CURRENT TRENDS IN MRI USE IN PROSTATE CANCER

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OUTLINE

- OBJECTIVES
- REVIEW OF MRI ANATOMY
- APPROACHES TO DIAGNOSING PROSTATE CANCER
- MULTIPARAMETRIC MRI
- PIRADS CLASSIFICATION
- WHOLE BODY MRI
- CONCLUSION

OBJECTIVES

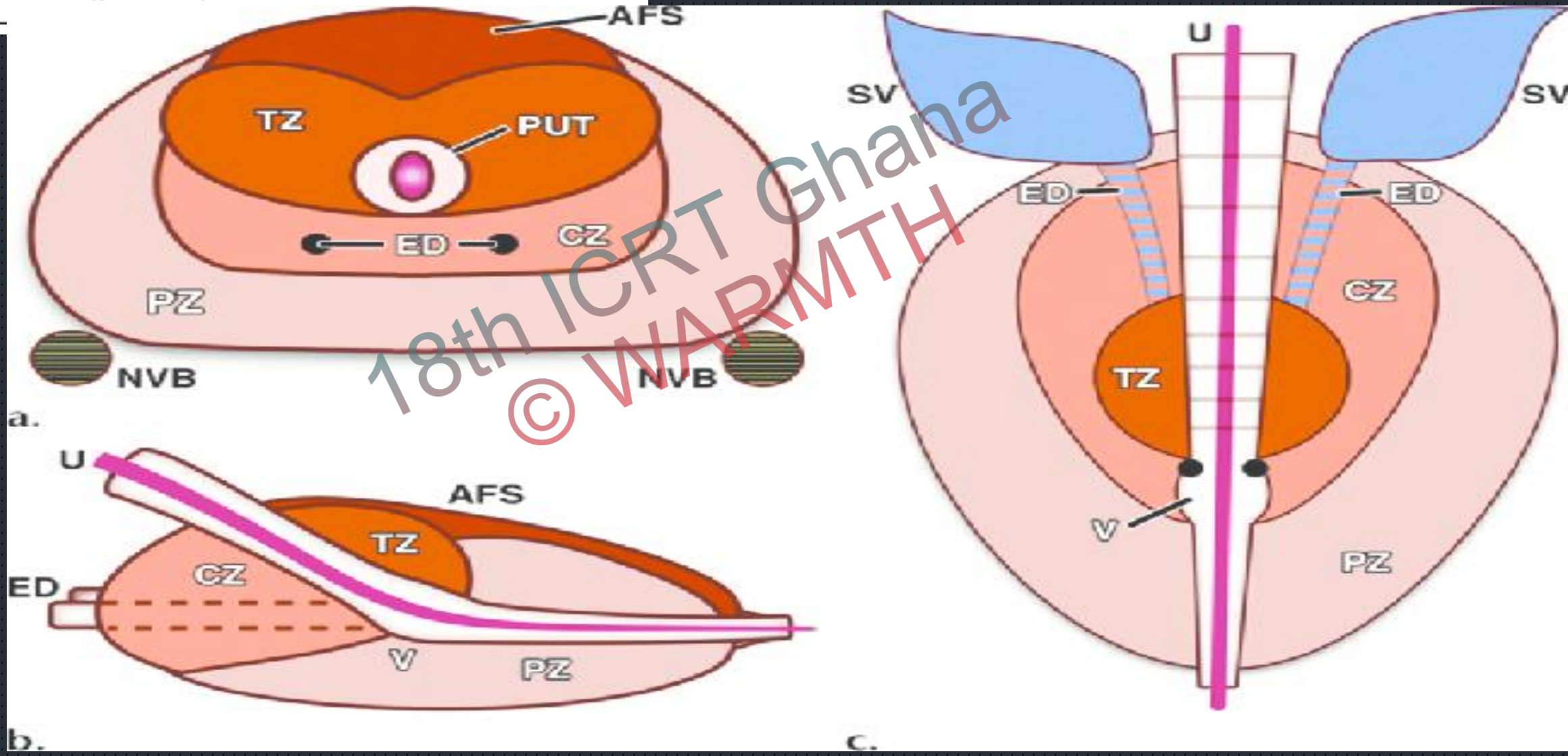
- PARTICIPANTS WILL BE ABLE TO LIST THE STRENGTHS AND WEAKNESSES OF THE MAIN DIAGNOSTIC IMAGING MODALITIES USED IN PROSTATE CANCER MANAGEMENT

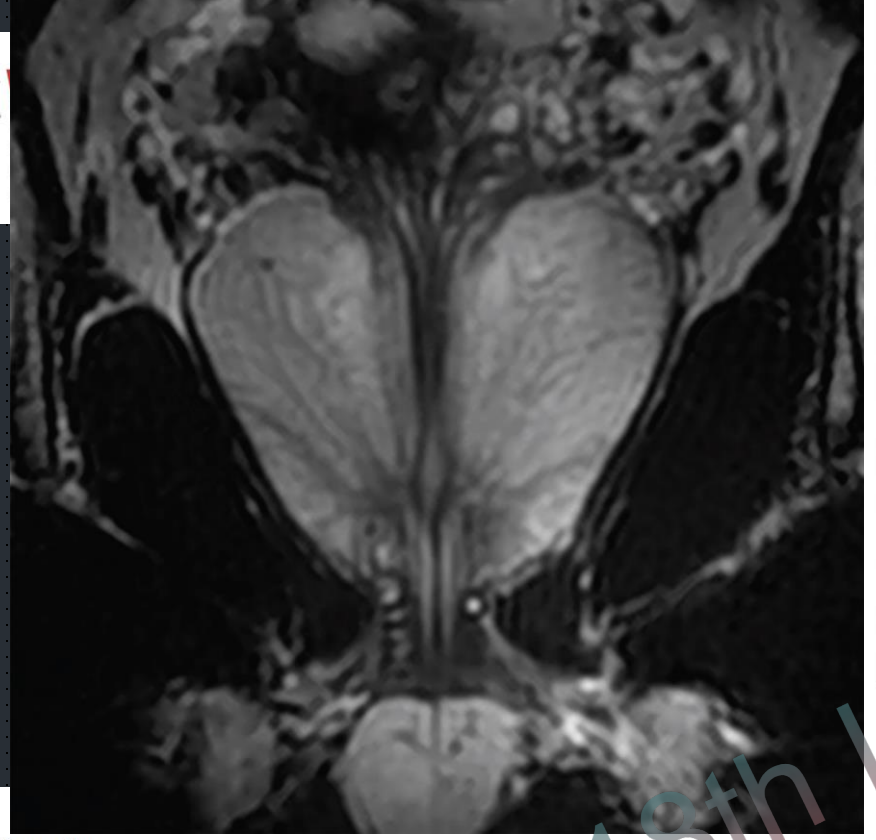
RadioGraphics

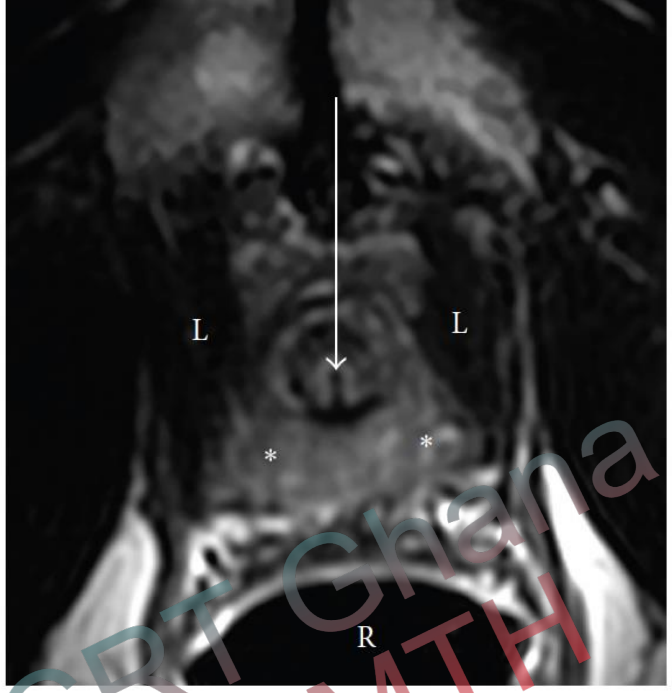
Imaging-guided Prostate Biopsy: Conventional and Emerging Techniques[1]

TEACHING POINTS
See last page

Joseph H. Yacoub, MD • Sadhna Verma, MD • Jonathan S. Moulton, MD
Scott Eggener, MD • Aytekin Oto, MD







(a)

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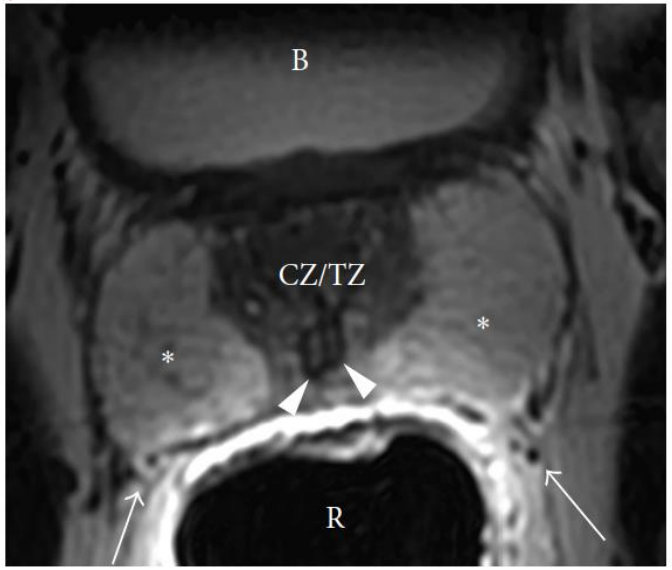


(c)

Review Article

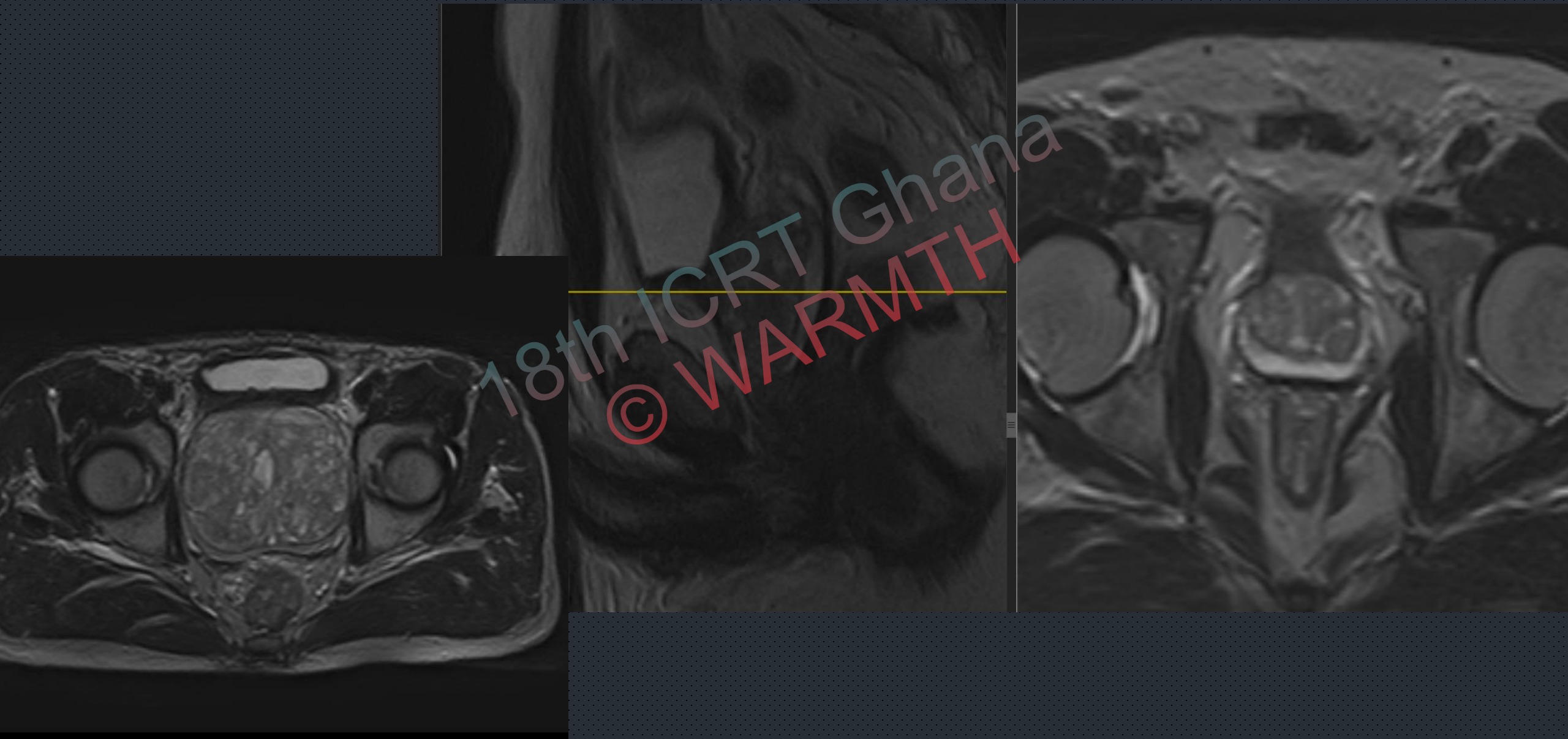
Anatomic Imaging of the Prostate

Anil Bhavsar and Sadhna Verma

University of Cincinnati Medical Center, Cincinnati, OH 45267-0762, USA

Correspondence should be addressed to Sadhna Verma; drsadhnaverma@gmail.com

MRI OF PROSTATE GLAND



PROSTATE CANCER DIAGNOSTIC PATHWAYS

- DIGITAL RECTAL EXAMINATION (DRE)
- PROSTATE SPECIFIC ANTIGEN TEST (PSA)
- TRANS RECTAL ULTRASOUND BIOPSY (TRUS)- 27-44%- ROTHWAX ET AL
- MULTIPARAMETRIC-MRI – MP-MRI/BIPARAMETRIC MRI -BP-MRI
- WHOLE BODY-MRI – WB-MRI

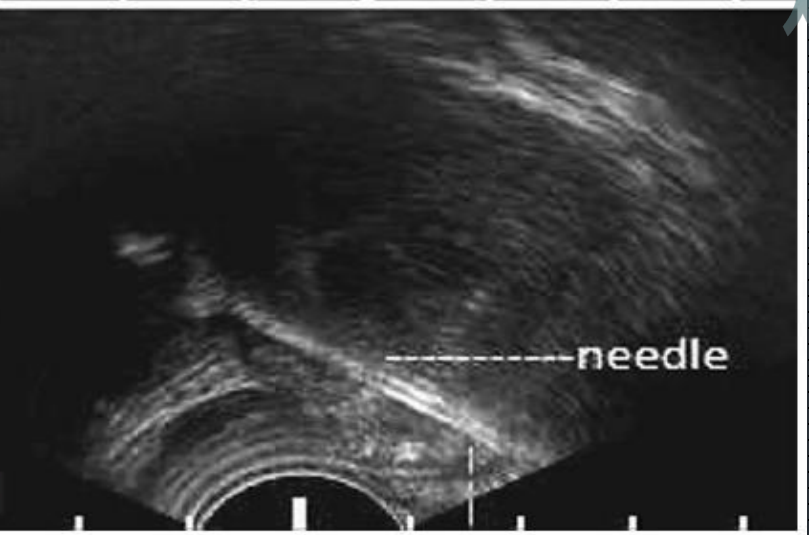
PROSTATE CANCER (PCA) DIAGNOSTIC GOALS

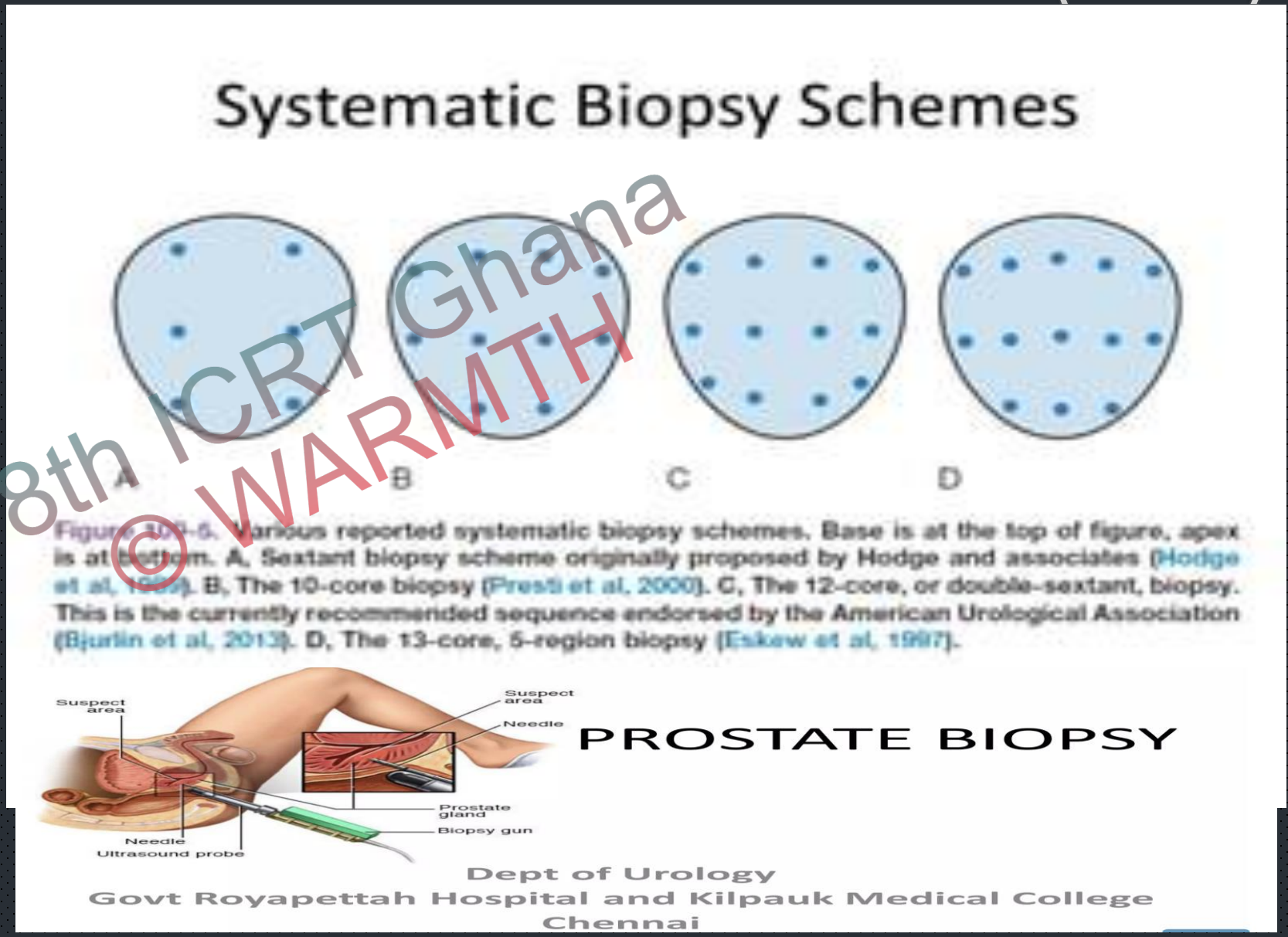
- LOCALISE THE LESION WITH THE GLAND
- REDUCE DIAGNOSIS OF CLINICALLY INSIGNIFICANT PCA (CIPA)
- INCREASE DIAGNOSIS OF CLINICALLY SIGNIFICANT PCA (CSPA)
- ASSESS THE AGGRESSIVE NATURE OF THE LESION

TRANS RECTAL ULTRASOUND BIOPSY (TRUS)

- ACCEPTED MODE OF BIOPSYING THE PROSTATE
- MOST COMMON METHOD OF BIOPSYING THE PROSTATE
- LOW COST COMPARED TO MP-MRI
- MAY BE RANDOM OR MRI-ASSISTED
- OFTEN 10-12 CORES ARE USUALLY TAKEN

TRANS RECTAL ULTRASOUND BIOPSY (TRUS)





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PMCID: PMC6828624
PMID: 31172275

The primacy of multiparametric MRI in men with suspected prostate cancer

Jonathan Richenberg,[1] Vibeke Løgager,[2] Valeria Panebianco,[3] Olivier Rouviere,[4,5] Geert Villeirs,[6] and Ivo G. Schoots[7]

Introduction

Go to:

In 2012, the European Society of Urogenital Radiology (ESUR) prostate committee promoted the use of multiparametric MRI (mpMRI) in the routine management of men with suspected or confirmed prostate cancer [1]. That proposal has gained widespread acceptance. The debate has now moved to *when* mpMRI should be used.

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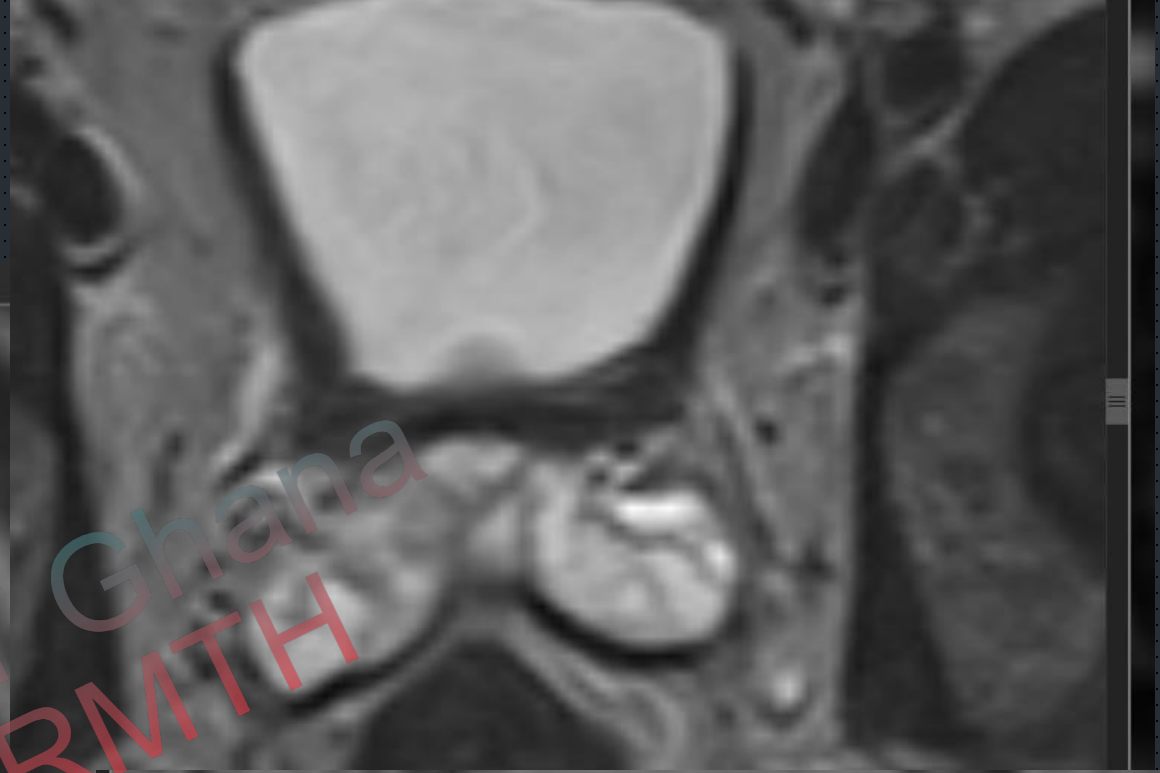
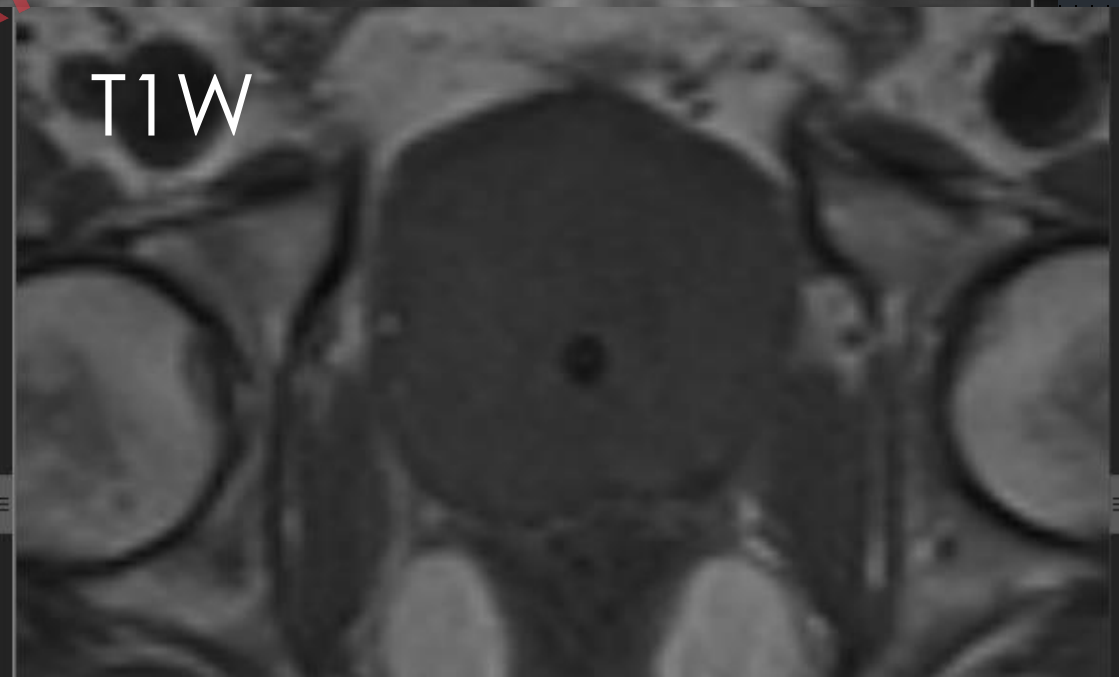
T2W- IMAGING





T1W

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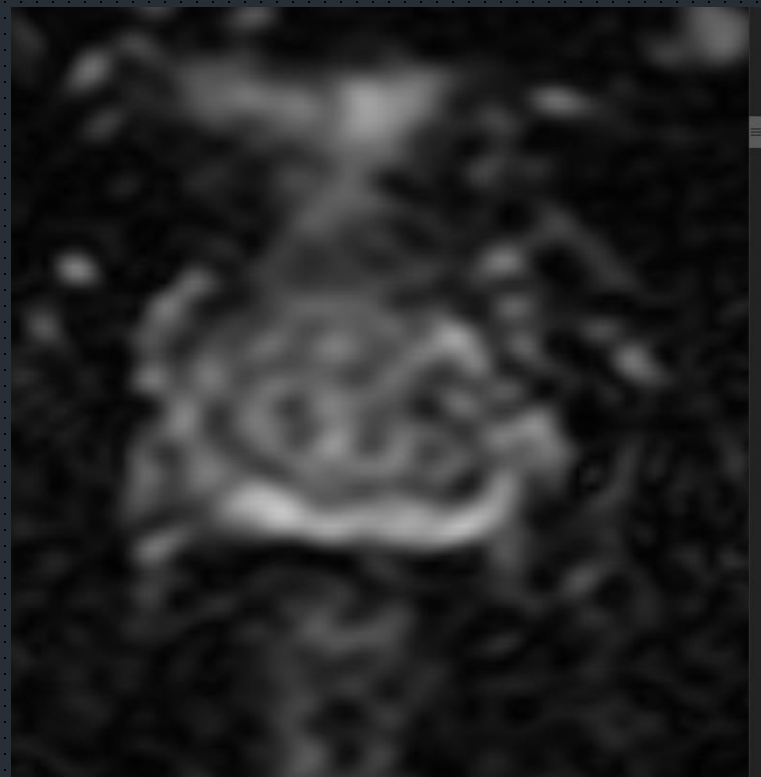
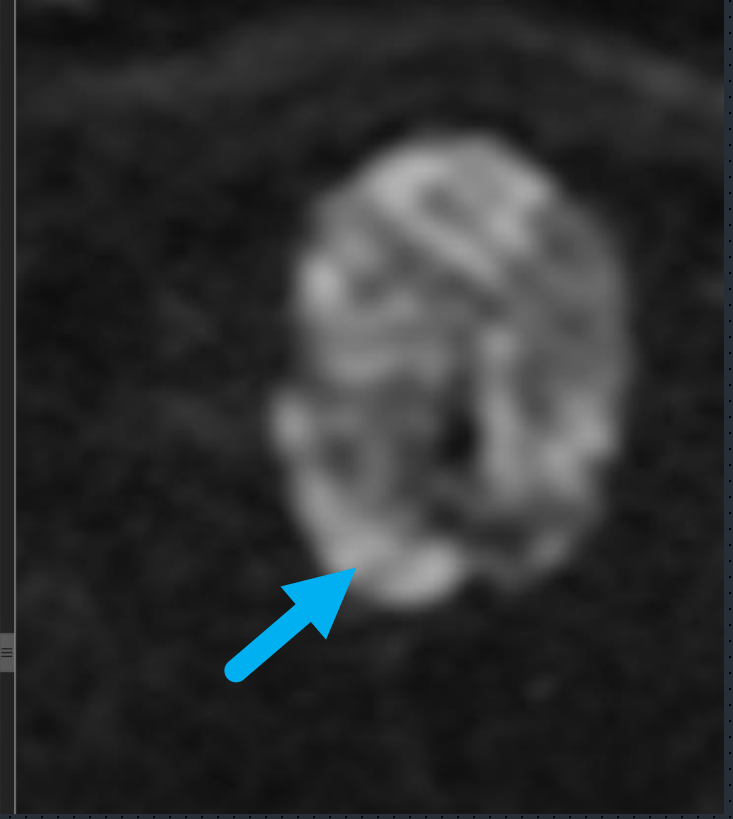
DWI/ADC





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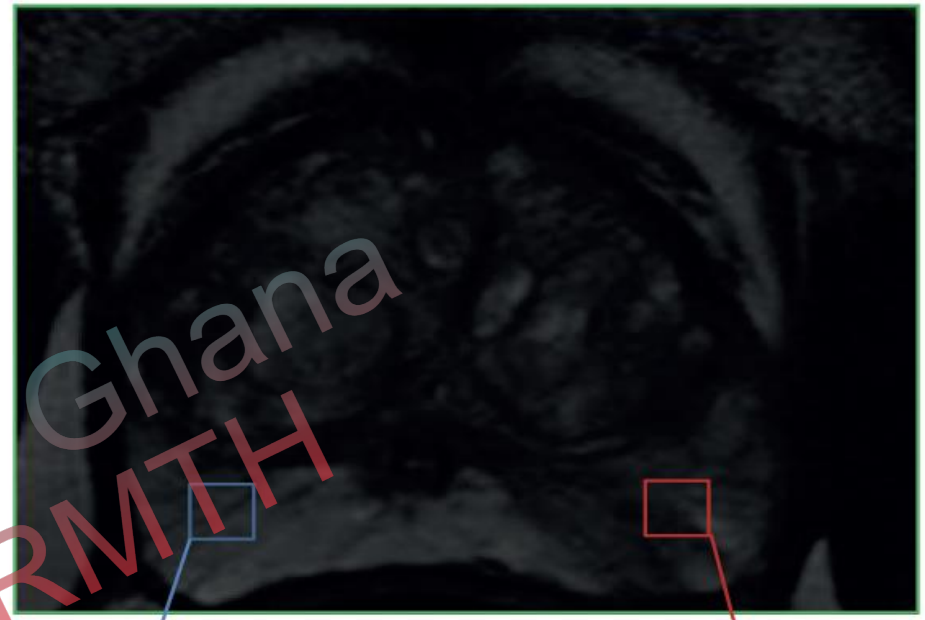
DCE

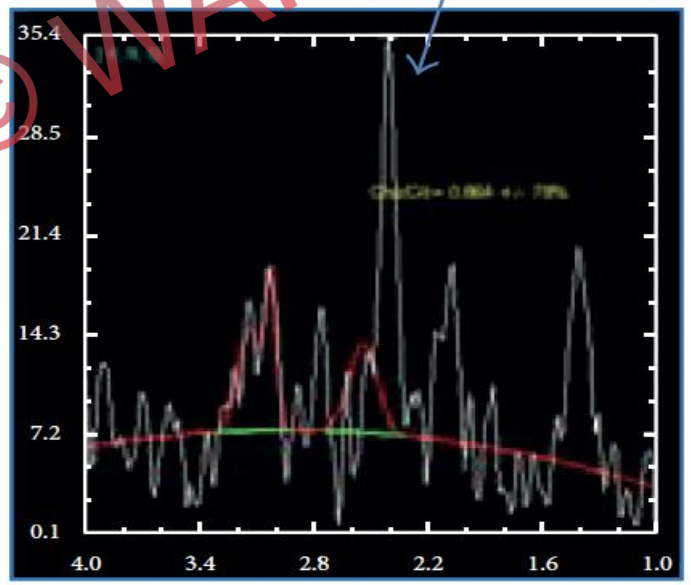
MRI SPECTROSCOPY

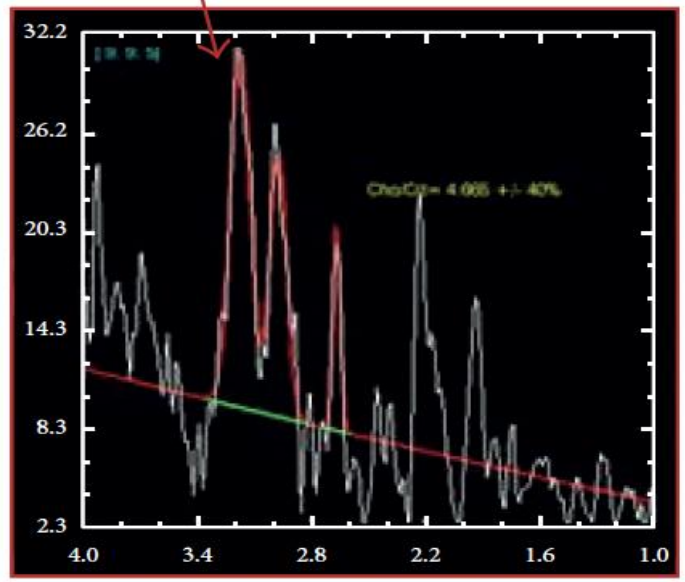
Review Article

Functional MRI in Prostate Cancer Detection

Sandeep Sankineni, Murat Osman, and Peter L. Choyke







PIRADS V2.1

PI-RADS™ v2.1 assessment uses a 5-point scale based on the likelihood (probability) that a combination of mpMRI findings on T2W, DWI, and DCE correlates with the presence of a clinically significant cancer for each lesion in the prostate gland.

PI-RADS™ v2.1 Assessment Categories

PIRADS 1 – Very low (clinically significant cancer is highly unlikely to be present)

PIRADS 2 – Low (clinically significant cancer is unlikely to be present)

PIRADS 3 – Intermediate (the presence of clinically significant cancer is equivocal)

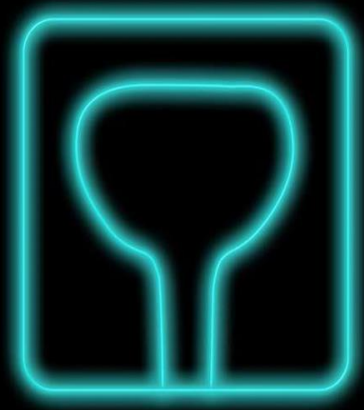
PIRADS 4 – High (clinically significant cancer is likely to be present)

PIRADS 5 – Very high (clinically significant cancer is highly likely to be present)

PI-RADS®

Prostate Imaging – Reporting and Data System

2019
Version 2.1



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2. PI-RADS Assessment for T2W

Score	Peripheral Zone (PZ)
1	Uniform hyperintense signal intensity (normal)
2	Linear or wedge-shaped hypointensity or diffuse mild hypointensity, usually indistinct margin
3	Heterogeneous signal intensity or non-circumscribed, rounded, moderate hypointensity Includes others that do not qualify as 2, 4, or 5
4	Circumscribed, homogenous moderate hypointense focus/mass confined to prostate and <1.5 cm in greatest dimension
5	Same as 4 but ≥1.5cm in greatest dimension or definite extraprostatic extension/invasive behavior

Score	Transition Zone (TZ)
1	Normal appearing TZ (rare) or a round, completely encapsulated nodule. ("typical nodule")
2	A mostly encapsulated nodule OR a homogeneous circumscribed nodule without encapsulation. ("atypical nodule") OR a homogeneous mildly hypointense area between nodules
3	Heterogeneous signal intensity with obscured margins Includes others that do not qualify as 2, 4, or 5
4	Lenticular or non-circumscribed, homogeneous, moderately hypointense, and <1.5 cm in greatest dimension
5	Same as 4, but ≥1.5cm in greatest dimension or definite extraprostatic extension/invasive behavior

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2. PI-RADS Assessment of DWI

Signal intensity in a lesion should be visually compared to the average signal of "normal" prostate tissue in the histologic zone in which it is located.

Score	Peripheral Zone (PZ) or Transition Zone (TZ)
1	No abnormality (i.e., normal) on ADC and high b-value DWI
2	Linear/wedge shaped hypointense on ADC and/or linear/wedge shaped hyperintense on high b-value DWI
3	Focal (discrete and different from the background) hypointense on ADC and/or focal hyperintense on high b-value DWI; may be markedly hypointense on ADC or markedly hyperintense on high b-value DWI, but not both.
4	Focal markedly hypontense on ADC and markedly hyperintense on high b-value DWI; <1.5cm in greatest dimension
5	Same as 4 but ≥1.5cm in greatest dimension or definite extraprostatic extension/invasive behavior

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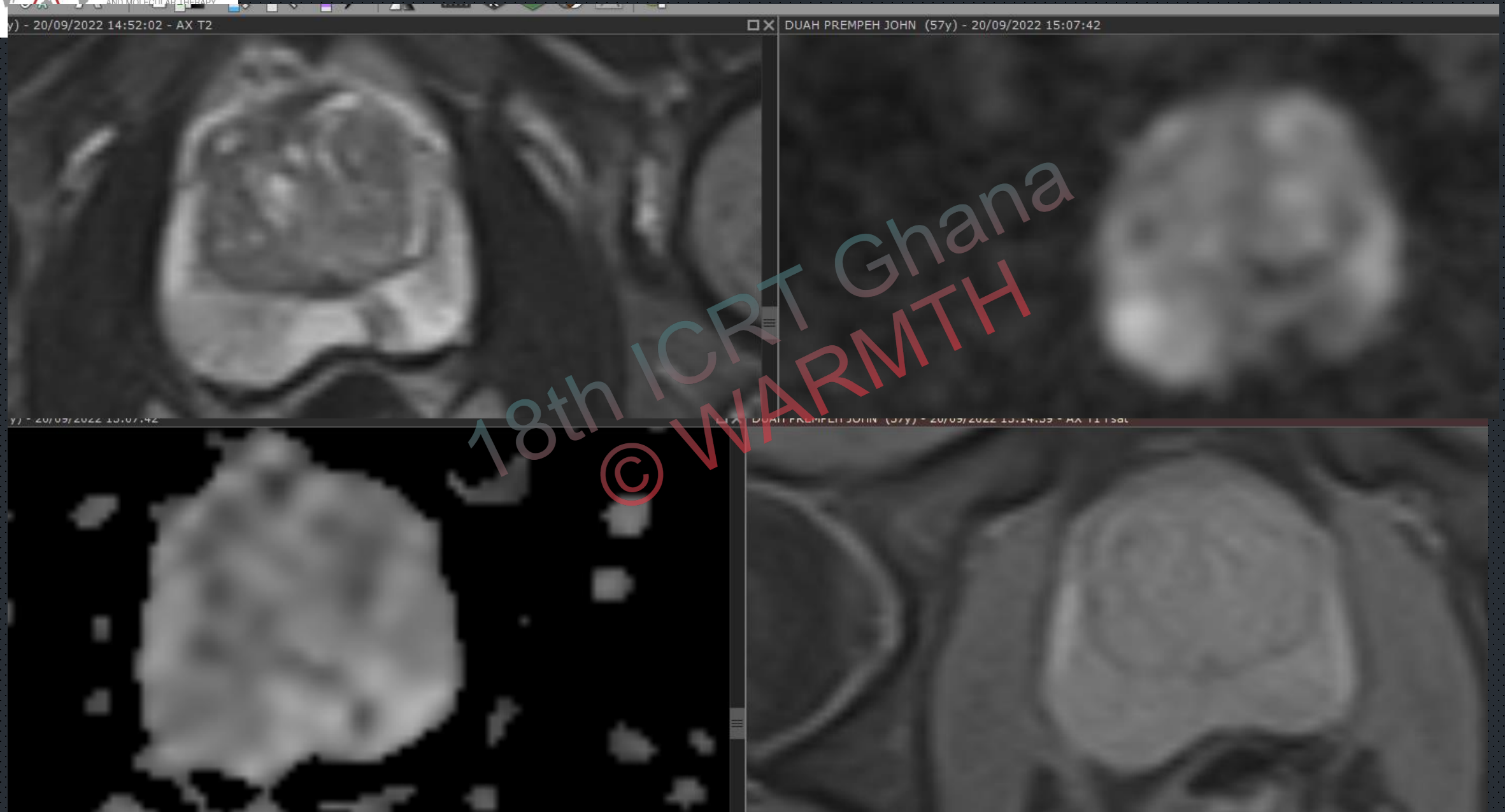
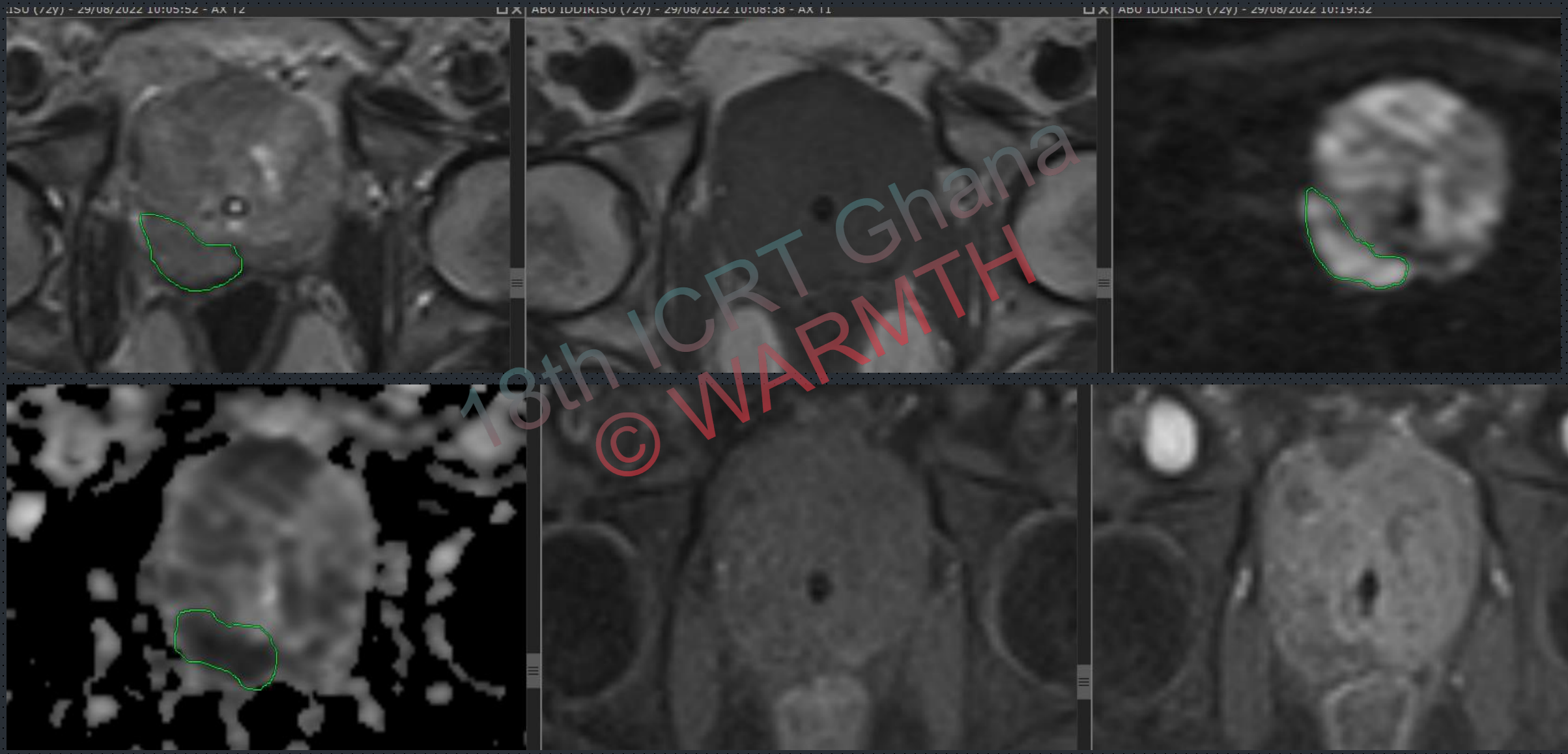
2. PI-RADS Assessment for DCE

Score	Peripheral Zone (PZ) or Transition Zone (TZ)
(–)	no early or contemporaneous enhancement; or diffuse multifocal enhancement NOT corresponding to a focal finding on T2W and/or DWI or focal enhancement corresponding to a lesion demonstrating features of BPH on T2WI (including features of extruded BPH in the PZ)
(+)	focal, and; earlier than or contemporaneously with enhancement of adjacent normal prostatic tissues, and; corresponds to suspicious finding on T2W and/or DWI

PIRADS 2



PIRADS 5



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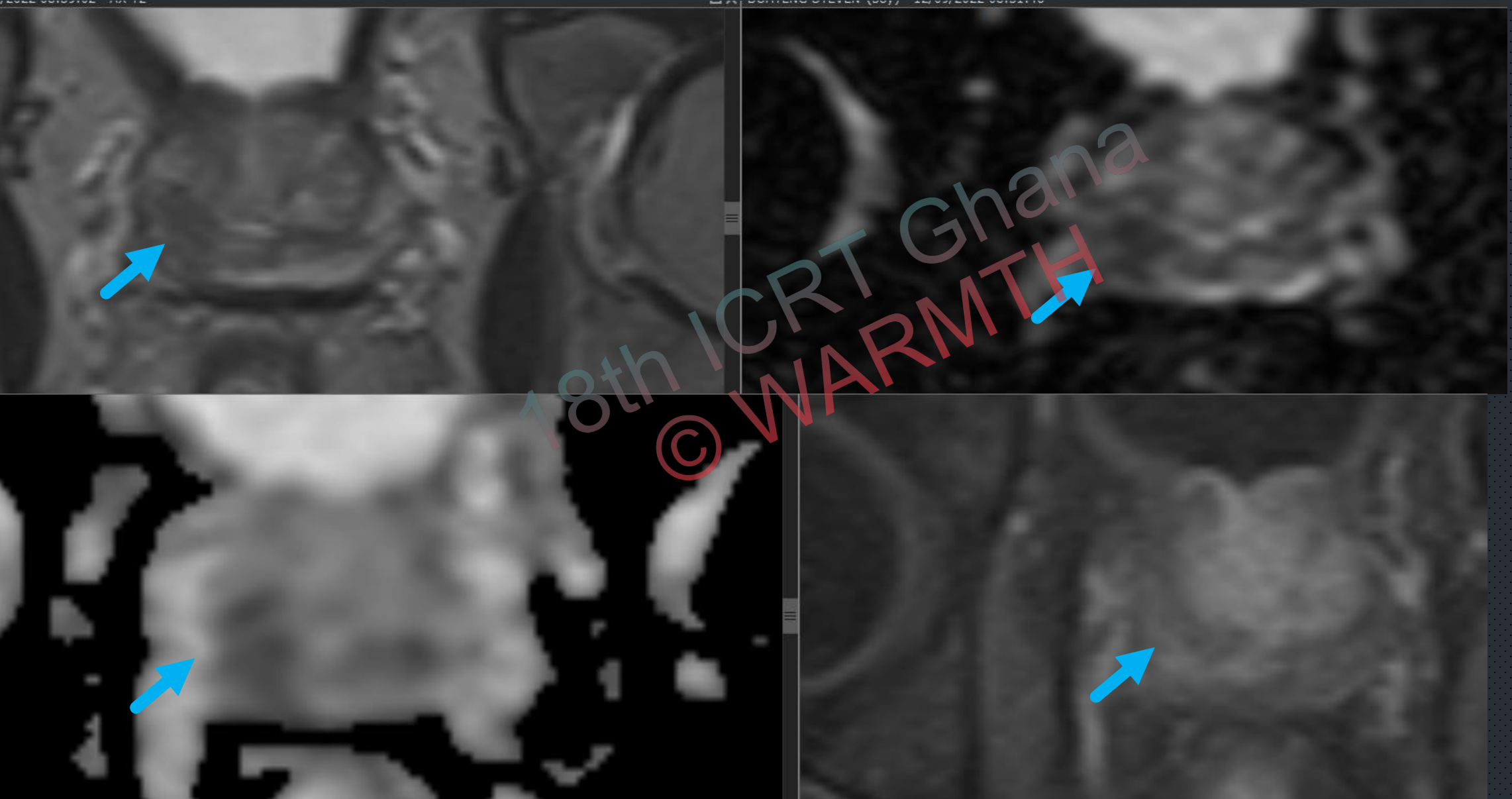

BP-MRI

3. Commentary on bi-parametric MRI

Despite the limited role of DCE in determining the overall PI-RADS assessment category experience has shown that, in some instances, DCE may assist in detection of csPCa in both the PZ and TZ, and in clinical practice some have viewed DCE as a 'safety-net' or 'back-up' sequence, especially when DWI is degraded by artifacts or inadequate signal-to-noise ratio (SNR).

Given the limited role of DCE, there is growing interest in performing prostate MRI without DCE, a procedure termed "biparametric MRI" (bpMRI). A number of studies have reported data that supports the value of bpMRI for detection of csPCa in biopsy-naïve men and those with a prior negative biopsy.

The PI-RADS Steering Committee supports continued research concerning the performance of bpMRI in various clinical scenarios and acknowledges the potential benefits, including: (1) elimination of adverse events and gadolinium retention that have been associated with some gadolinium based contrast agents (GBCAs), (2) shortened examination times, and (3) reduced costs, possibly resulting in increased accessibility and utilization of MRI for biopsy-naïve men with suspected prostate cancer.

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European Association of Urology

Platinum Priority – Prostate Cancer

Editorial by Jelle O. Barentsz, Peter Mulders, Winald Gerritsen and Jurgen J. Fütterer on pp. 93–95 of this issue

METastasis Reporting and Data System for Prostate Cancer: Practical Guidelines for Acquisition, Interpretation, and Reporting of Whole-body Magnetic Resonance Imaging-based Evaluations of Multiorgan Involvement in Advanced Prostate Cancer

Anwar R. Padhani [a,], Frederic E. Lecouvet [b], Nina Tunariu [c], Dow-Mu Koh [c], Frederik De Keyzer [d], David J. Collins [c], Evis Sala [e], Heinz Peter Schlemmer [f], Giuseppe Petralia [g], H. Alberto Vargas [e], Stefano Fanti [h], H. Bertrand Tombal [i], Johann de Bono [j]*

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Pricolo *et al. Cancer Imaging* (2020) 20:77
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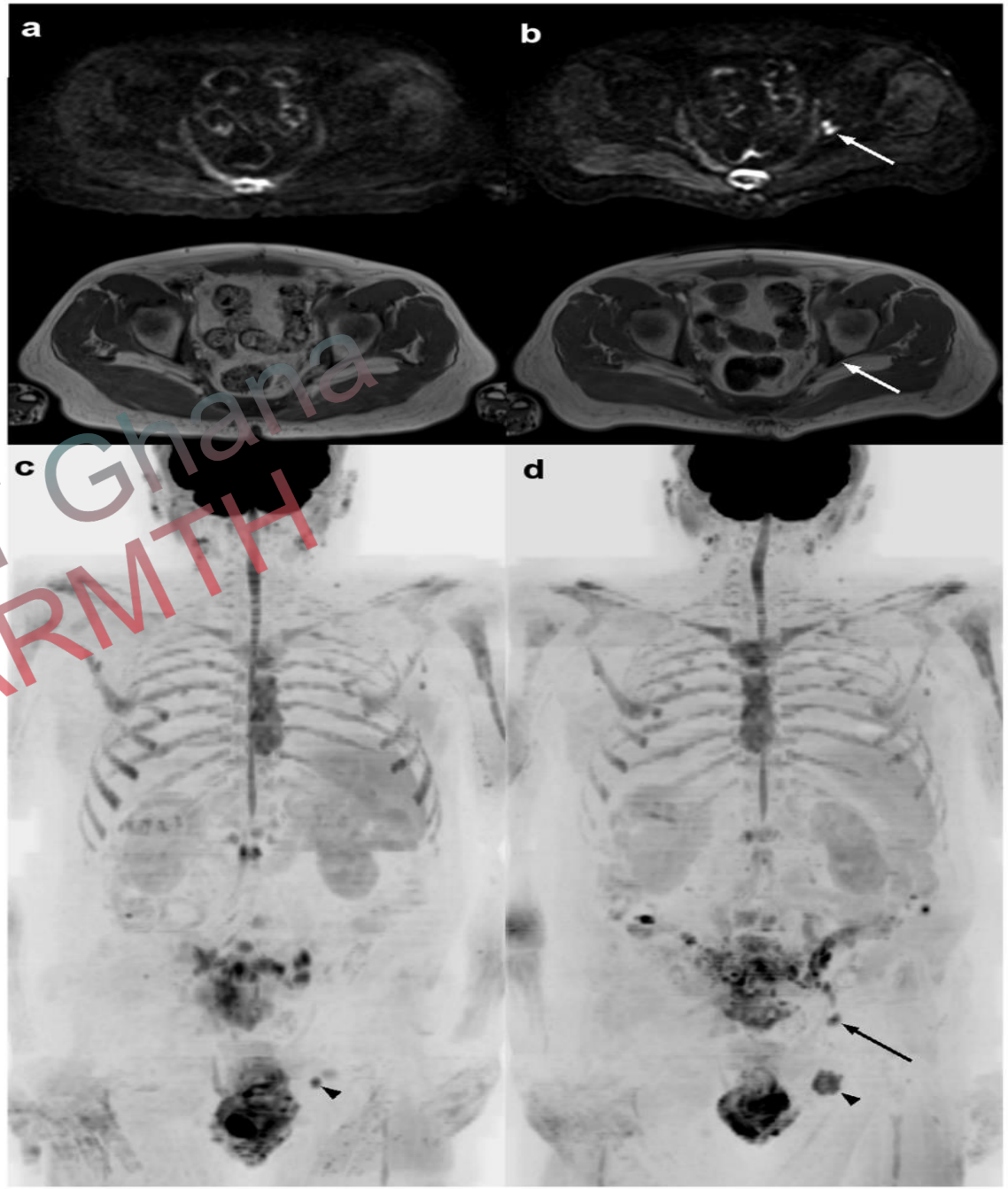
Cancer Imaging

RESEARCH ARTICLE Open Access

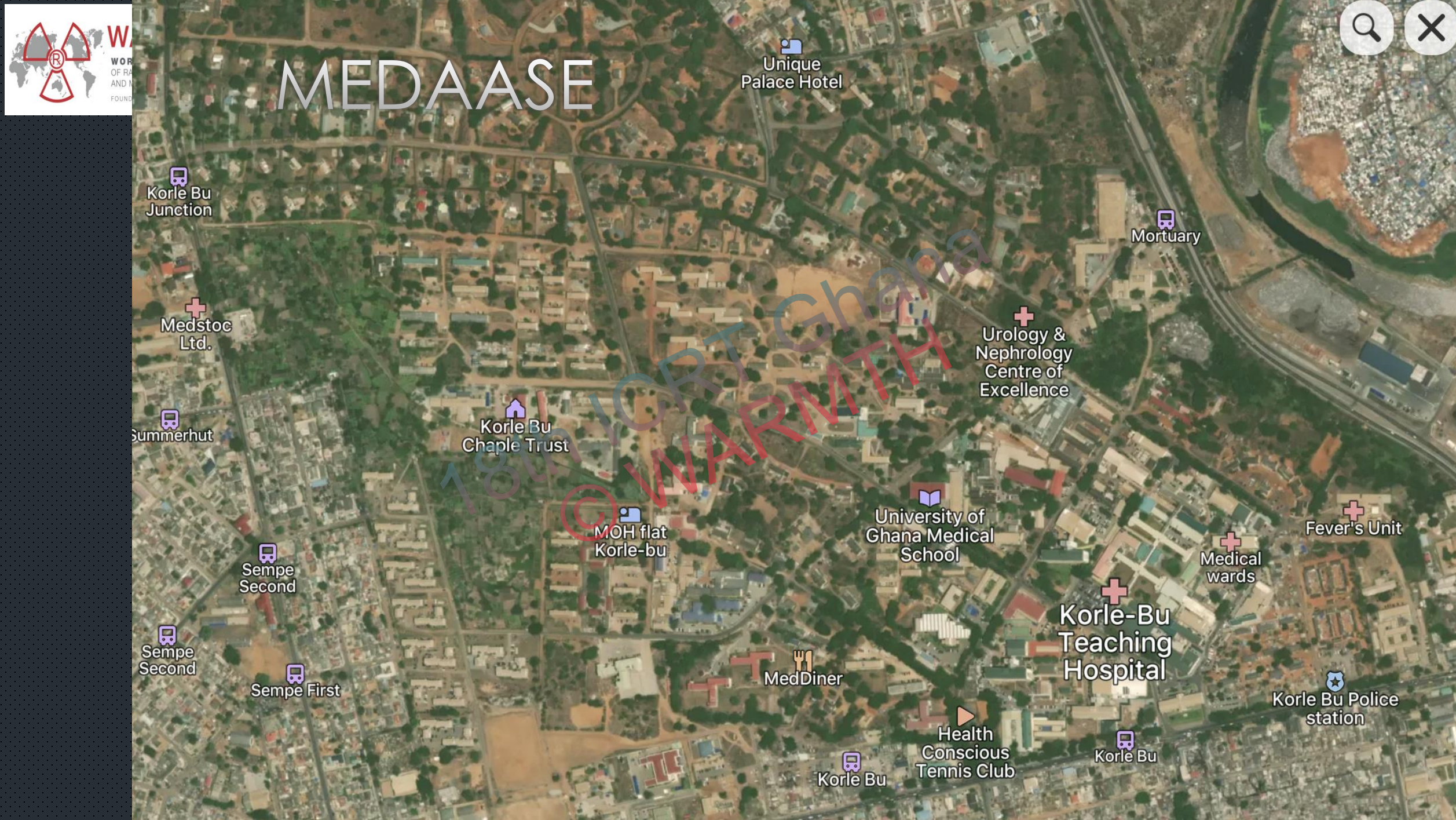
Whole-body magnetic resonance imaging (WB-MRI) reporting with the METastasis Reporting and Data System for Prostate Cancer (MET-RADS-P): inter-observer agreement between readers of different expertise levels

Paola Pricolo[1], Eleonora Ancona[1,2], Paul Summers[1], Jorge Abreu-Gomez[3], Sarah Alessi[1], Barbara Alicja Jereczek-Fossa[4,5], Ottavio De Cobelli[5,6], Franco Nolè[7], Giuseppe Renne[8], Massimo Bellomi[1,5], Anwar Roshanali Padhani[9] and Giuseppe Petralia[5,10*]



CONCLUSION

- IMAGING HAS HAD A SIGNIFICANT POSITIVE INFLUENCE ON THE MANAGEMENT OF PROSTATE CANCER –TRUS, MP-MRI
- THE ADDITION OF MP-MRI HAS SIGNIFICANTLY IMPROVED THE SENSITIVITY OF PCA DIAGNOSIS ALBEIT WITH VARYING DEGREES OF LIMITATIONS
- WB-MRI IS GRADUALLY PROVING TO BE VERY SENSITIVE TO METASTATIC LESIONS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