

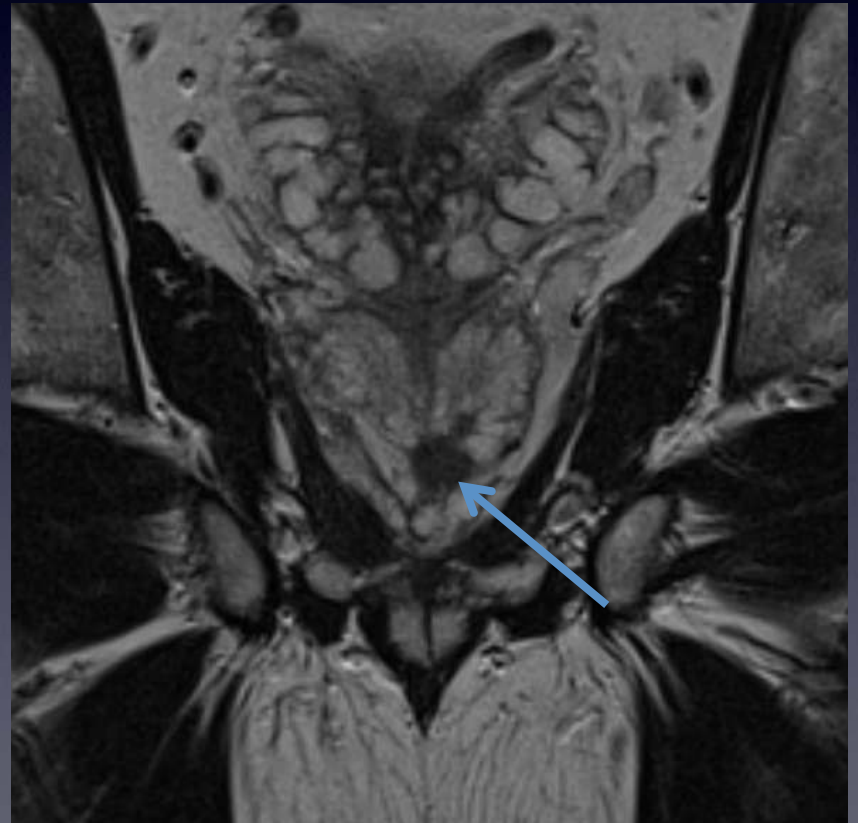
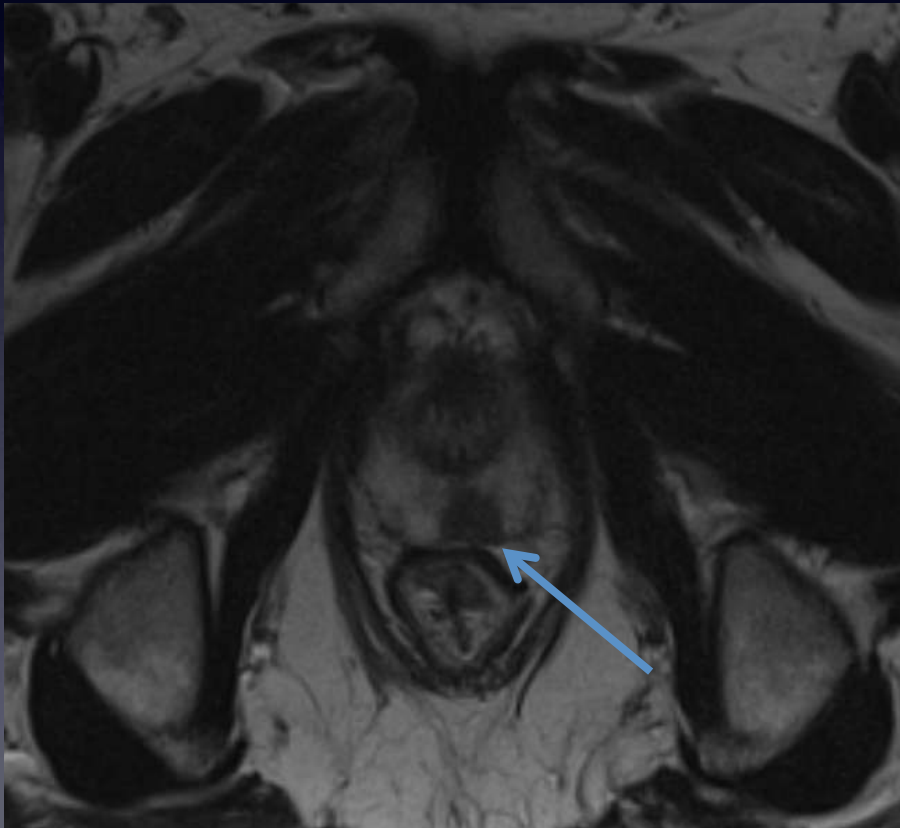
*Novel trends in robot assisted
radical prostatectomy*

Multiparametric MRI
guides surgery

Giuseppe Petralia

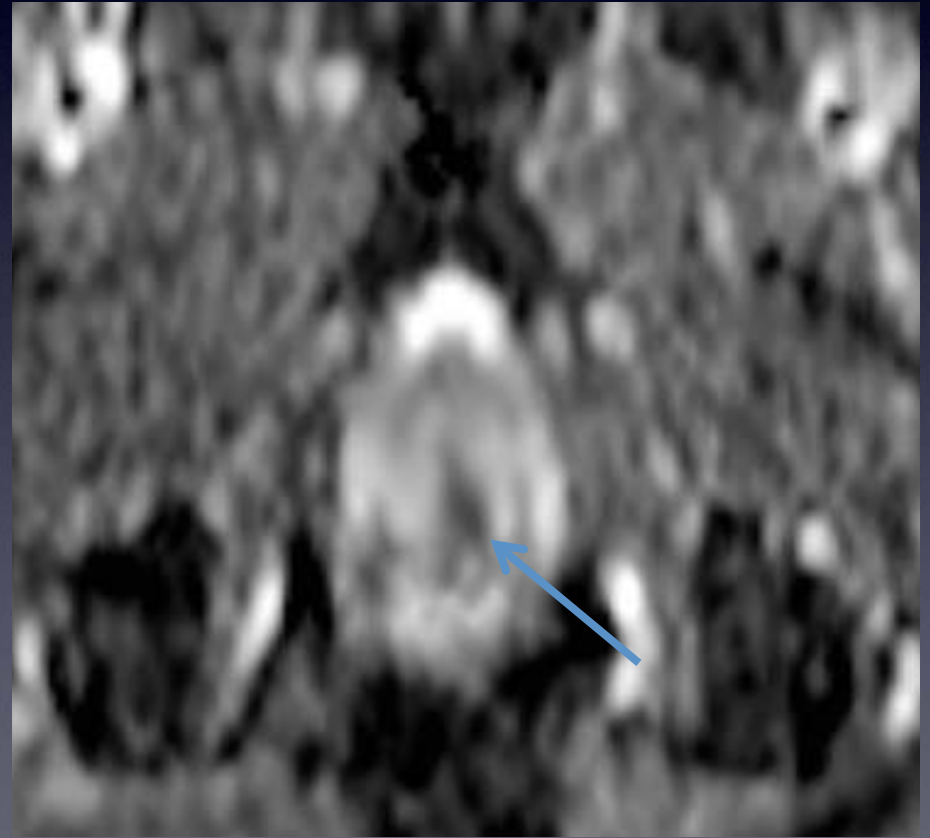
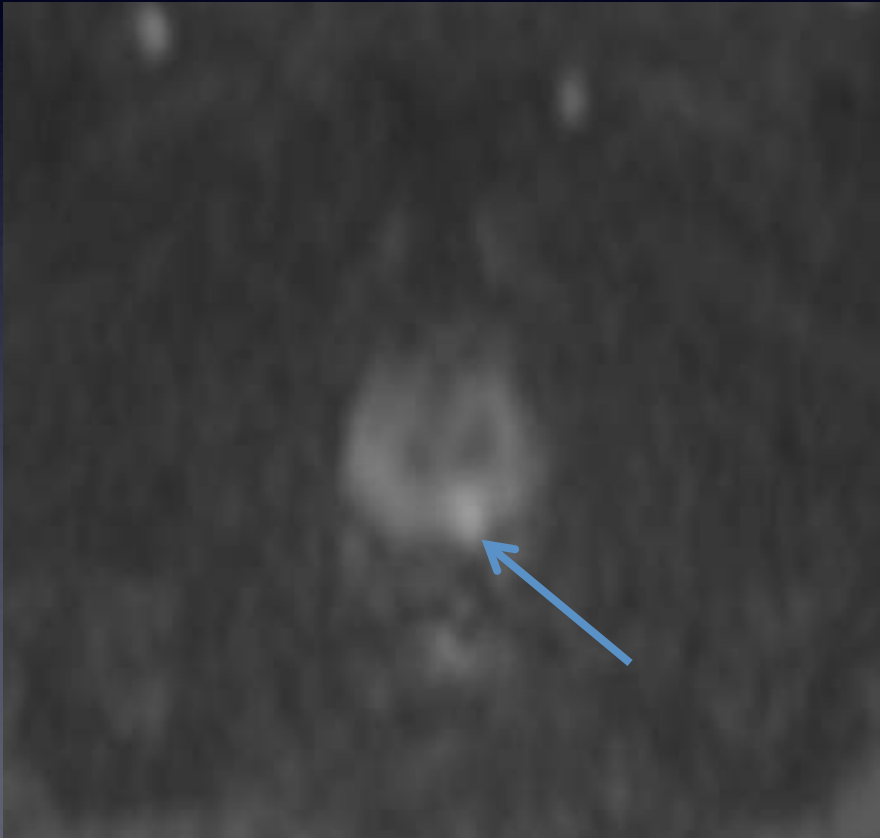
Morphology ...

- Hi-Res T2WI → Pixel = 0.6 x 0.6 mm



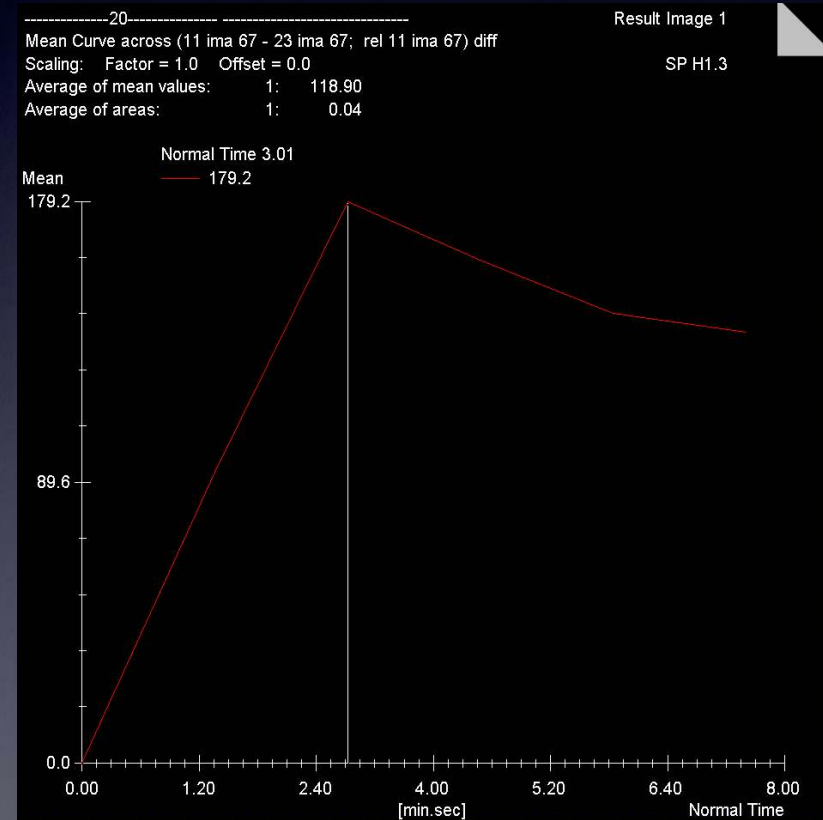
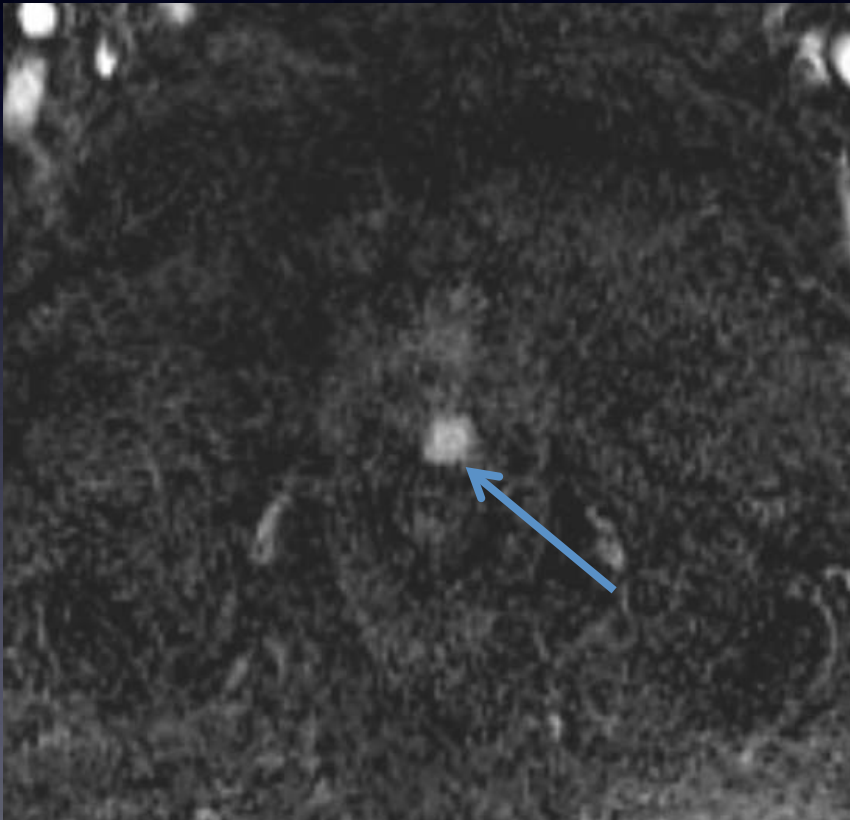
... and beyond

- DWI → cellularity

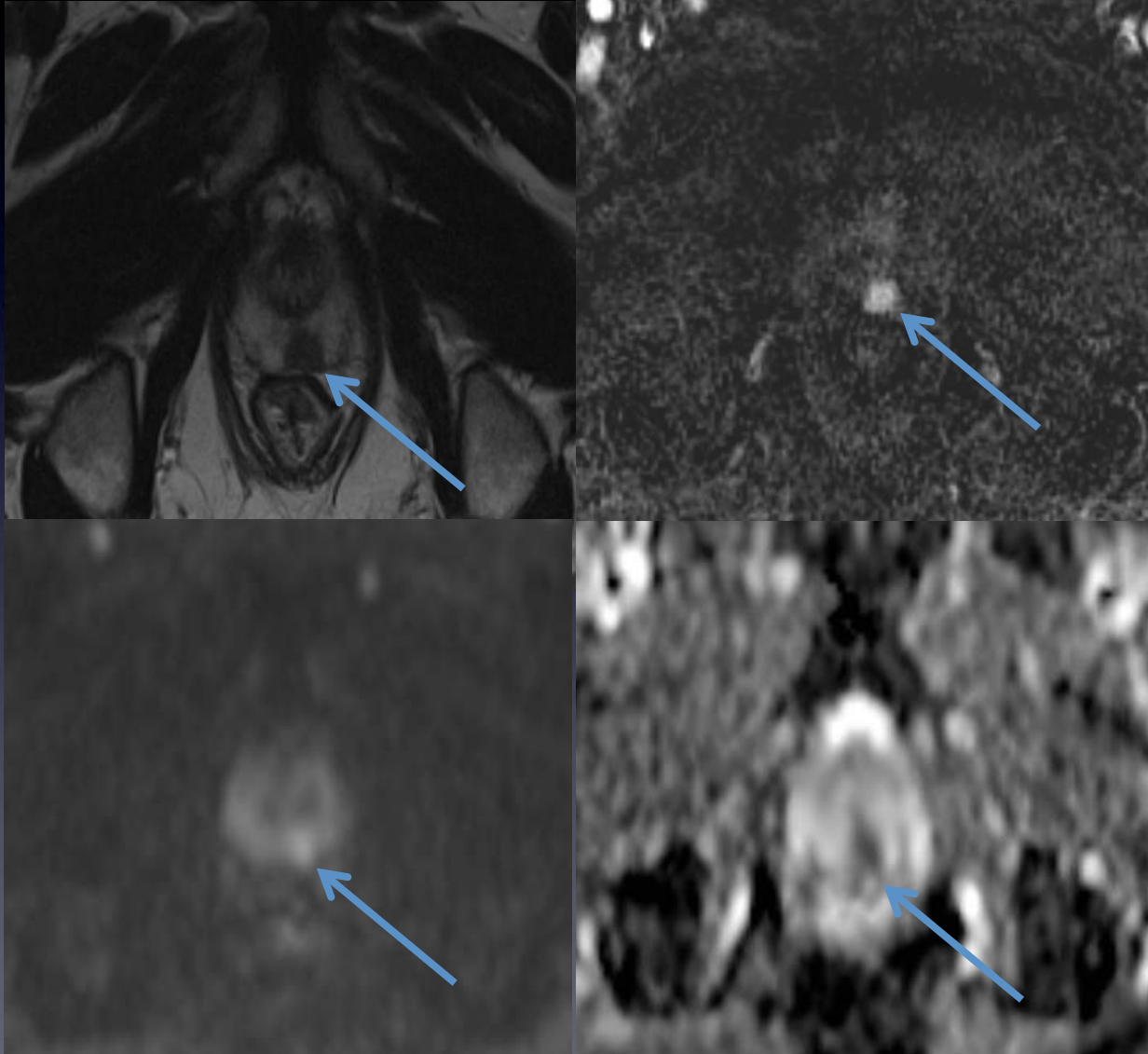


... and beyond

- DCE → perfusion



Multiparametric MRI



Multiparametric analysis



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

Received: 16 October 2011 / Revised: 23 November 2011 / Accepted: 2 December 2011 / Published online: 10 February 2012
© The Author(s) 2012. This article is published with open access at Springerlink.com

Abstract The aim was to develop clinical guidelines for multi-parametric MRI of the prostate by a group of prostate MRI experts from the European Society of Urogenital Radiology (ESUR), based on literature evidence and consensus expert opinion. True evidence-based guidelines could not be formulated, but a compromise, reflected by “minimal” and “optimal” requirements has been made. The scope of these ESUR guidelines is to promulgate high quality MRI in acquisition and evaluation with the correct indications for prostate cancer across the whole of Europe and eventually outside Europe. The guidelines for the optimal technique and three protocols for “detection”, “staging” and “node and bone” are presented. The use of endorectal coil vs. pelvic phased array coil and 1.5 vs. 3 T is discussed. Clinical indications and a PI-RADS classification for structured reporting are presented.

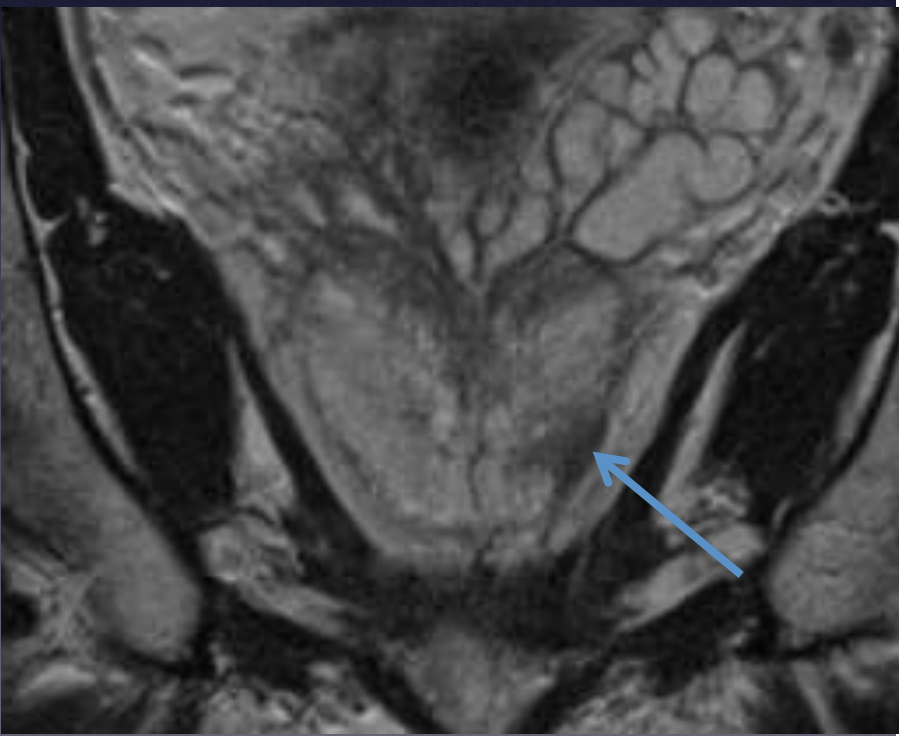
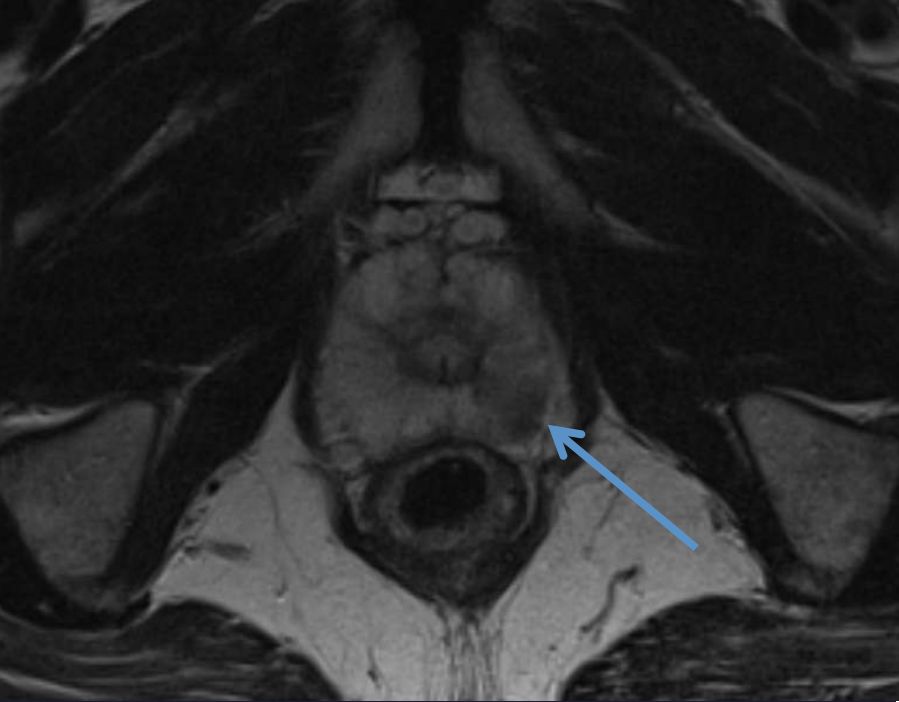
Key Points

- *This report provides guidelines for magnetic resonance imaging (MRI) in prostate cancer.*
- *Clinical indications, and minimal and optimal imaging acquisition protocols are provided.*
- *A structured reporting system (PI-RADS) is described.*

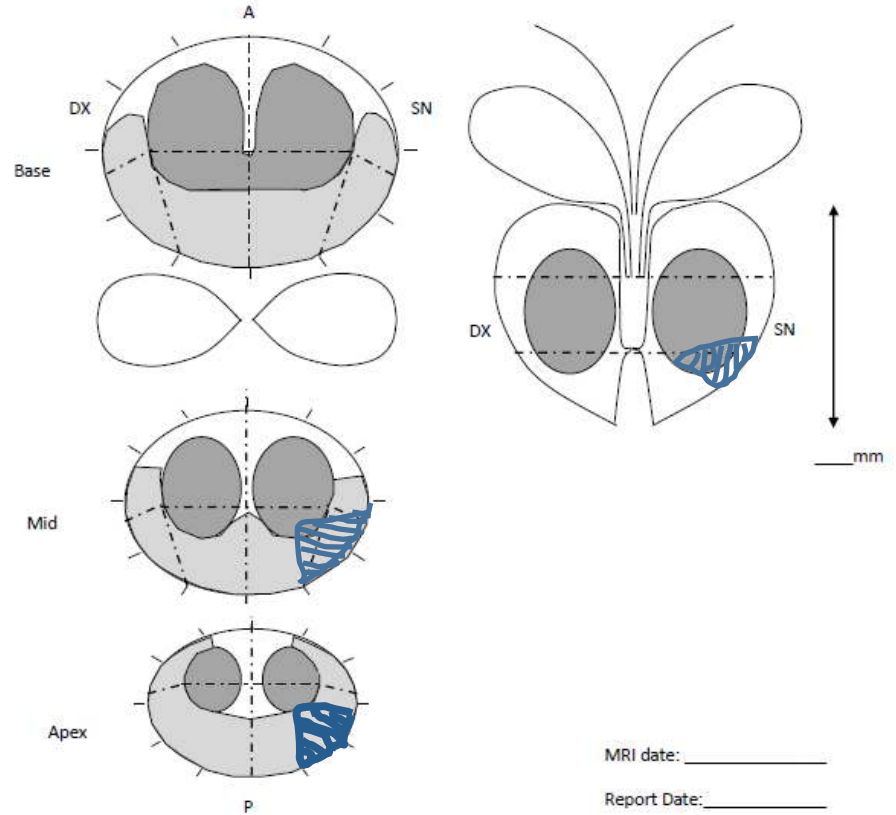
Keywords Prostate cancer · MRI · Guidelines · Oncology · ESUR

Introduction

In their lifetime, 1 in 6 men will be clinically diagnosed with prostate cancer. This accounts for annually 350,000 cases,



NAME: G.G. DOCTOR: PETRALIA / MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



MRI date: _____

Report Date: _____

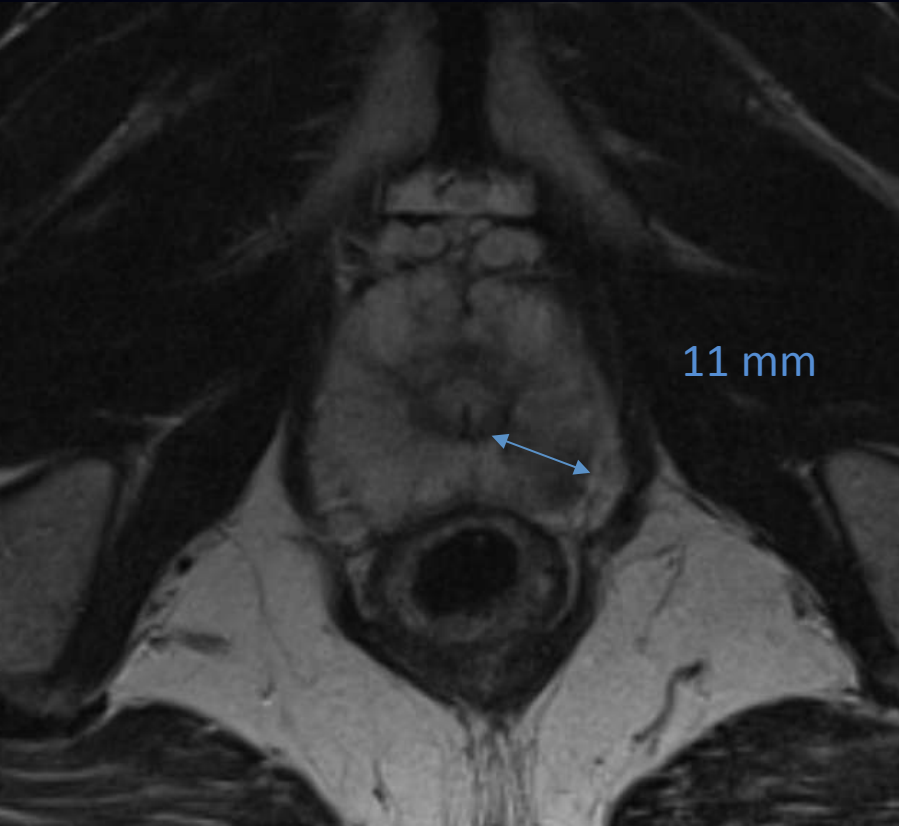
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1								
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign
 to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

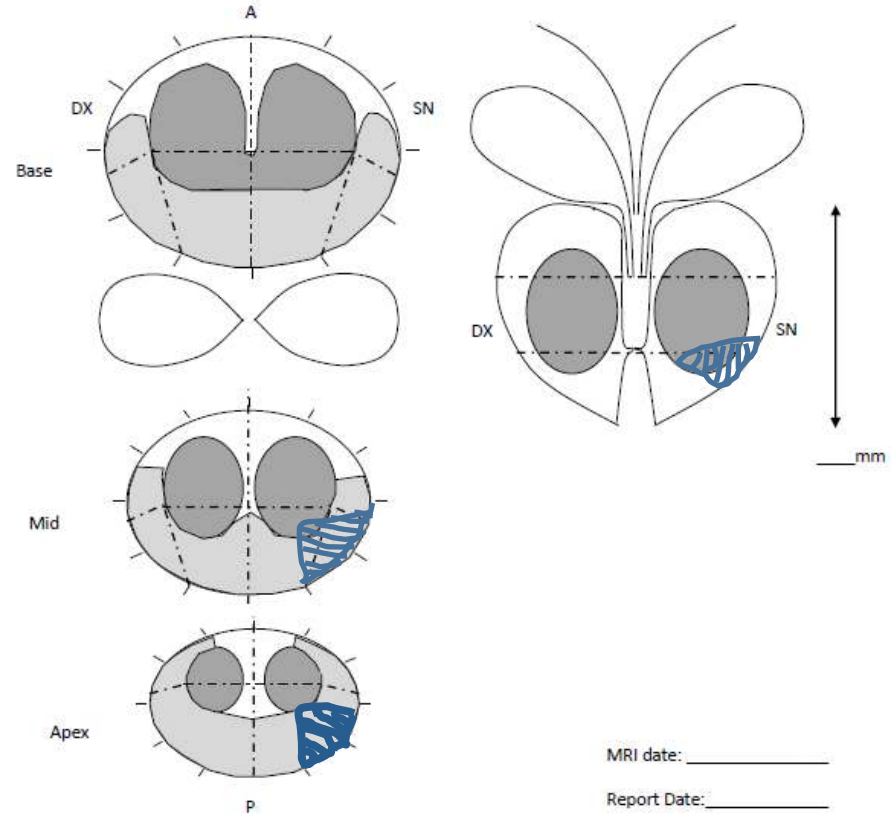
PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

Size



NAME: G.G DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



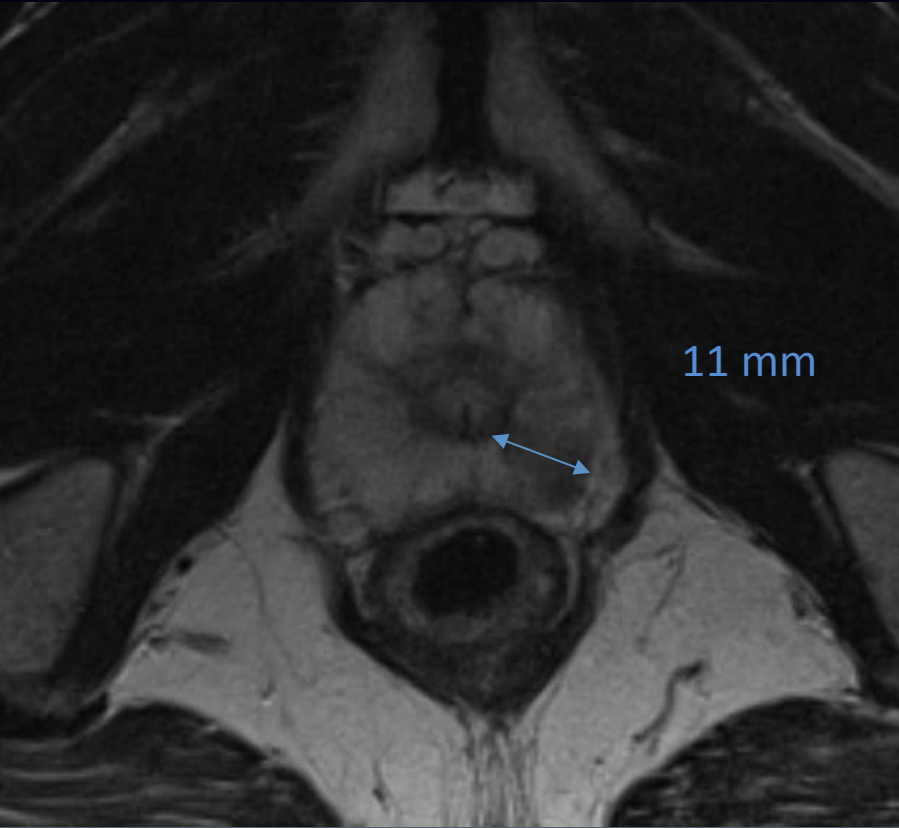
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11							
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

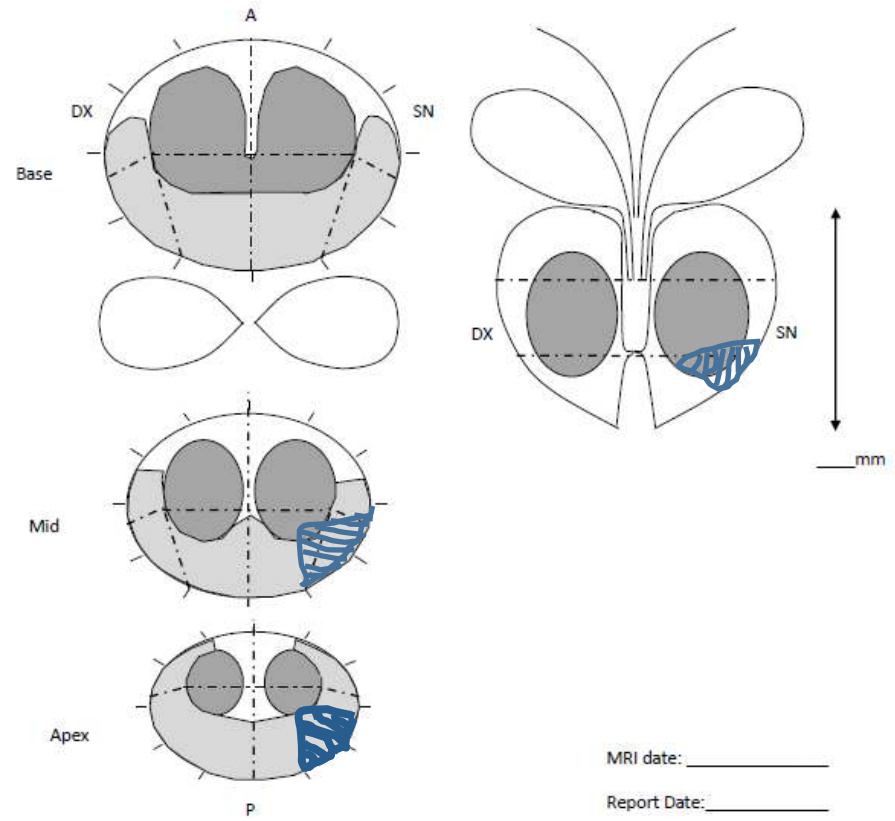
PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

Site



NAME: G.G DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



MRI date: _____
 Report Date: _____

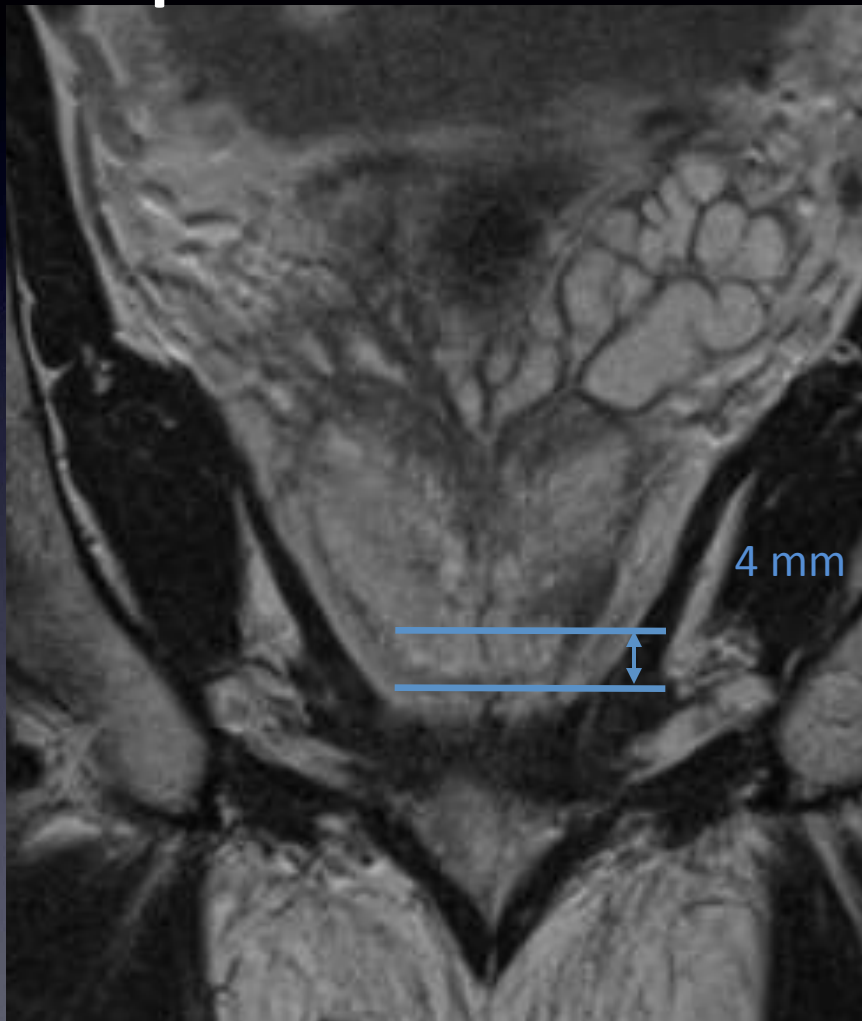
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ						
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

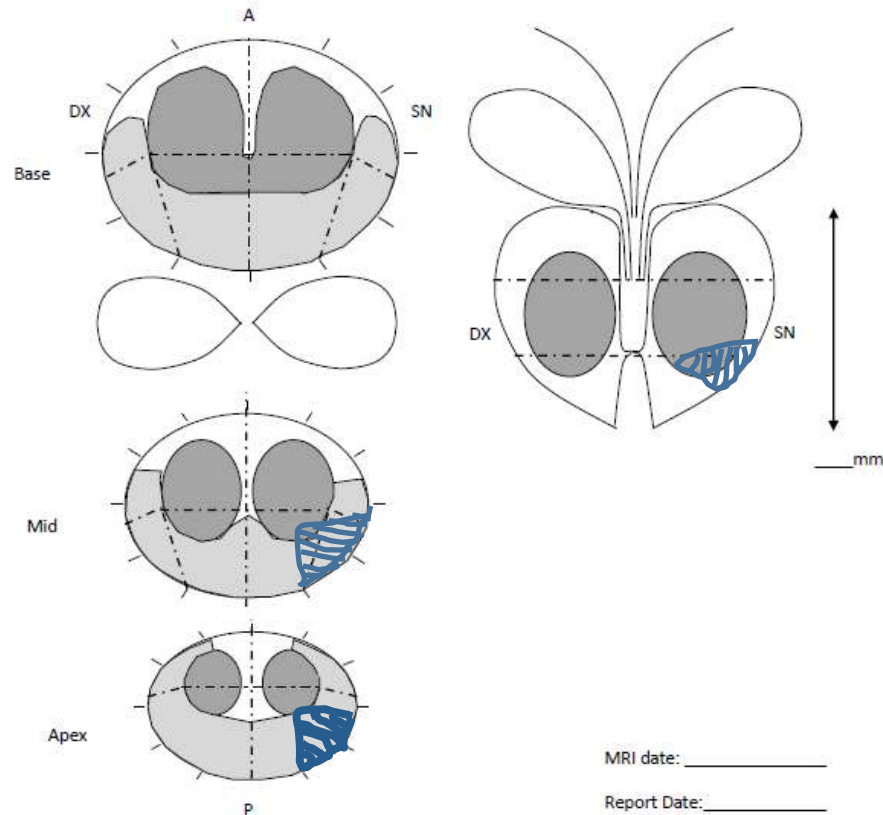
PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

Distance from Apex



NAME: G.G. DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



MRI date: _____

Report Date: _____

Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4					
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

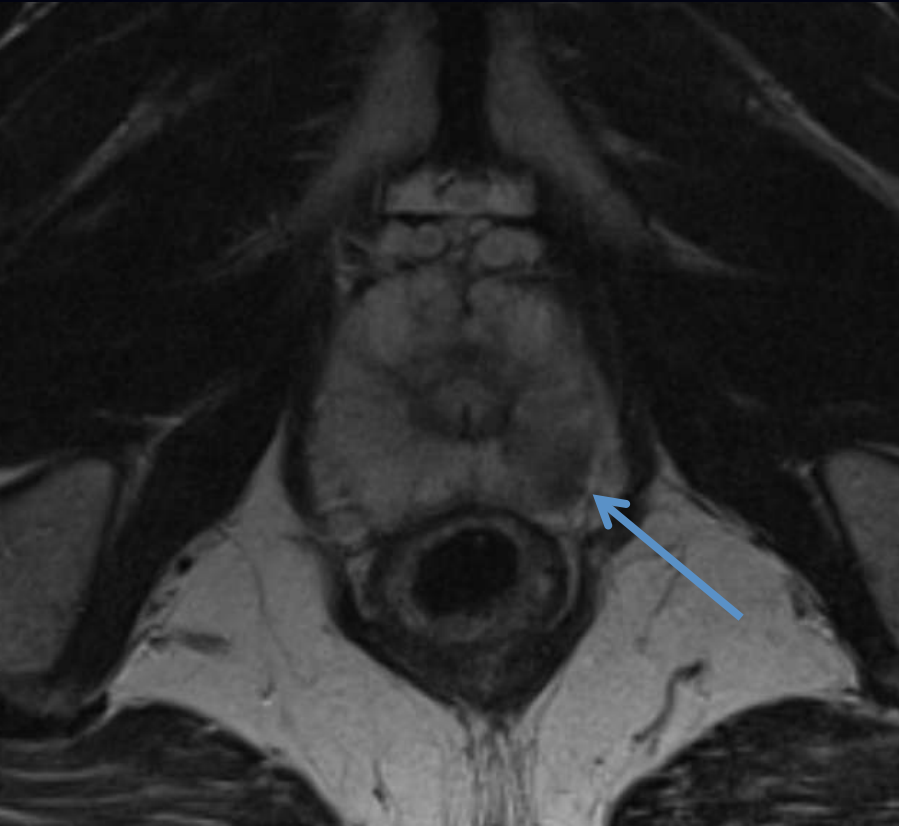
PI-RADS scoring system

- Interpretation

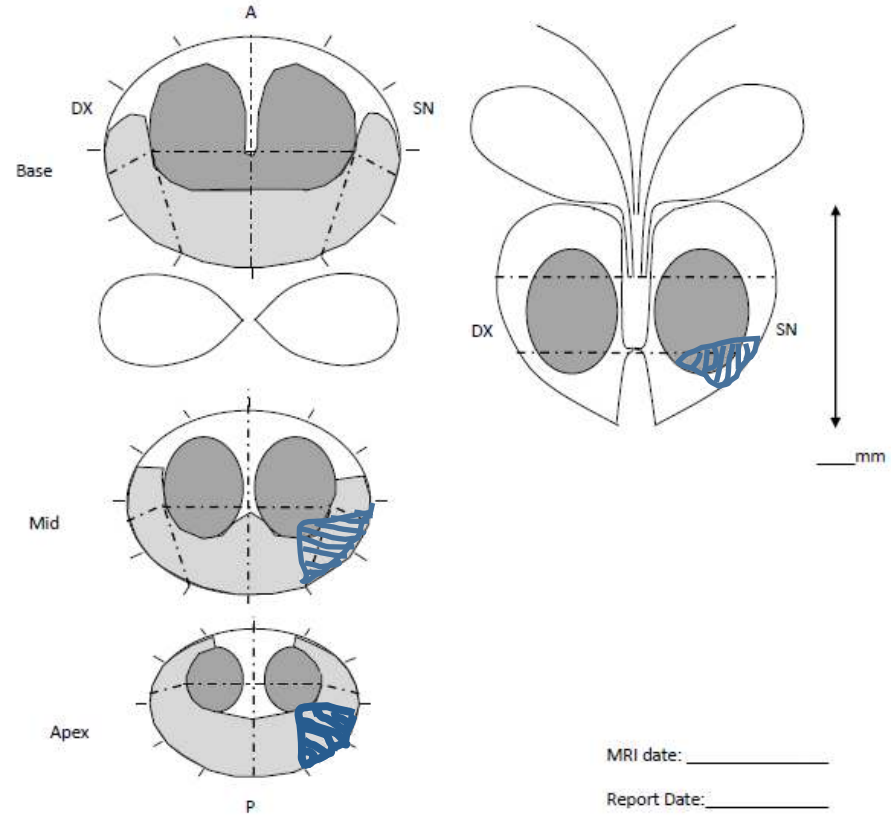
Table 3 PI-RADS scoring system

Score	Criteria
A1. T2WI for the peripheral zone (PZ)	
1	Uniform high signal intensity (SI)
2	Linear, wedge shaped, or geographic areas of lower SI, usually not well demarcated
3	Intermediate appearances not in categories 1/2 or 4/5
4	Discrete, homogeneous low signal focus/mass confined to the prostate
5	Discrete, homogeneous low signal intensity focus with extra-capsular extension/invasive behaviour or mass effect on the capsule (bulging), or broad (>1.5 cm) contact with the surface
A2. T2WI for the transition zone (TZ)	
1	Heterogeneous TZ adenoma with well-defined margins: "organised chaos"
2	Areas of more homogeneous low SI, however well marginated, originating from the TZ/BPH
3	Intermediate appearances not in categories 1/2 or 4/5
4	Areas of more homogeneous low SI, ill defined: "erased charcoal sign"
5	Same as 4, but involving the anterior fibromuscular stroma or the anterior horn of the PZ, usually lenticular or water-drop shaped.
B. Diffusion weighted imaging (DWI)	
1	No reduction in ADC compared with normal glandular tissue. No increase in SI on any high b-value image (≥ 800)
2	Diffuse, hyper SI on ≥ 800 image with low ADC; no focal features, however, linear, triangular or geographical features are allowed
3	Intermediate appearances not in categories 1/2 or 4/5
4	Focal area(s) of reduced ADC but iso-intense SI on high b-value images (≥ 800)
5	Focal area/mass of hyper SI on the high b-value images (≥ 800) with reduced ADC
C. Dynamic contrast enhanced (DCE)-MRI	
1	Type 1 enhancement curve
2	Type 2 enhancement curve
3	Type 3 enhancement curve
+1	For focal enhancing lesion with curve type 2-3
+1	For asymmetric lesion or lesion at an unusual place with curve type 2-3

T2WI (1 to 5)



NAME: G.G. DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



MRI date: _____

Report Date: _____

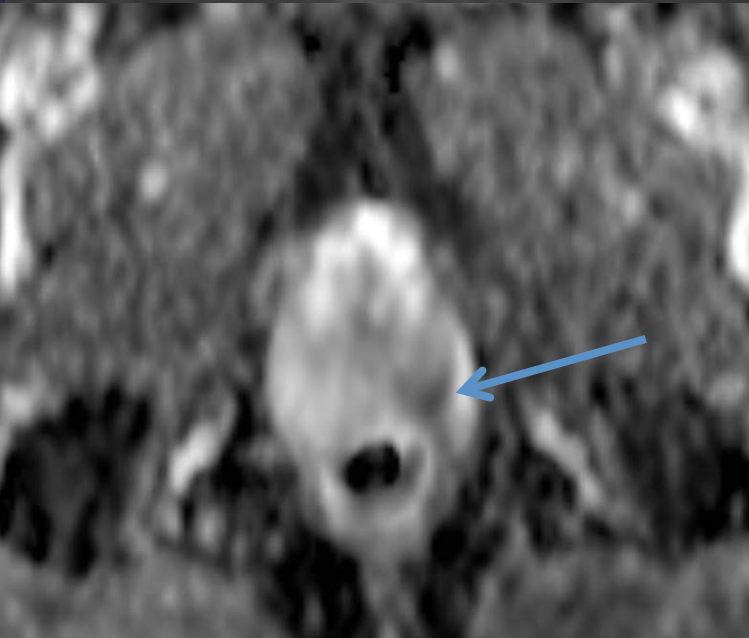
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4				
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign
 to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

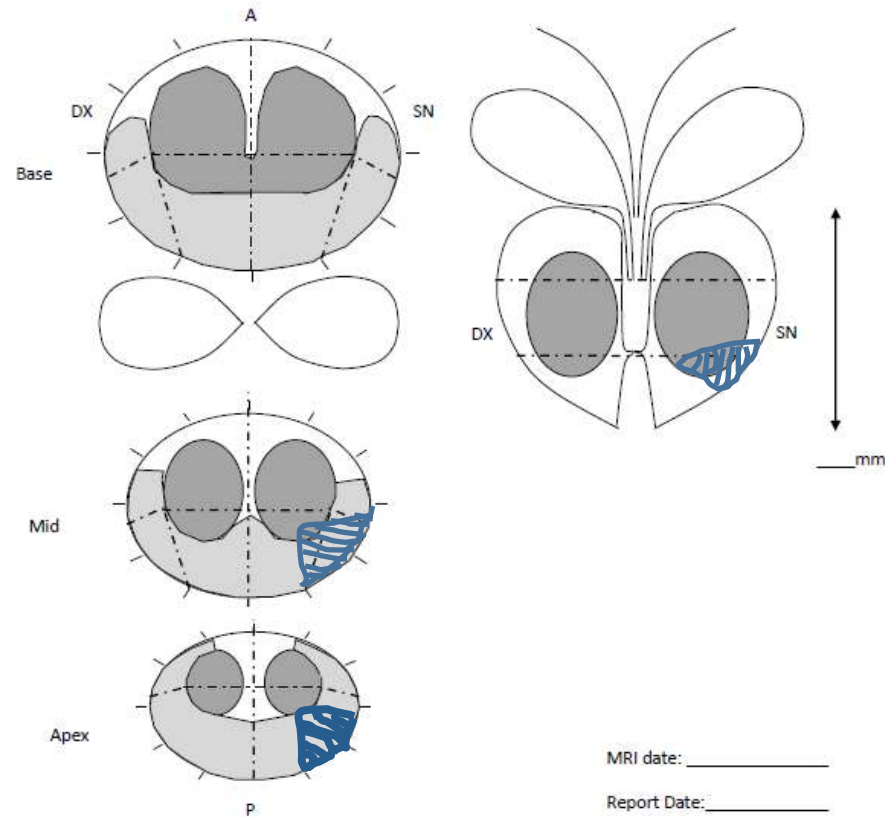
PI-RADS: clinically significant disease is
 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

DWI (1 to 5)



NAME: G.G. DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



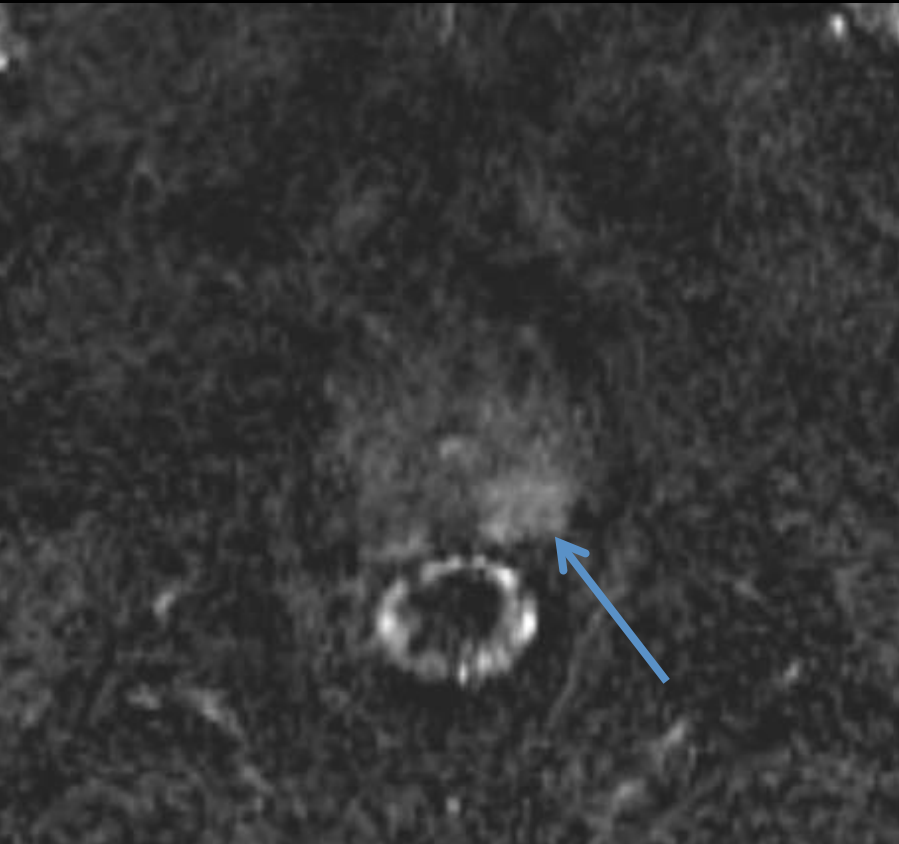
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5			
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

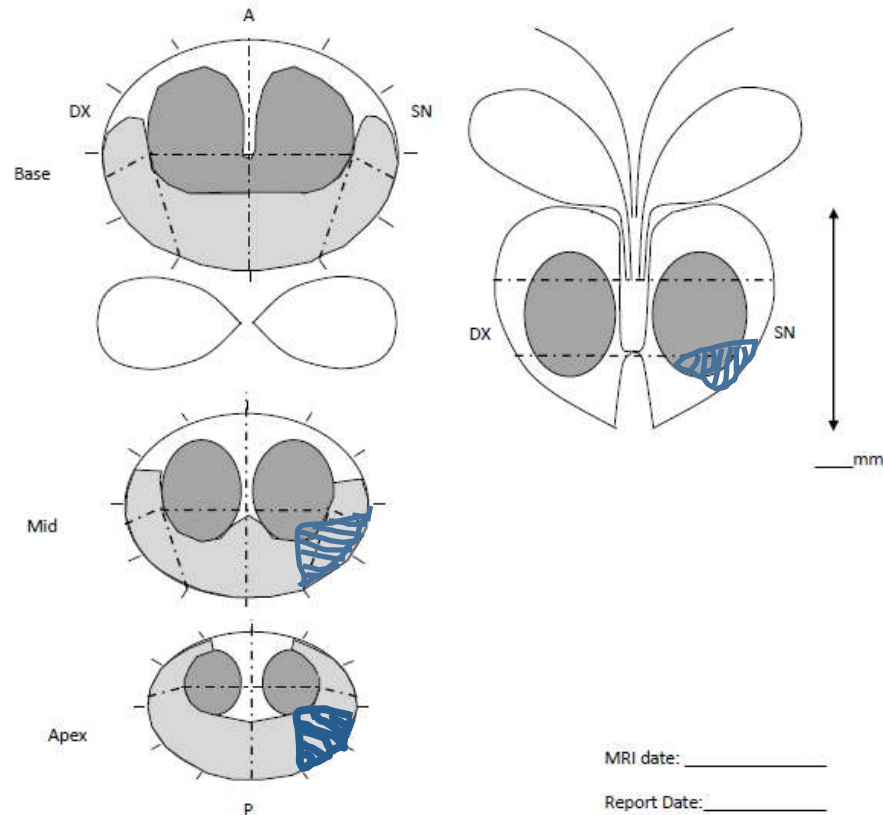
PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____

DCE (1 to 5)



NAME: G.G. DOCTOR: PETRALIA7MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7



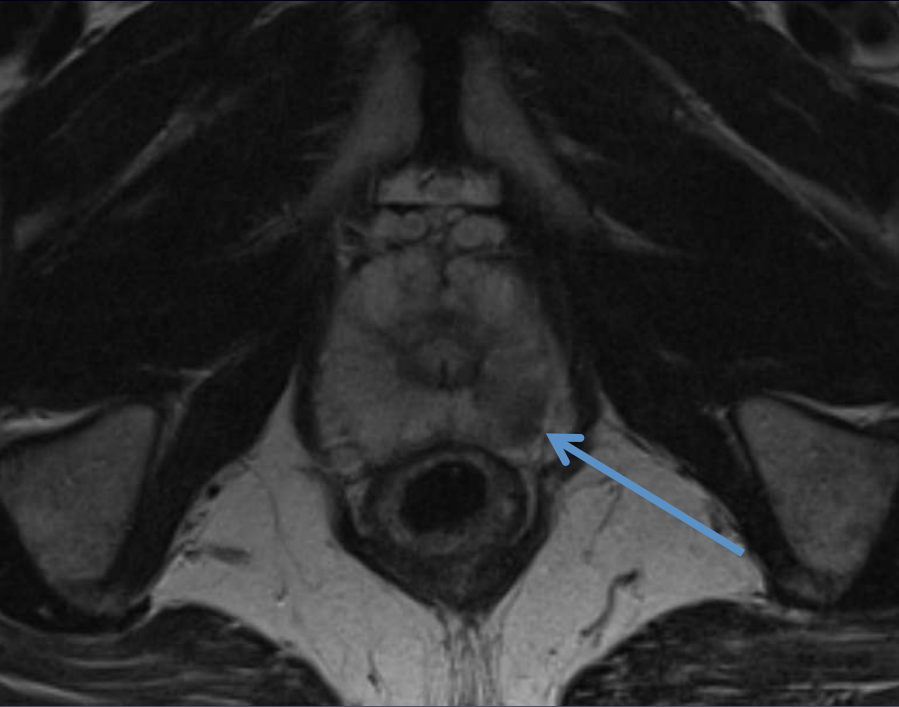
Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5	5		
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign
 to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)

PI-RADS: clinically significant disease is
 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

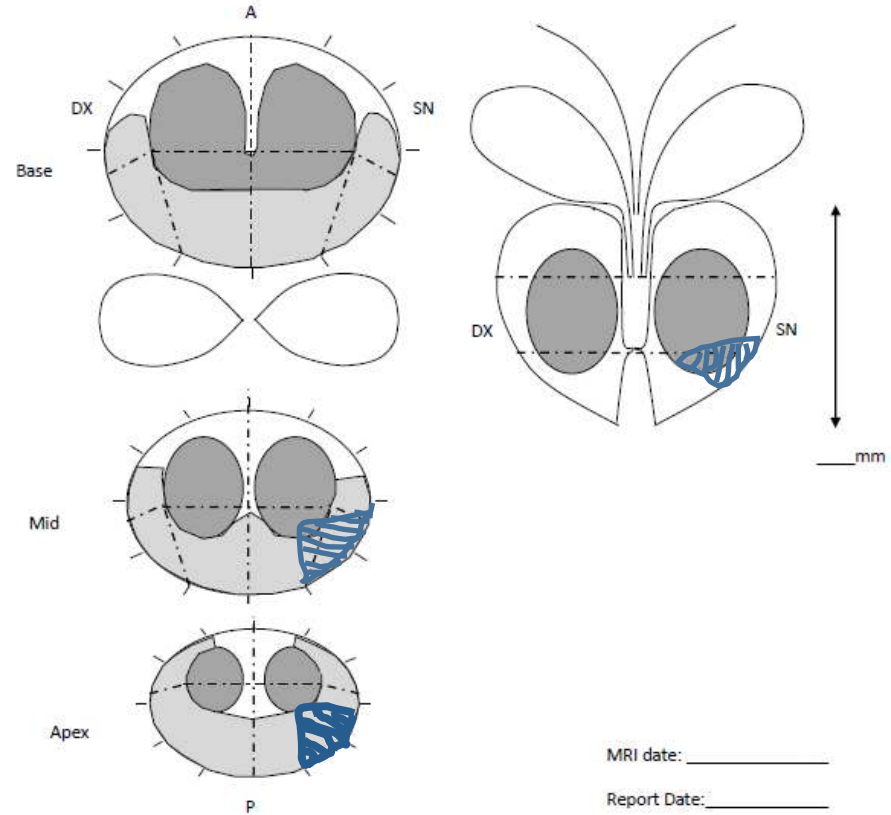
NOTES: _____

Contact with capsule



NAME: G.G. DOCTOR: PETRALIA/MUSI

INDICATION: STAGING PSA (ng/ml): 7.7



Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5	5	Yes	
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign
to 5 = definitely malignant

Contact with capsule (YES or NO)

Site (PZ, TZ, AFS)

PI-RADS: clinically significant disease is 1 = highly unlikely
2 = unlikely
3 = equivocal
4 = likely
5 = highly likely

NOTES: _____

PI-RADS final scoring

- COMMUNICATE RESULT:
 - 1: clinically significant disease highly un-likely
 - 2: clinically significant disease un-likely
 - 3: clinically significant disease equivocal
 - 4: clinically significant disease likely
 - 5: clinically significant disease highly likely

Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5	4	Yes	5
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign
to 5 = definitely malignant

Contact with capsule (YES or NO)

Site (PZ, TZ, AFS)

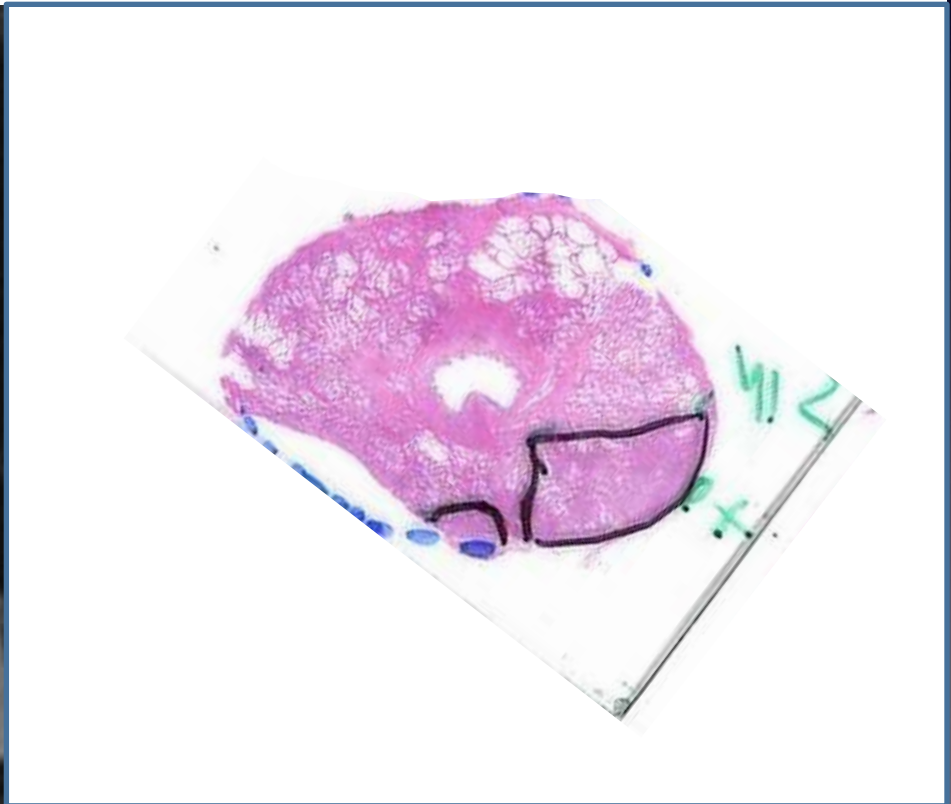
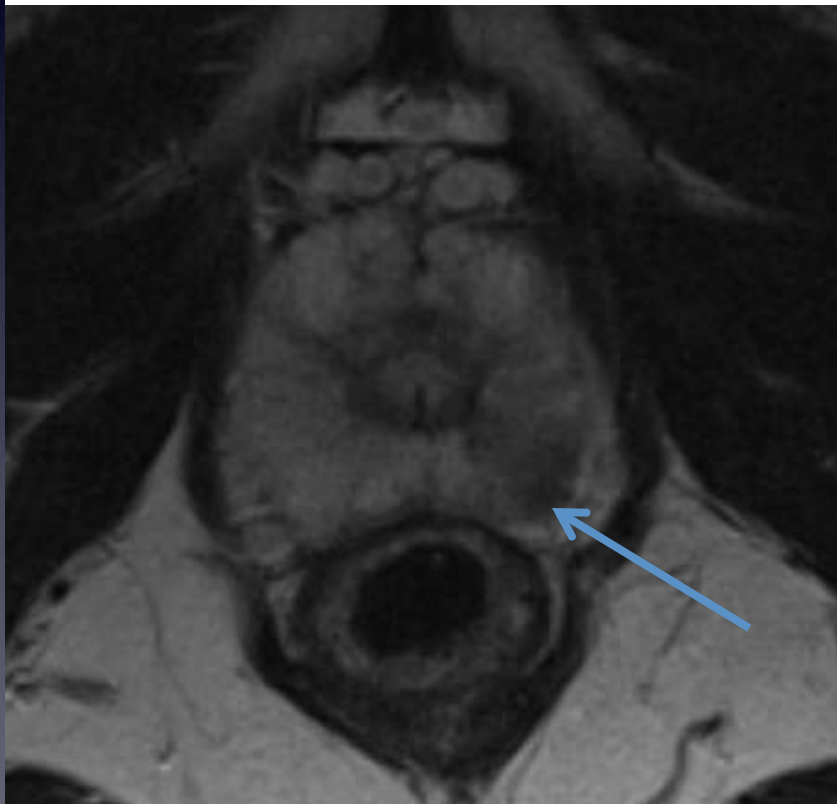
PI-RADS: clinically significant disease is 1 = highly unlikely

2 = unlikely

3 = equivocal

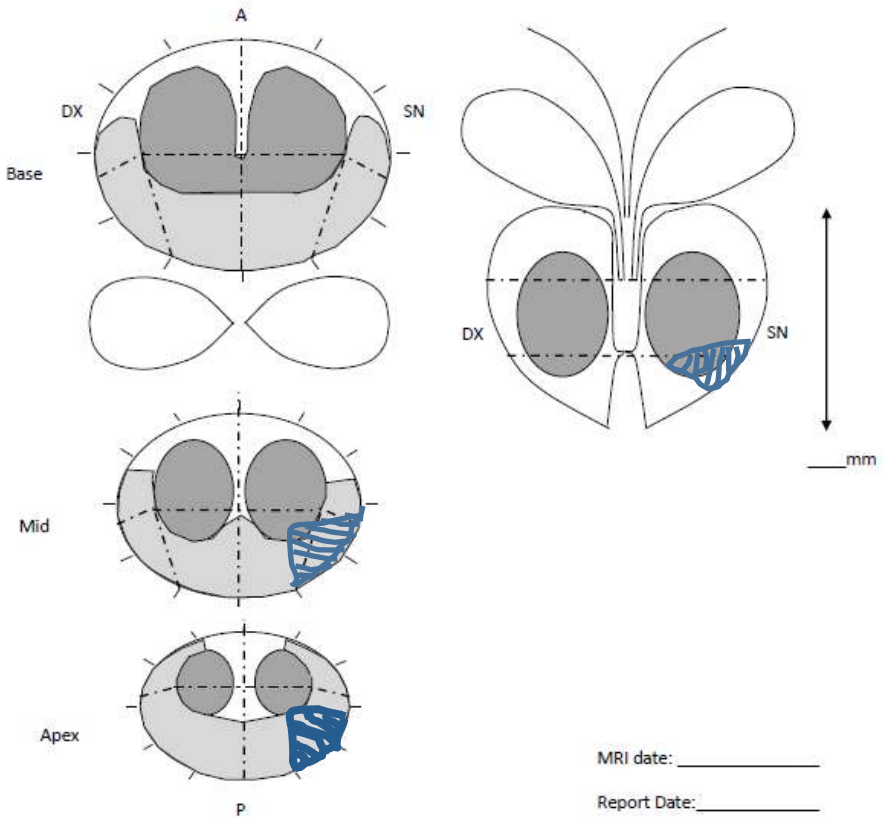
4 = likely

5 = highly likely



NAME : G.G. DOCTOR: PETRALIA/MUSI

INDICATION: STAGING PSA (ng/ml): 7.7




MRI date: _____
Report Date: _____

Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5	4	Yes	5
2								
3								
4								
5								

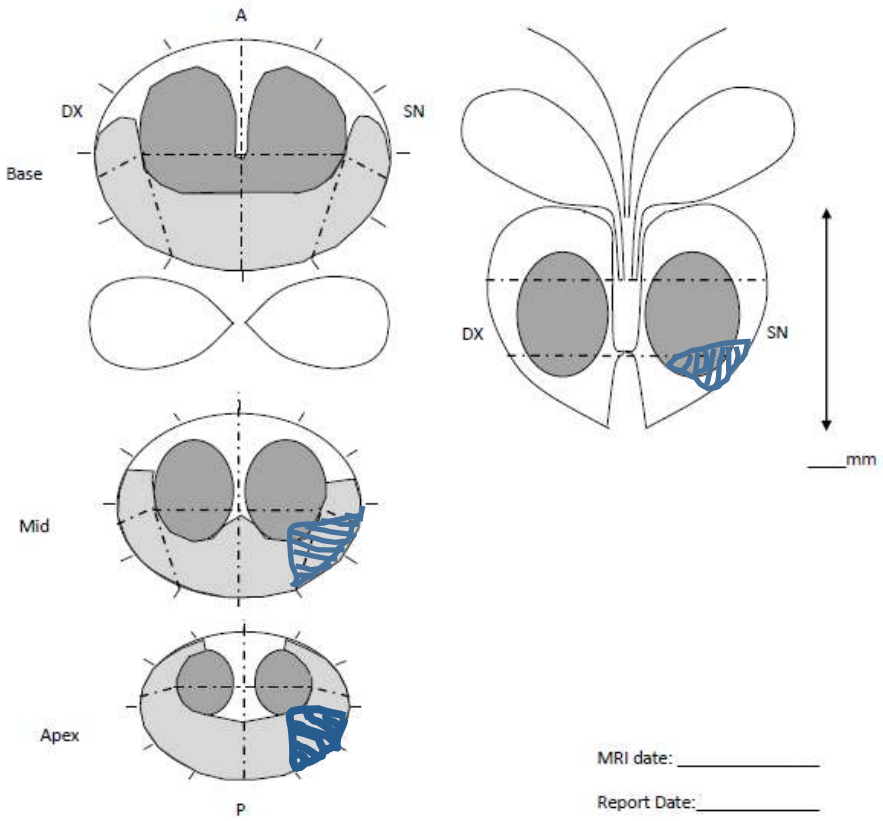
T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
Contact with capsule (YES or NO)
Site (PZ, TZ, AFS)

PI-RADS: clinically significant disease is 1 = highly unlikely
2 = unlikely
3 = equivocal
4 = likely
5 = highly likely

NOTES: _____

 **Operating room**

NAME: G. G. DOCTOR: PETRALIA/MUSI
 INDICATION: STAGING PSA (ng/ml): 7.7

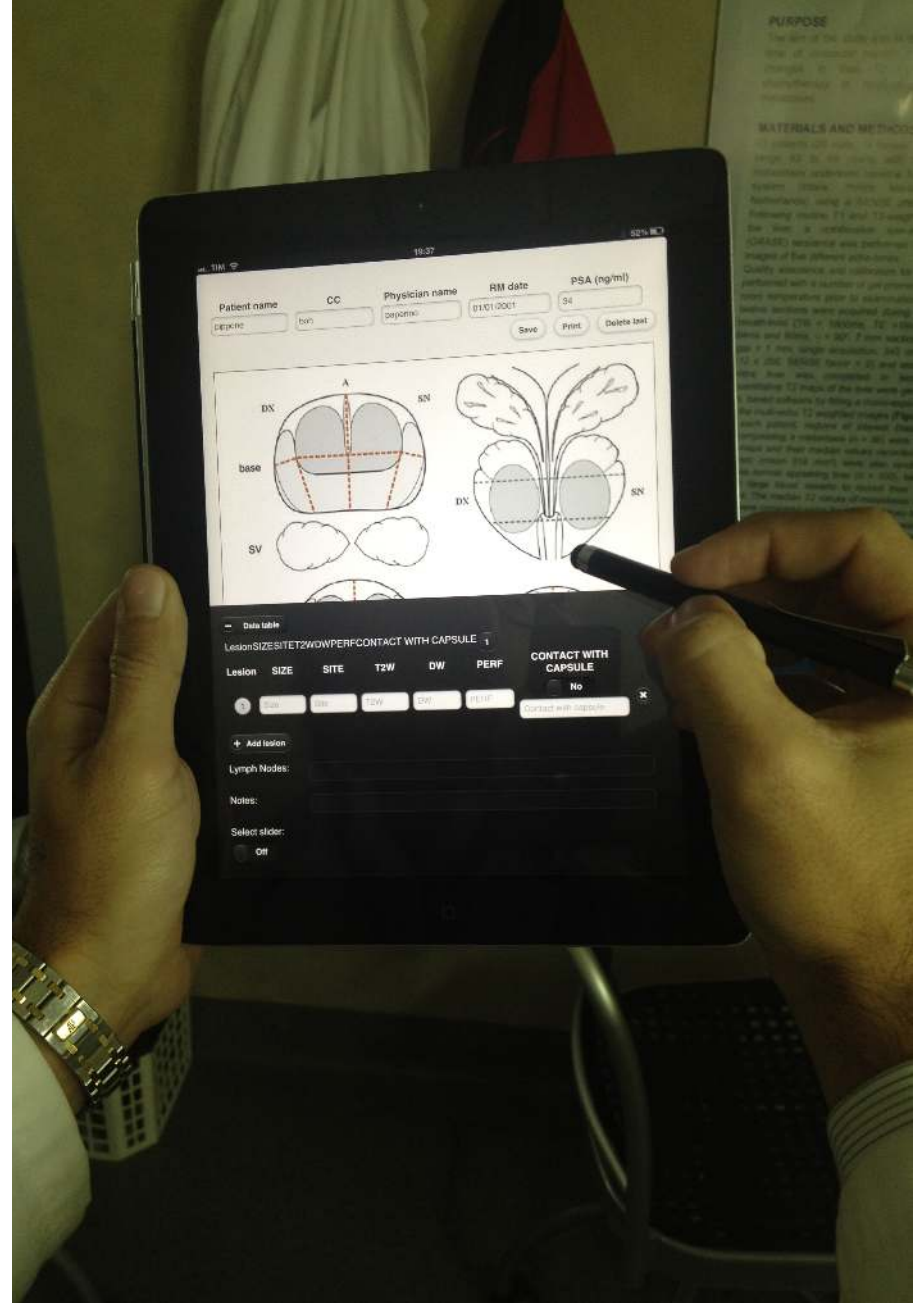


Lesion	Size	Site	Distance from Apex	T2W	DWI	PERF	Contact with Capsule	PI-RADS
1	11	PZ	4	4	5	4	Yes	5
2								
3								
4								
5								

T2W, DW, PERF → From 1 = definitely benign to 5 = definitely malignant
 Contact with capsule (YES or NO)
 Site (PZ, TZ, AFS)


PI-RADS: clinically significant disease is 1 = highly unlikely
 2 = unlikely
 3 = equivocal
 4 = likely
 5 = highly likely

NOTES: _____



App



 available on the App Store



OROBIX

in collaboration with

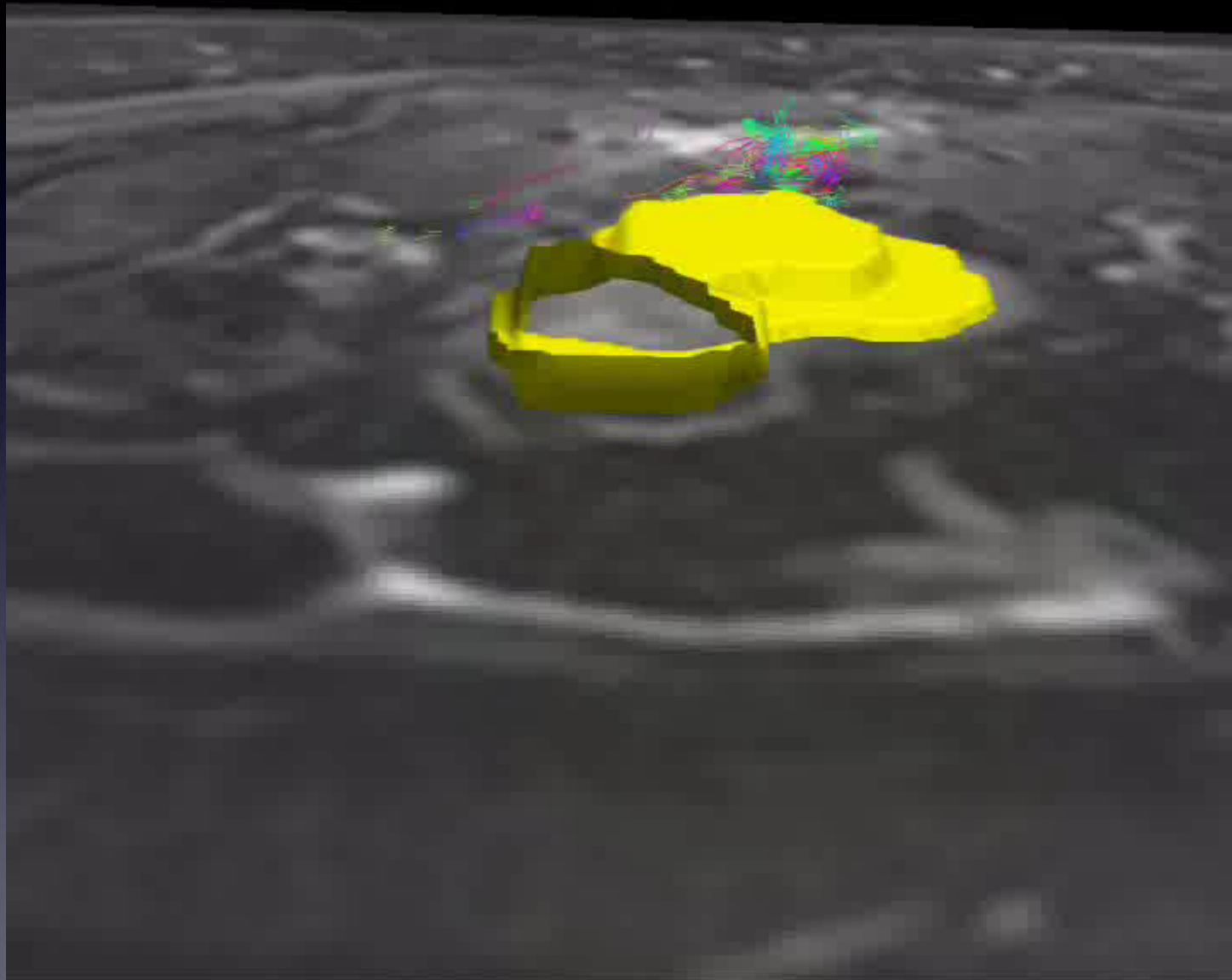
Giuseppe Petralia

IEO - European Institute of Oncology, Milan - Italy

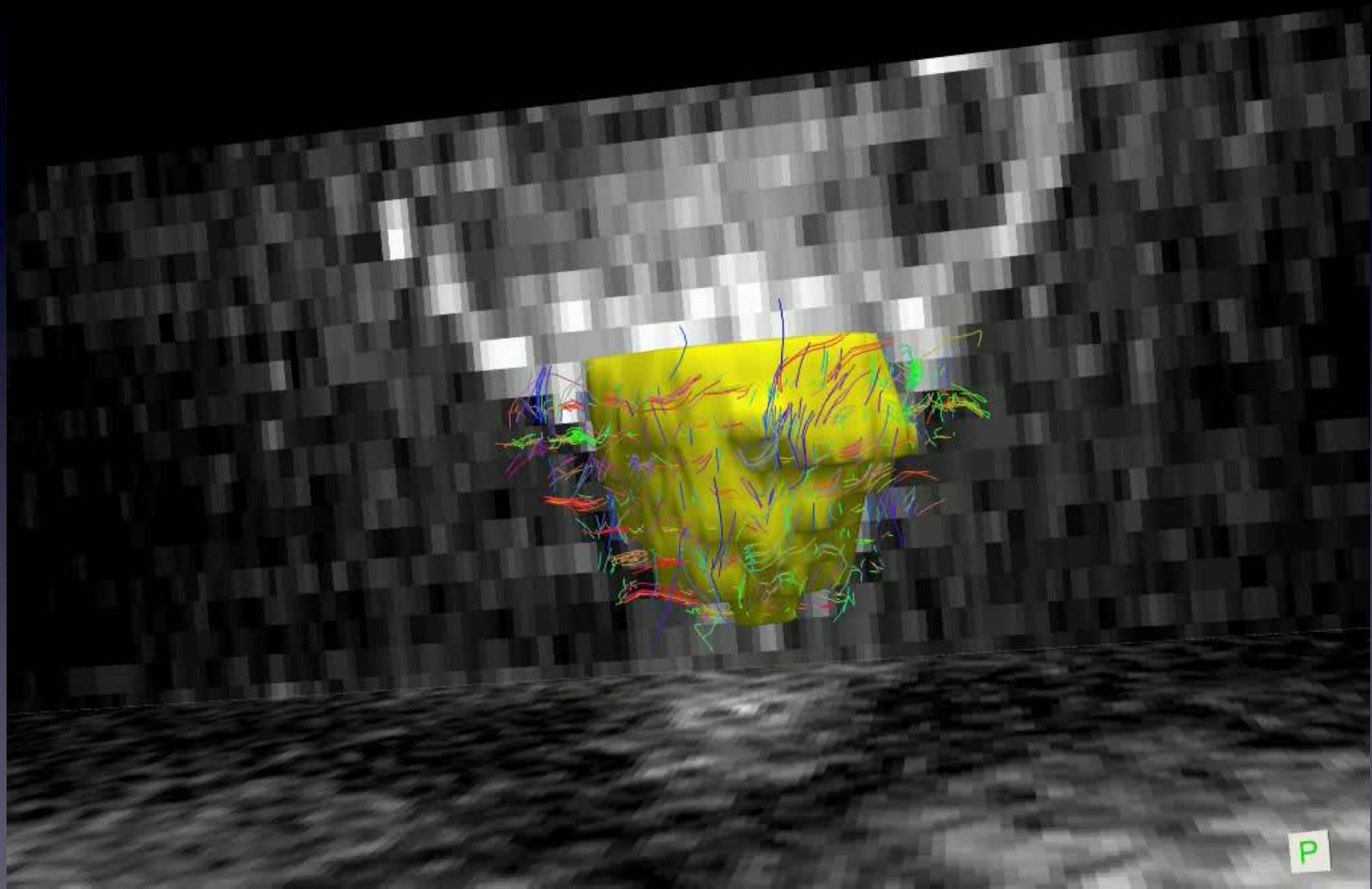
www.robix.com/RADcommunicator

RADcommunicator@robix.com

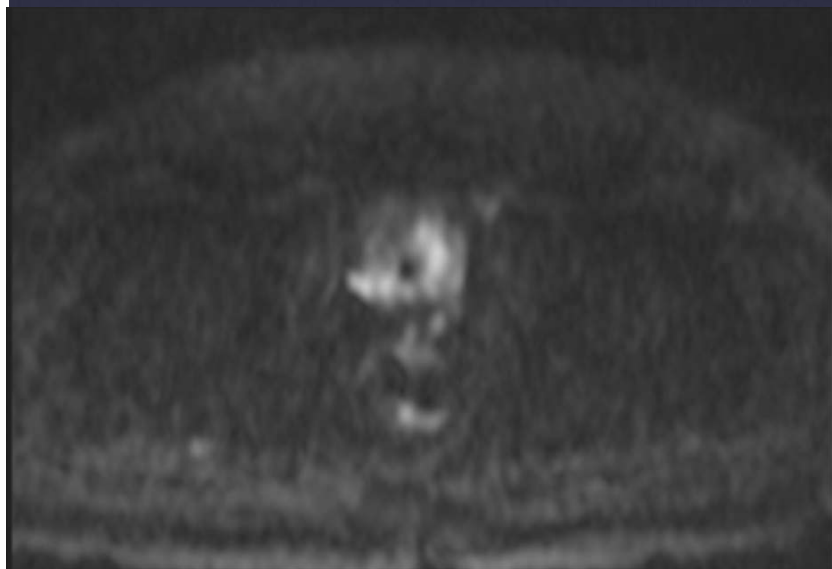
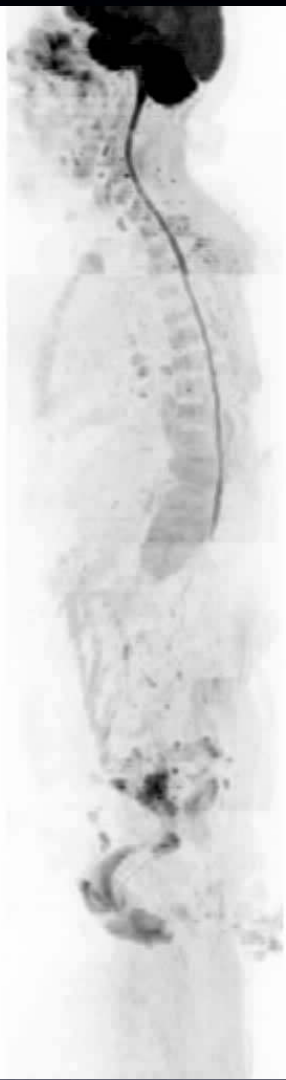
Inferior hypogastric plexus



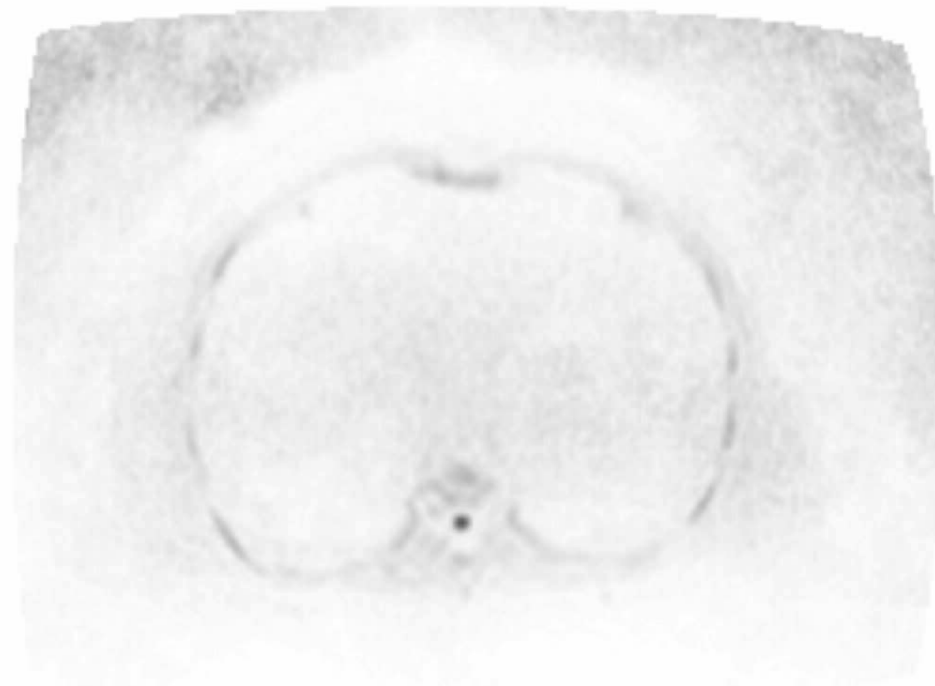
Prostatic plexus



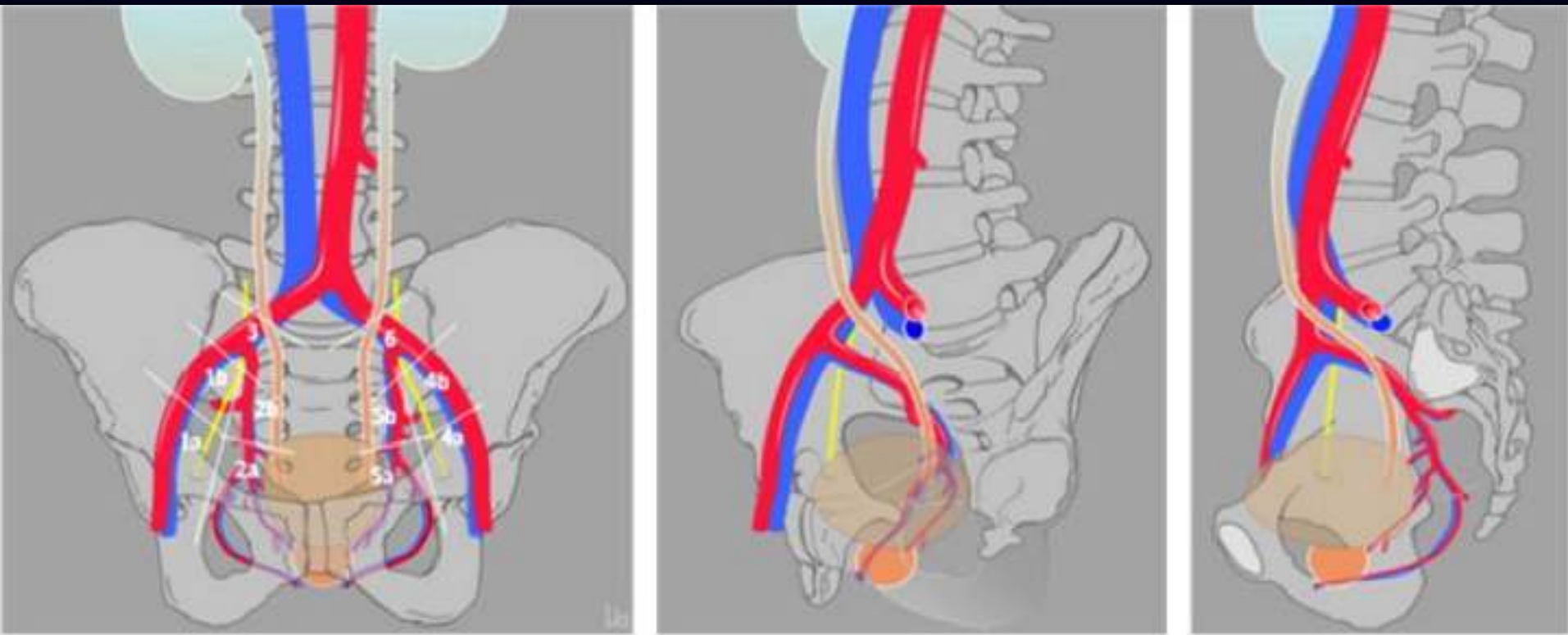
Whole-body diffusion (Bone & Node)



Whole-body diffusion (Bone & Node)



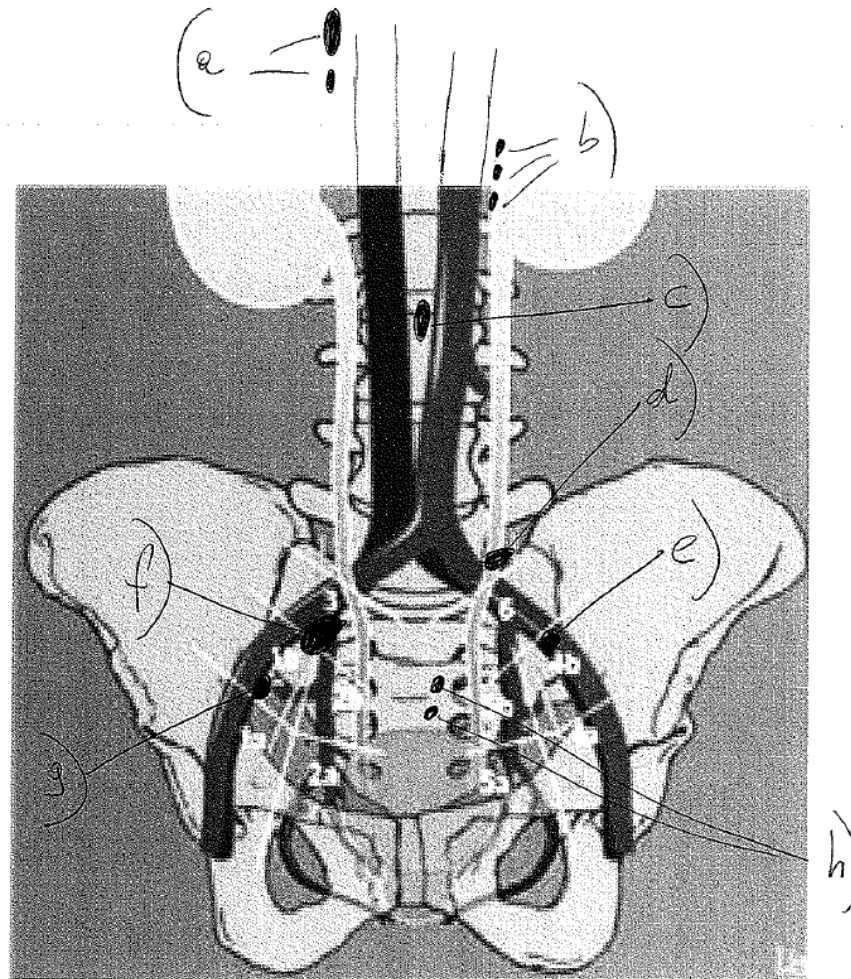
Whole-body diffusion (Bone & Node)



Whole-body diffusion (Bone & Node)

Metastatic lymph nodes:

- a) • **Retrocrural right:**
 - two lymph nodes of 6mm (im 14 se 104) and 3mm (im 26 se 104)
- b) • **Paraortic left:**
 - three lymph nodes <5mm (im 30, 36, 38 se 104)
- c) • **Interaortocaval:**
 - one of 7mm (im 40 se 104)
- d) • **common iliac left:**
 - one of 5mm (im 56 se 104)
- e) • **external iliac left:**
 - one of 6mm (im 74 se 104)
- f) • **internal iliac right:**
 - one of 26mm (im 66 se 104)
- g) • **external iliac right:**
 - one of 5mm (im 67 se 104)
- h) • **Mesorectal:**
 - two lymph nodes of 5mm (im 6 se 19) and 7mm (im 2 se 19).



3D rendering

L

H

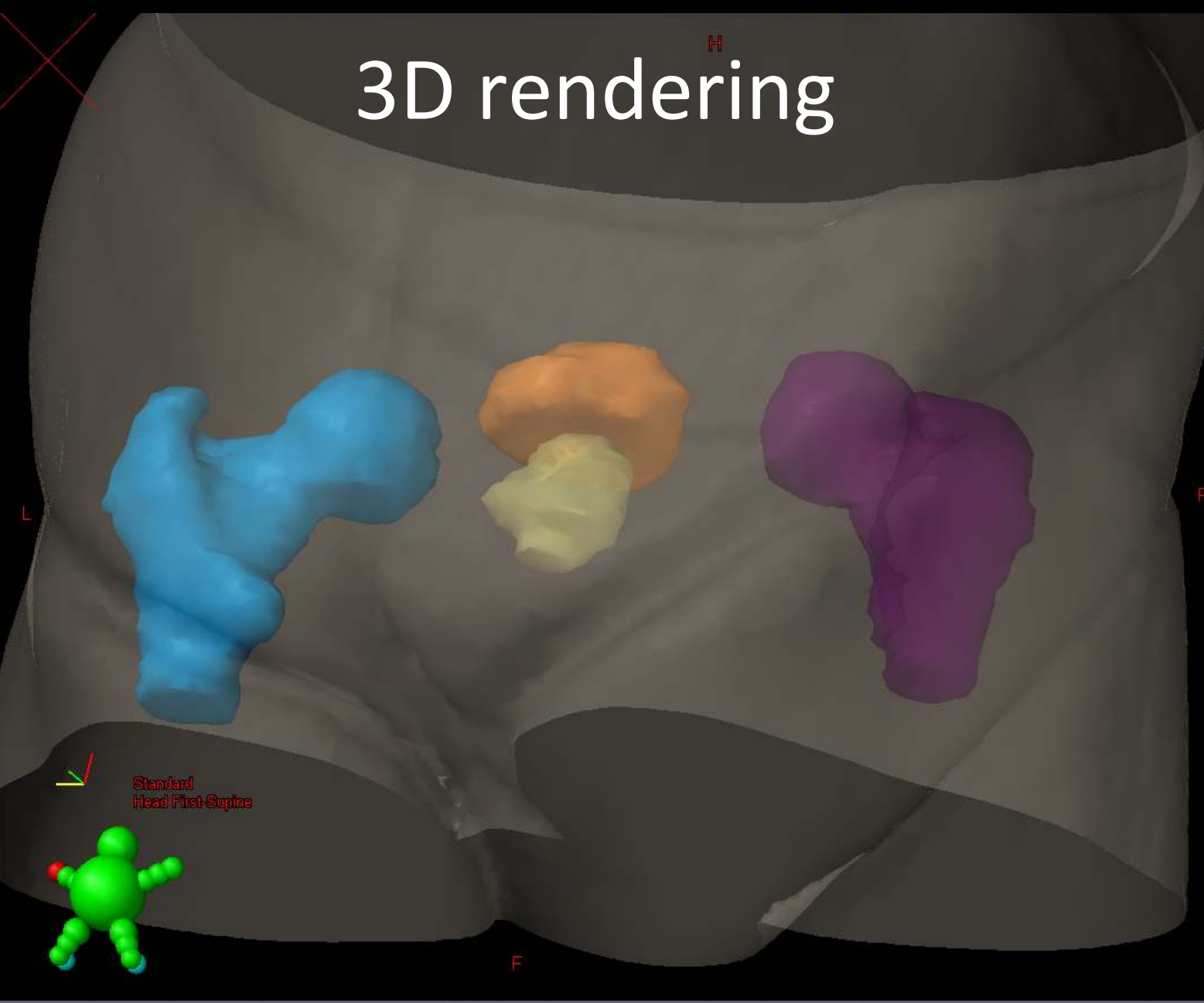
R



Standard
Head First-Supine



F



3D model



Thanks