

Impact of Motion on Quality of T2W Prostate MRI

Baris Turkbey M.D.

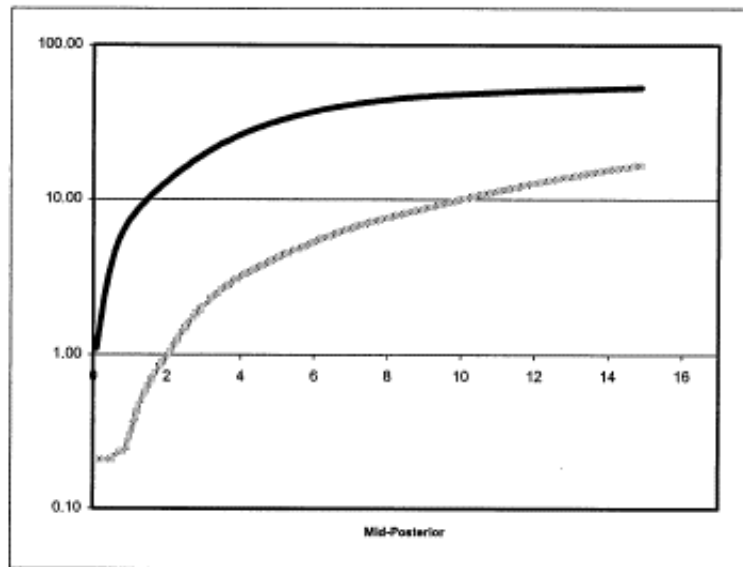
Molecular Imaging Program,

National Cancer Institute, NIH, Bethesda, MD, USA

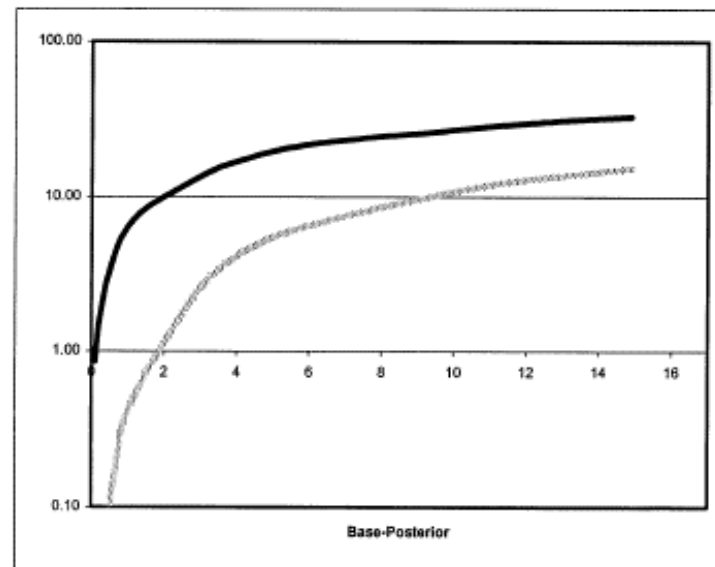


Motion of the Prostate Gland

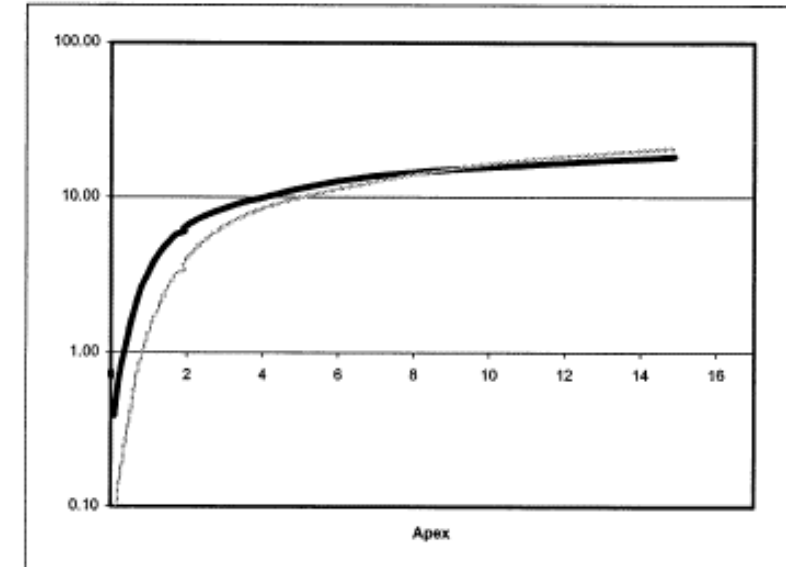
- Prostate gland is documented to move during MRI.
 - This motion is more pronounced if rectum is full vs. empty.
 - Prostate motion can impact quality of MR (specifically T2W MRI).



(a)

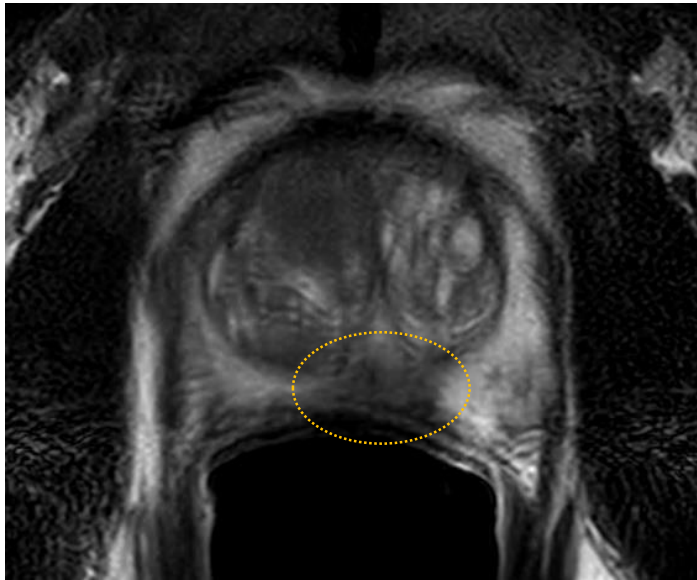


(b)

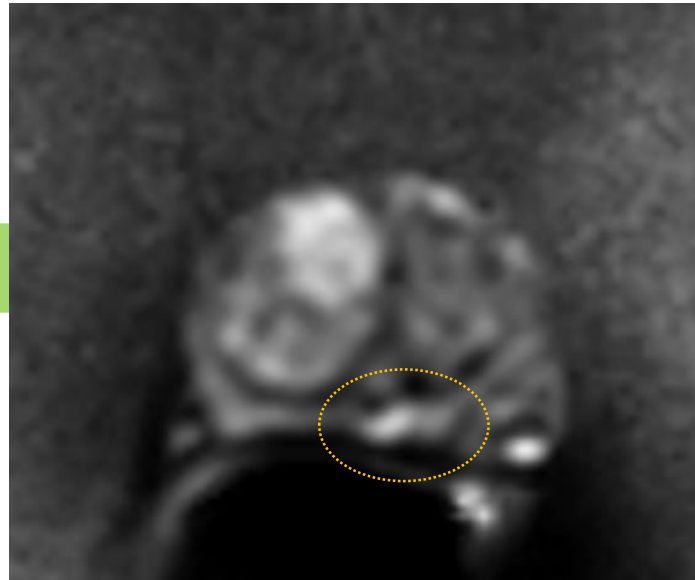


(c)

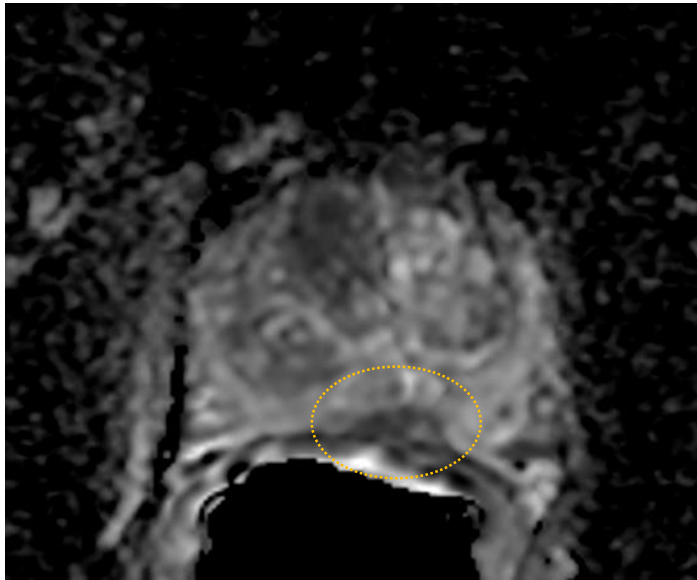
Fig. 2. Probability of displacement of >3 mm over a time frame of 20 min for 3 points of interest characterizing prostate motion: (a) midposterior, (b) base posterior, and (c) apex. The solid line represents the full-rectum group, whereas the dashed line represents the empty-rectum group.



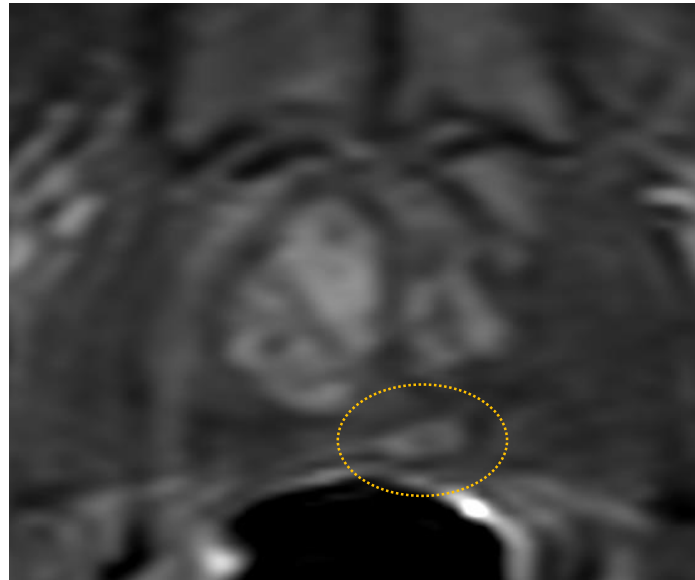
Axial T2W MRI **with significant motion**



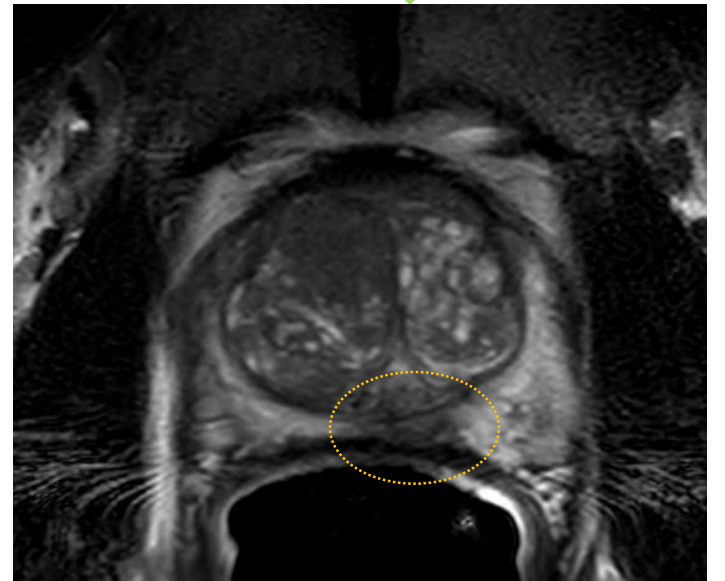
b2000 DW MRI



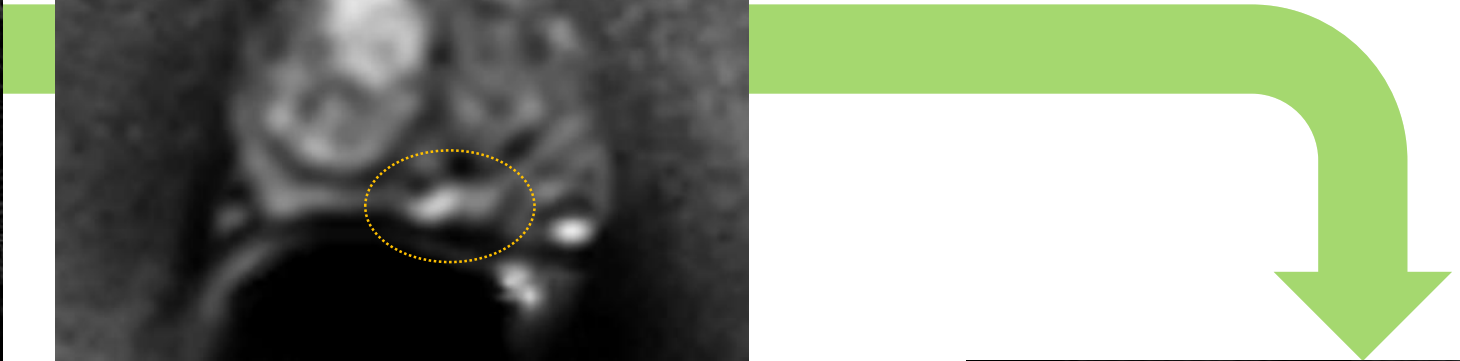
ADC map

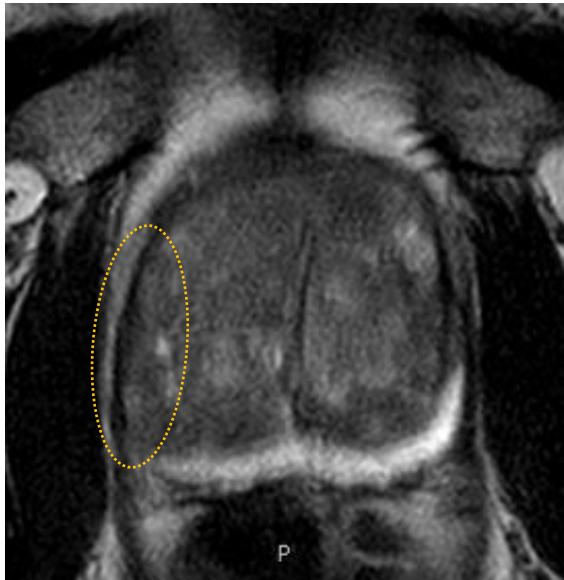


DCE MRI

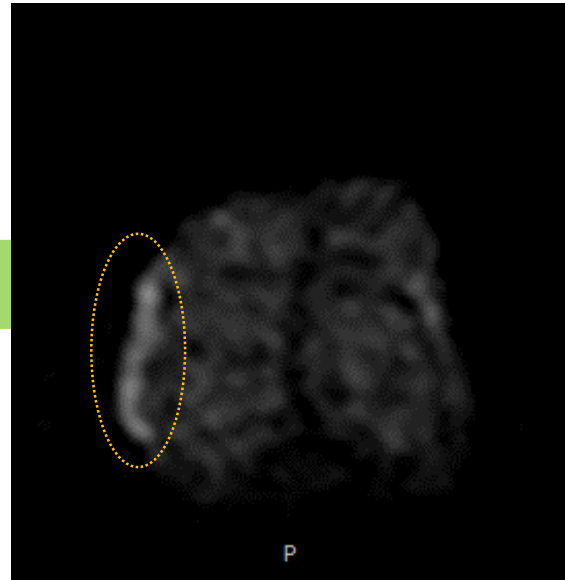


Repeat axial T2W MRI
without significant motion

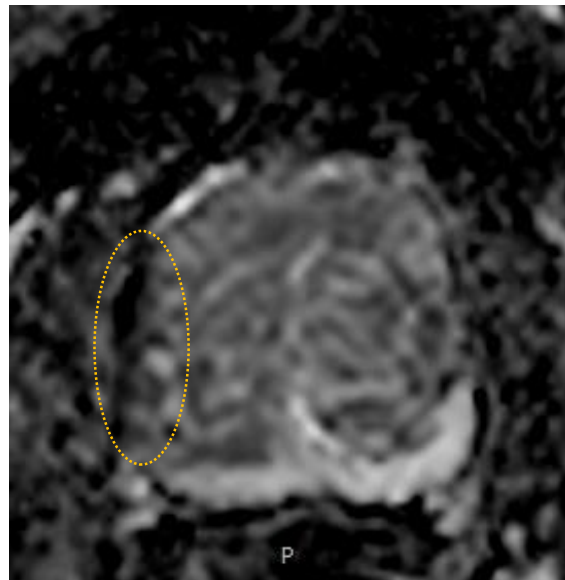




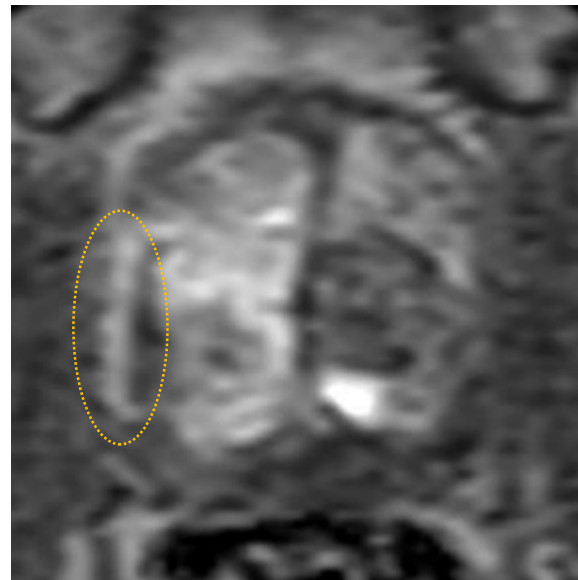
Axial T2W MRI with significant motion



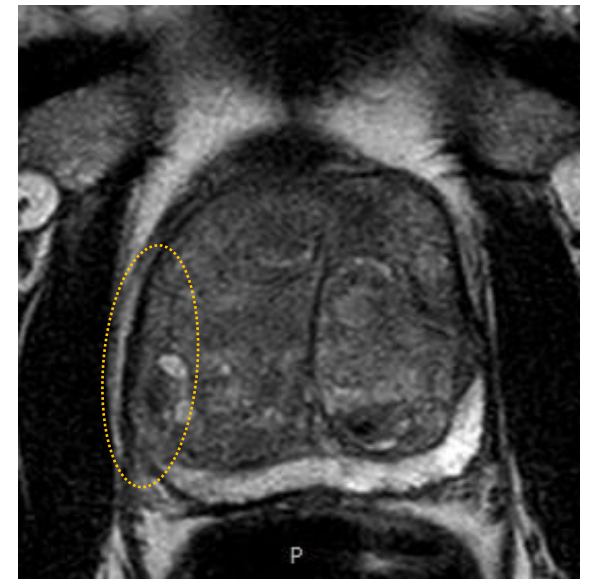
b1500 DW MRI



ADC map

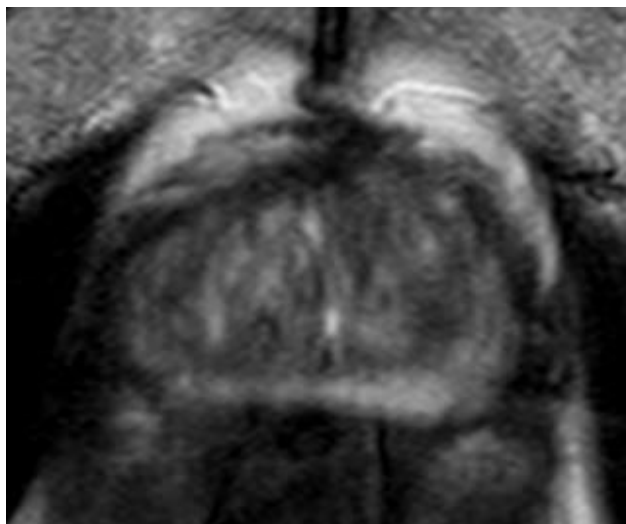


DCE MRI

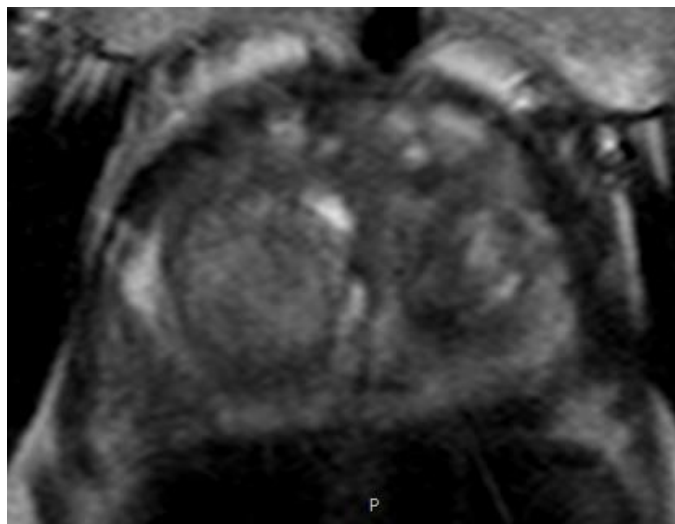


Repeat axial T2W MRI without significant motion

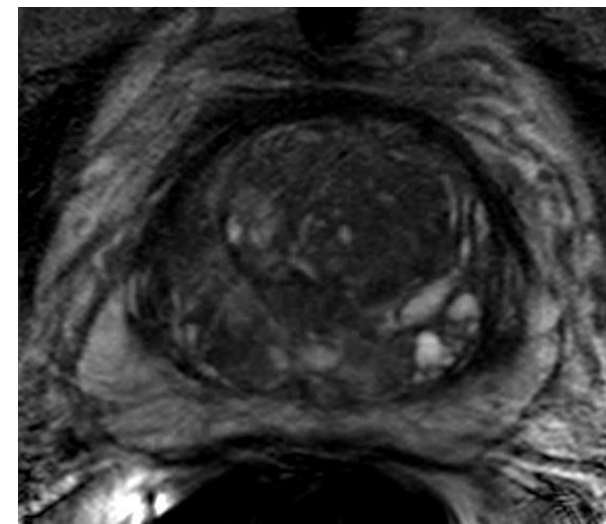
**Axial T2W MRI with
significant motion**



Case sample 1

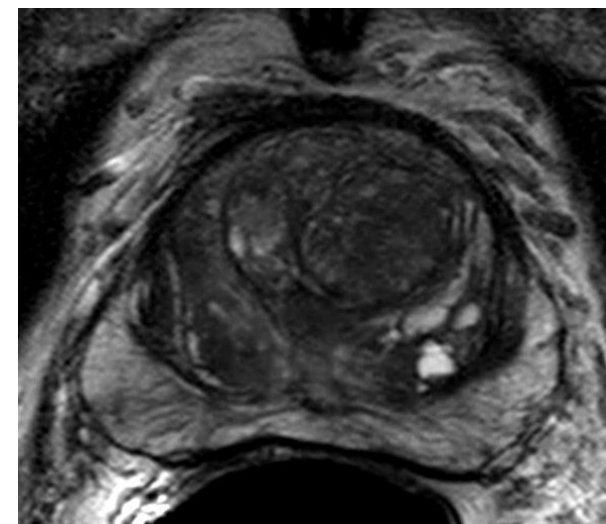
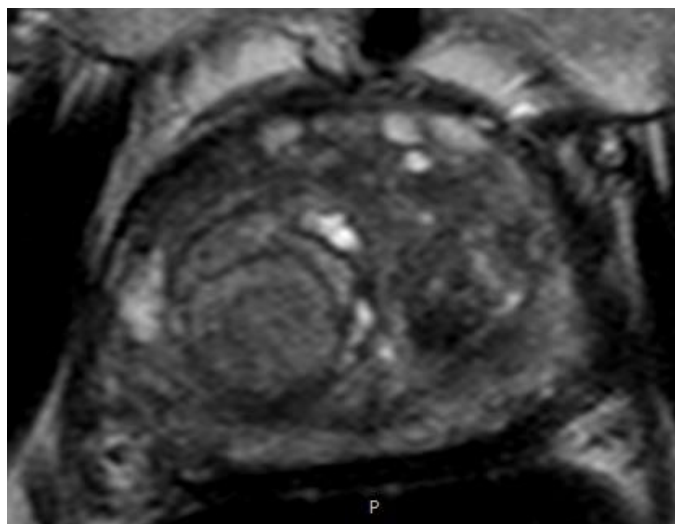
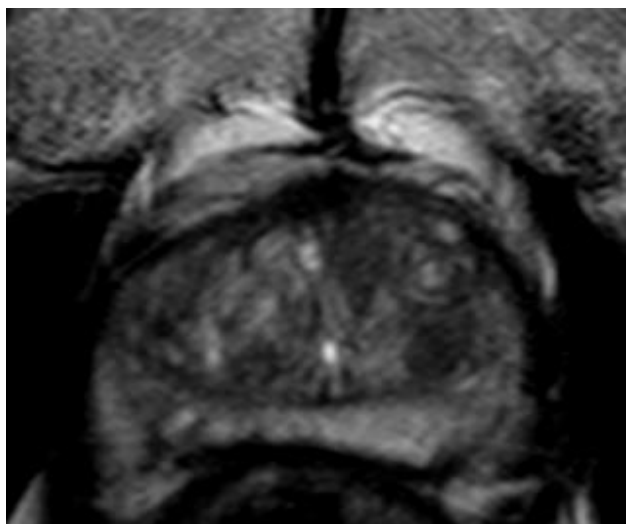


Case sample 2



Case sample 3

**Repeat axial T2W MRI
without significant motion**



Teaching Points

- Significant motion can impact quality of T2W MRI of the prostate:
 - Decreased lesion visibility
 - Decreased accuracy of prostate and lesion contouring for guided biopsies/focal therapy
- Potential solutions:
 - (A) Use of antispasmodic agents (e.g. glucagon, scopolamine butylbromide, or sublingual hyoscyamine sulfate)
 - (B) Use of dedicated pulse sequences (e.g. PROPELLER/BLADE) instead of/in addition to standard T2W pulse sequence
 - If (A) and (B) are not available, repeat the pulse sequence impacted with significant motion
- **Please check for significant motion artifacts timely to ensure a good quality prostate MRI**

References

- ACR PI-RADSV2.1 document: <https://www.acr.org/-/media/ACR/Files/RADS/PI-RADS/PIRADS-V2-1.pdf?la=en>
- Ghilezan MJ, Jaffray DA, Siewerdsen JH, et al. Prostate gland motion assessed with cine-magnetic resonance imaging (cine-MRI). *Int J Radiat Oncol Biol Phys.* 2005;62(2):406-417.
- Kargar S, Borisch EA, Froemming AT, et al. Modified acquisition strategy for reduced motion artifact in super resolution T2 FSE multislice MRI: Application to prostate [published online ahead of print, 2020 May 17]. *Magn Reson Med.* 2020;10.1002/mrm.28315.
- Ullrich T, Quentin M, Schmaltz AK, et al. Hyoscine butylbromide significantly decreases motion artefacts and allows better delineation of anatomic structures in mp-MRI of the prostate. *Eur Radiol.* 2018;28(1):17-23.
- Rosenkrantz AB, Bennett GL, Doshi A, Deng FM, Babb JS, Taneja SS. T2-weighted imaging of the prostate: Impact of the BLADE technique on image quality and tumor assessment. *Abdom Imaging.* 2015;40(3):552-559.