



**esur2022**

28th European Symposium on Urogenital Radiology

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Athens



# Controversies in Prostate MRI

***Jelle Barentsz***

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*Andros Clinics, Arnhem, The Netherlands*

# No Conflicts of Interest



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**jelle.barentsz@radboudumc.nl or j.barentsz@andros.nl**



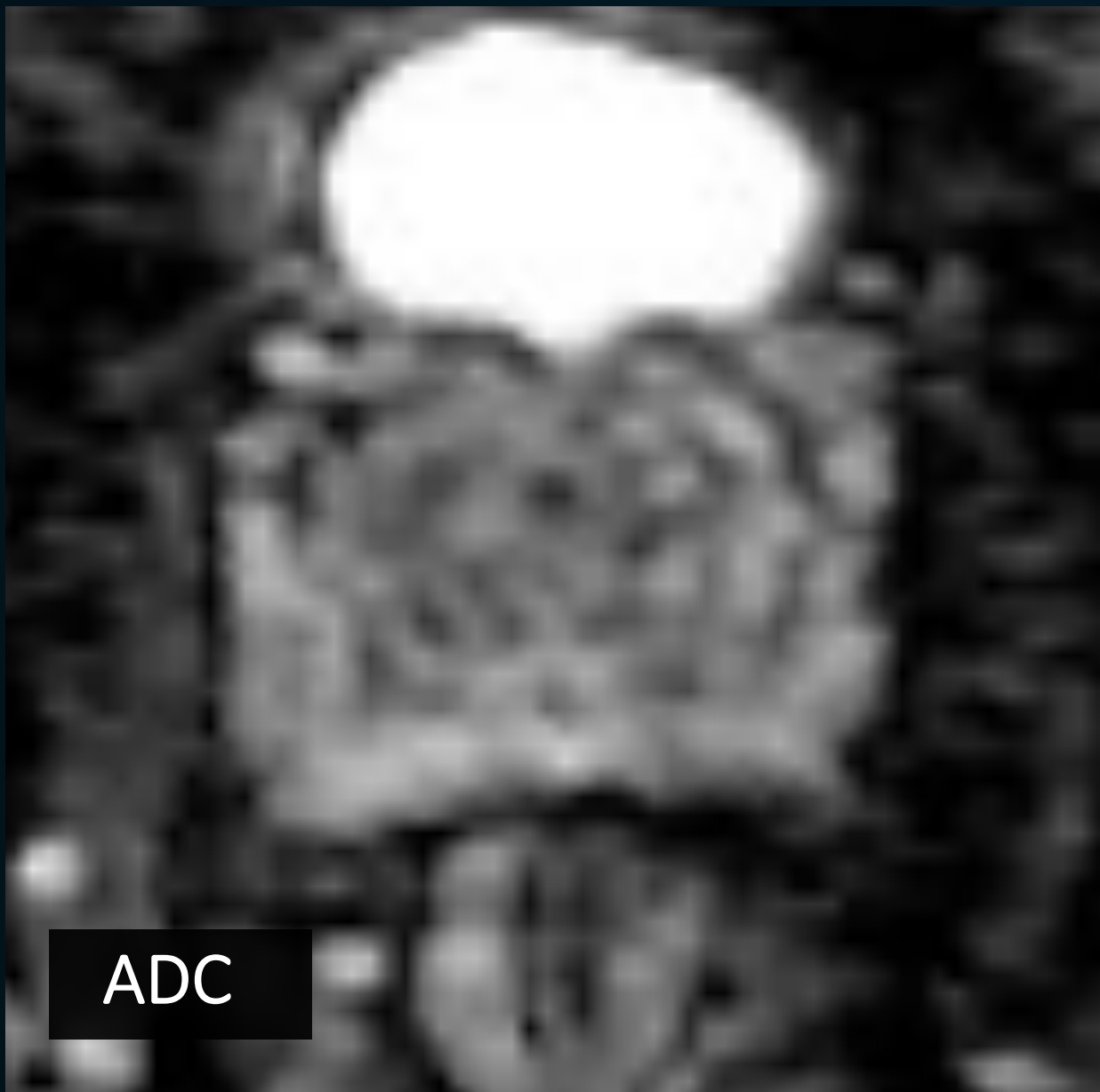
**www.mri-prostate-barentsz.nl**

*“A case I see too often*

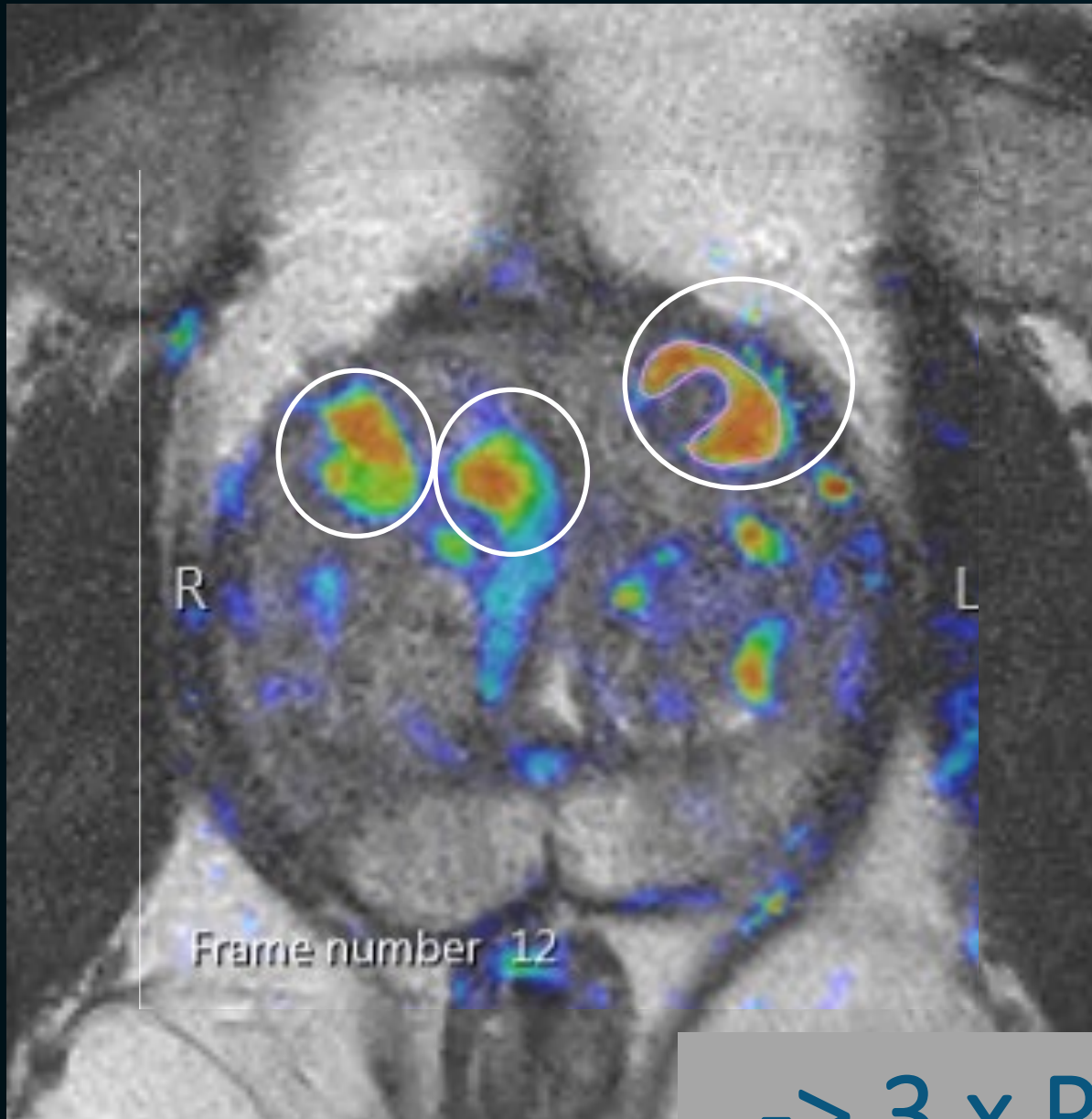
54 Y; PSA 16 ng/ml, T1c, PSAD 0.13

## 3T MRI

- Technically according to guidelines
- PI-RADS?



Erased Charcoal



-> 3 x PI-RADS 4

*“A case I see too often*

54 Y; PSA 16 ng/ml, T1c, PSAD 0.13

3x PI-RADS 4

-> MR-Fus targeted- and random biopsy  
(24 needles) under general anaesthesia

*“A case I see too often*

54 Y; PSA 16 ng/ml, T1c, PSAD 0.13

3x PI-RADS 4

-> MR-Fus targeted- and random biopsy  
(24 needles) under general anaesthesia

What would you do as patient?

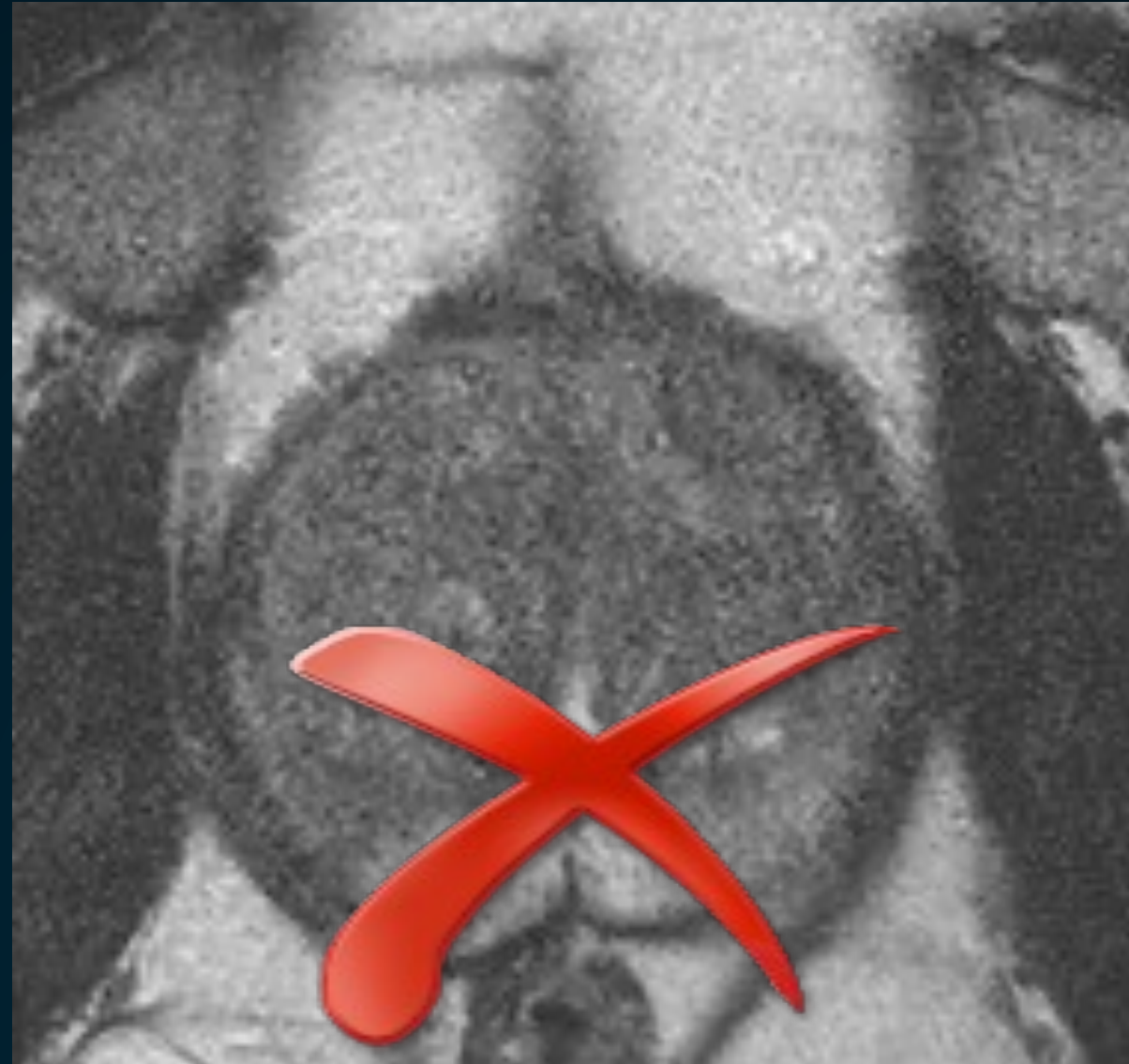
**SEE THE EXPERT!**

New MRI



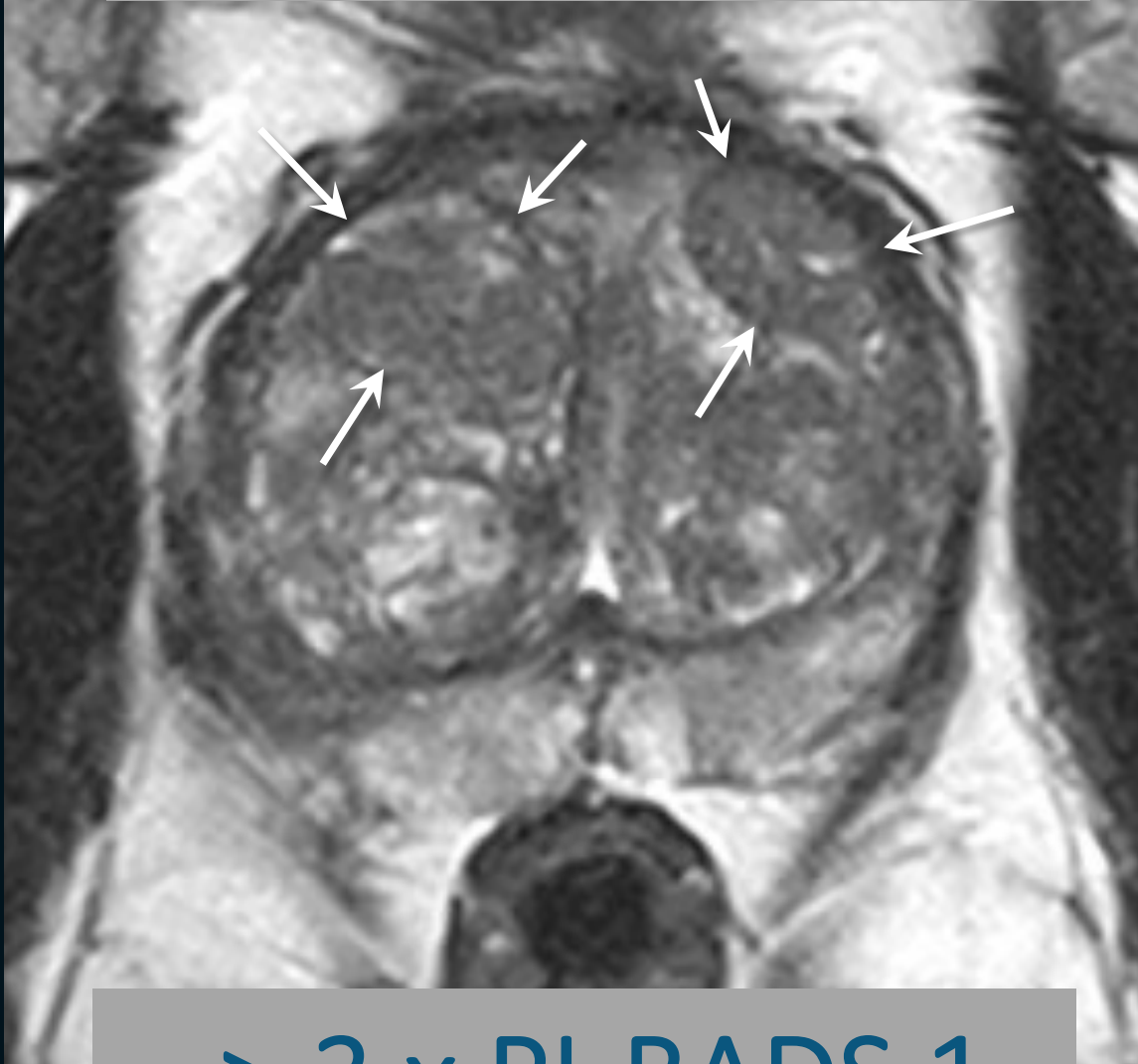
Both images are according to the guidelines

New MRI



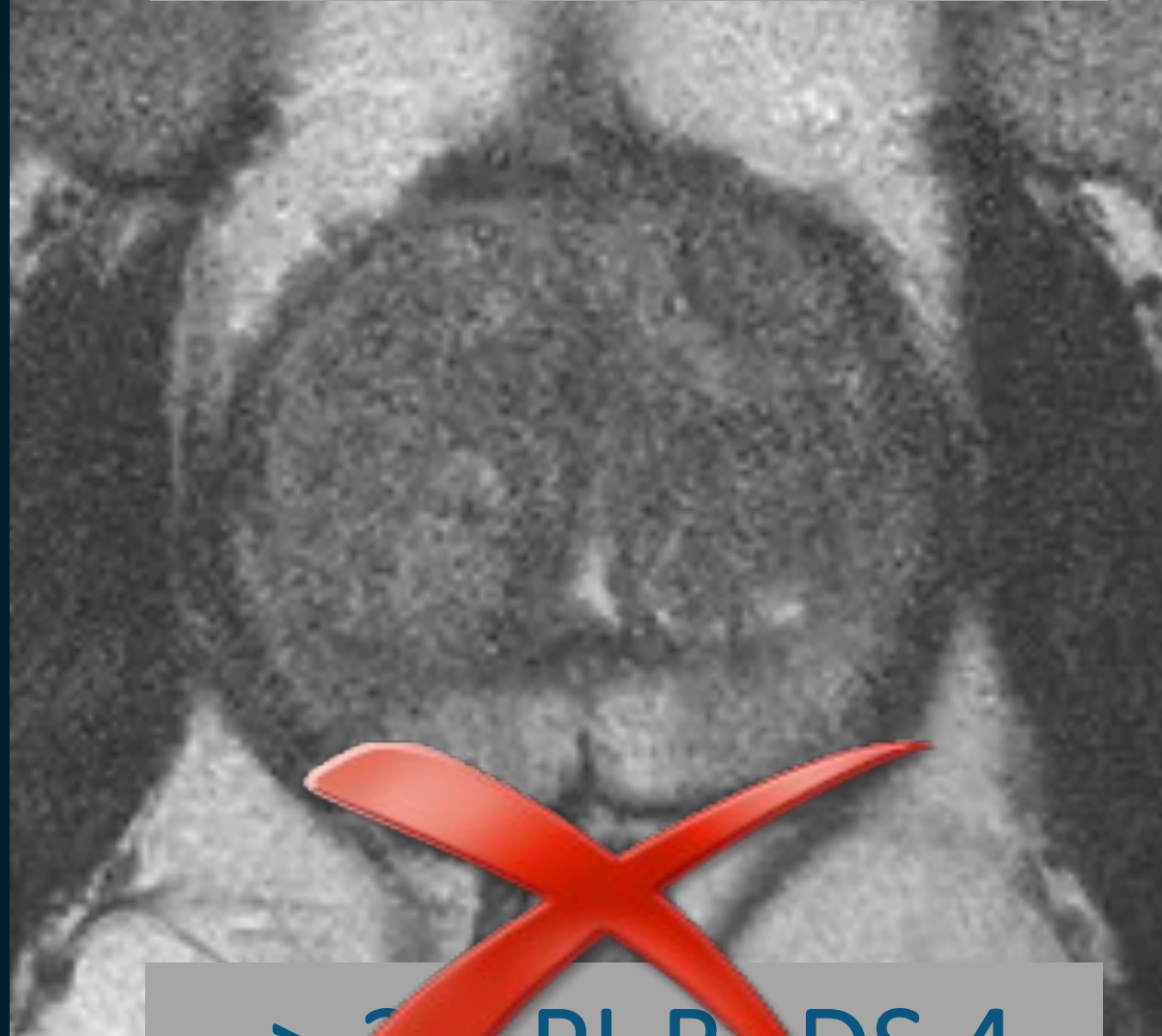
But: Poor Quality, no DCE

Well Demarcated



-> 3 x PI-RADS 1

'Erased Charcoal'



-> 3 x PI-RADS 4

# Main controversies in prostate MRI

- Is expertise required?
- Do we need contrast?
- Random needles in addition to MR-targeted biopsy?



**EXPERTISE**



Teacher

Unaware  
incompetent

Teacher



Unaware  
incompetent

Aware  
incompetent

Teacher



Unaware  
incompetent

Aware  
incompetent

Aware  
competent

Teacher



Unaware  
incompetent

Aware  
incompetent

Aware  
competent

Unaware  
competent

Teacher





***“Everybody can read prostate MRI after  
a course!” (?)***

# Expert vs non-expert

## Quality matters

|                                | Expert MRI<br>(n=3194) | 'Average'<br>(n=5219) |
|--------------------------------|------------------------|-----------------------|
| <b>No biopsy</b> (PI-RADS 1-2) | <b>57%</b><br>NPV 96%  | <b>33%</b><br>NPV 96% |
| <b>Biopsy:</b>                 |                        |                       |
| <b>No Prostate Cancer</b>      | <b>8%</b>              | <b>21%</b>            |
| <b>Prostate Cancer</b>         | <b>35%</b>             | <b>46%</b>            |
| <b>- Insignificant PCa</b>     | <b>9%</b>              | <b>17%</b>            |
| <b>- Significant PCa</b>       | <b>26%</b>             | <b>29%</b>            |

# Expert vs non-expert

## Quality matters

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# Accuracy and Agreement of PIRADSv2 for Prostate Cancer mpMRI: A Multireader Study

Matthew D. Greer BS,<sup>1,2</sup> Anna M. Brown BSE, MPhil,<sup>1,3</sup> Joanna H. Shih PhD,<sup>4</sup>  
Ronald M. Summers MD, PhD,<sup>5</sup> Jamie Marko MD,<sup>6</sup> Yan Mee Law MD,<sup>7</sup>  
Sandeep Sankineni MD,<sup>1</sup> Arvin K. George MD,<sup>8</sup> Maria J. Merino MD,<sup>9</sup>  
Peter A. Pinto MD,<sup>8</sup> Peter L. Choyke MD,<sup>1</sup> and Baris Turkbey MD<sup>1\*</sup>

Specialists: less PI-RADS 3 diagnoses (OR 2.25)

# Accuracy and Agreement of PIRADSv2 for Prostate Cancer mpMRI: A Multireader Study

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Specialist >2000 MRI's

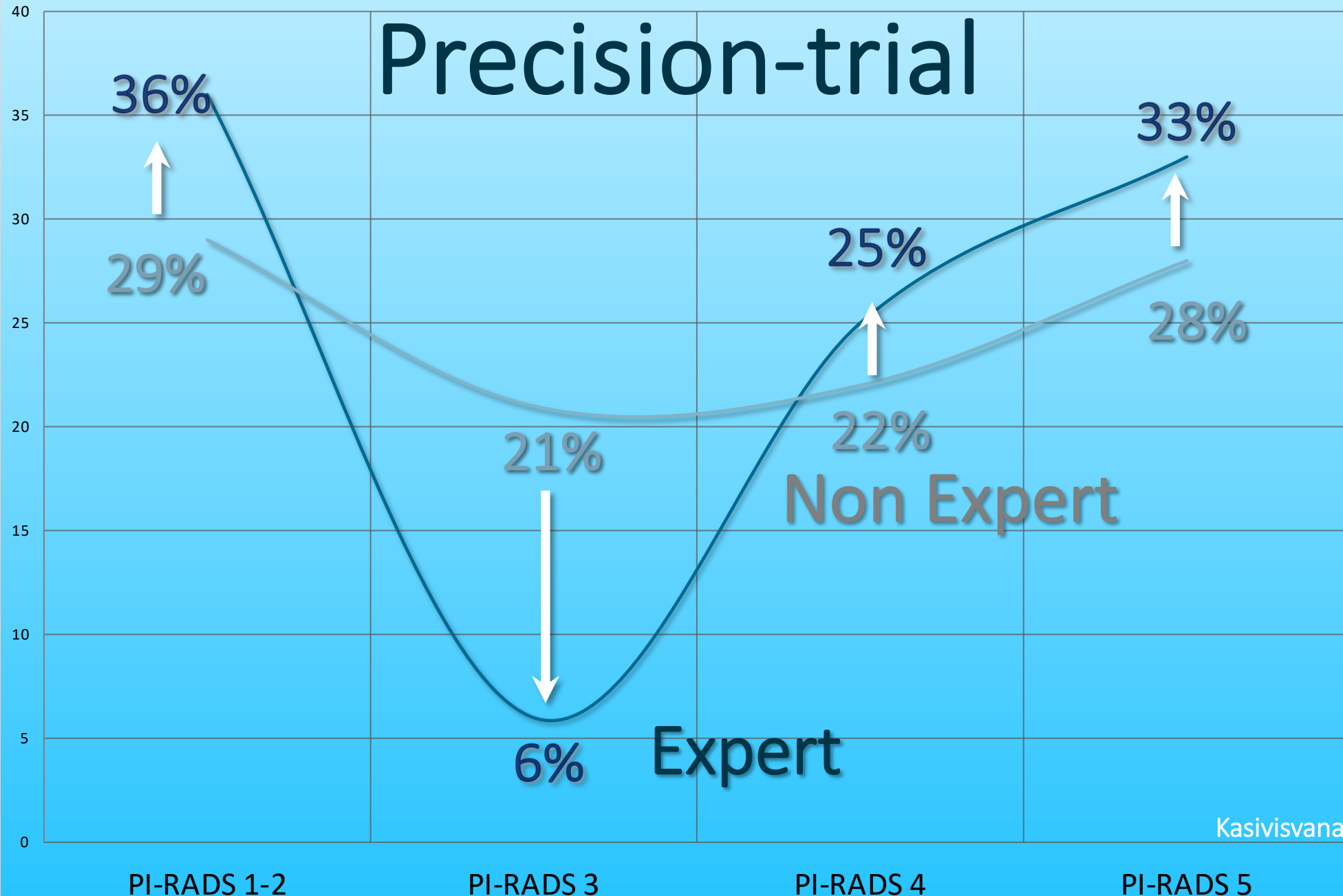
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Specialist >2000 MRI's

Non-Specialists 300-500 MRI's

# Precision-trial



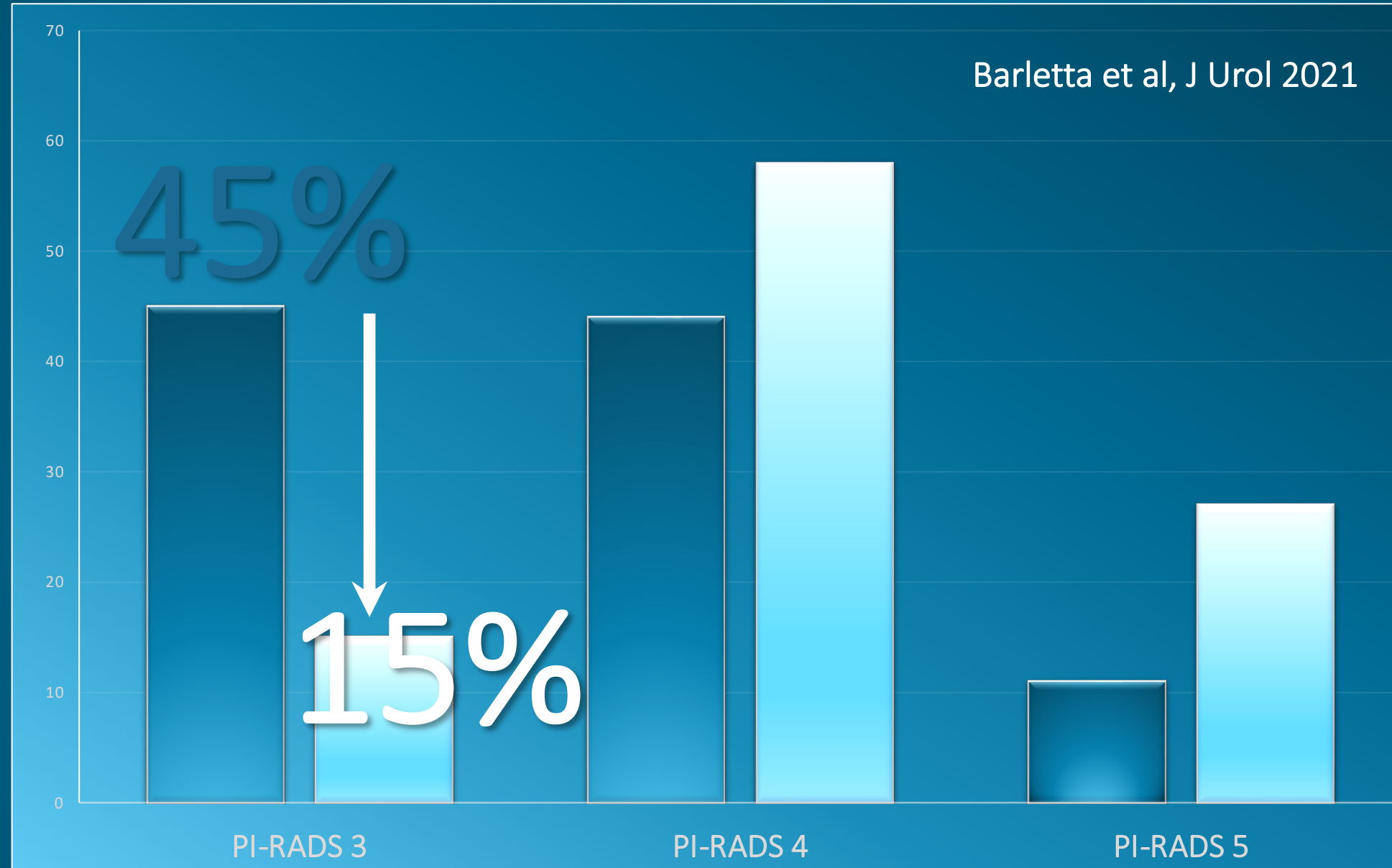
# Effect of Central Review: PI-RADS 3: 45% -> 15%



No Review



Central Review



# Quality

Image quality reporting is **mandatory** (using PI-QUAL v2)

European Radiology

<https://doi.org/10.1007/s00330-020-06929-z>

UROGENITAL



## **ESUR/ESUI consensus statements on multi-parametric MRI for the detection of clinically significant prostate cancer: quality requirements for image acquisition, interpretation and radiologists' training**

Maarten de Rooij<sup>1</sup>  • Bas Israël<sup>1,2</sup> • Marcia Tummers<sup>3</sup> • Hashim U. Ahmed<sup>4,5</sup> • Tristan Barrett<sup>6</sup> • Francesco Giganti<sup>7,8</sup> • Bernd Hamm<sup>9</sup> • Vibeke Løgager<sup>10</sup> • Anwar Padhani<sup>11</sup> • Valeria Panebianco<sup>12</sup> • Philippe Puech<sup>13</sup> • Jonathan Richenberg<sup>14</sup> • Olivier Rouvière<sup>15,16</sup> • Georg Salomon<sup>17</sup> • Ivo Schoots<sup>18,19</sup> • Jeroen Veltman<sup>20</sup> • Geert Villeirs<sup>21</sup> • Jochen Walz<sup>22</sup> • Jelle O. Barentsz<sup>1</sup>

2

**mpMRI**

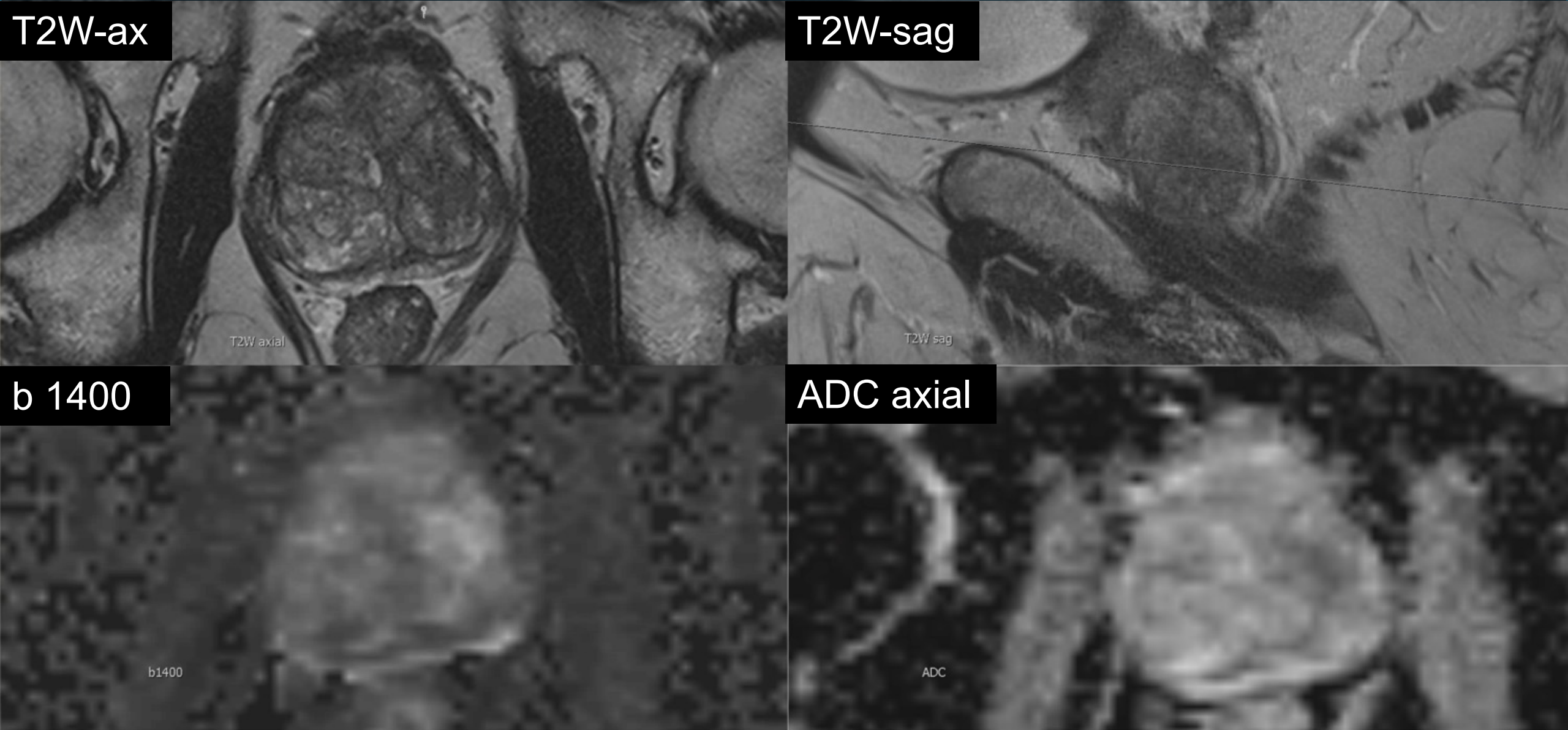
**bpMRI**

# *“Another case*

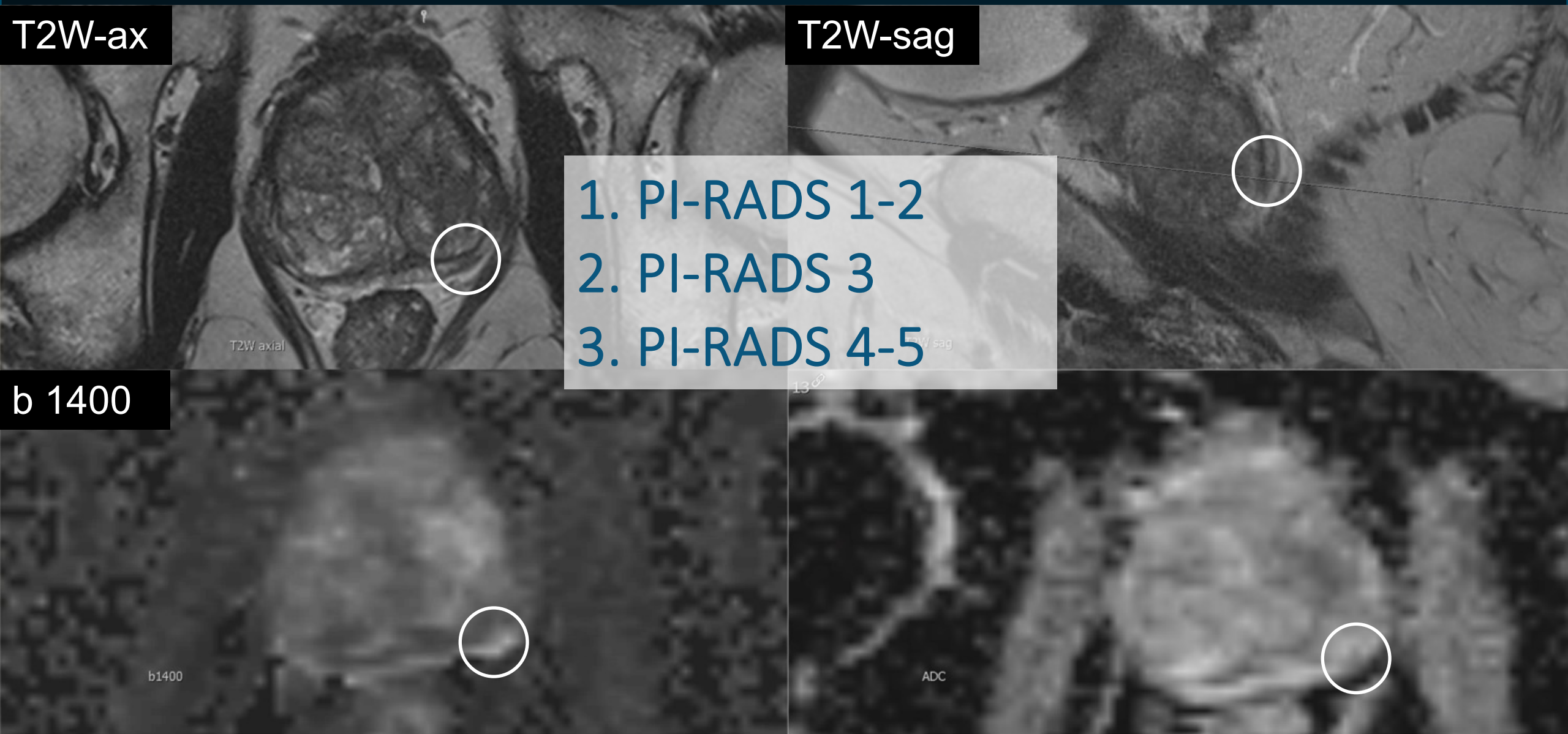
74 Y; PSA 9.6 ng/ml, T0, PSAD 0.13

## 3T MRI

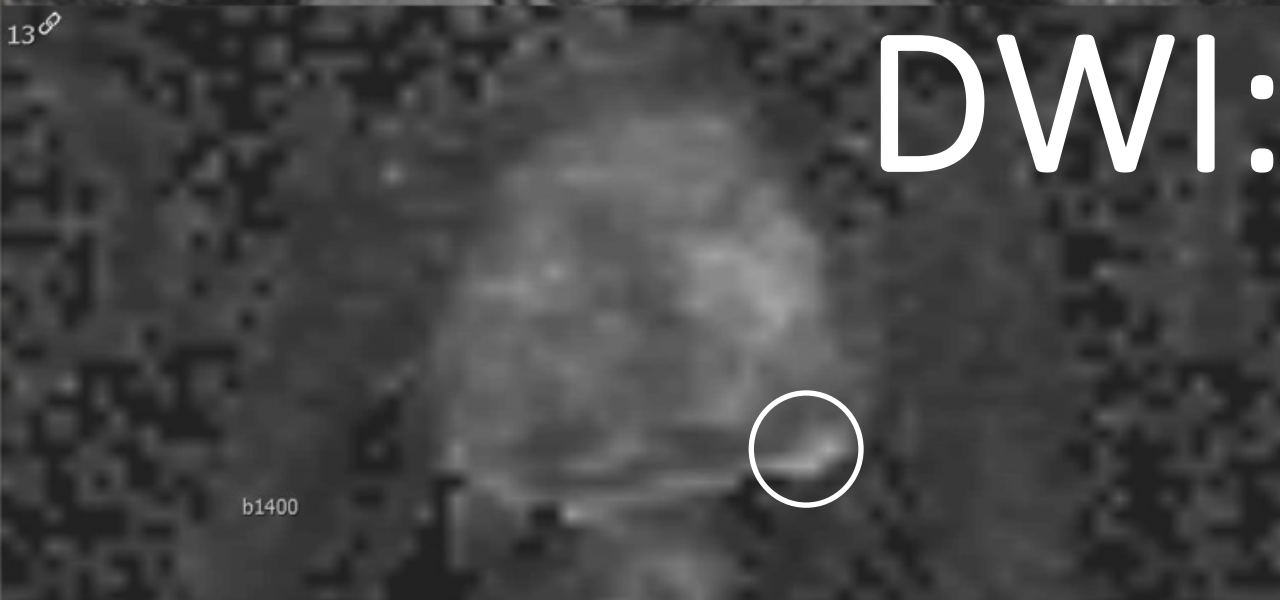
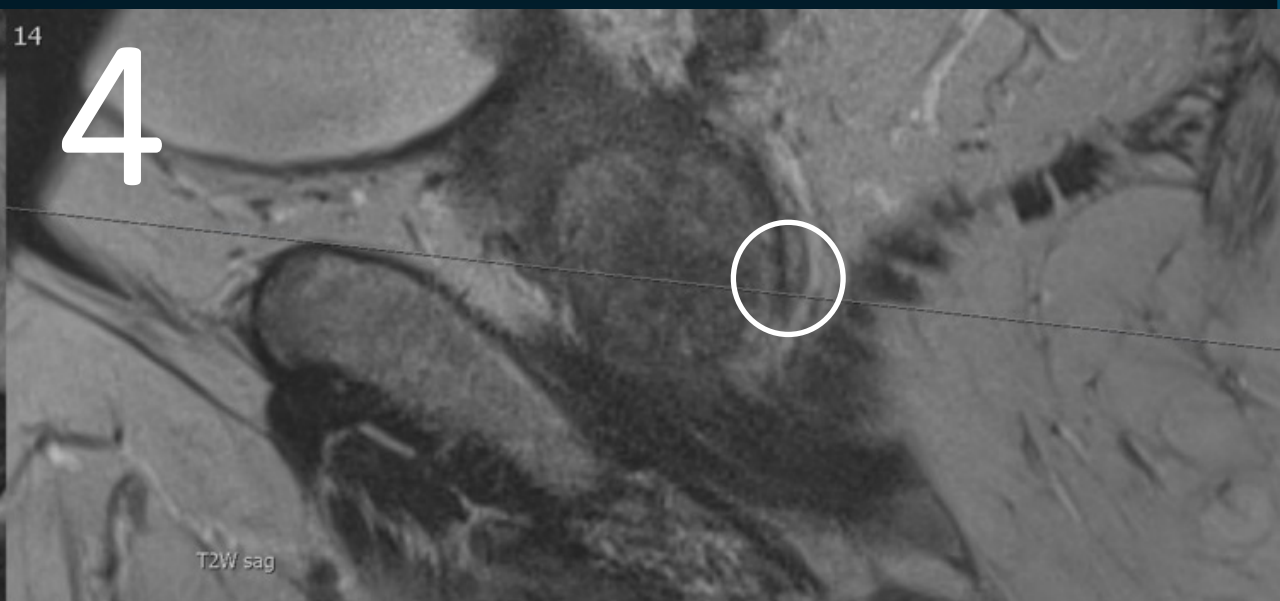
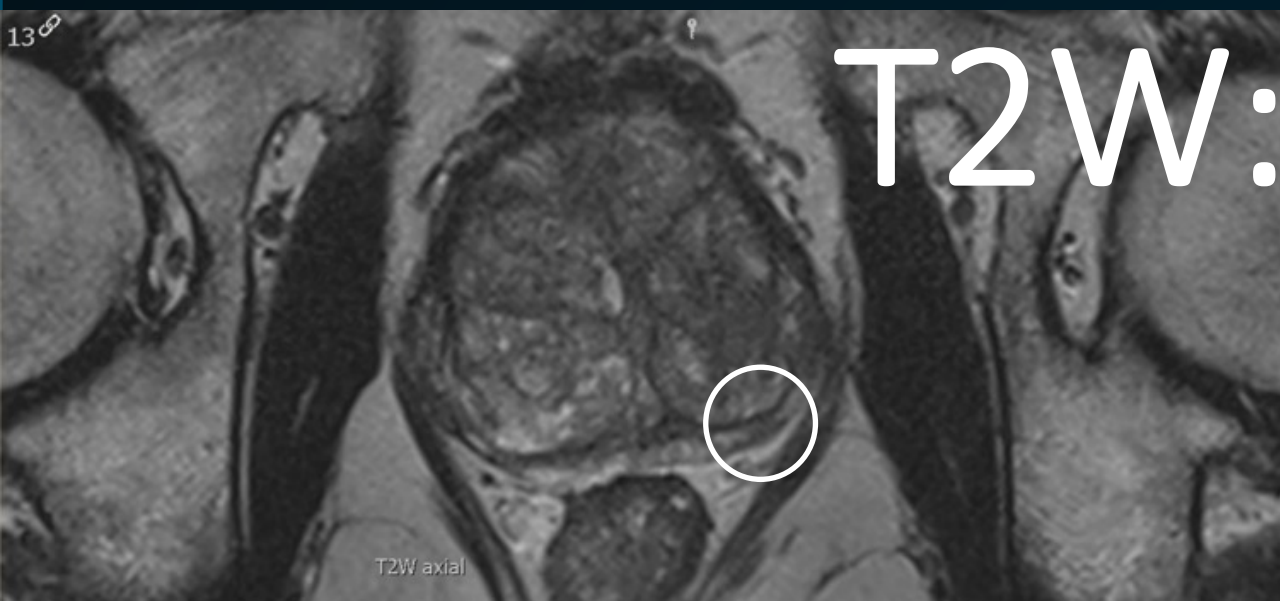
- Technically according to guidelines
- No DCE



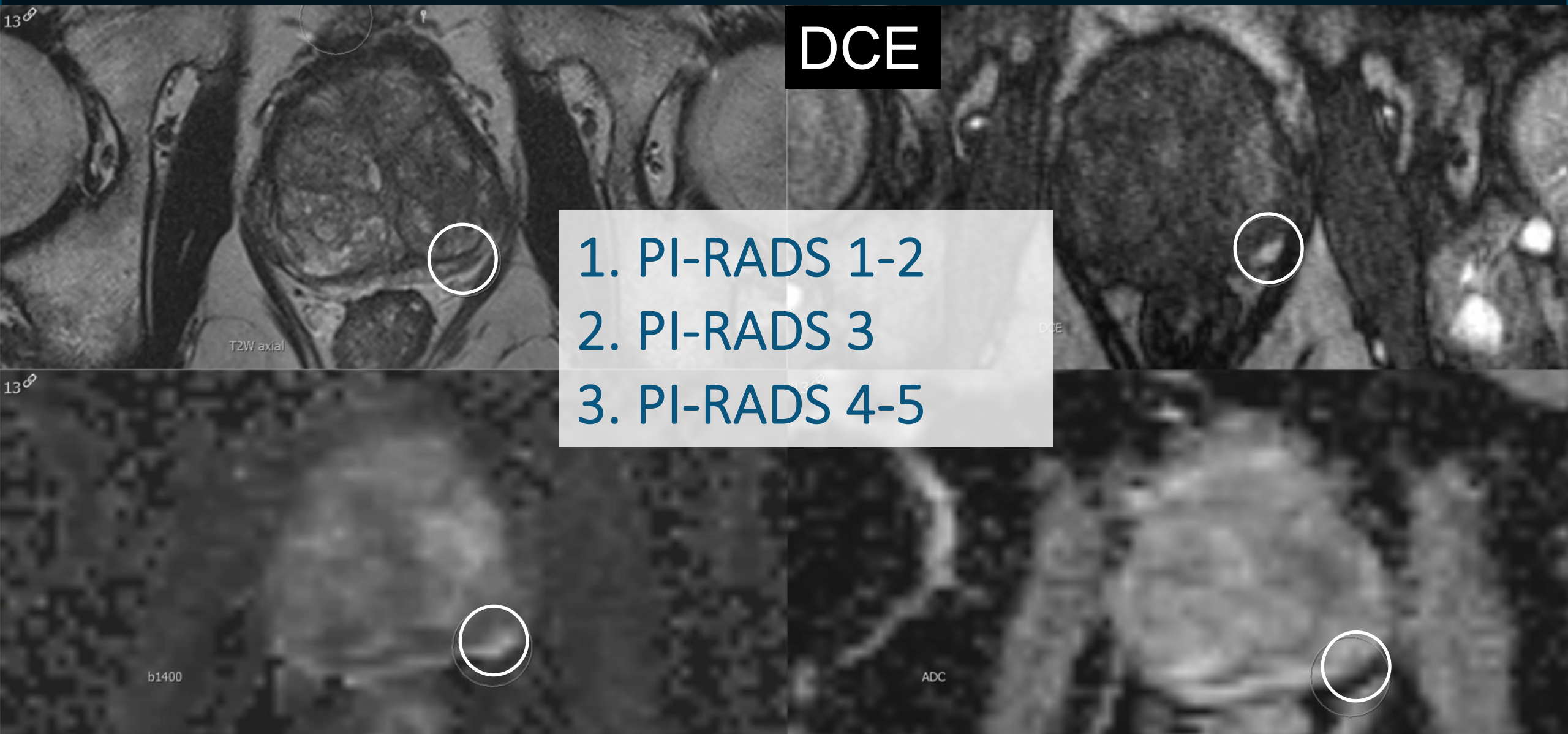
# Your Diagnosis?



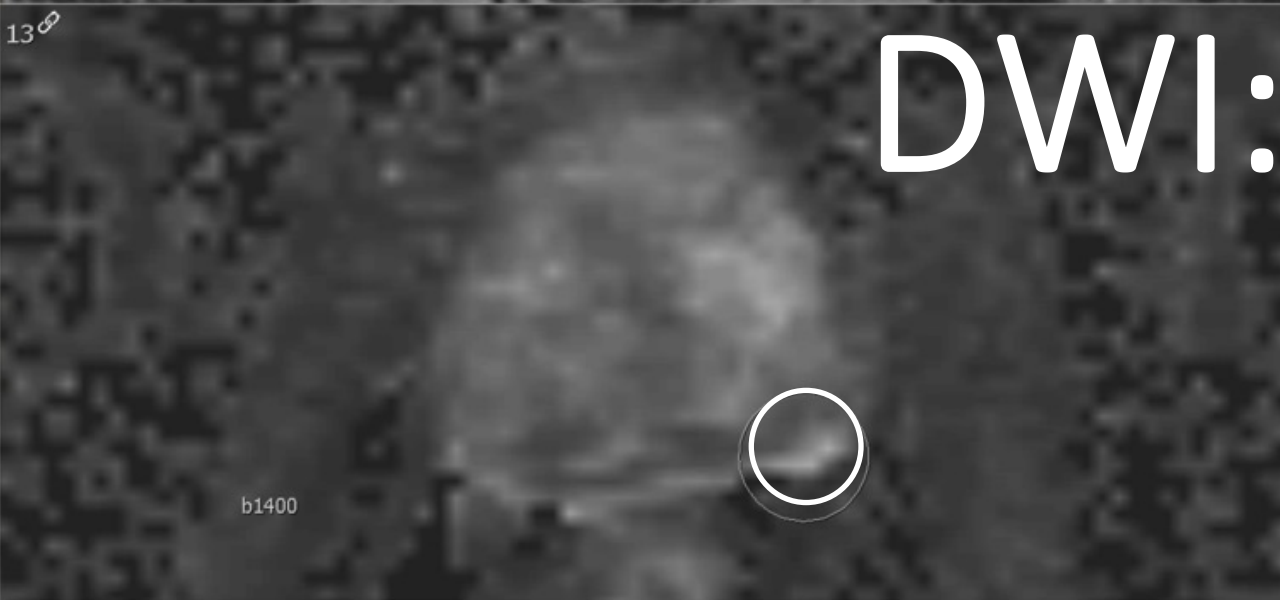
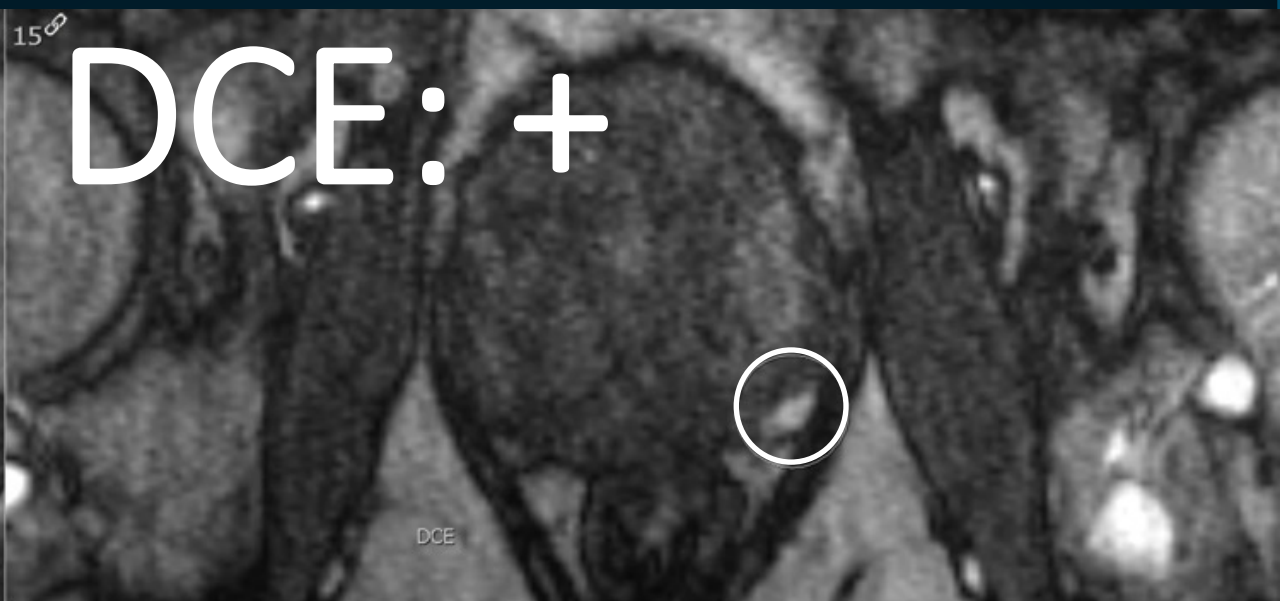
# PI-RADS: 3



# Your Diagnosis with DCE?

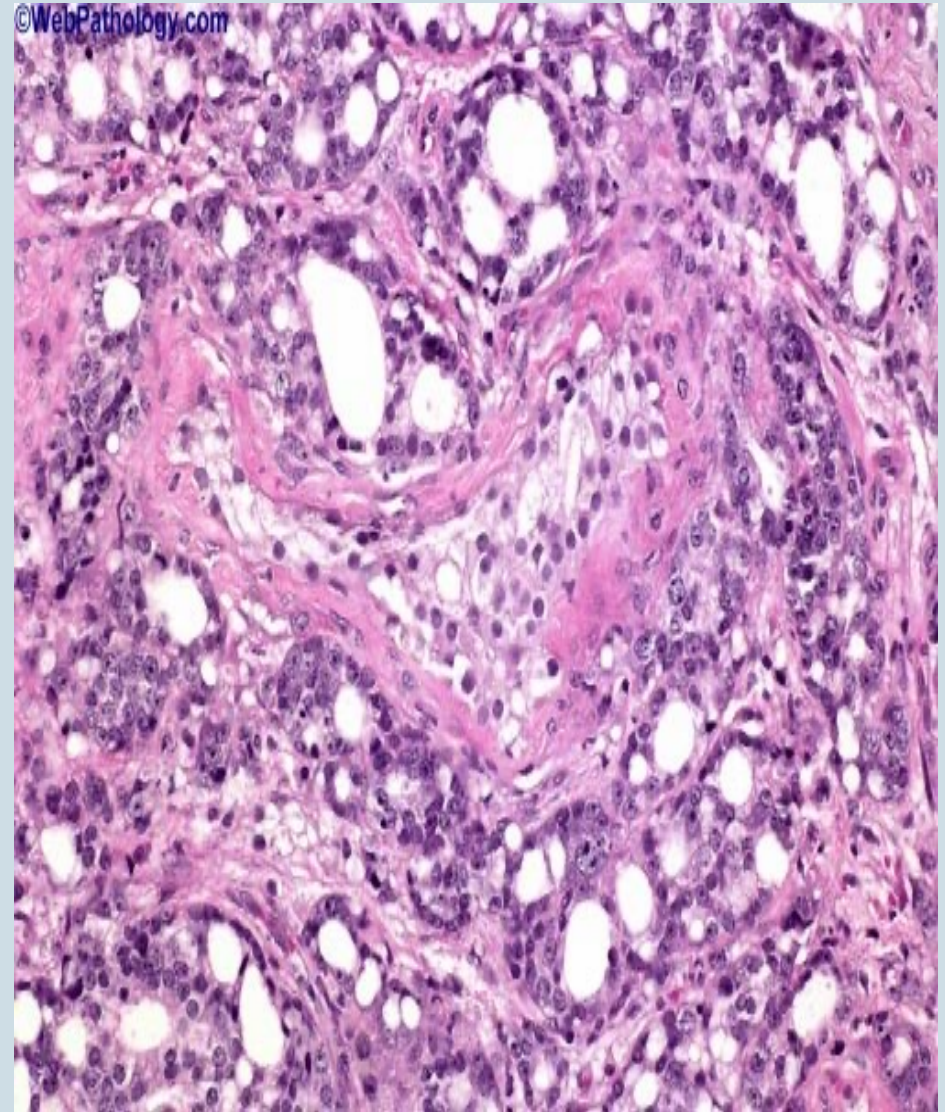


# PI-RADS 4



# MRD-biopsy

GS: 4+4 (GG 4)



[Enter Hamlet. ]

HAMLET

To dce, or not to dce, that is the Question:  
Whether 'tis Nobler in the minde to suf  
The Slings and Arr  
Or to take Armes:  
Opposing a sleeper



available at [www.sciencedirect.com](http://www.sciencedirect.com)  
journal homepage: [www.europeanurology.com](http://www.europeanurology.com)



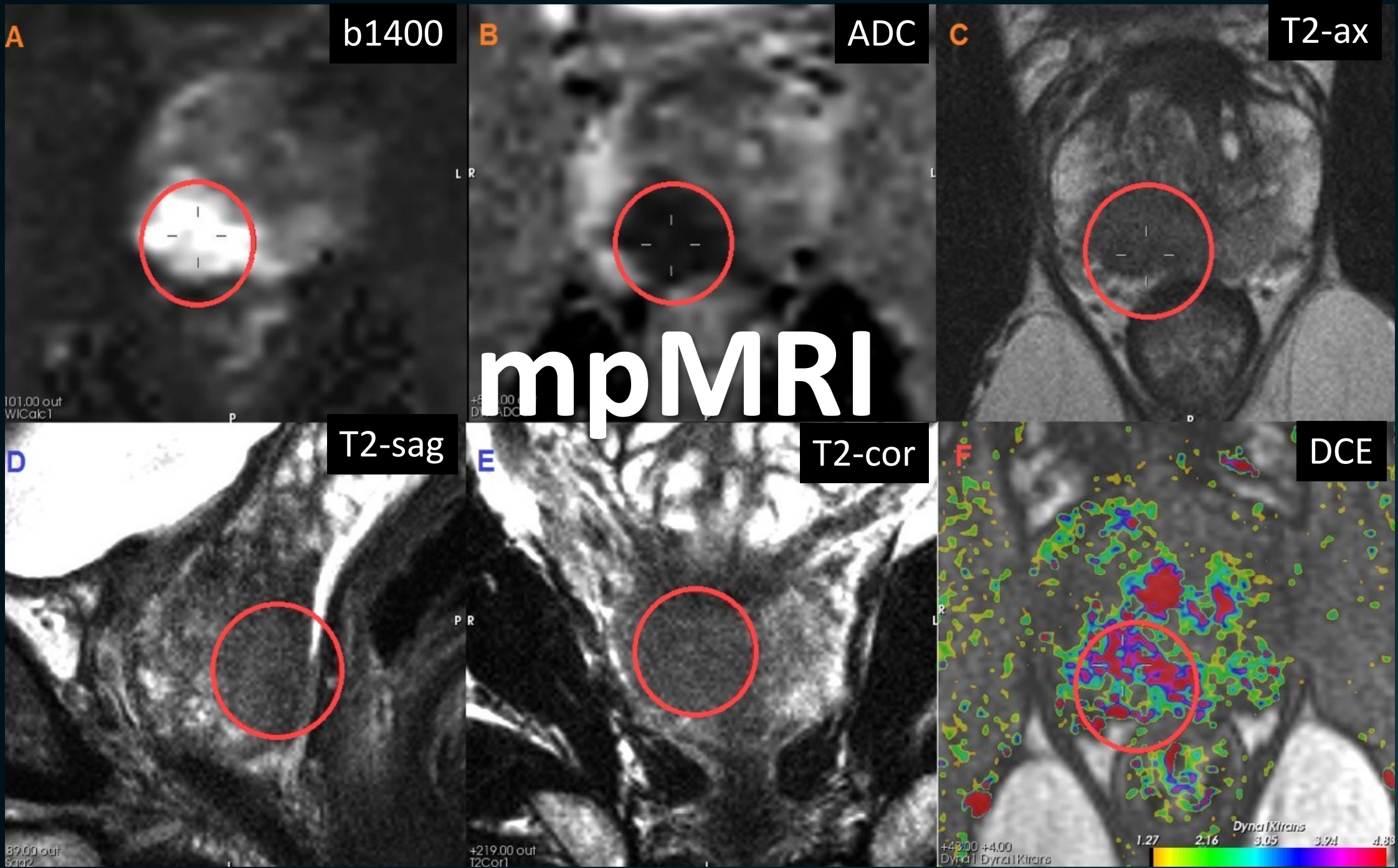
European Association of Urology

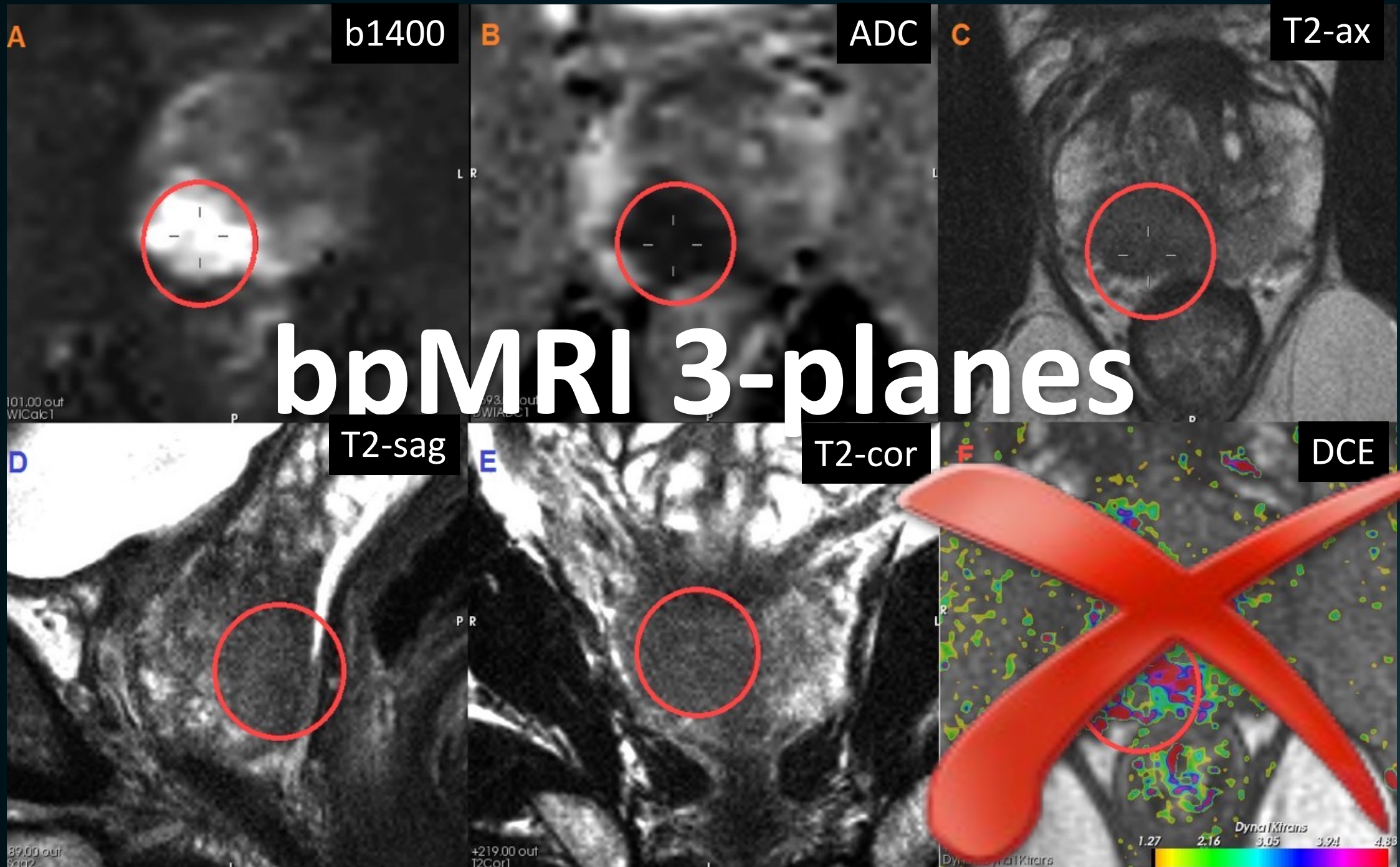


Platinum Priority – Prostate Cancer  
*Editorial by XXX on pp. x–y of this issue*

## High Diagnostic Performance of Short Magnetic Resonance Imaging Protocols for Prostate Cancer Detection in Biopsy-naïve Men: The Next Step in Magnetic Resonance Imaging Accessibility

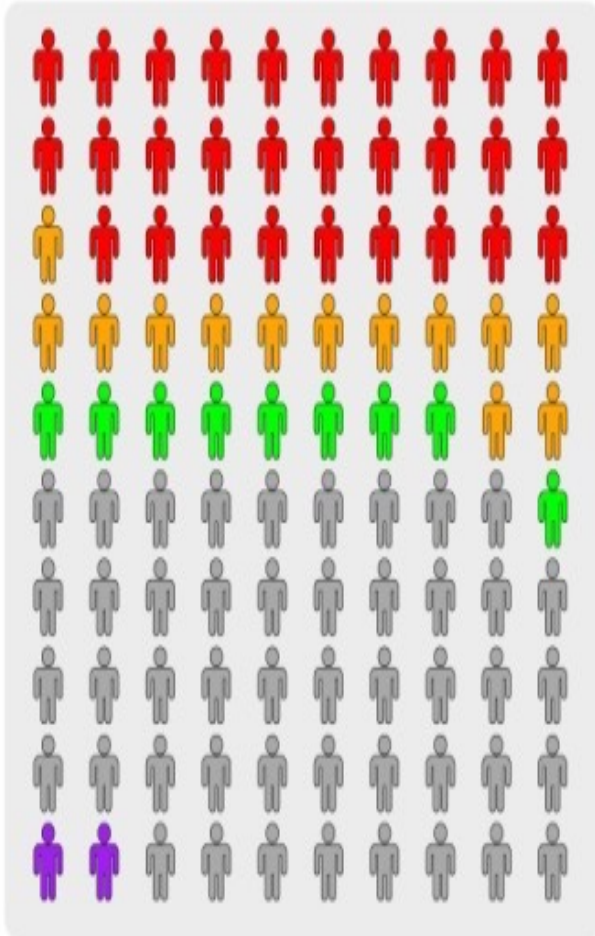
Marloes van der Leest<sup>a,†,\*</sup>, Bas Israël<sup>a,b,†</sup>, Erik Bastiaan Cornel<sup>c</sup>, Patrik Zámecnik<sup>a</sup>, Ivo G. Schoots<sup>d</sup>, Hans van der Lelij<sup>e</sup>, Anwar R. Padhani<sup>f</sup>, Maroeska Rovers<sup>g</sup>, Inge van Oort<sup>b</sup>, Michiel Sedelaar<sup>b</sup>, Christina Hulsbergen-van de Kaa<sup>h</sup>, Gerjon Hannink<sup>g</sup>, Jeroen Veltman<sup>i,‡</sup>, Jelle Barentsz<sup>a,‡</sup>



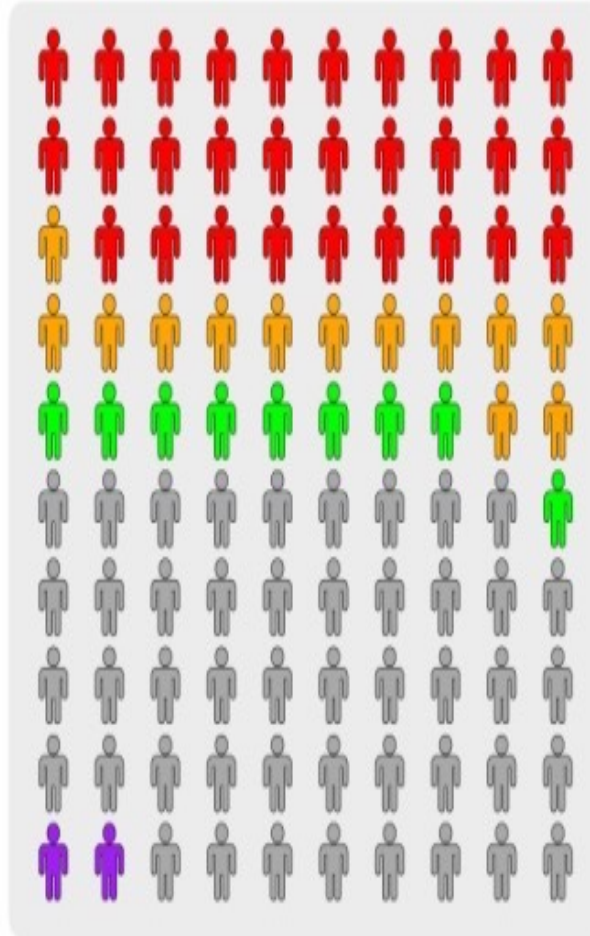


# mpMRI vs bpMRI

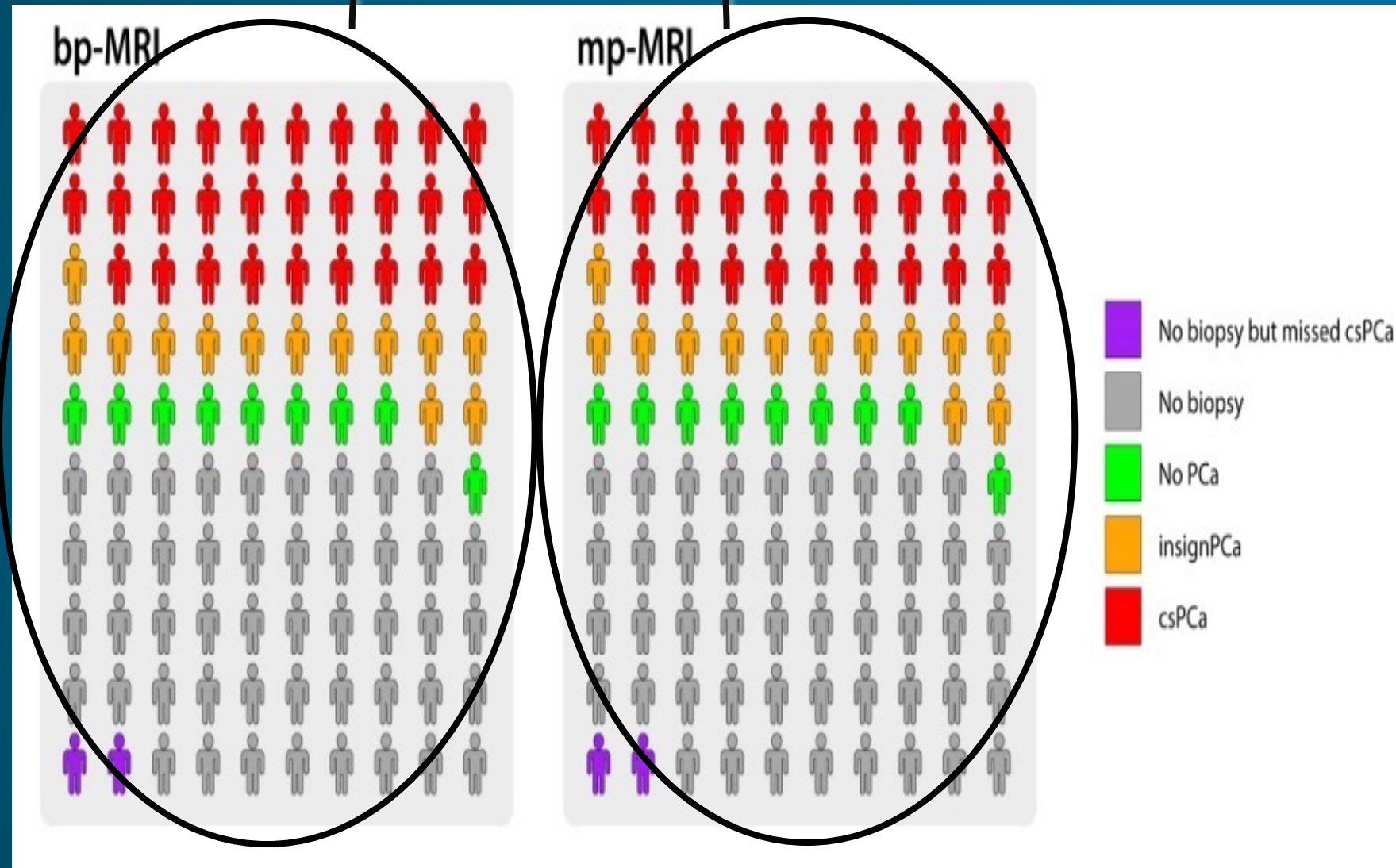
bp-MRI



mp-MRI



# Equal results



# bpMRI vs mpMRI

12 studies (n=2142), head-to-head

Mixed indications



November 2018, Volume 211, Number 5

Genitourinary Imaging  
Original Research

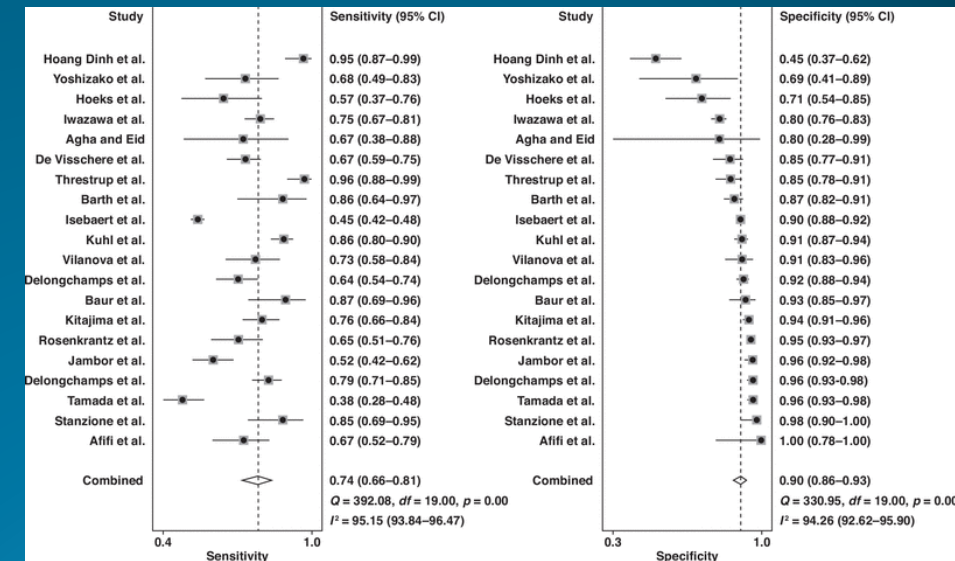
Head-to-Head Comparison Between Biparametric and Multiparametric MRI for the Diagnosis of Prostate Cancer: A Systematic Review and Meta-Analysis

Sungmin Woo<sup>1,2</sup>, Chong Hyun Suh<sup>2,3</sup>, Sang Youn Kim<sup>1</sup>, Jeong Yeon Cho<sup>1,4</sup> ... [Show all](#)

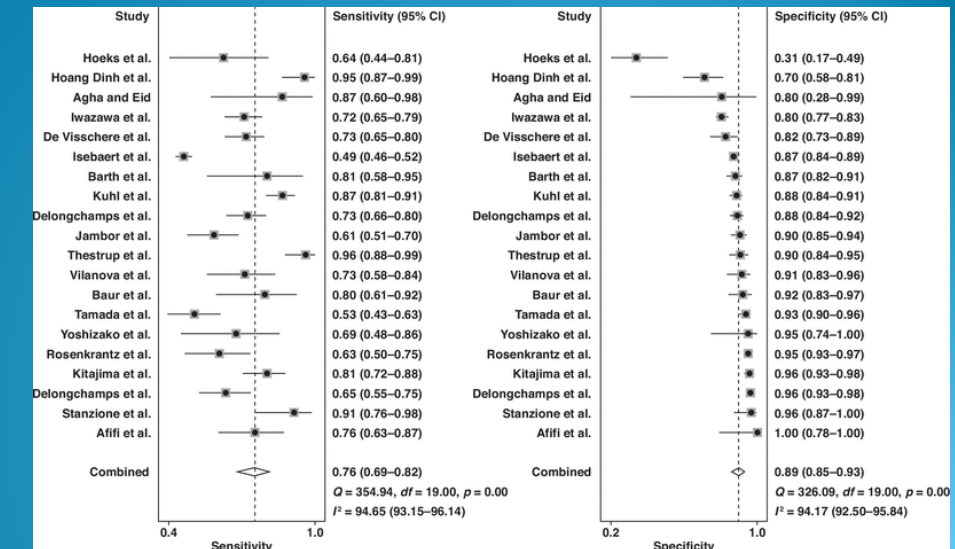
[« Previous Article](#) | [Next Article »](#)

- bpMRI: se: 0.74; sp: 0.90
- mpMRI: se: 0.76; sp: 0.89

-> no difference



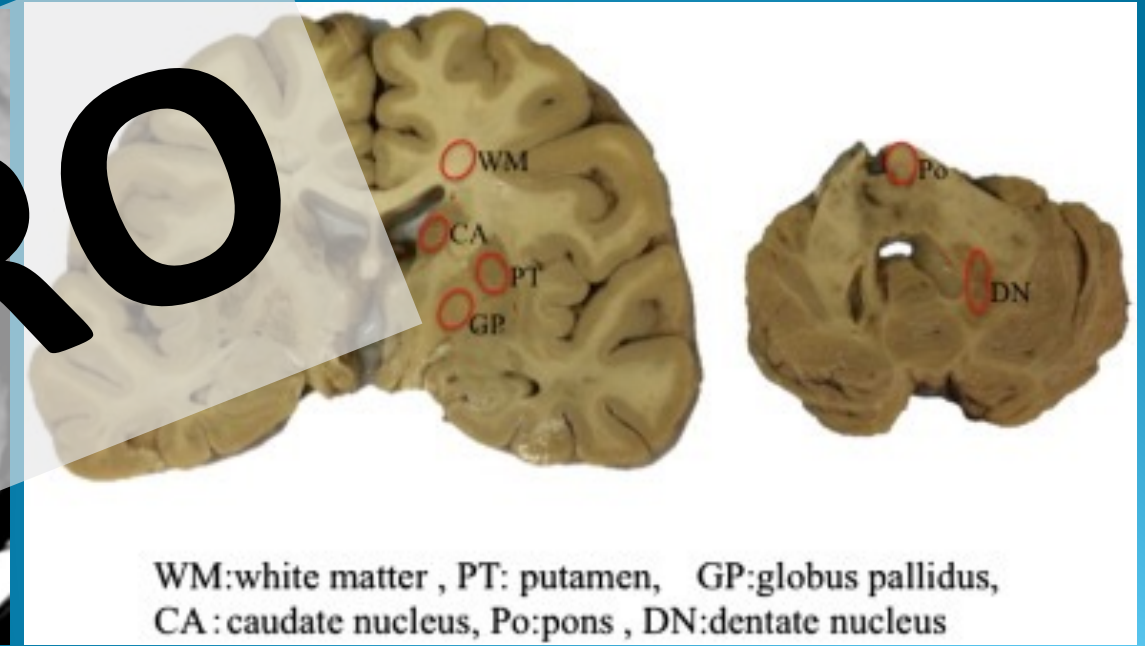
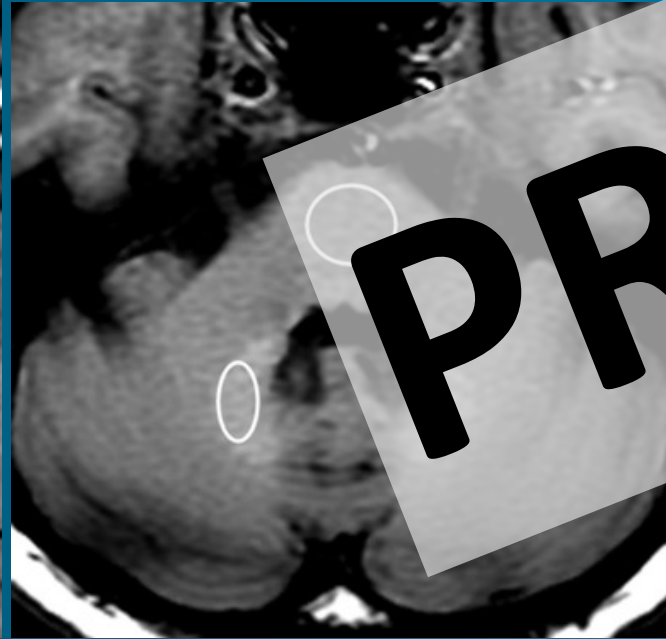
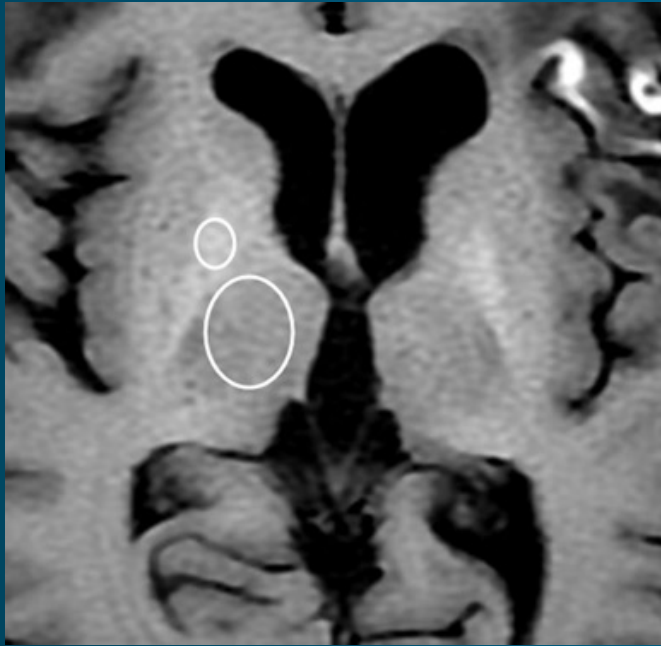
bpMRI



mpMRI

# -> No Contrast?

PRO: No allergy, no Gd-depositions, Less costly, Fast



But,...

bpMRI requires

**EXPERTISE**

**CON**

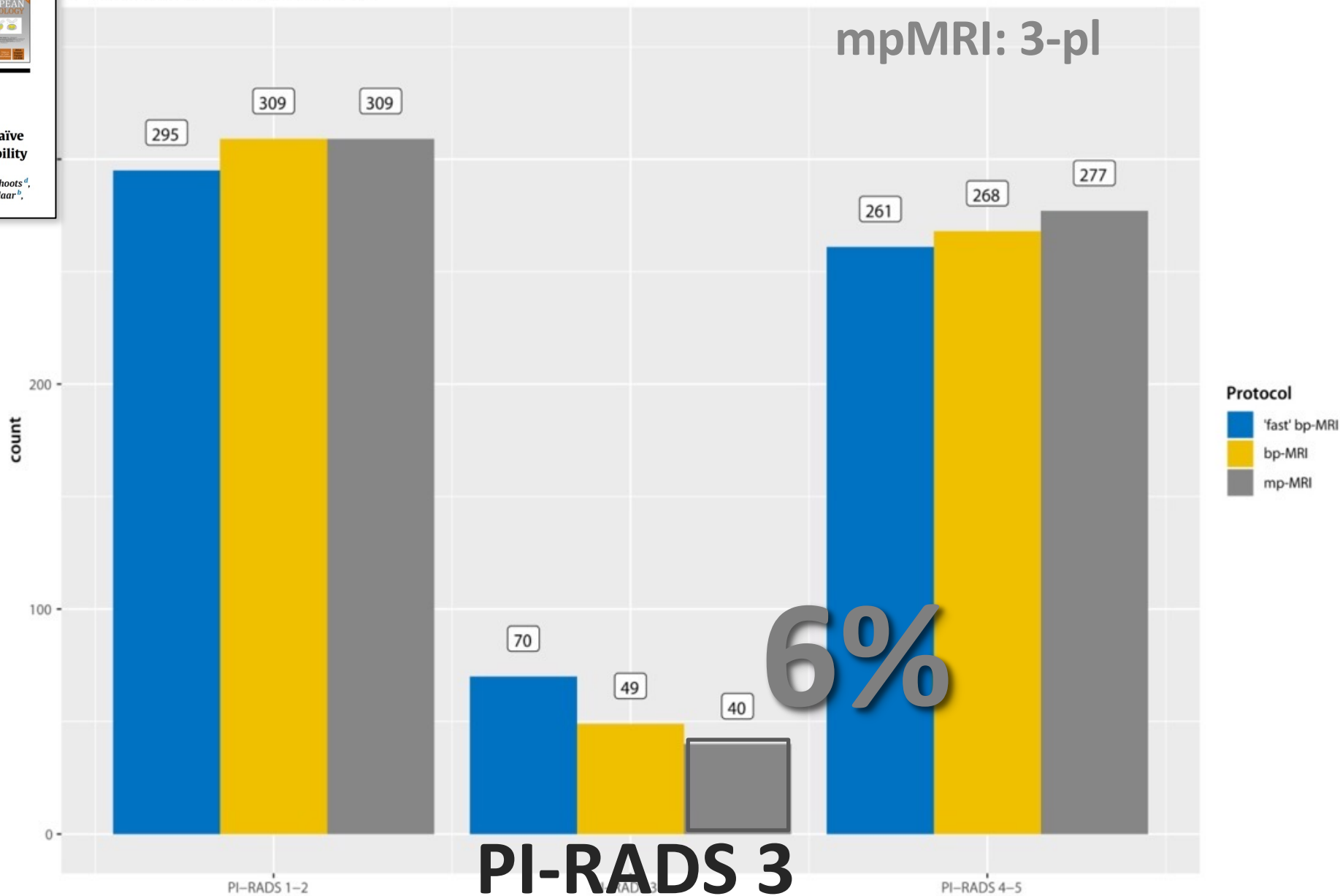


# High Diagnostic Performance of Short Magnetic Resonance Imaging Protocols for Prostate Cancer Detection in Biopsy-naïve Men: The Next Step in Magnetic Resonance Imaging Accessibility

Marloes van der Leest<sup>a,\*,4</sup>, Bas Israël<sup>a,b,1</sup>, Erik Bastiaan Cornel<sup>a</sup>, Patrik Zámečník<sup>a</sup>, Ivo G. Schoots<sup>d</sup>, Hans van der Lelij<sup>e</sup>, Anwar R. Padhani<sup>f</sup>, Maroeska Rovers<sup>g</sup>, Inge van Oort<sup>h</sup>, Michiel Sedelaar<sup>h</sup>, Christina Hulsbergen-van de Kaa<sup>h</sup>, Gerjon Hannink<sup>g</sup>, Jeroen Veltman<sup>h,i</sup>, Jelle Barentsz<sup>a,1</sup>



## PI-RADS assessment per protocol

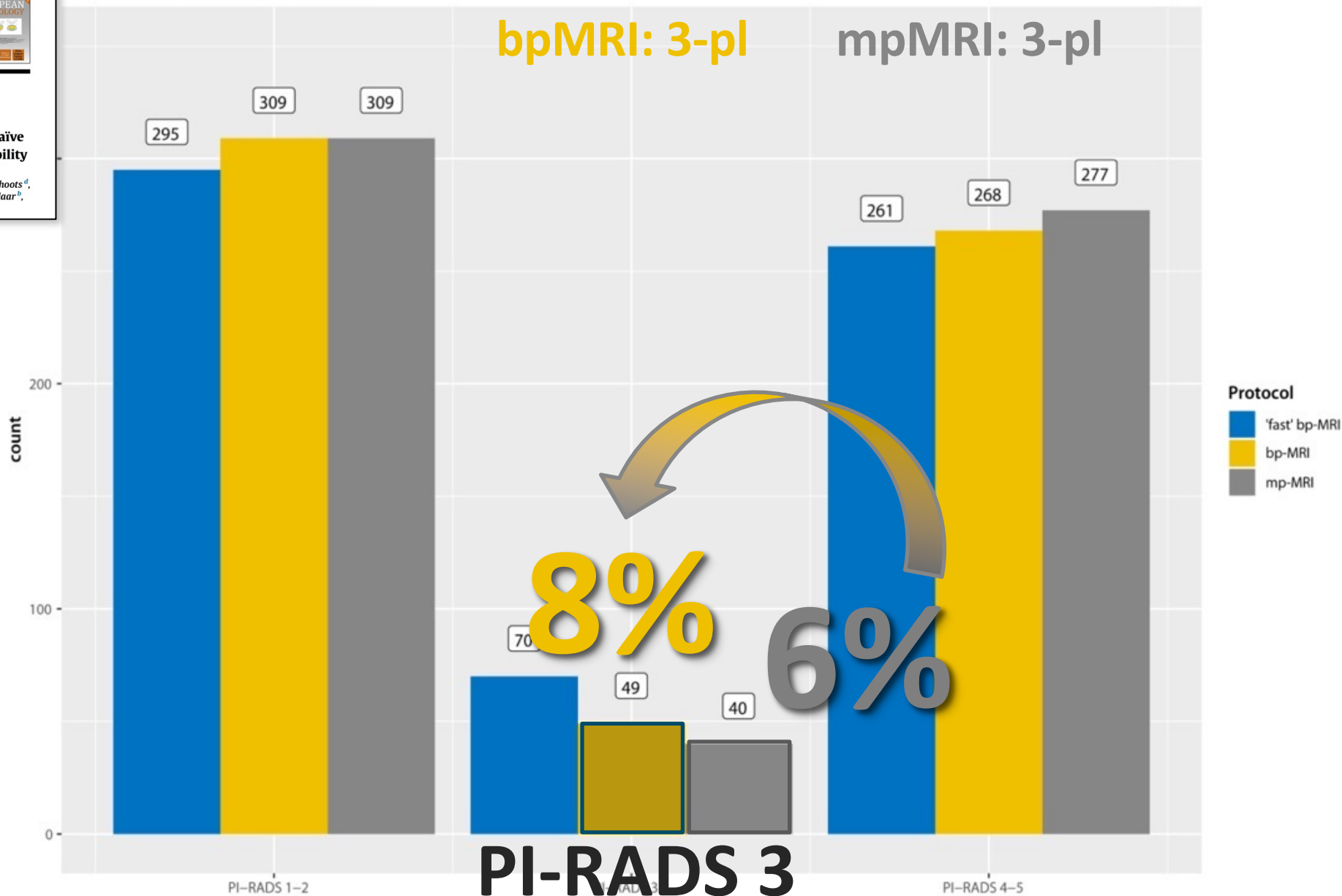


# High Diagnostic Performance of Short Magnetic Resonance Imaging Protocols for Prostate Cancer Detection in Biopsy-naïve Men: The Next Step in Magnetic Resonance Imaging Accessibility

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## PI-RADS assessment per protocol



# CON

**Increases uncertainty**

**Less experienced**

**Radiologist**

**PI-RADS 3: 21%→28%**



# To **DCE**,.....

- Previous negative bpMRI with persistent clinical suspicion
- In DWI-artefacts (e.g. Hip-protheses)
- With Lower level of expertise

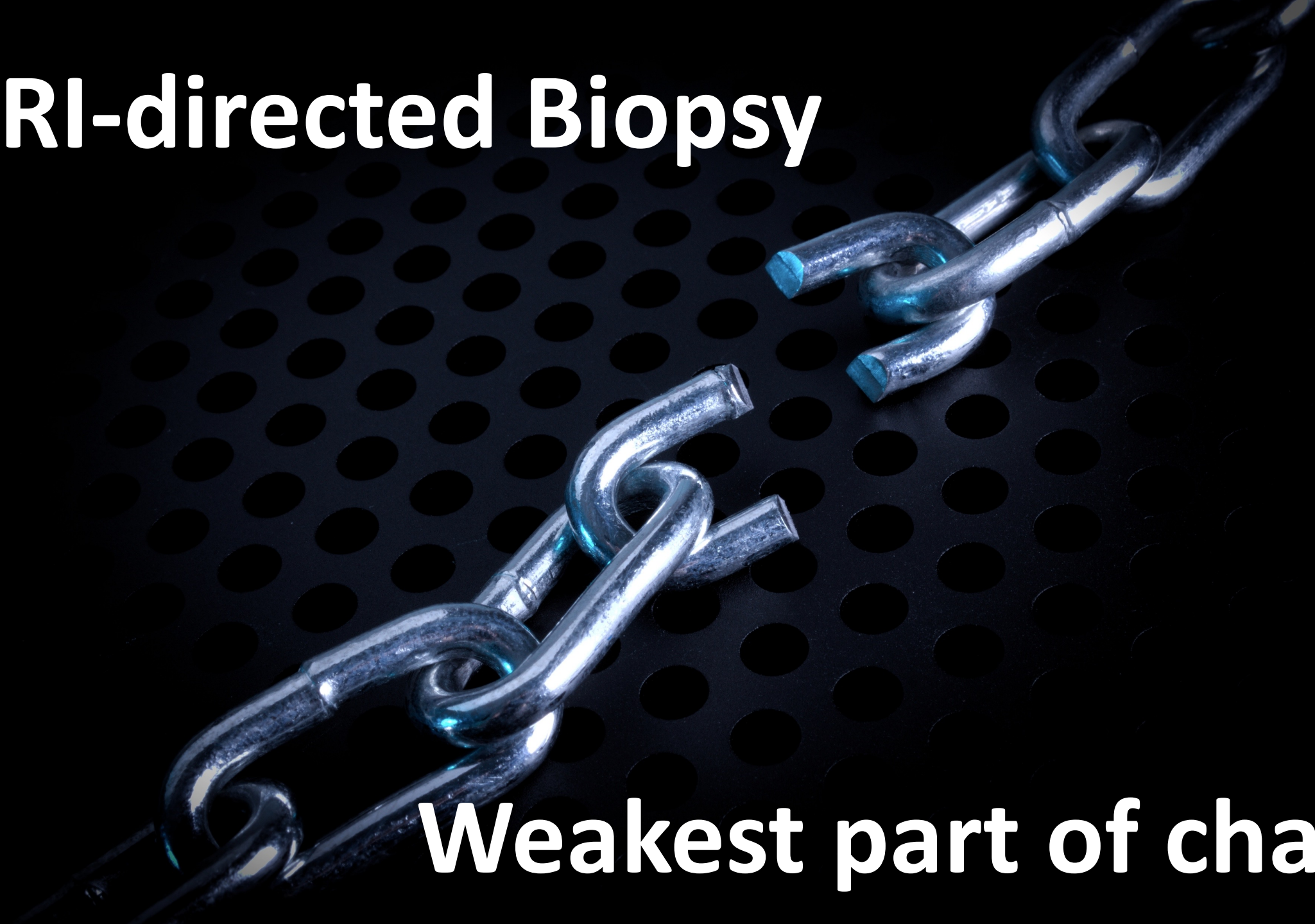
or **not** to **DCE** (= use bpMRI).....

- Low-risk population (e.g. sceening)
- High a-priori chance of having a significant PCa
- Gd 'on-demand' (direct or order patient back)

3

**MRDB**  
**WITH EXTRA**  
**CORES?**

# MRI-directed Biopsy

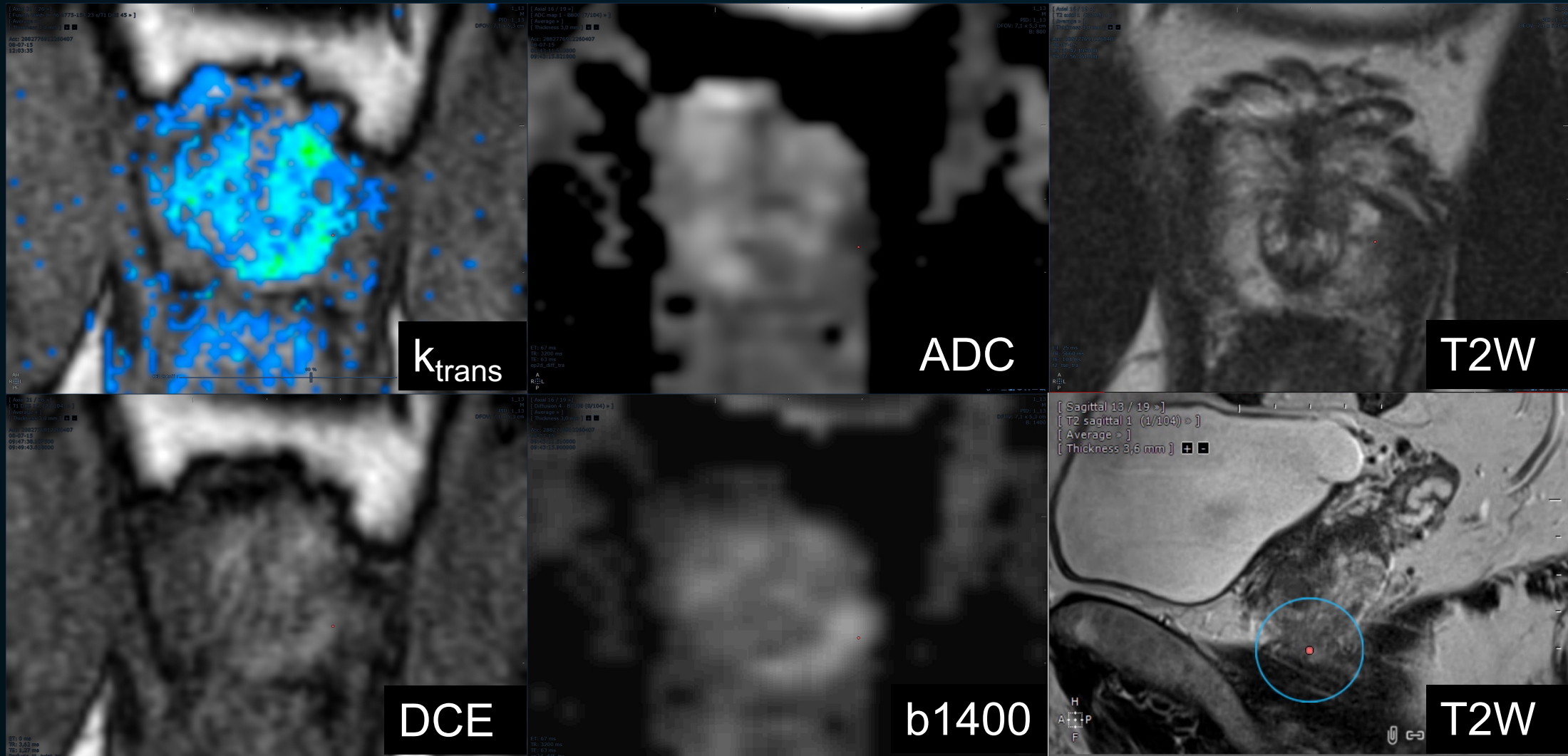
A close-up photograph of a broken metal chain. The chain is made of thick, silver-colored metal links. One link is broken, with the two ends separated. The chain is resting on a dark, perforated metal surface, which has a grid of small, circular holes. The lighting is dramatic, highlighting the metallic texture and the broken joint.

**Weakest part of chain?**

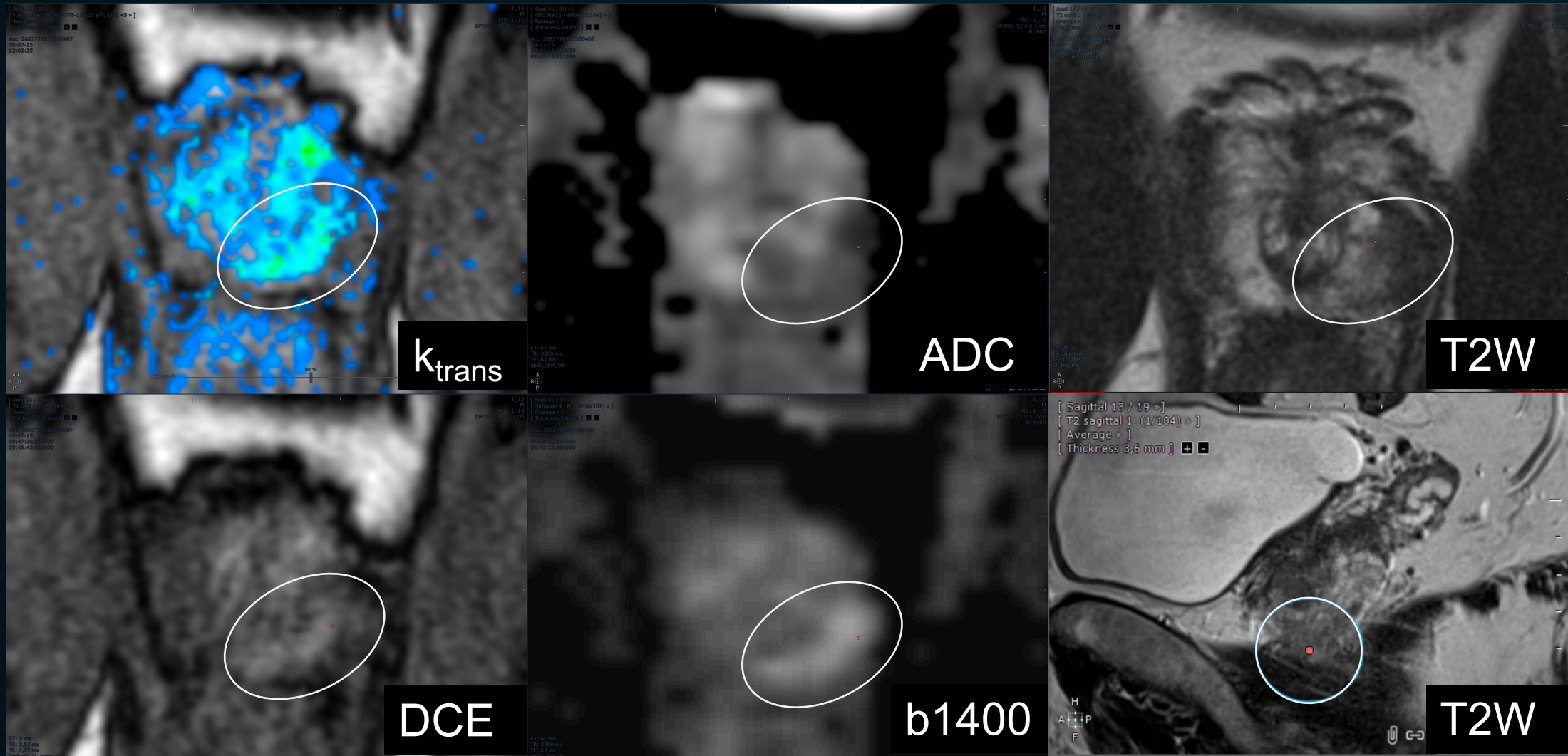


**Where do we target for?**

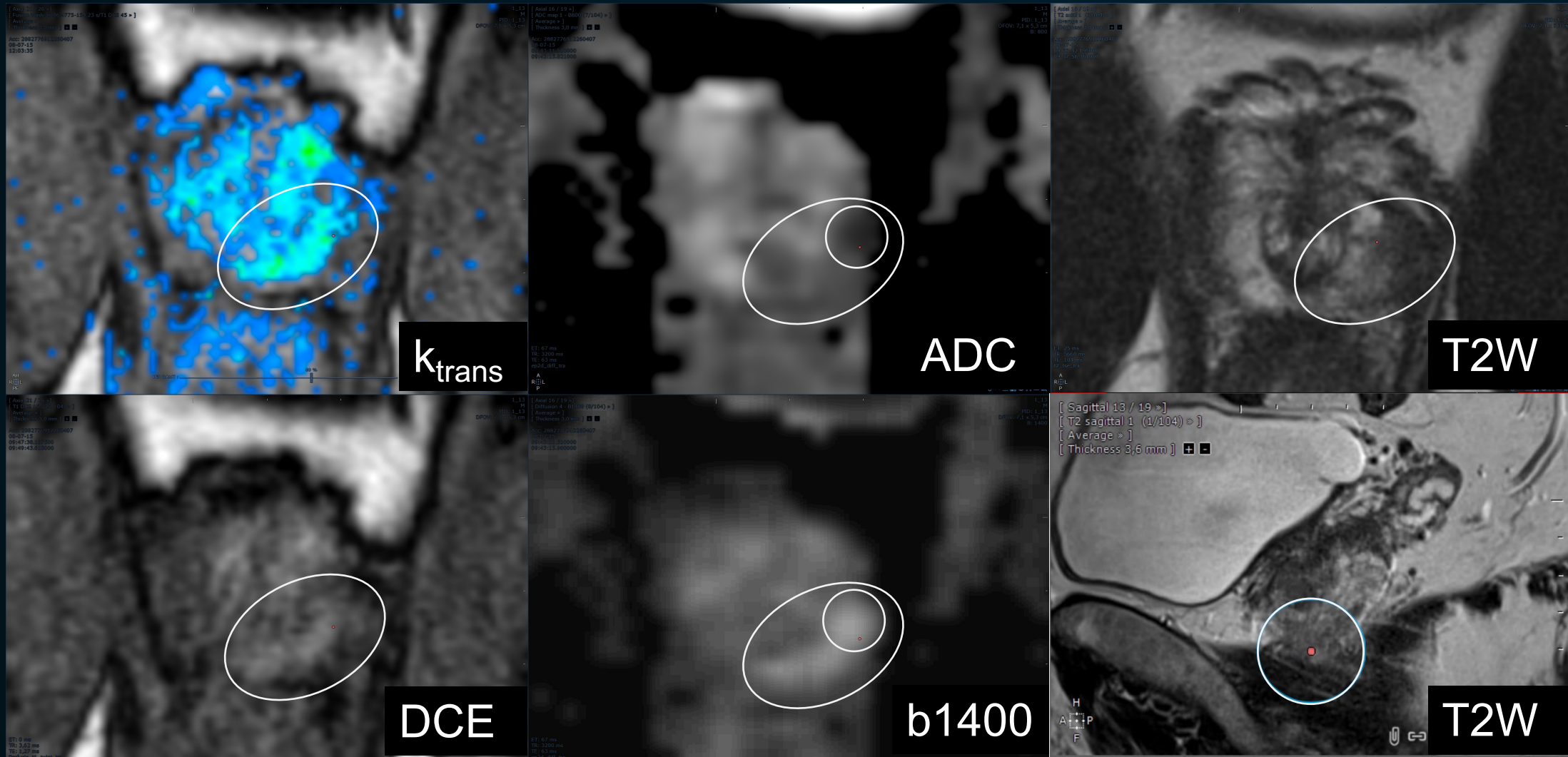
66y, PSA 6.1 ng/ml, 45 cc, PSAD 0.13



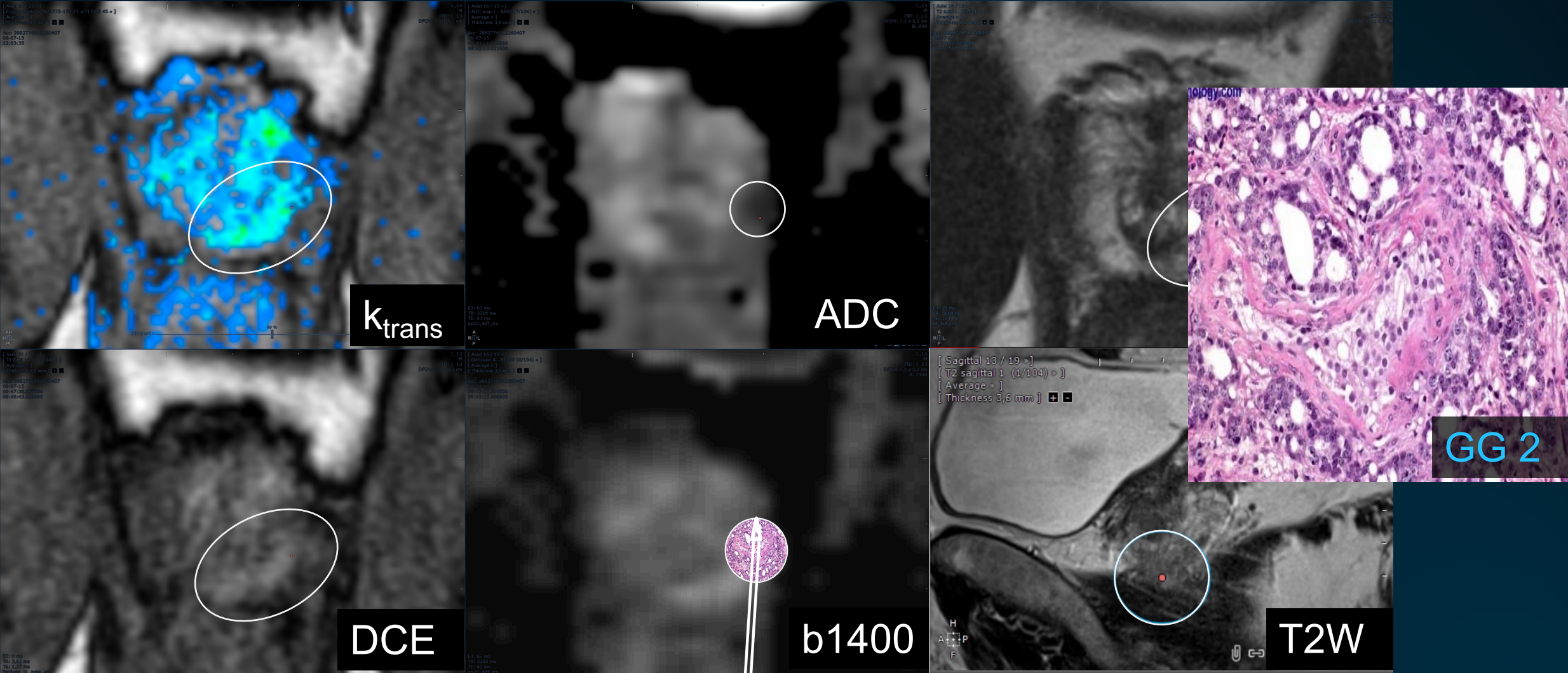
# Where do we target for with MRDB?



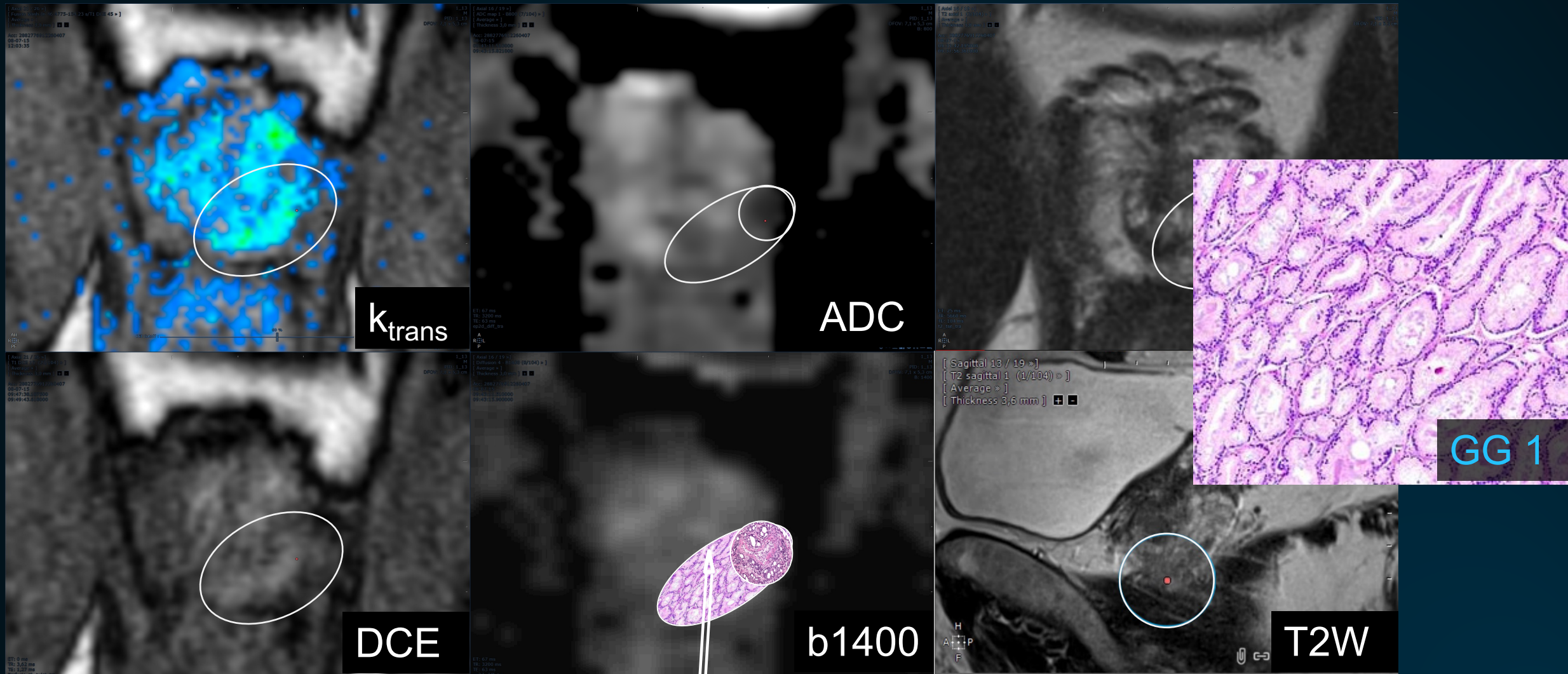
# Target the lowest ADC-spot (brightest b1400)



# Lowest ADC-spot: GG 2



Surrounded by GG1



# MRDB biopsy w/wo random biopsy

7 studies, n=2582

JAMA  
Network | Open™

Original Investigation | Imaging

## Comparison of Multiparametric Magnetic Resonance Imaging and Targeted Biopsy With Systematic Biopsy Alone for the Diagnosis of Prostate Cancer

### A Systematic Review and Meta-analysis

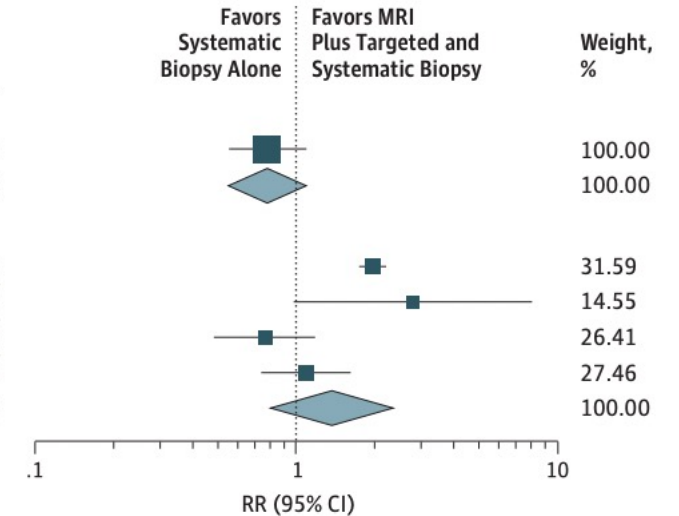
Martha M. C. Elwenspoek, PhD; Athena L. Sheppard, MSc; Matthew D. F. McInnes, MD, PhD; Samuel W. D. Merriel, MSc; Edward W. J. Rowe, MD; Richard J. Bryant, FRCS(Urol), PhD; Jenny L. Donovan, PhD; Penny Whiting, PhD

Additional random sampling:

-> no improvement

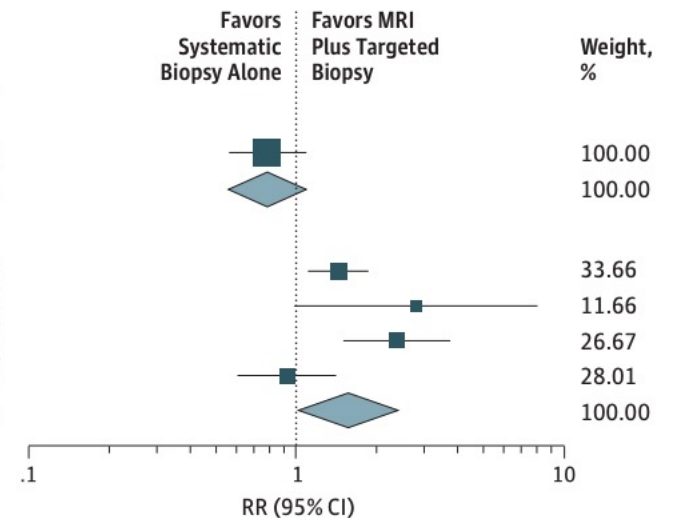
#### A MRI followed by targeted and systematic biopsy

| Study                                 | RR (95% CI)      |
|---------------------------------------|------------------|
| Biparametric MRI                      |                  |
| Baco et al, <sup>25</sup> 2016        | 0.78 (0.55-1.09) |
| Subtotal                              | 0.78 (0.55-1.09) |
| Multiparametric MRI                   |                  |
| Panebianco et al, <sup>27</sup> 2015  | 1.95 (1.73-2.20) |
| Park et al, <sup>28</sup> 2011        | 2.80 (0.98-7.98) |
| Plata-Bello et al, <sup>31</sup> 2018 | 0.76 (0.49-1.18) |
| Tontilla et al, <sup>30</sup> 2016    | 1.09 (0.74-1.61) |
| Subtotal ( $I^2=87.2\%$ , $P=.00$ )   | 1.36 (0.79-2.34) |



#### B MRI followed by targeted biopsy

| Study                                     | RR (95% CI)      |
|-------------------------------------------|------------------|
| Biparametric MRI                          |                  |
| Baco et al, <sup>25</sup> 2016            | 0.78 (0.55-1.09) |
| Subtotal                                  | 0.78 (0.55-1.09) |
| Multiparametric MRI                       |                  |
| Kasivisvanathan et al, <sup>26</sup> 2018 | 1.43 (1.10-1.87) |
| Park et al, <sup>28</sup> 2011            | 2.80 (0.98-7.98) |
| Porpiglia et al, <sup>29</sup> 2017       | 2.38 (1.50-3.77) |
| Tontilla et al, <sup>30</sup> 2016        | 0.92 (0.60-1.41) |
| Subtotal ( $I^2=70.7\%$ , $P=.02$ )       | 1.57 (1.02-2.41) |



# Targeted only versus extra (TRUS) cores

- 5 MR-TBx + 5 adjacent cores: 9% extra sPCa1 and 4% iPCa

EUROPEAN UROLOGY XXX (2021) XXX–XXX

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available at [www.sciencedirect.com](http://www.sciencedirect.com)  
journal homepage: [www.europeanurology.com](http://www.europeanurology.com)

  
European Association of Urology



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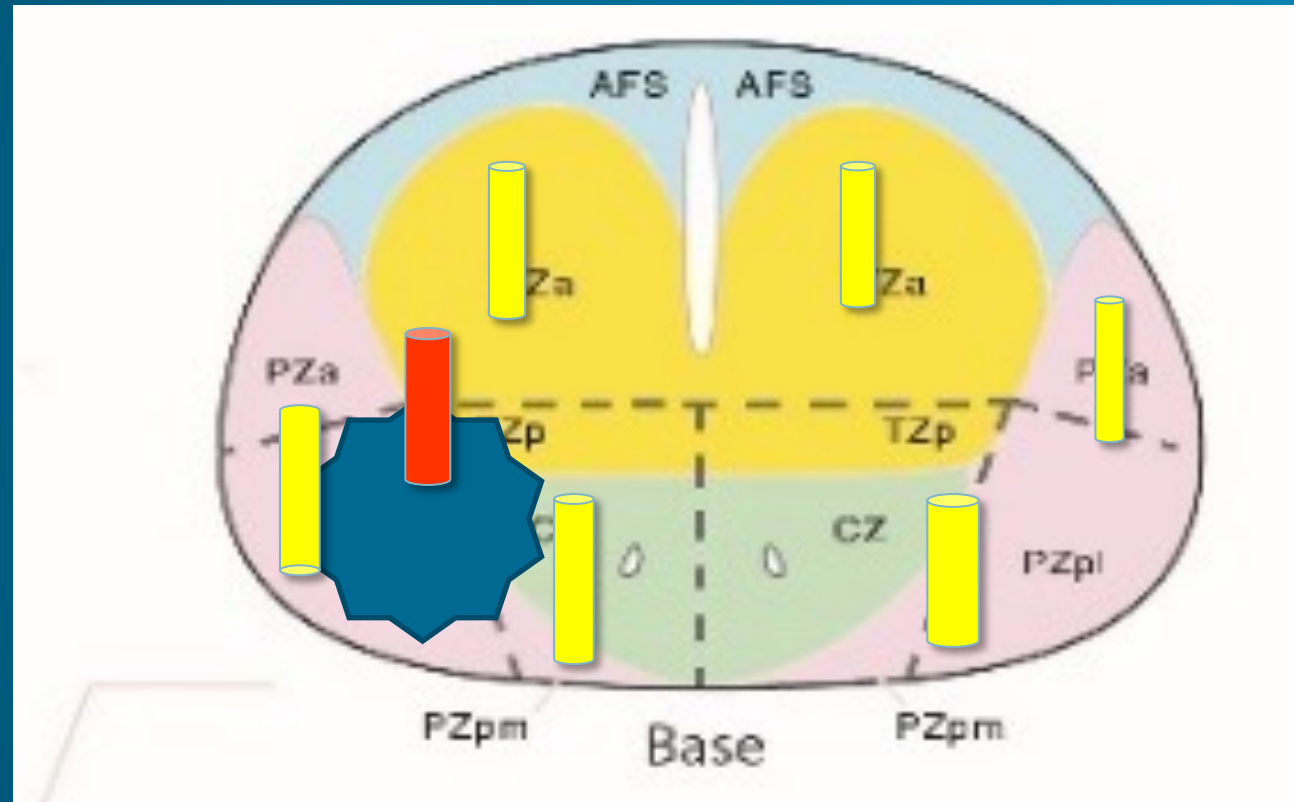
**Research Letter**

**Perilesional Biopsies Increase Detection of Significant Prostate Cancer in Men with PI-RADS 4/5 Lesions: Validation of the PI-RADS Steering Committee Recommendation**

*John Lahoud<sup>a</sup>, Paul Doan<sup>a</sup>, Lawrence Kim<sup>a,b</sup>, Manish I. Patel<sup>a,b,\*</sup>*

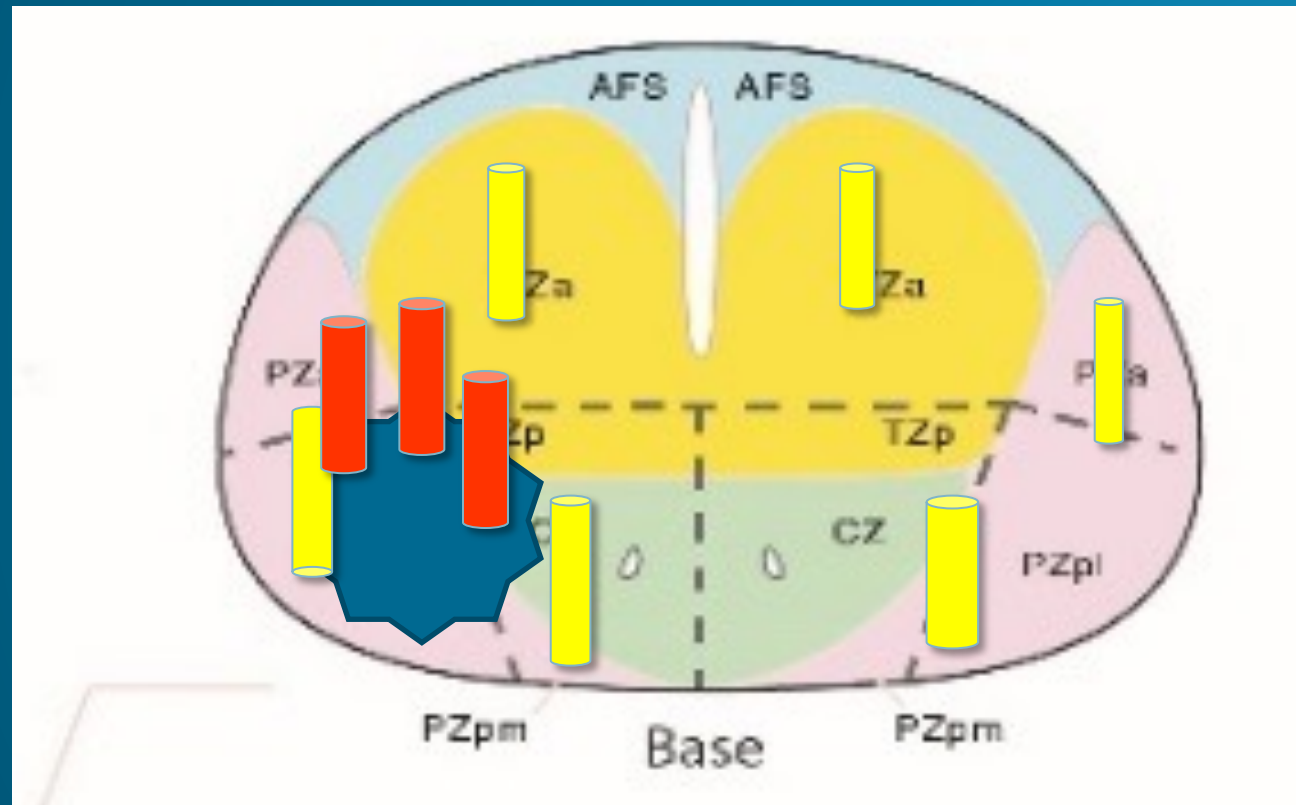
# Why does MRDB miss sPCa?

- Due to **sampling errors**:
  - sPCa: often in sextant **adjacent** to MRI-lesion<sup>1-4, 15</sup>

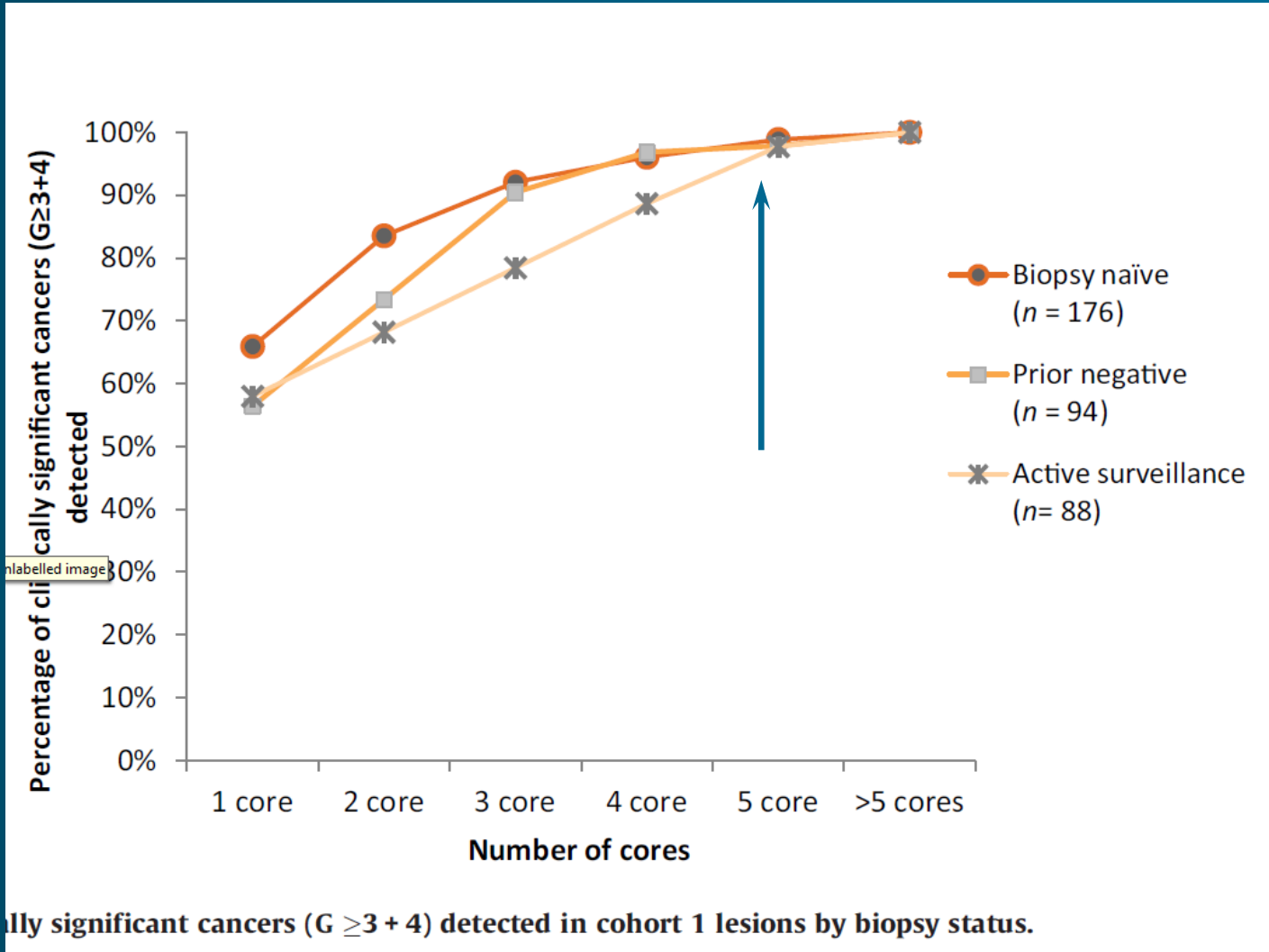


# Why does MRDB miss sPCa?

- **Focal saturation** around target MRI lesions increases yields of sPCa without greatly affecting over-diagnosis rates



# Optimal number of cores per suspicious lesion is 4-5

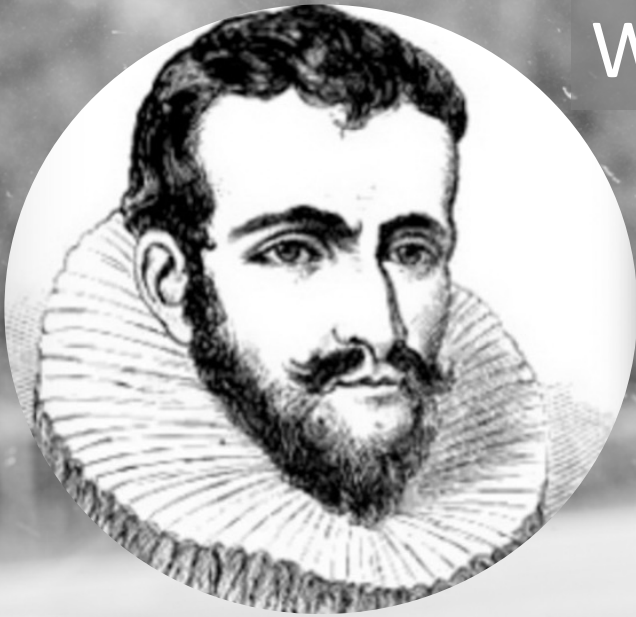


Lu AJ, et al. Role of Core Number and Location in Targeted MRI-US Fusion Prostate Biopsy. Eur Urol. 2019 Jul;76(1):14-17.



# Why does MRDB miss csPCa?

- Optimal number of cores per MRI suspicious lesion is 4-5
- Fewer cores for larger lesions
- More for diffuse, heterogenous, anterior, PI-RADS 3 and small PI-RADS 4 lesions in larger glands



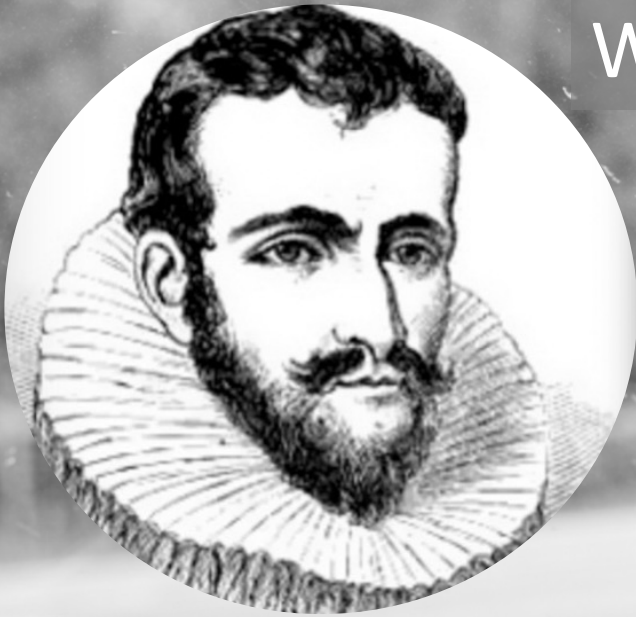
Willem

Barentsz' Advice



Jelle @ 25 yrs

**RANDOM  
BIOPY**



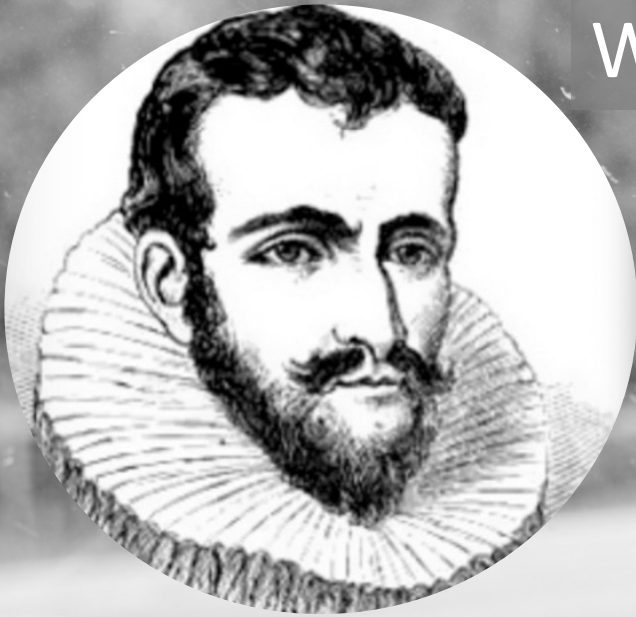
Willem

## Barentsz' Advice



Jelle @ 25 yrs





Willem

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**FOCAL  
SATURATION**

# Is random biopsy needed? My advice:

Source EAU 2021

- No random biopsy

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- No random biopsy
- Focal Saturation biopsy
  - in small PI-RADS 3-4 lesions,
  - in diffuse heterogenous lesions,
  - in anterior TZ lesions in large glands, and
  - when experience < 150 cases.

# Is random biopsy needed? My advice:

Source EAU 2021

- No random biopsy
- Focal Saturation biopsy in small PI-RADS 3-4 lesions, in diffuse heterogenous lesions, in anterior TZ lesions, and in large glands, and when experience < 150 cases.
- Focal Therapy: consider performing random biopsy in all cases to detect GG1 and small GG2 PCa foci

# TAKE HOME MESSAGES

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- Expertise matters
- No contrast: experience, good Quality, low-risk (and very high)
- Beside MRDB, no random biopsy, but focal saturation  
(especially difficult lesions & beginners)

# QUESTIONS?



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