

FOV	Min.	Max.	S/R	R/L	A/P
24.0	18	48	Center	L30.0	A30.0
Slice Thickness: 5.0	Spacing: 10.0	10.0	10.0		
# Slices: 9			9	9	9



MR Thermometry and Image Generation

Proper parameter selection allows for exploitation of tissue properties:

Tissue contrast
Flow quantification
Perfusion
Diffusion
Phase shifts

- Echo Time
- Repetition Time
- Flip Angle
- Bandwidth
- Signal Averages
- Matrix

Patient Information

Accession Number: 0000
Patient ID: 0000
Patient Name: _____
Auto Start:

Patient Protocols

Site: _____
Patient Position: Supine
Patient Entry: Feet First
Coil: 8CARDIAC
Series Description: 3-plane localizer
Plane: 3-Plane
Mode: 2D
Pulse Seq: Fiesta
Imaging Options: Seq, Fast
Psd Name: _____
Protocol: _____ HIS/RIS

Scan Timing

	Min.	Max
# of TE(s) per scan	1.0	2.0
TE2	1.0	1.0
TR	5.0	6000.0
Inv. Time	0	100000
T12	50	4000
Flip Angle	1	90
Echo Train Length		
Bandwidth	2.0	250.0
Bandwidth2	0.0	250.0

Additional Parameters

Graphic RX: OFF
Image Enhance: _____
Users CVs Screen: _____

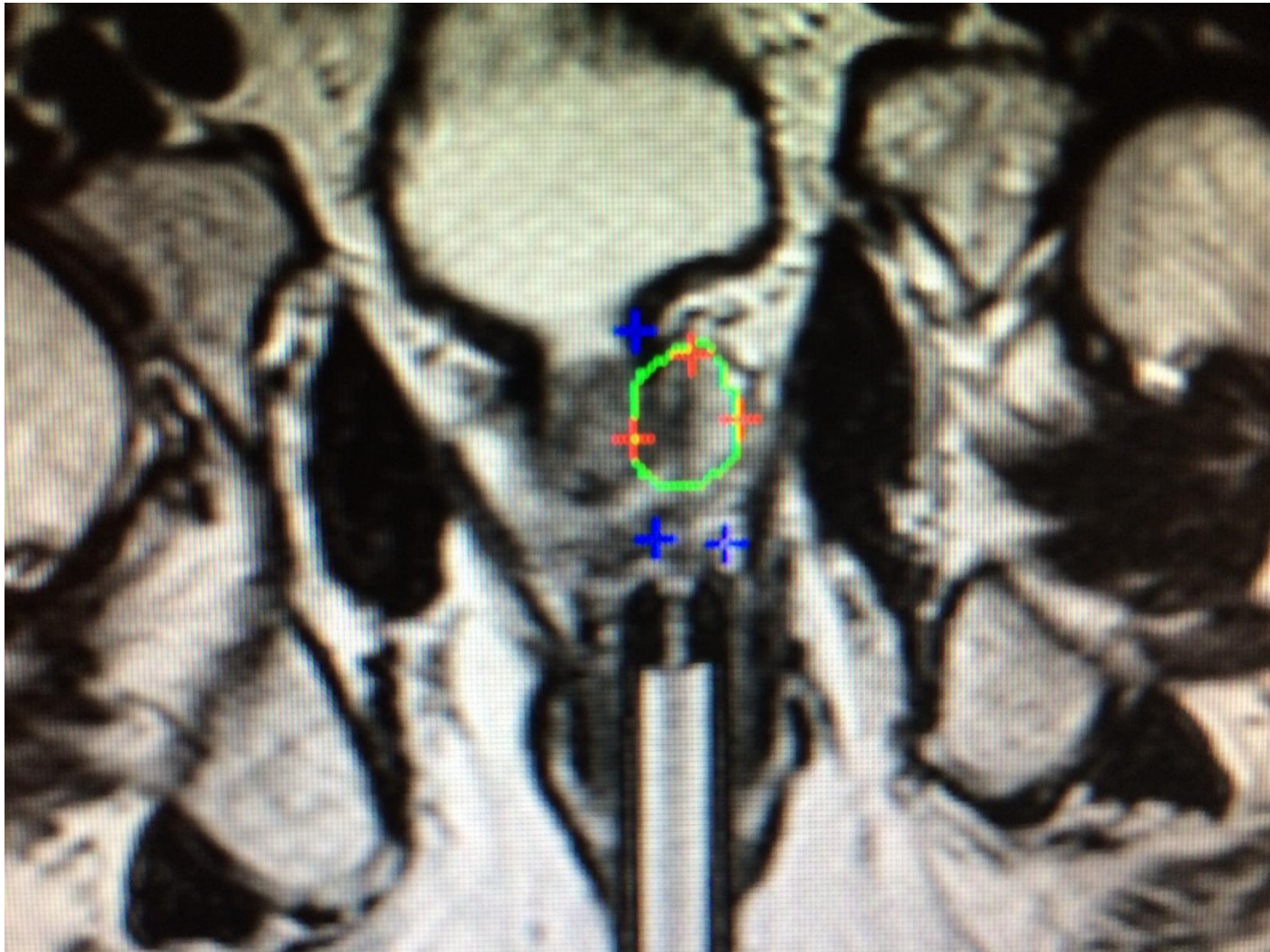
Acquisition Timing

Freq: 256
Freq DIR: Unswap
Phase: 128
Flow Comp Direction: _____
NEX: 1.00
Shim: Auto
Phase FOV: 1.00
Phase Correct: _____
Contrast: _____
As Before Pause: 0
Amf: _____ ml
Agent: _____

Scanning Range

	Min.	Max	S/I	R/L	A/P
FOV	18	48	Center: 0.0	L30.0	A30.0
Slice Thickness			Spacing: 10.0	10.0	10.0
# Slices			9	9	9

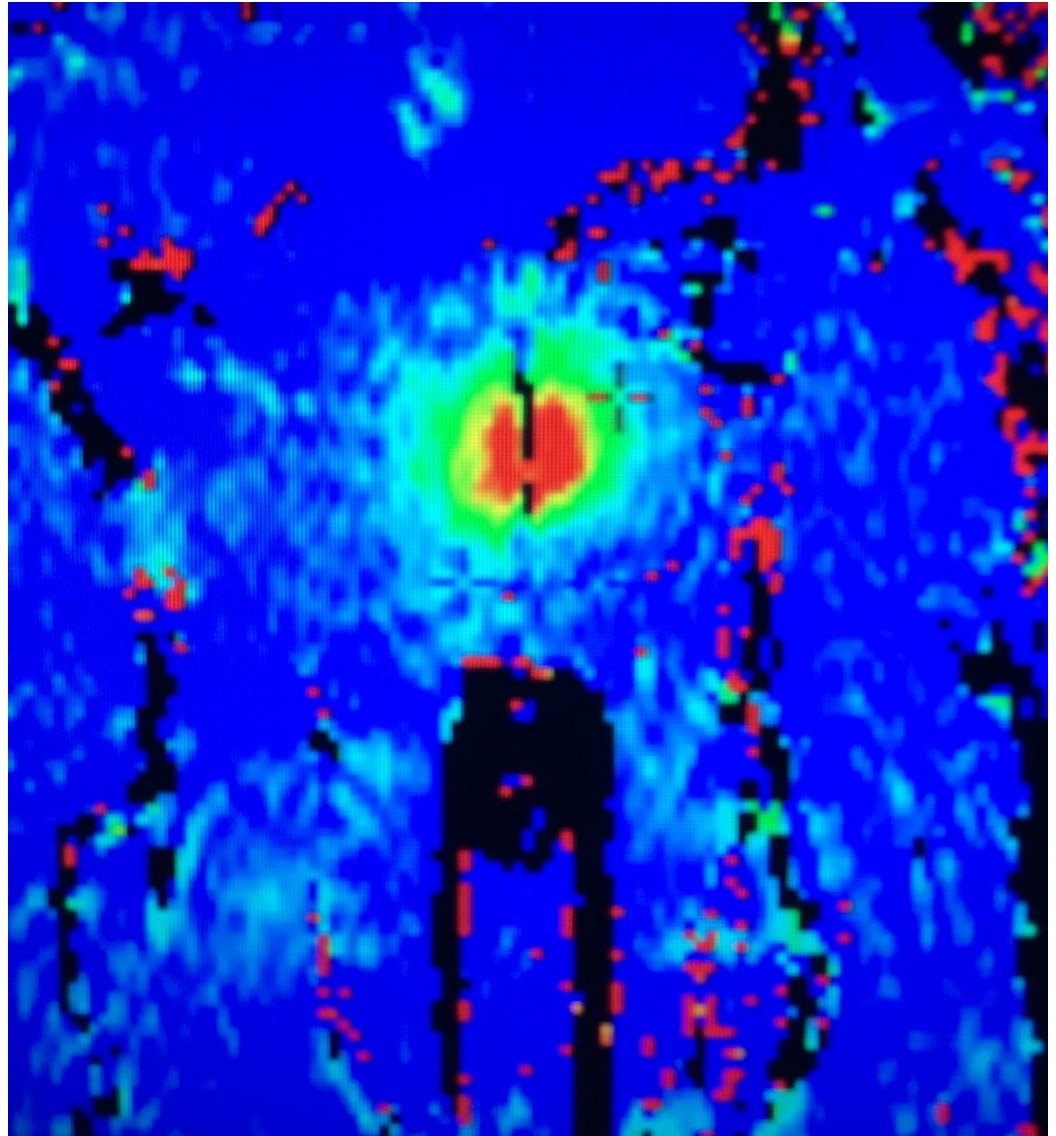
Contouring and Safety Controls



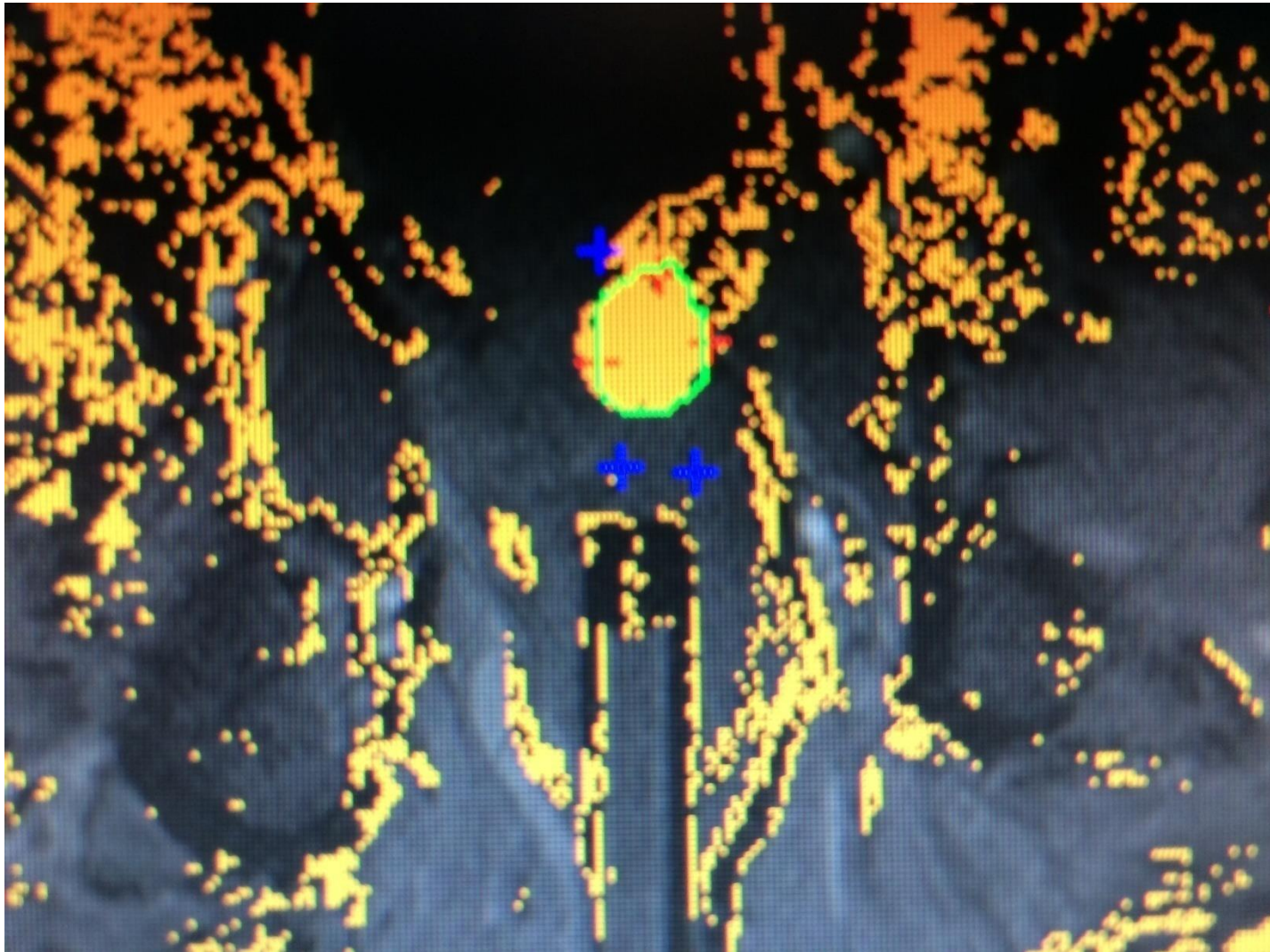
Real Time MR Thermometry

Test Dose
4W (27%)
~100 degrees F

Treatment Dose
12W (80%)
90 sec



Irreversible Damage Estimate

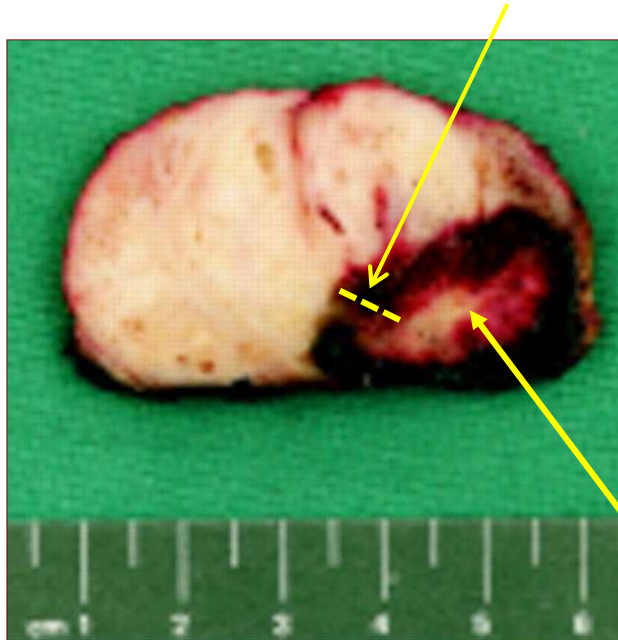


Laser interstitial thermal therapy margins

Precision and Control

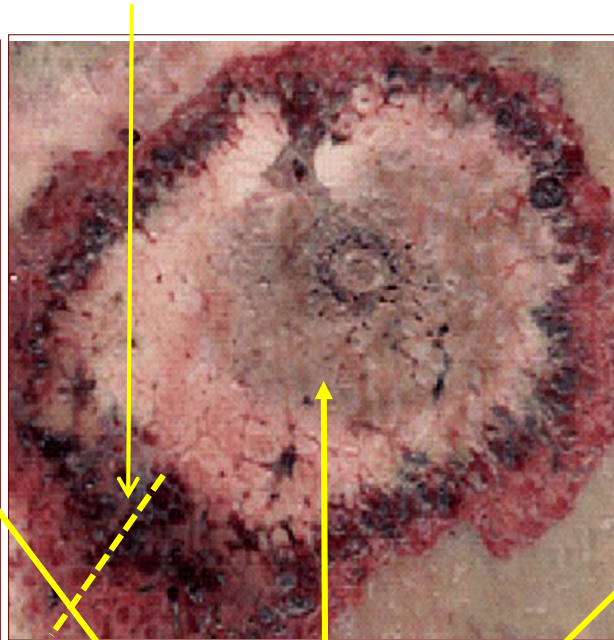
Sharp transition zone between dead and viable tissue

Transition zone
in HIFU can be 5-10 mm



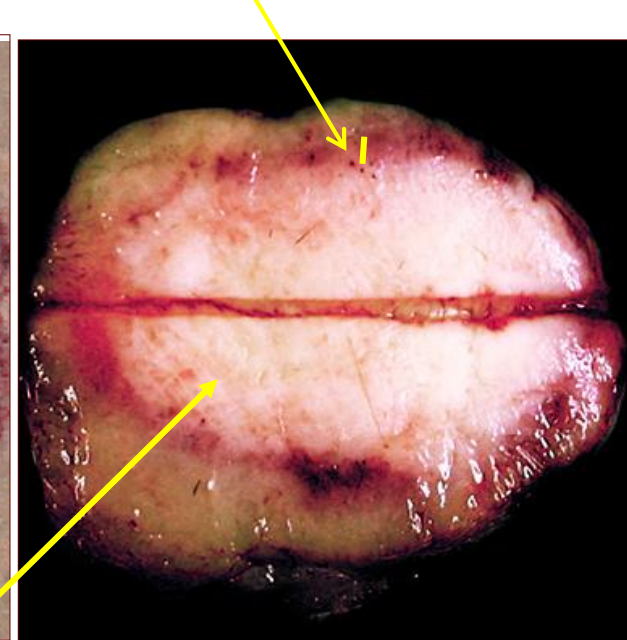
US-guided HIFU lesion

Transition zone in RF and
Cryo can be 5-10 mm



Necrotized tissue

Visualase transition
zone is less than 1 mm



Technical aspects – ECR 2011

EPOSTM
Electronic Presentation Online System

ESR
European Society of Radiology

Technical aspects of trans-rectally delivered, MRI-guided laser therapy of prostate cancer

Poster No.: C-1045
Congress: ECR 2011
Type: Scientific Paper
Authors: B. M. Greenwood¹, J. F. Feller², R. McNichols³; ¹Pewaukee, WI/US, ²Indian Wells, CA/US, ³Houston, TX/US
Keywords: Genital / Reproductive system male, Oncology, Pelvis, MR, CAD, Image manipulation / Reconstruction, Ablation procedures, Laser, Computer Applications-General, Tissue characterisation
DOI: 10.1594/ecr2011/C-1045

Results: NCT 02243033, as of Sept. 2015

- 45 patients
- 4 salvage patients for BCR
- 62 cancer foci treatments
- Age range: 50-81 years
- Initial PSA
 - Range = 0.9 - 28
 - Mean = 7.12
- MRI tumor volume
 - Range = 0.1 – 4.1 cc
 - Mean = 0.88 cc

Results: Treatment Naïve

Gleason Score*	Patients	Cancer Foci
3+3	15	18
3+4	20	26
4+3	10	12

Zone†	Cancers
PZ	36
TZ	22
CZ	3

* Four patients had GS6 and GS7 lesions, one had both 3+4 and 4+3

† Seven patients were treated for multifocal cancer

Results: Salvage

Therapy	Cancer Foci	Patients
Brachytherapy	3	2
Proton beam	1	1
Cryotherapy	1	1

Gleason Score	Cancer Foci	Patients
3+3	0	0
3+4	1	1
4+3	3	2
4+4	0	0
4+5	1	1

Results: Treatment Naïve

- Total procedure time = 1.5-4.0 hours

Goal of eliminating T2W / ADC map attained initially in 80%

MRI vol. of coagulation necrosis 1.2-11.8 cc

- No serious adverse events, no morbidity!

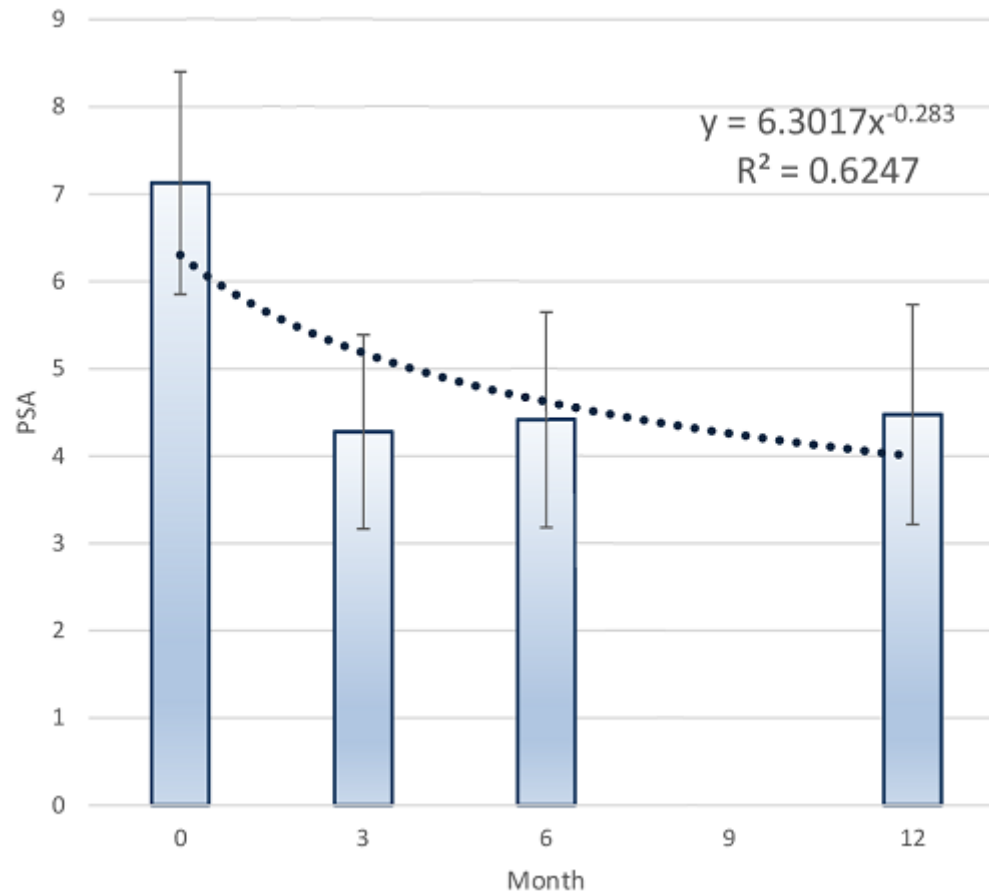
2 cases of asymptomatic periprostatic necrosis

3 cases of retention cyst

13 patients with positive biopsy at treatment site
consistent with residual/recurrent cancer

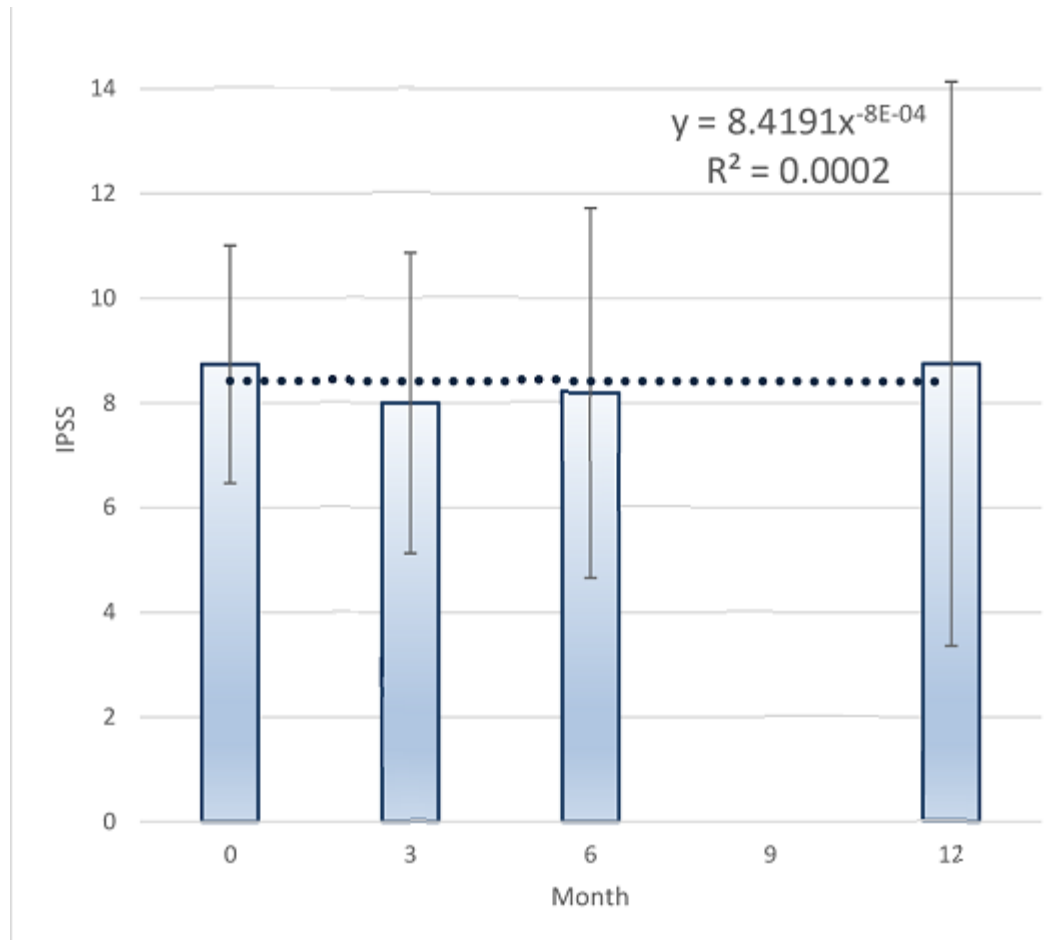
- Positive margin rate = 26%
- Incidence cancer rate = 6%
- 10 patients retreated with laser focal therapy

Results - PSA

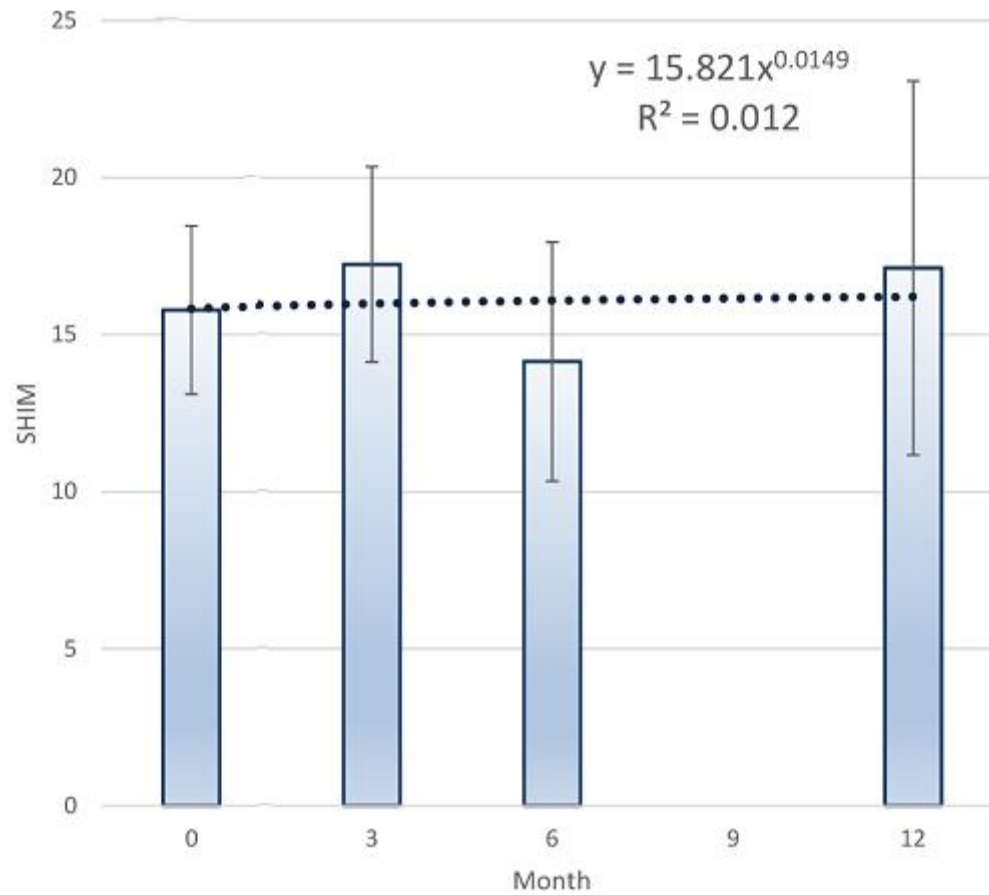


47% decrease of mean PSA 1 year after laser focal therapy

Results - IPSS



Results - SHIM



Results: Patient Withdrawal

- 1 patient expired from metastatic melanoma
- 1 patient withdrew for personal reasons
- 1 patient withdrew after negative 6 month bx (GS 3+3) because of travel
- 5 patients went on to whole gland therapy (11%)
 - 4 incidence cancer patients (2 GS 4+4, 1 GS 4+3 multifocal, 1 3+4) elected RP*
 - Importantly, no additional technical difficulty reported with RP
 - 1 GS 3+3 elected PBT before 6 month Bx

*One 4+4 was downgraded to 4+3 at surgery

Small Series Conclusions

1. Outpatient MR guided transrectal laser focal therapy of prostate cancer is feasible and safe
2. Positive margin rate = 26%
3. Whole gland therapy rate = 10%
4. Incidence cancer rate = 6%
5. Patients are still re-treatment viable (focal or whole gland therapy)
6. Continuity of imaging modality:

Multiparametric MRI >> MR Guided Bx >> MR Guided Focal Therapy

Take Home Message

Establishing an MRI based prostate laser focal therapy program is a multi-disciplinary team sport!



MRI Program for Detection and Treatment of Prostate Cancer

- I. Multi-parametric MRI of the prostate
- II. MR guided biopsy
- III. MR guided focal laser ablation of prostate cancer (Investigational)

MRI is the GPS for detecting and localizing prostate cancer!

Acknowledgements

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- John Feller, MD
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 - Axel Winkel (Invivo-Germany)
 - Wes Jones
-
- Andrew Farrall, PhD
 - Elda Railey, Co-founder Focus on Research

Thank you for your attention!

bernadette.greenwood@desertmedicalimaging.com

Research Advocacy Network

