The Battle of the Biopsies: Transrectal Versus Transperineal Prostate Biopsy

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JOHNS HOPKINS
MEDICINE

Prostate Biopsy History

- Pre-1980's: Transperineal Biopsy, Digitally Guided, General Anesthesia
- Post-1980's: TRUS Guided, Peripheral Zone Directed
- Accuracy and tolerability improved, and so did cancer detection

Problems Emerge

- Risk of infectious complications increased
- Prevalence of resistant bacteria in the population increased
- Over-detection and treatment of indolent tumors increased in parallel
- 30-day admission post biopsy per SEER/Medicare as high as approximately 7%

Loeb et al. J of Urol, 2011

Solutions Developed

- Augmented Antimicrobial Prophylaxis
- Rectal Swab Culture
- Betadine Enema
- Needle Handling / Cleansing (eg Dip in Formalin)

Womble PR et al, J Urol 194:403, 2015

AUA Quality Improvement Summit 2014: Summit Recommendations

- Establish biopsy protocols; evaluate and report infection rates quarterly
- Consult local antibiogram prior to prescription of antibiotics
- Identify potential patients at high risk; recent abx use, international travel and previous biopsy
- Rectal swab or augmented abx for high risk

Sepsis and superbugs: should we favor transperineal over the transrectal approach for prostate biopsy?

- Pooled prospective databases from multiple centers for re-admission for infection after bx
- Literature review (TR): 5% infection
- Rate of sepsis from published series of TP biopsy approached zero

Grummet JP, et al. BJU Int 2014:384.

Do These Strategies Work? Yes…BUT

- Augmented prophylaxis is poor antibiotic stewardship and will lead to more resistance

- Rectal swabs are a logistical nightmare for most practices (and many patients will need “big gun” antibiotics)

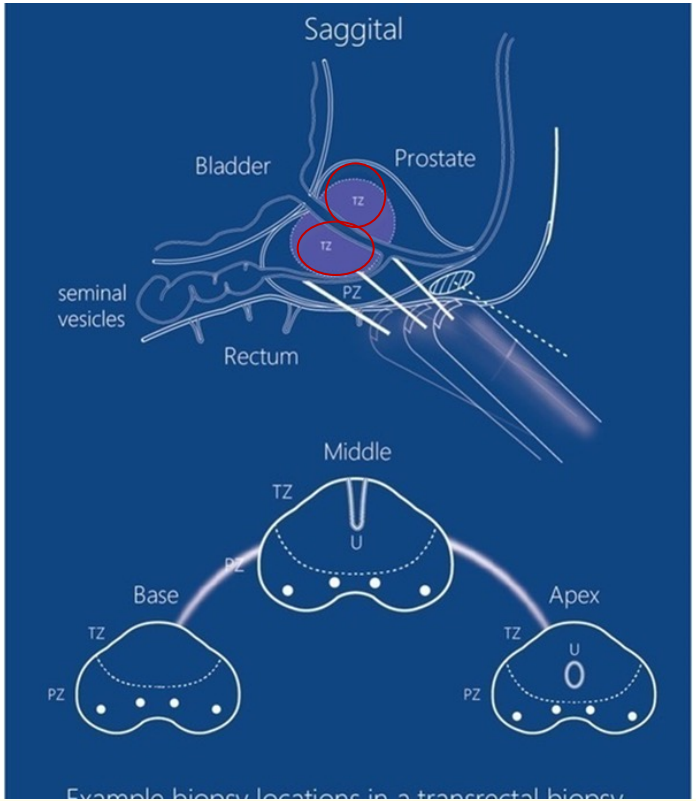
Cancer Detection and Treatment

- Active Surveillance is a main management option for patients with VLR and LR prostate cancer
  - Requires repeat biopsies

- Missed anterior tumors are a problem– especially in patients of African Genetic Ancestry

Schaeffer et al., Eur Urol 2016

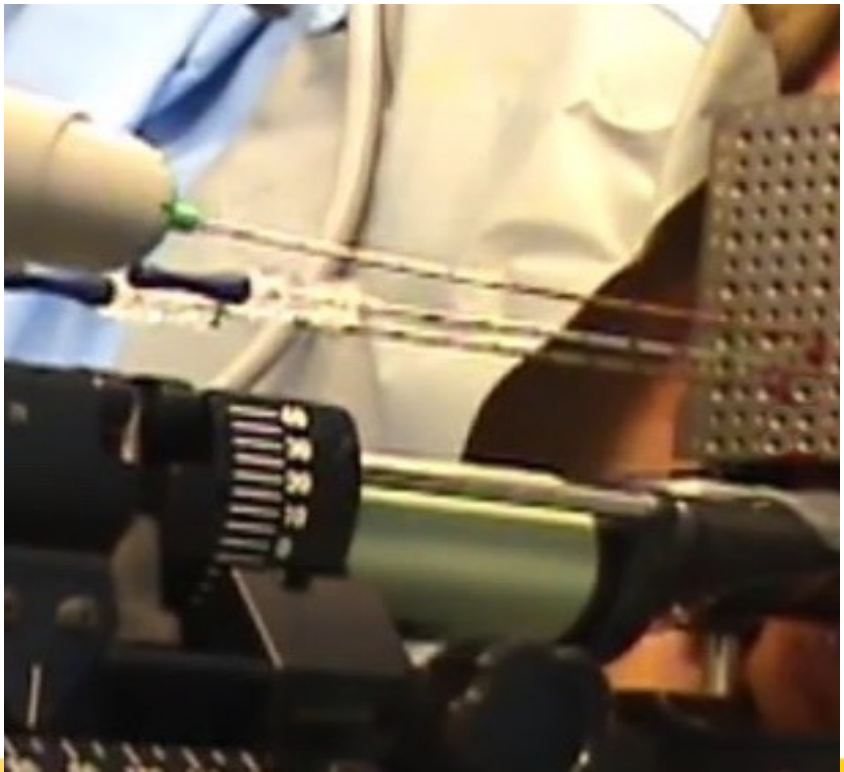
TRUS biopsies can miss significant anterior



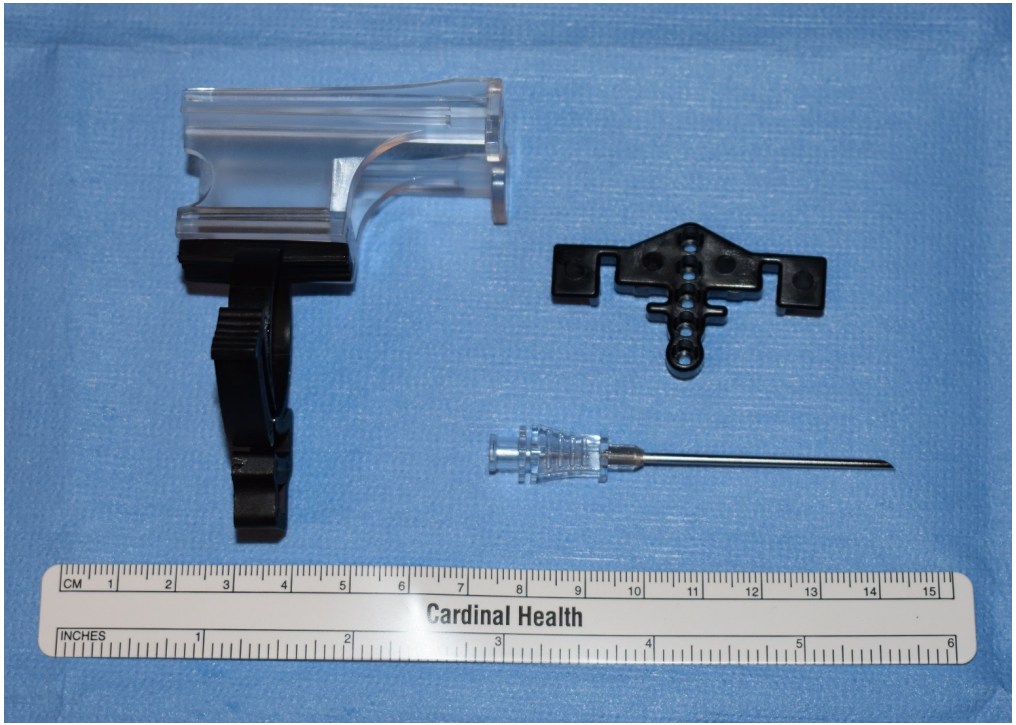
- Pure geometry: 70% cancers are in PZ and needle goes in at acute angle; 30% of cancer are anterior, poorly accessed by TRUS biopsy

Transperineal Template Biopsy

- Requires GA, low throughput
- Brachytherapy grid used
  - 130,000 USD
  - Time: set up, readjustments
- ***Cannot be performed in the office setting!!!***
- Complexity
  - Learning curve



An Alternative: In Office Transperineal Biopsy with Local Anesthesia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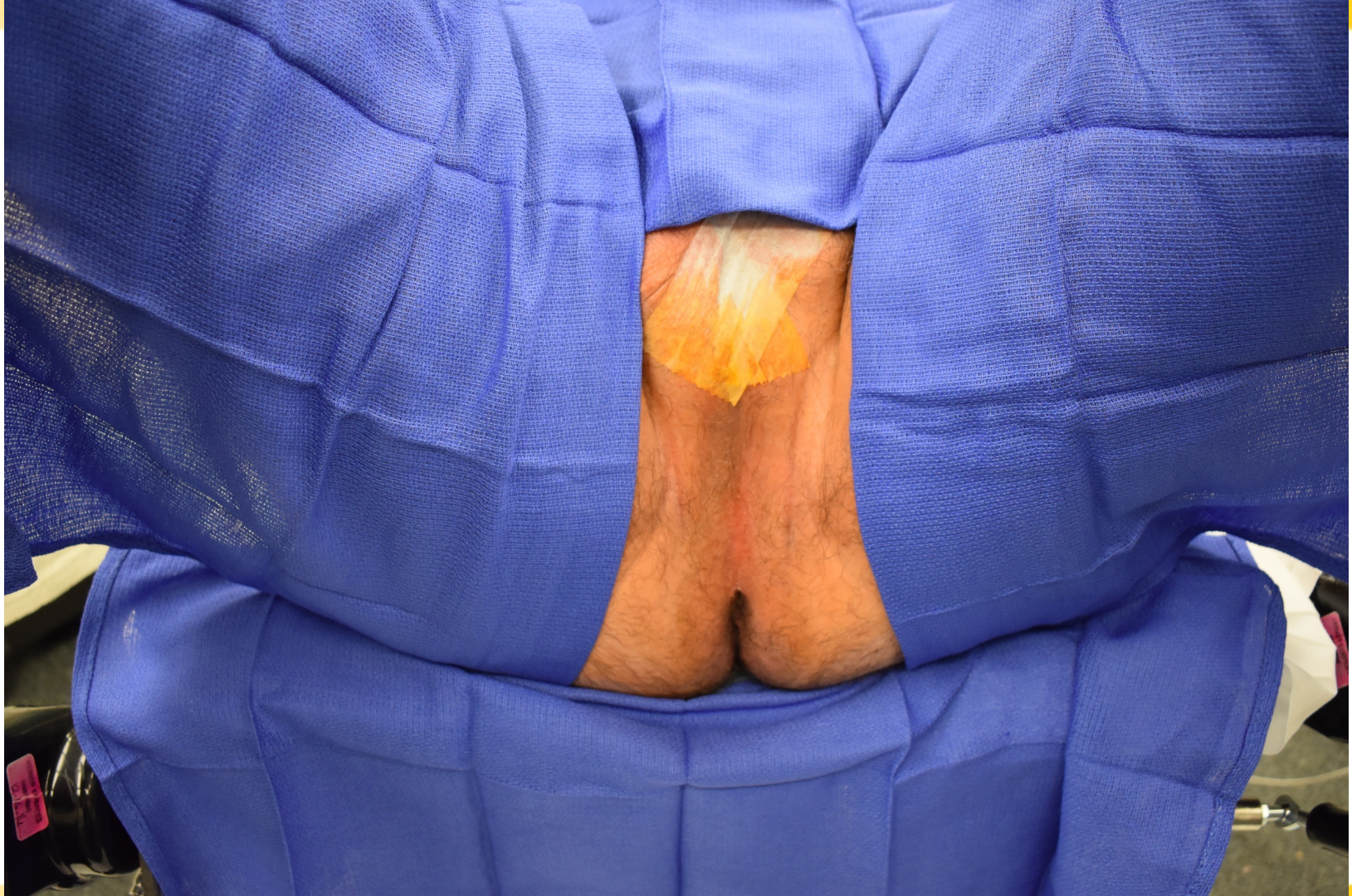
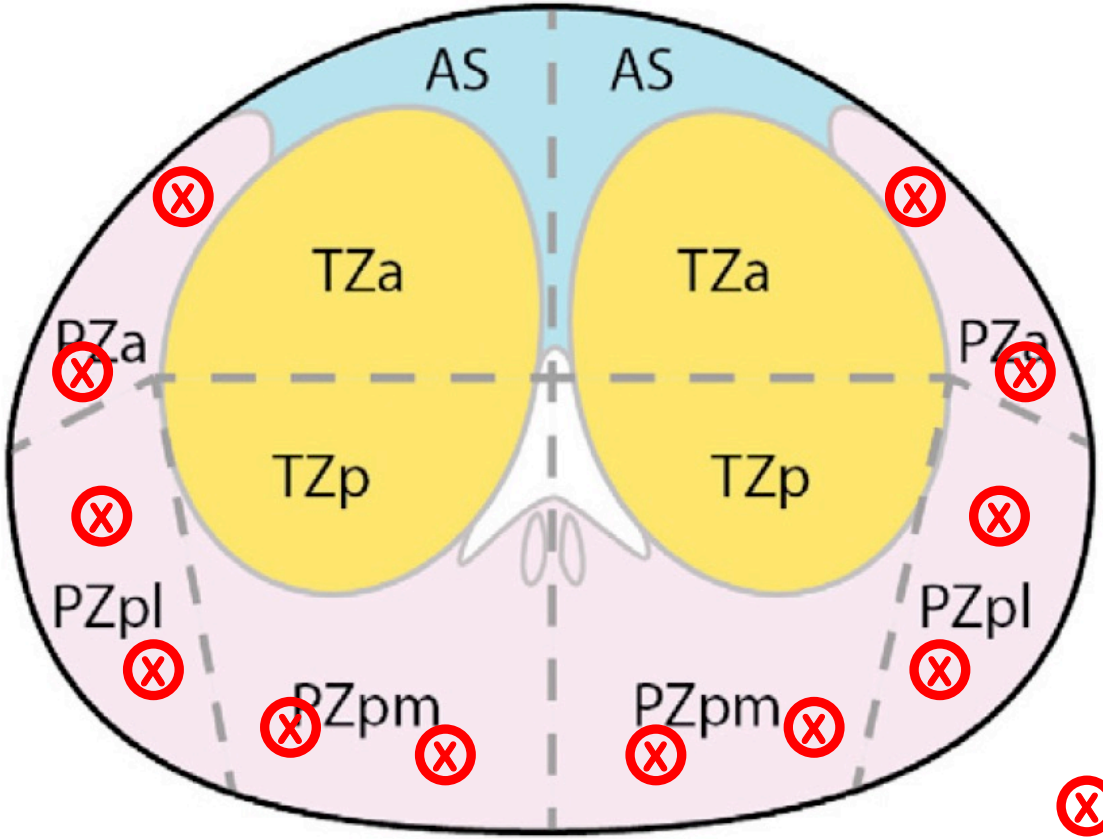


Biopsy Template



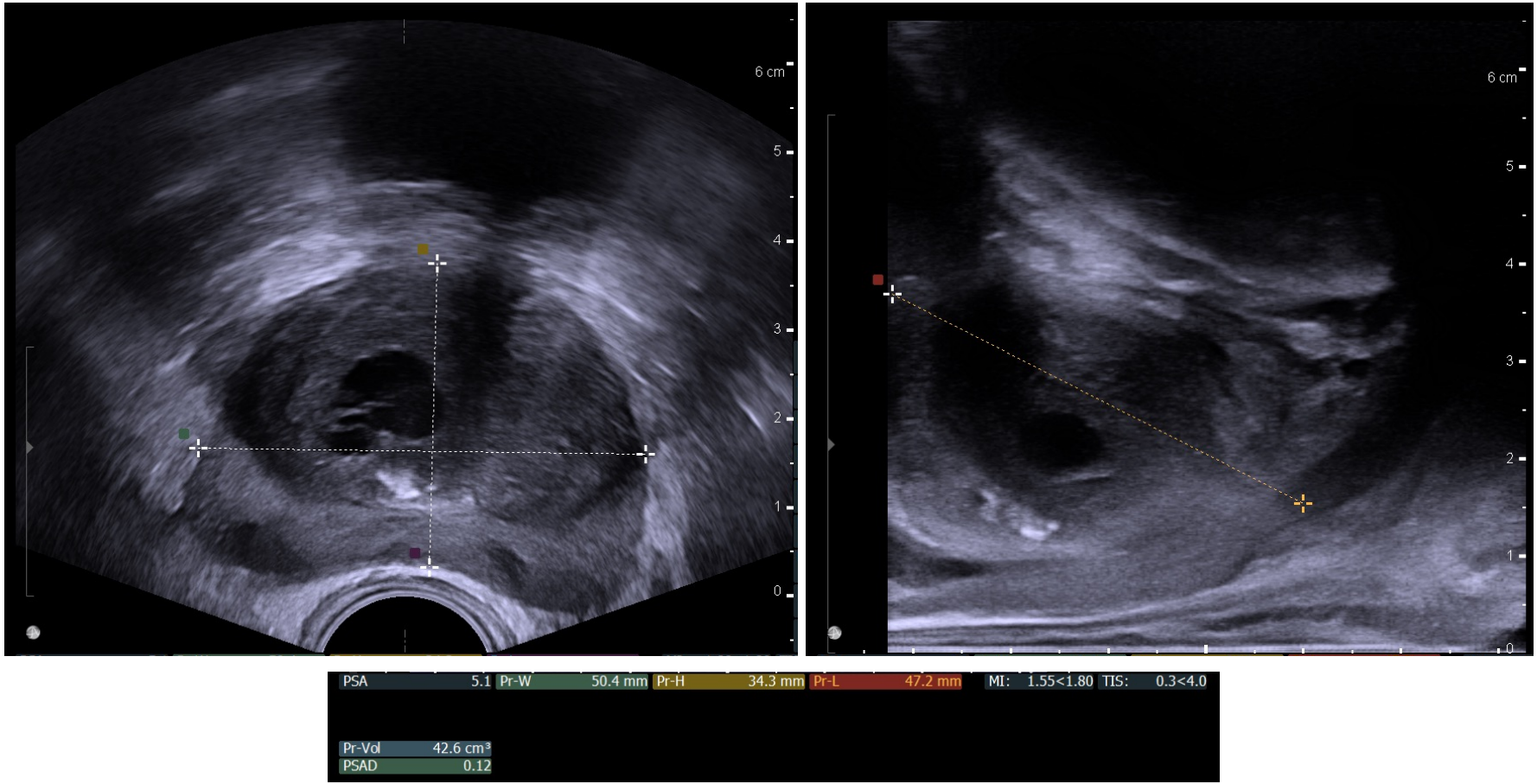
Meyer et al, Urology 2018

Posterior, Lateral, Anterior

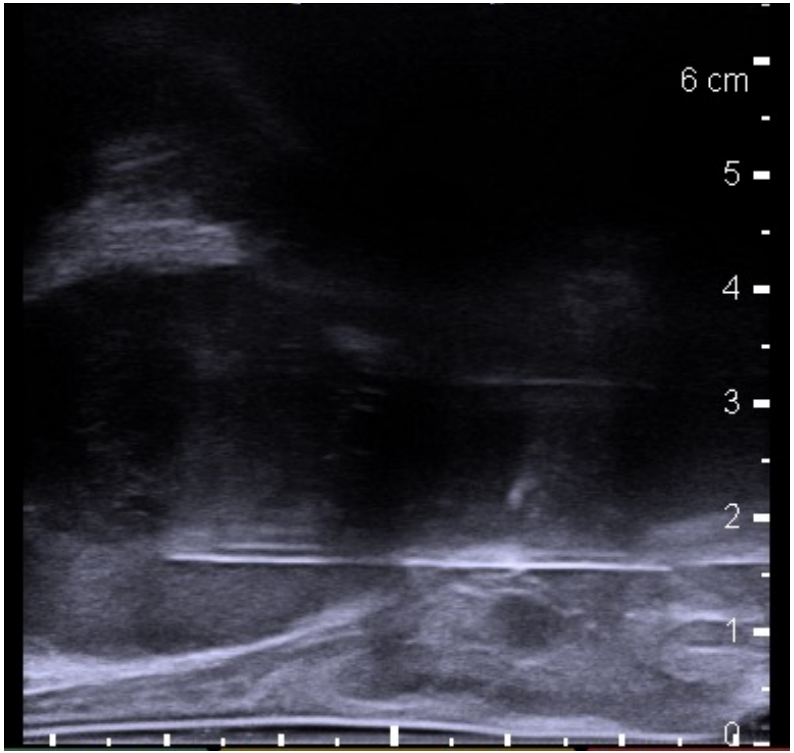
bk3000 Ultrasound

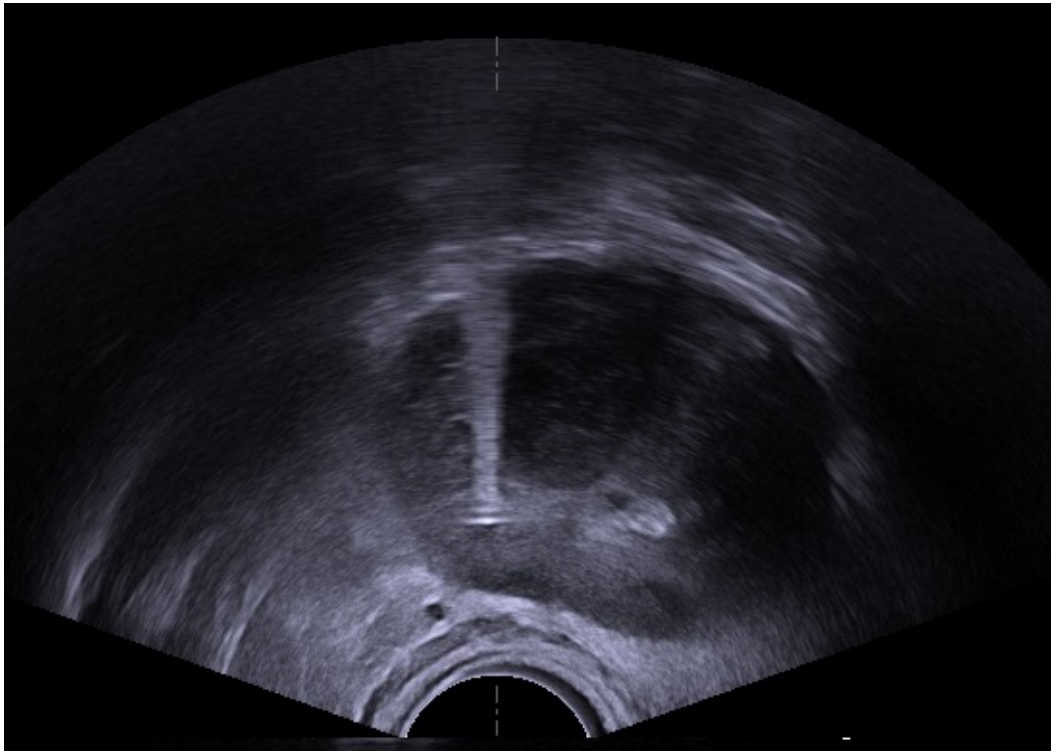
Endocavity Biplane E14CL4b (9048)

High Resolution Images with Biplanar Probe

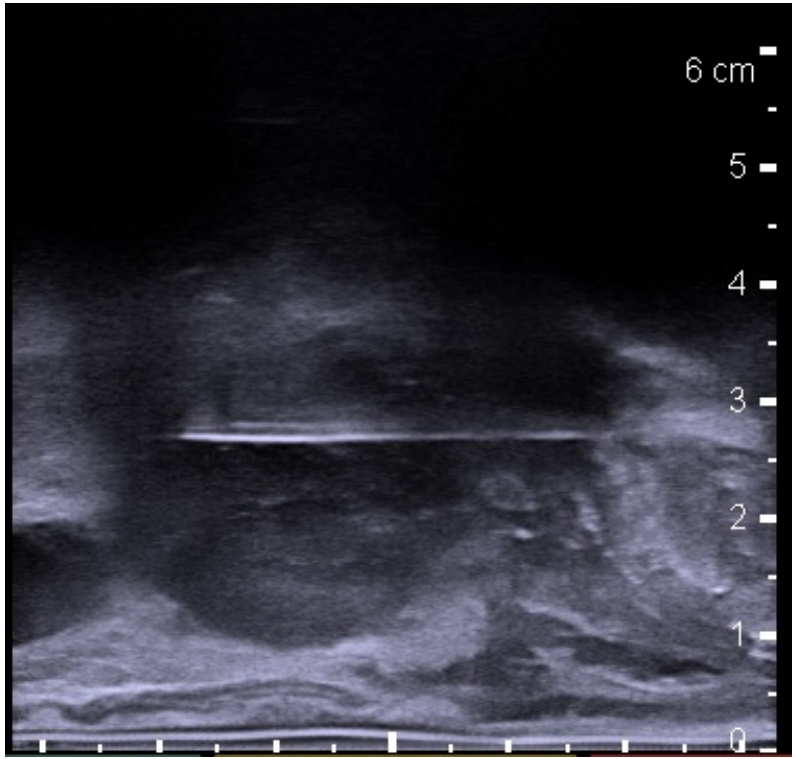


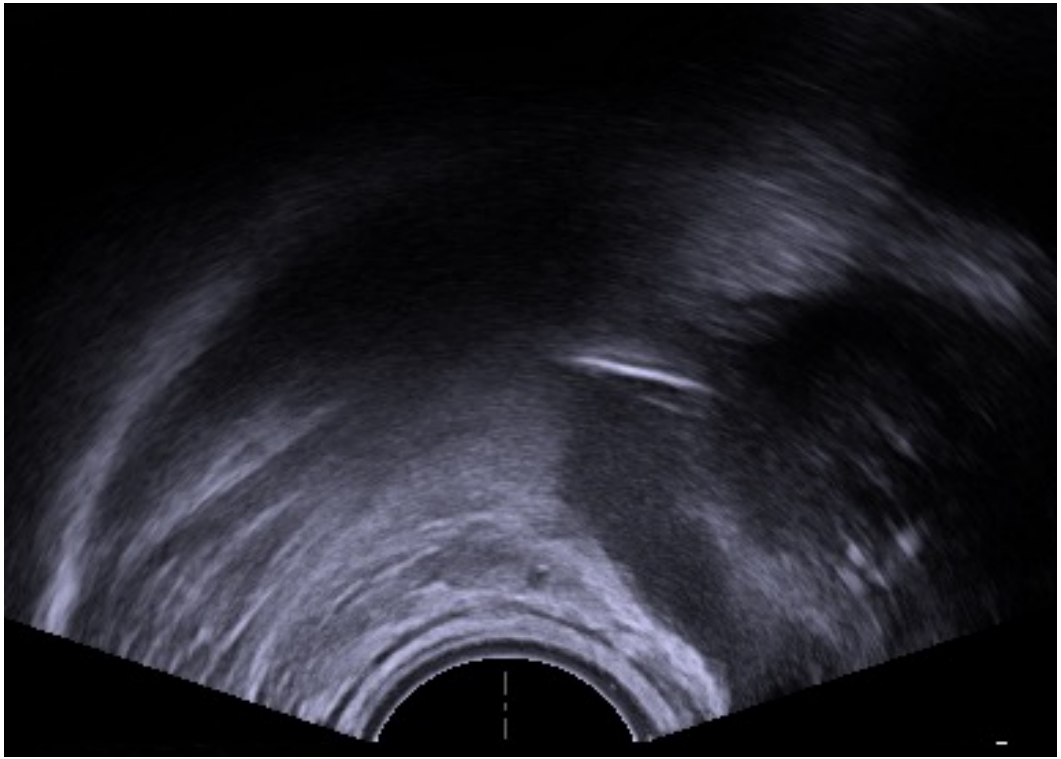
Right Posterior Biopsy





Right Anterior Biopsy





Transperineal Versus Transrectal Magnetic Resonance Imaging–targeted and Systematic Prostate Biopsy to Prevent Infectious Complications: The PREVENT Randomized Trial

Funded by NCI R01, PI: Jim Hu, Edward Schaeffer, and Mohammad Allaf

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Specific Aims

Specific Aim 1 (SA1): To compare **adverse events** following in-office transperineal vs. transrectal MRI-targeted biopsy (Bx)

1a. To compare **infection rates** following in-office transperineal vs. transrectal MRI-targeted.
1b. To compare **bleeding complications** and **urinary retention** following in-office transperineal vs. transrectal MRI-targeted Bx.

Specific Aim 2 (SA2): To compare **pain and discomfort** for in-office transperineal vs. transrectal MRI-targeted Bx.

Specific Aim 3 (SA3): To compare **detection of prostate cancer** with in-office transperineal vs. transrectal MRI-targeted Bx.

Table 1 – Characteristics by randomization arm

Characteristic	Transperineal (*N* = 287), *n* (%)	Transrectal (*N* = 280), *n* (%)
Type of biopsy		
Transperineal	272 (95)	19 (6.8)
Transrectal	15 (5.2)	261 (93)
Age	66 (61, 71)	66 (61, 70)
Race		
Asian	12 (4.2)	16 (5.7)
Black or African American	32 (11)	44 (16)
Other	17 (5.9)	15 (5.4)
Unknown	37 (13)	37 (13)
White	189 (66)	168 (60)
Hispanic ethnicity	11 (4.7)	10 (4.3)
Unknown	51	49
BMI	27 (25, 30)	27 (24, 31)
Unknown	1	0
History of smoking	66 (23)	68 (24)
Unknown	1	1
Family history of prostate cancer	69 (24)	65 (23)
Unknown	2	3
Indication		
Abnormal digital rectal exam	6 (2.1)	10 (3.6)
Elevated PSA	279 (98)	269 (96)
None of the above	1 (0.3)	1 (0.4)
Unknown	1	0
PSA	5.8 (4.4, 8.0)	5.8 (4.6, 8.3)
Prostate volume	41 (32, 57)	43 (32, 59)
Unknown	2	4
MRI	286 (100)	278 (99)
MRI PI-RADS score		
1	7 (2.5)	6 (2.2)
2	22 (7.7)	27 (9.8)
3	67 (24)	52 (19)
4	119 (42)	123 (45)
5	69 (24)	68 (25)
No MRI performed	1 (0.3)	2 (0.6)
Unknown	2	2
Number of systematic cores	12 (12, 12)	12 (12, 12)
Number of targeted cores	3 (2, 5)	3 (2, 5)
Unknown	3	1

No Antibiotics with TP;
Rectal Swab Directed in TR arm

Characteristic	Transperineal (*N* = 287), *n* (%)	Transrectal (*N* = 280), *n* (%)	Difference (%)	95% Confidence interval (%)	*p* value
Infection	0 (0)	4 (1.4)	−1.4	−3.6, 0.2	0.059
Urinary retention	1 (0.3)	3 (1.1)	−0.7	−2.8, 1.0	
Bleeding requiring intervention	0 (0)	1 (0.4)	−0.4	−2.0, 1.0	
Gleason grade group 2–5	151 (53)	141 (50)	2.0	−6.0, 10	
Gleason grade group 1	49 (17)	62 (22)	−5.1	−12, 1.7	

Characteristic	*N*	Transperineal (*N* = 287)	Transrectal (*N* = 280)	Adjusted difference	95% Confidence interval
Biopsy pain	548	3.6 (2.3)	3.0 (2.1)	0.6	0.2, 0.9
Unknown		10	9		
Biopsy pain ≥7 (severe)	548	33 (12%)	19 (7.0%)	5.0%	−0.1%, 10%
Unknown		10	9		
Biopsy discomfort	554	4.2 (2.5)	3.8 (2.3)	0.4	0.0, 0.8
Unknown		9	4		
Biopsy anxiety	565	3.9 (3.0)	4.2 (2.9)	−0.3	−0.8, 0.1
Unknown		1	1		
7-d survey discomfort	448	2.1 (2.4)	1.7 (2.2)	0.3	−0.1, 0.7
Unknown		61	58		
7-d survey pain present	449	22 (9.7%)	32 (14%)	−5.2%	−12%, 1.5%
Unknown		61	57		
7-d survey pain score >3	444	15 (6.6%)	13 (6.0%)	0.8%	−4.6%, 6.3%
Unknown		61	62		

Detection of clinically significant cancer 53% TP vs. 50% TR (ns)

	ProBE-PC (n=763)	PREVENT (n=567)
Non-white (%)	98 (13%)	210 (37%)
Bx indication	44% prior Biopsy	First-Time Biopsy
Center(s)	Single	10
Urologists	3	24
Randomization	Coin flip	Central web-based REDCap
TP vs TR prophylaxis	None vs. Augmented	None vs. Targeted
TP vs TR infections	2.7% vs. 2.6% (p=0.99)	0% vs. 1.4% (p=0.059)
Infection Definition	fever (including undocumented), any GU infection, sepsis, any antibiotic prescription, ER visits, hospitalization office visits, or phone calls	Uncomplicated UTI Complicated UTI Sepsis
Median # Bx cores	14 vs. 13	15 vs. 15

Conclusions

- 12 TP systematic cores suffices with MRI targets
- Zero RCT TP infections without antibiotic prophylaxis
- TP more pain and discomfort than TR, but resolved by 7-days post-biopsy (clinical significance unclear)
- No significant difference in infections, urinary retention and bleeding complications
- Given lower than expected TR infections, NCI granted continued enrollment to 734 subjects
- Outcomes similar for no antibiotics TP vs. swab directed TR prostate biopsy