Prostate Cancer MRI
Accurate Diagnosis and Treatment

Magnetic Resonance Imaging

PSA to Prostate MRI

for patients and curious doctors

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To read all the Educational Pamphlets 2017 go to pcamri.com
Can you imagine treating a patient for a high fever, racking cough, pneumonia without a chest x-ray or CT Scan?

We can not imagine diagnosing or treating prostate cancer without being able to image it.

That’s what we were doing.

The prostate today can be seen in structural and functional detail with multi parametric prostate MRI.
Prostate MRI
What Can It Really Do?

Accurately Identifies, Characterizes, Defines and Stages

**Prostate Cancer Nodules**

*Identifies*

- Number of nodules
- Nodule(s) location within the prostate
- Nodule(s) volume
- Capsule invasion

*Characterizes*

- The likelihood of cancer
  - the 3 parameters (T2w, DWI/ADC, DCE)
- Cancer aggressiveness (predicts Gleason grade)

*Defines*

- The most aggressive significant (Index) Cancer Nodule

*Stages (below the aorta bifurcation)*

- Cancer involving the capsule, adjacent, seminal vesicles, bones, nodes

**Prostate MRI, 94 % accurate in finding significant prostate cancer nodules**
How Does It Do It?

3 parameters characterize prostate nodules the likelihood of cancer (predicts Gleason grade)

**T2w – anatomy** (chief TZ cancer detective)

T2 weighted Images

**DWI/ADC - biology** (chief PZ cancer detective)

Diffusion Weighted Images

Apparent Diffusion Coefficient

(restriction of water diffusion among cancer cells)

**DCE - vascularity**

Dynamic Contrast Enhancement

mini angiogram, gadolinium injection

T2w roadmap

DWI/ADC traffic congestion

DCE new arterial construction
the 3 MRI parameters

Normals

Courtesy of Dr. M. Emberton

T2w

ADC

DCE

68 years, brother with prostate cancer, PSA 4.2 → 5.9, over 5 years, PSAD 0.08
DRE- no nodule, no biopsy indicated
The MRI Report

Patient – Age, prostate cancer Risk Assessment data
Initial MRI, Previous MRI
5 alfa-reductase inhibitors

Prostate volume, PSA, PSA Density

Identification

> Nodule(s) location - 27 sectors / 39 sectors
> Nodule volume

Characterization – Likert/PI-RADS

3 Parameters – T2w, DWI/ADC, DCE – 5 point Score
1 Highly likely No cancer
2 Likely No cancer
3 Unsure
4 Likely cancer
5 Highly likely cancer

Tumor Staging - capsule, cancer outside the prostate
(adjacent, seminal vessels, bones, nodes)

Comparison to previous MRI

Other incidental findings
(bowel, bladder, large blood vessels, hernia, etc.)

Radiologist Summary

Initial MRI – Screening - a baseline reference
– Diagnostic - specifies nodule(s) to biopsy, cancer staging
Repeat MRI – Monitoring - men at risk, active surveillance
- residual or recurrent cancer after treatment
Prostate Sectors

27 Sectors

39 Sectors
PI-RADS v2
American College Radiology
pub. online 2015

AS  anterior stroma
TZ  transition zone
PZ  peripheral zone
CV  central zone
a   anterior
p   posterior
pl  posterior lateral
pm  posterior medial
The **Significance** of a nodule imaged on MRI *depends on:*

- **Individual Risk Assessment** (includes some of these criteria)
  - age, life expectancy, major illnesses, family-genetic history, Race, chemical-medication exposures, previous (UTI, MRI, biopsy, pelvic surgery, radiation), predictor tables, urology exam, DRE, urinalysis-culture, PSA, PSA trend, biomarkers, testosterone, renal function, TRUS-PSA Density

- **Patient data** provided in the MRI requisition

- **Quality** of the MRI image acquisition
  - Do MRIs before biopsy artefacts, makes interpretation more difficult
  - 5-alfa-reductase inhibitors change prostate MRI morphology decreasing cancer nodule volume and lowers PI-RADS scores

- **Experience and quality** of the Radiologist, Urologist and Pathologist

- **Nodule(s)** size, location, 3 Parameter Score 1,2,3,4,5

- **Index Cancer Nodule** (most aggressive)
  - largest volume, highest score or involving the capsule

- **MRI Local Staging** (below aorta bifurcation)
  1. Cancer nodule • confined *inside* the prostate ≤ 0.2 cc
     • confined *inside* the prostate ≥ 0.5 cc
  2. Cancer nodule involves prostate capsule and/or neurovascular bundle
  3. Limited local cancer *spread* - adjacent, seminal vesicles
  4. Cancer *spread* involves bladder, rectum, nodes, bones

- **Biopsy** Gleason grade
Black gentleman, PSA 4.1

• Age 57, life exp >10 yrs, Fhx brother Pca
• PSA (over 5 yrs) 2.1-4.1, DRE neg. MRI 45cc, Sc 1, PSAD 0.09
• No biopsy indicated

DRE +, PSA 5.8

• Age 70 wm, life exp >10 yrs, no Fhx, PSA 2.3-5.8 (7 yrs)
• DRE +, MRI 49 cc, Sc 5, PSAD 0.11, nodule 2.6cc (Lt PZ, PL, 10p, 12p)
• Biopsy Gleason grade 4+3
3 previous biopsy sessions negative

- Age 67 wm, Fhx +, life exp > 10 yr, PSA 2.9 - 9.4 (10yr)
- DRE neg, MRI 52 cc, Sc 4-5, PSAD 0.18, nodule 1.8cc
  Sector Lt AS, TZa, 14 as, 9 a
- Biopsy Gleason grade 4+4

Prostate Cancer Risk Assessment
selects men for MRI
MRI selects men for biopsy

TRUS/MRI Fusion Targeted Biopsy
- Fewer biopsy sessions, fewer biopsy complications
- Earlier diagnosis, earlier treatment
- Less diagnosis of not-aggressive insignificant low grade cancers
- Less over treatment
Prostate MRI: A Team Effort

Radiologists  Provide and interpret the MRI to identify the undiagnosed, residual or recurrent cancers.

Urologist  Use the MRI to select which men to biopsy, where to biopsy, in treatment decisions and monitoring.

Pathologists  Provide the tissue proof of the presence of cancer, the concordance with the MR images.

The JGH Team

Radiology  – Drs. F. Discepola, M. Levental, A. Mandelanakis, V. Pelsser, L. Rosenbloom


Pathology  – Drs. A. Gologan, M. Alameldin

Prostate MRI requires precise image acquisition, experienced radiologist, MRI knowledgeable urologist and pathologist to prove the presence of cancer
Prostate MRI
Imaged Based Prostate Cancer Management

For Diagnosis
- Which men to biopsy
- Which sector to target the biopsy
- Monitor patients not requiring biopsy

When Cancer
- For Treatment – helps selects type and planning
- After Treatment – evaluation for residual or recurrent cancer

Treatment Options
- Pre Programmed Follow-Up – MRI monitoring men at risk, no cancer diagnosed
- Active Surveillance – MRI selection and monitoring diagnosed not-aggressive, insignificant untreated cancers
- Surgery, Radiation, Focal Therapy, Medical Oncology and combinations

References

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