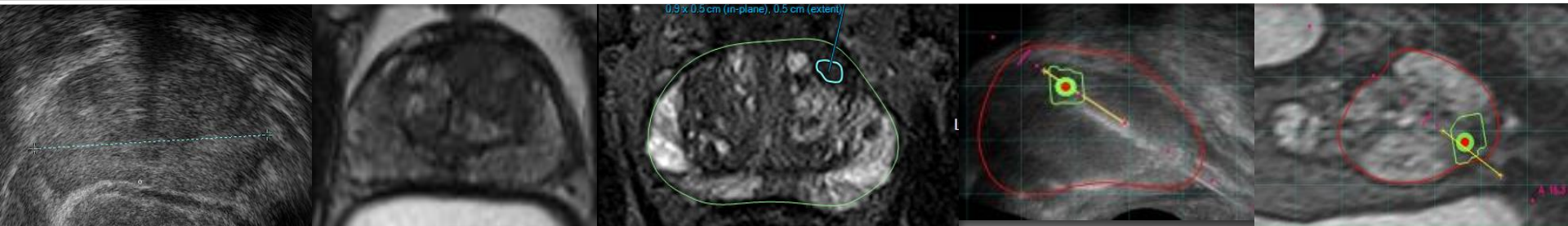


ACR Prostate MR course

MRI-Targeted Prostate Biopsy



Andrei S Purysko, MD

Abdominal Imaging Section & Nuclear Radiology Department, Imaging Institute

Glickman Urological and Kidney Institute

Cleveland Clinic

Disclosures

- Consulting agreement – Koelis
- Research support and consulting agreement with Blue Earth
Diagnostics

Objective

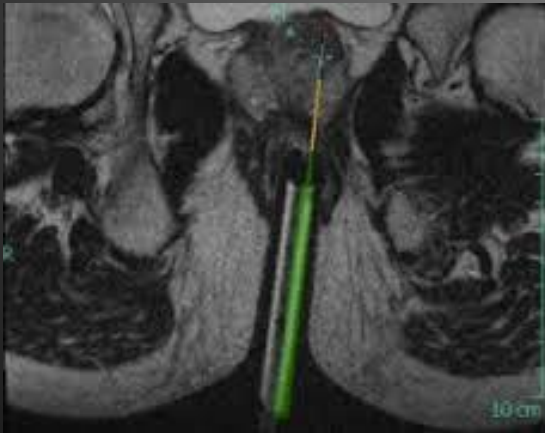
- To review the different approaches for use of mpMRI to help guide prostate biopsy, with emphasis on MR/US fusion biopsy techniques

MRI-Targeted Bx methods

- Any Bx technique where an MRI exam is used to determine the location of a suspicious target prior to biopsy

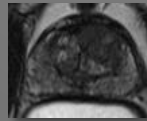
MRI-guided ("In-bore") Bx

Pro: direct visualization of target
Cons: time and cost



MR/US fusion Bx

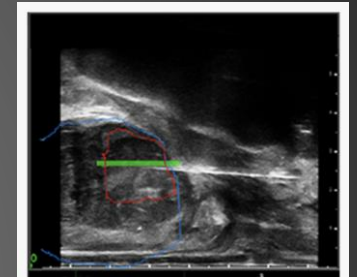
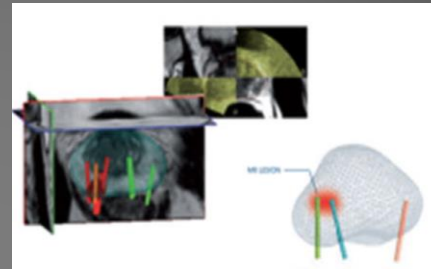
Cognitive



Software based

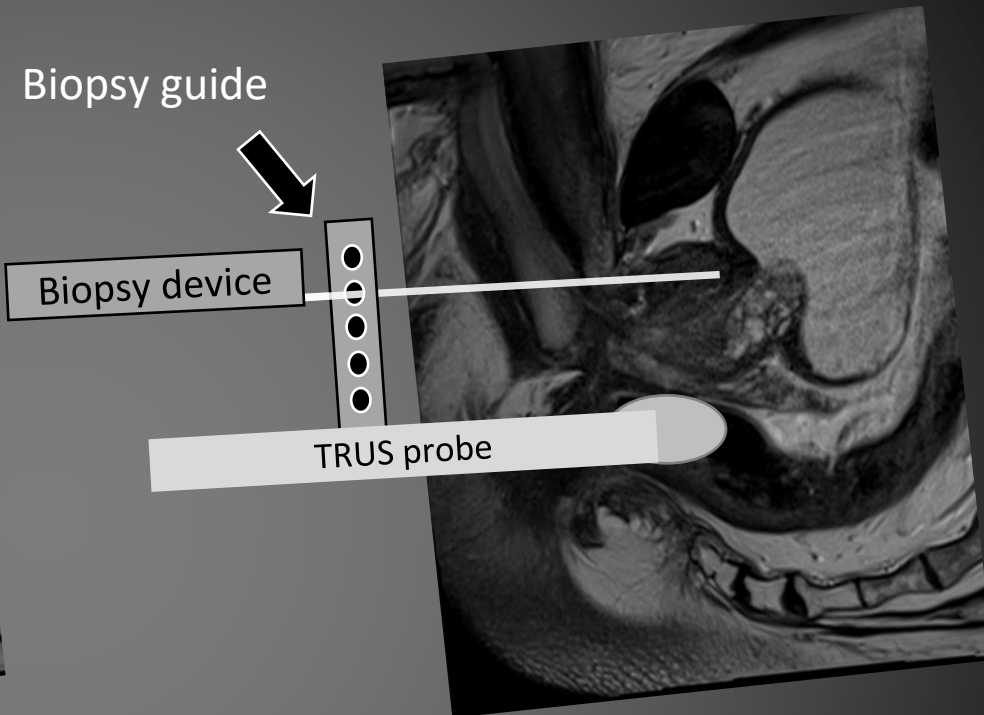
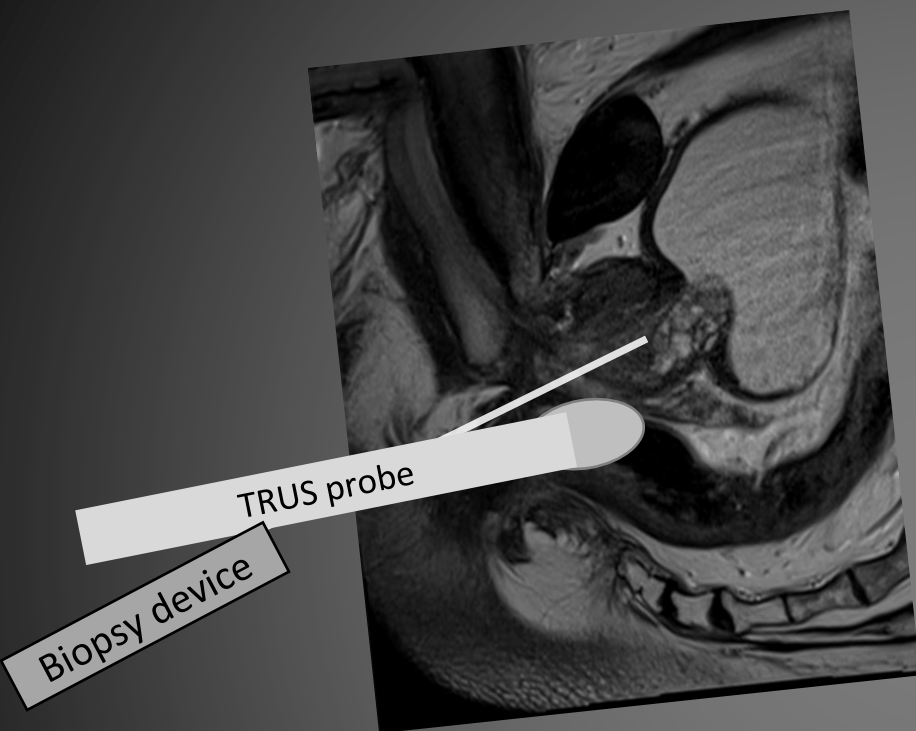


Software based MR/US fusion Bx



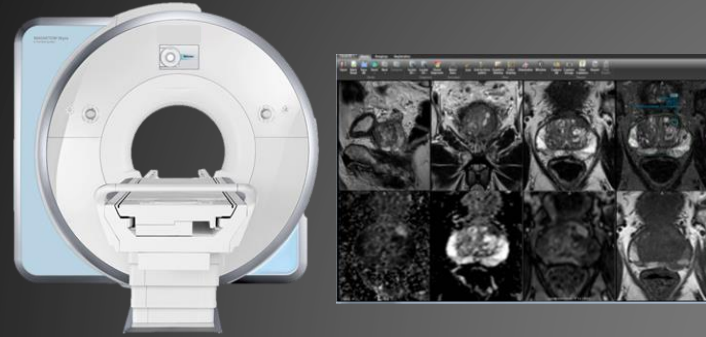
Electro-magnetic tracking	Electro-mechanical tracking	Organ based-tracking	Simple image fusion
UroNav	Artemis	Trinity	BkFusion
DynaCAD	ProFuse	MrDraw	MIM Symphony
Philips	Eigen Health	Koelis	GE Healthcare

MR/US fusion Bx



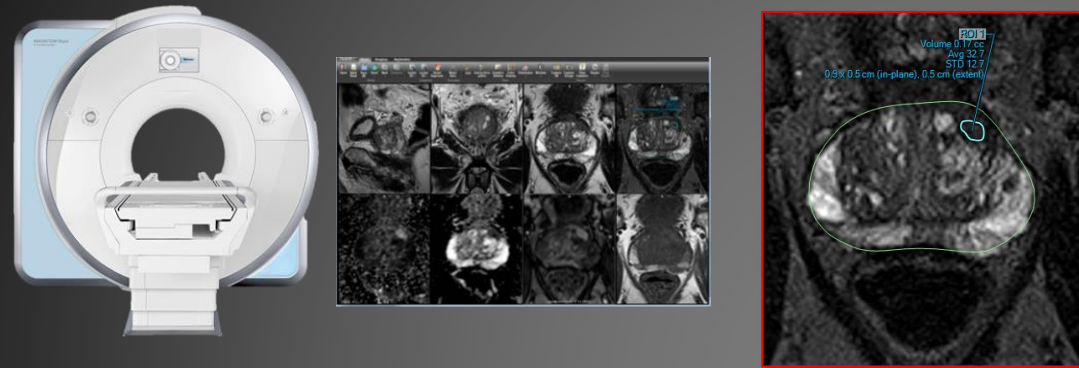
	Transrectal Bx	Transperineal Bx
Pro	Widely available LA	Near zero risk of urosepsis Better access to anterior lesions
Con	Risk of urosepsis Difficult to sample anterior lesions	Risk of urinary retention > discomfort (but can be done with LA)

MR/US fusion Bx workflow

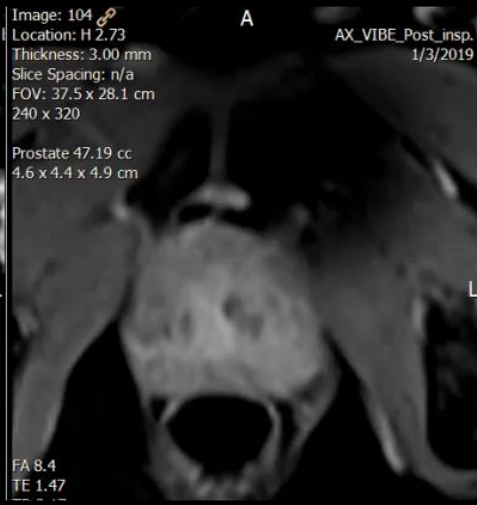
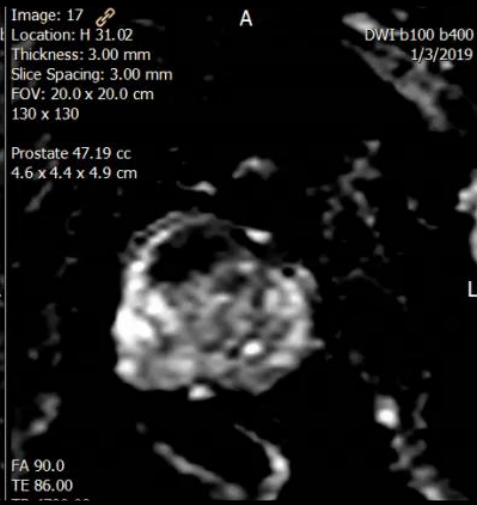
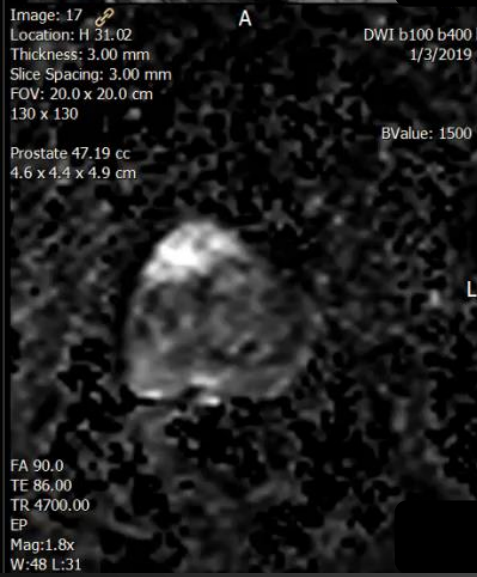
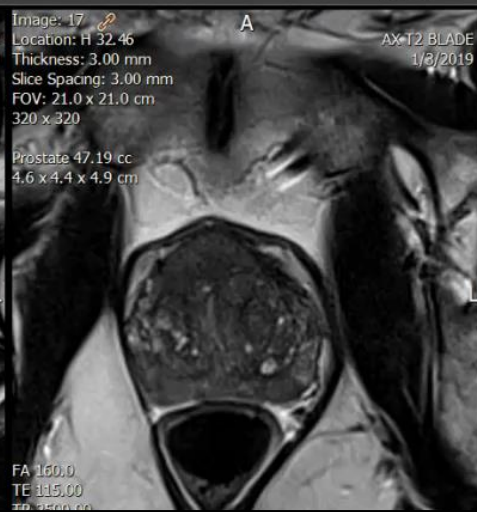
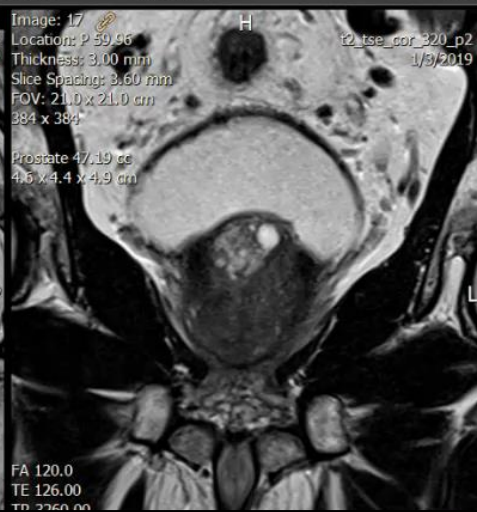
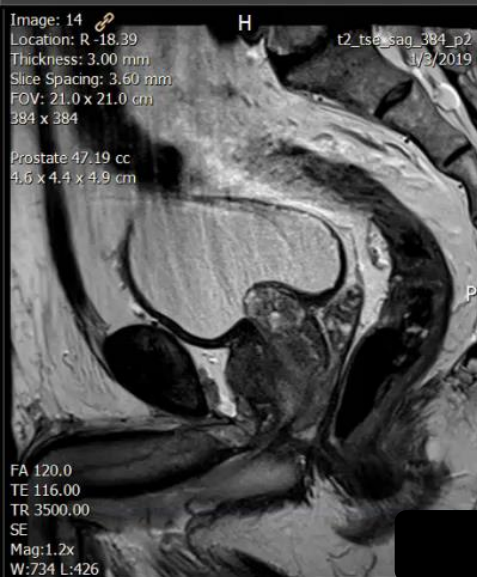


- Image acquisition and interpretation
 - PI-RADS v2.1
 - Proprietary software for annotation of the images

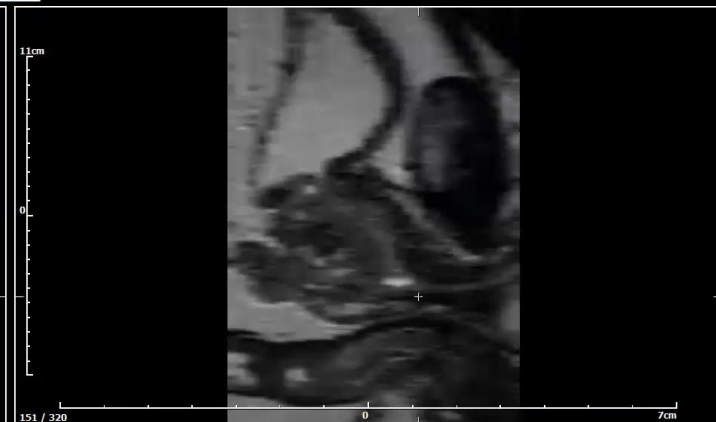
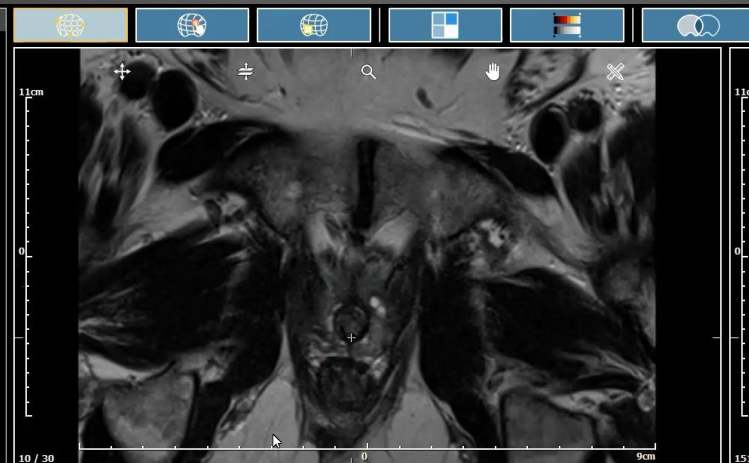
MR/US fusion Bx workflow



- Gland segmentation and creation of targets
 - 2D or 3D T2-WI: Higher spatial resolution and less susceptible to artifacts
 - Usually up to 3-4 targets to avoid increase in morbidity, duration of procedure and time/cost for path processing



[MR] - AX TSE T2



PROSTATE CONTOUR

Add point

Hide contour

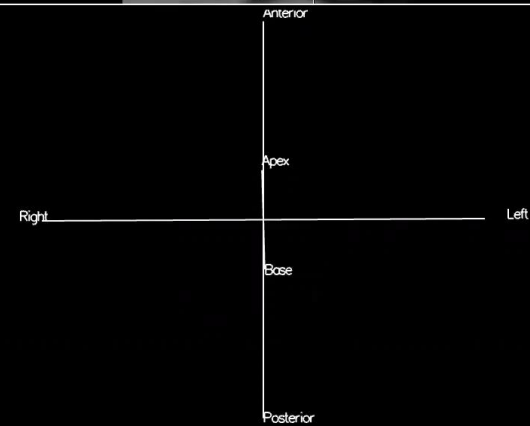
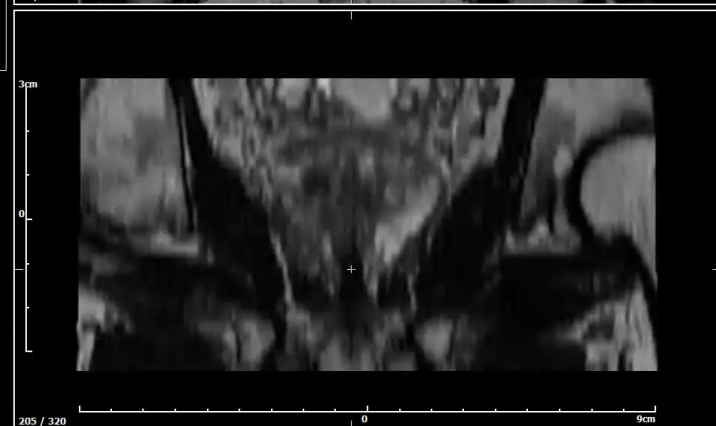
Delete point

Delete all points

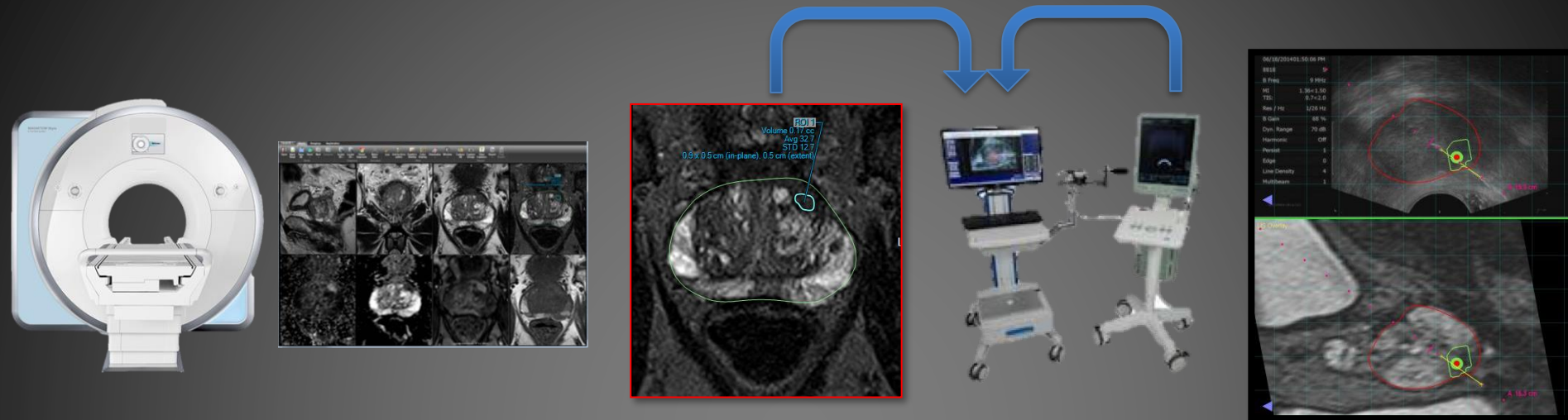
Add the Apex point

IMPORT CONTOUR

No exam to transfer

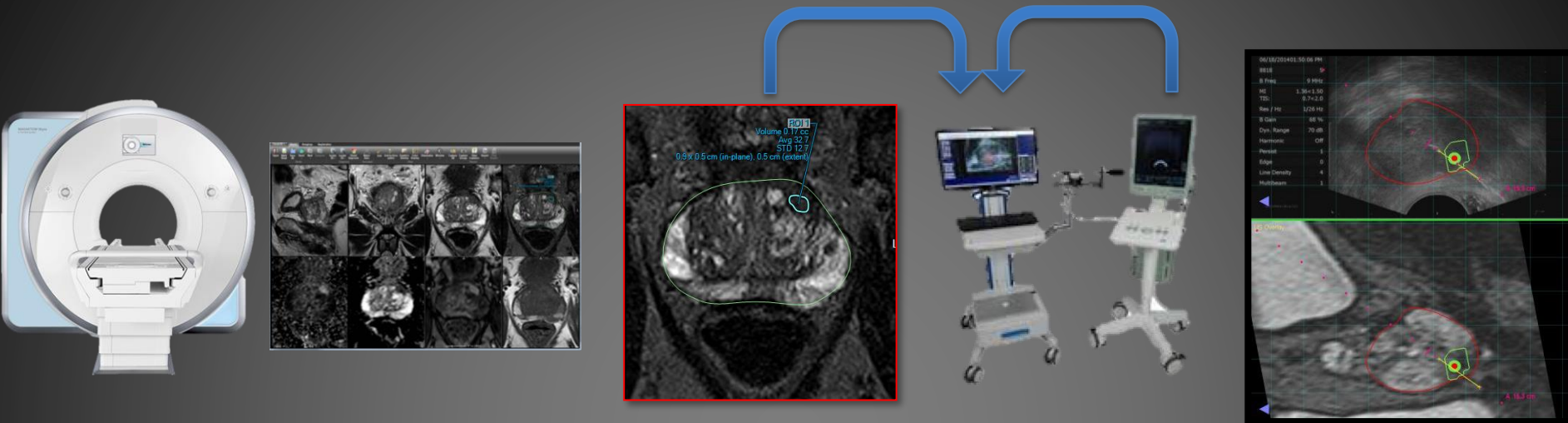


MR/US fusion Bx workflow

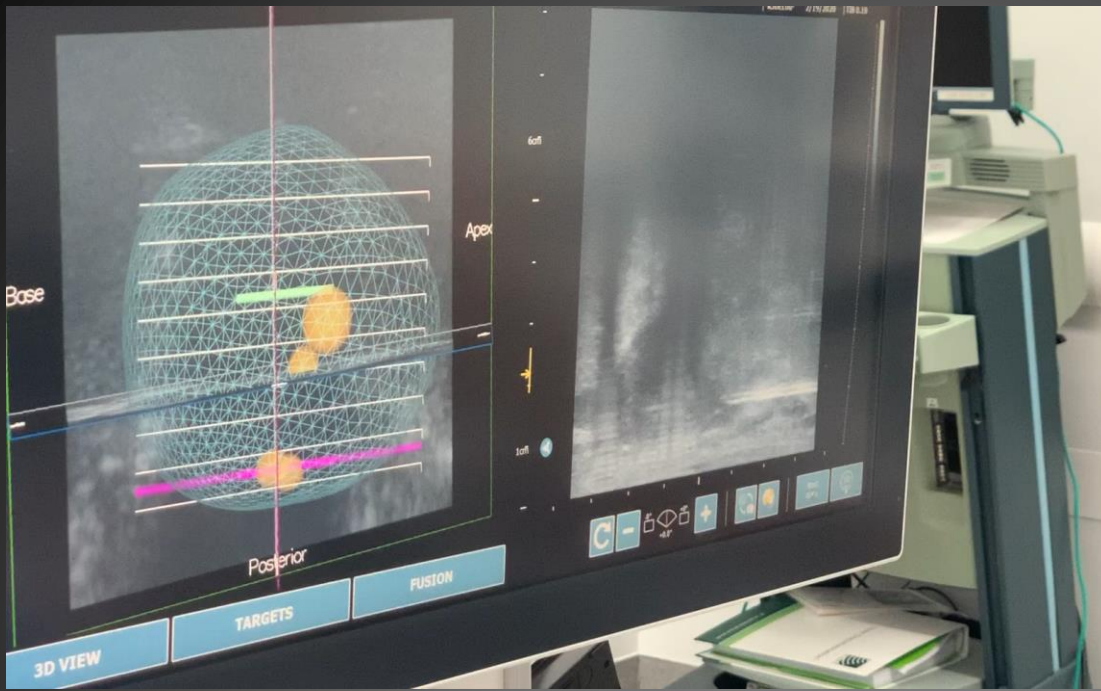


- Gland segmentation and creation of targets
 - 2D or 3D T2-WI: Higher spatial resolution and less susceptible to artifacts
 - Usually up to 3-4 targets to avoid increase in morbidity, duration of procedure and time/cost for path processing

MR/US fusion Bx workflow



- Gland segmentation and creation of targets
 - **2D or 3D T2-WI**: Higher spatial resolution and less susceptible to artifacts
 - Usually up to 3-4 targets to avoid increase in morbidity, duration of procedure and time/cost for path processing
- Target the **Index Lesion** first (Bx can deform the gland)
 - At least 2 cores/target



MR/US fusion Bx - FAQ

- Q: Which PI-RADS lesions do you target/biopsy?
- A:
 - All PI-RADS 5 and 4
 - Some PI-RADS 3
 - Consider patient's risk
 - PSAD (serum PSA/gland volume)
 - $\text{PI-RADS} \leq 3$ and $\text{PSAD} < 0.15 \text{ ng/ml/cc}$ have low risk for $\text{GG} \geq 2^{1,2}$
 - No PI-RADS 1 and 2

1. PMID: 28258784

2. PMID: 31200846

MR/US fusion Bx - FAQ

- Q: Do we still need to perform SBx?
- A: It depends
 - Negative mpMRI¹ – NPV (median):
 - All cancers: 82.4% (IQR, 69.0-92.4%)
 - CS PCa: **88.1%** (IQR, 85.7-92.3)
 - Positive mpMRI:
 - SBx should be considered at a minimum in the same side of MRI-target to enhance detection of CS PCa² (73.5% -> 96%)

¹Moldovan PC, et al. Eur Urol 2017 - PMID: 28336078

² Bryk DJ, et al. Urology 2017 - PMID: 27871829

MR/US fusion Bx

67-year-old PSA 7.53 ng/ml negative SB x1

FINAL DIAGNOSIS

1. Prostate, left base biopsy (A) - Adenocarcinoma of the prostate, Gleason score 3+4=7, involving two of two cores, 30% and 30%, 3 mm and 3 mm.
- Pattern 4 comprises 10% of the tumor (cribriform pattern).
2. Prostate, left mid biopsy (B) - Adenocarcinoma of the prostate, Gleason score 3+4=7, involving two of three cores, 80% and 10%, 6 mm and 1 mm.
- Pattern 4 comprises 10% of the tumor (cribriform pattern).
3. Prostate, left apex biopsy (C) - Adenocarcinoma of the prostate, Gleason score 3+4=7, involving one of two cores, 10%, 2 mm.
- Pattern 4 comprises 10% of the tumor (cribriform pattern).

FINAL DIAGNOSIS

1. Prostate, T1 left transitional zone, biopsy (A) - Benign prostatic tissue.
2. Prostate, T2 left lateral base, biopsy (B) - Benign prostatic tissue.

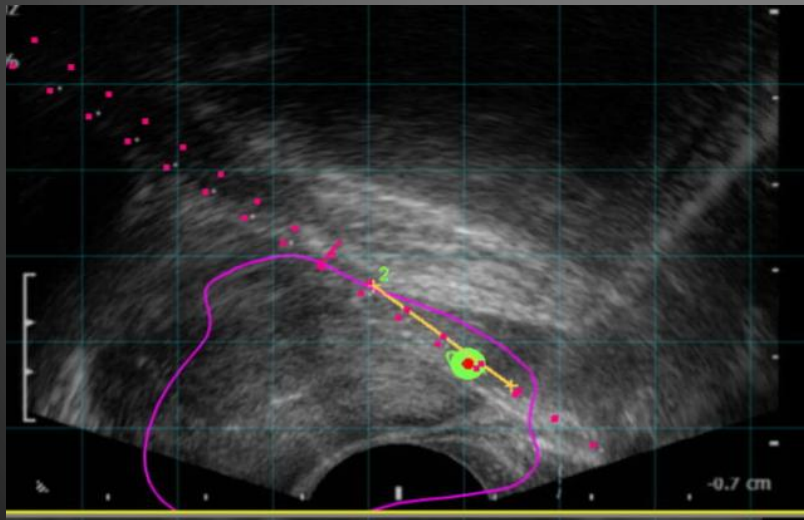
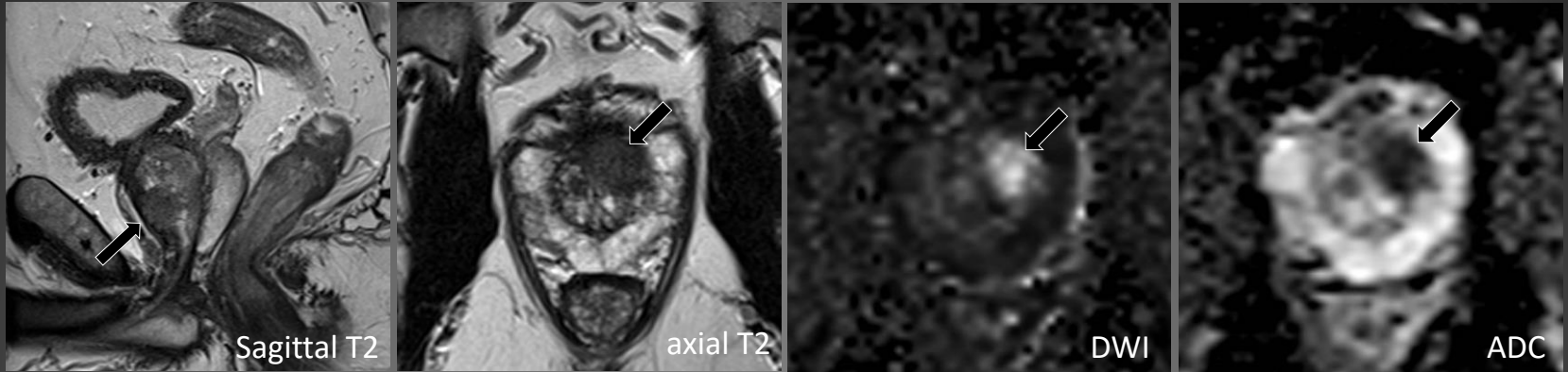
JKM/HLH/mal/07/24/2014

8. Prostate, left base to apex transitional zone, target 2 biopsy (H) - Adenocarcinoma of the prostate, Gleason score 3+4=7, involving three of three cores, 100%, 95%, 95%, 16 mm, 15 mm, 15 mm respectively.
- Pattern 4 comprises 10% of the tumor (cribriform pattern).

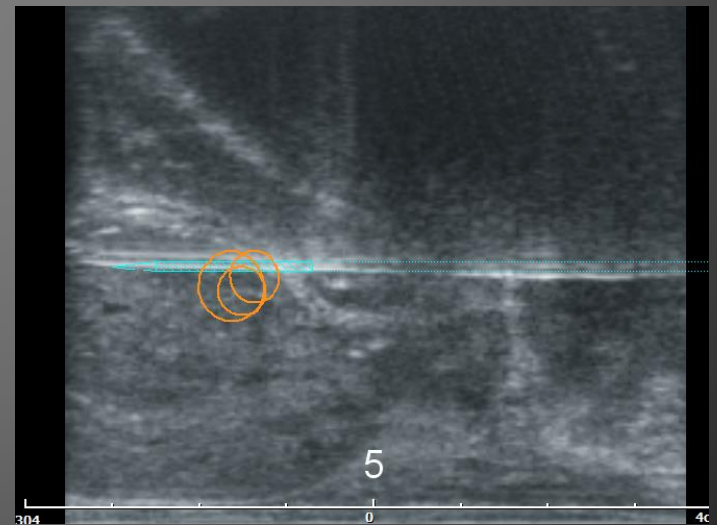


MR/US fusion Bx

Elevated PSA and prior negative systematic Bx



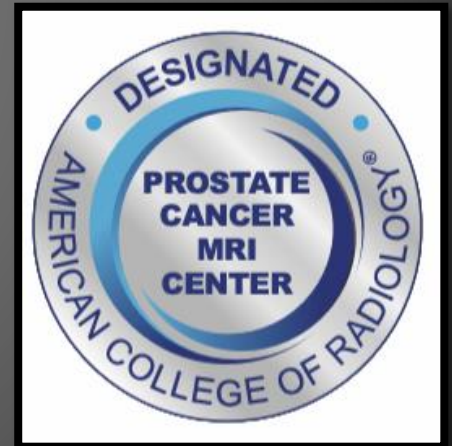
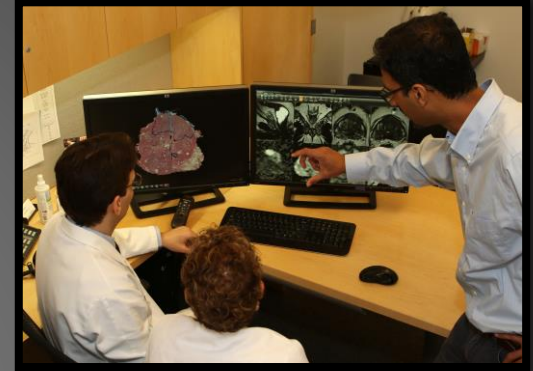
Transrectal Bx: negative



Transperineal Bx: GS 3 +4

After the biopsy...

- Critical importance to develop a feedback system to enable MRI and MRI-guided Bx accuracy evaluation
- Informal review and formal case discussions in conferences, tumor boards, and periodic radiologic–pathologic correlation
- *ACR Prostate Cancer MRI Center Designation*
 - *Requires facility to perform MRI-targeted prostate Bx (of any kind) or to have an agreement with a facility capable of performing the Bx*
 - *Facility must have a method for rad-path correlation*



Thank you!