Multi-parametric MR imaging in Low Risk Prostate Cancer

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Objectives
- How to decrease the number of biopsy cores and increase the yield?
- Can mp-MRI show the exact location of the (most) aggressive part of the tumor?

Clinical questions in PCa
1. Improve localization & detection
2. Determine aggression
3. Improve local staging
4. Detect nodal metastases
5. Detect recurrences

Problems: TRUS Bx
- Important cancers are missed
- Clinically insignificant cancers are identified by chance
- 36-46% undergrading of Gleason score
Clinical questions in PCa

1. Improve localization & detection
2. Determine aggression
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Localization/detection

Patient 62 y, PSA 28
8x negative TRUS Bx (96 cores)

Patient 62 y: Your diagnosis?
Patient 62 y

Multi-parametric “detection” MRI (30 min, no ERC)

T2-w anatomy

DWI (b800)

ADC

DCE - MRI

Next step?

MR-guided biopsy: patient 62 y

Gleason score 4+3

Multi-modality MR-guided biopsy in tumor detection

TRUS- or MR-guidance?

“my view!”

Hambrock J Urol 2010
Clinical questions in PCa

1. Improve detection & localization
2. Determine *aggression*
3. Improve local staging
4. Detect small nodal metastases
5. Detect recurrences / follow up

Dogs and Prostate

What is the association between dogs and prostate cancers?
Dogs and Prostate

- **Benign**
  - Image Left: Dog (c. T. Hambrock)
  - Image Right: Microscope slide (Gleason 3)

- **Intermediate aggressive**
  - Image Left: Dog (c. T. Hambrock)
  - Image Right: Microscope slide (Gleason 4)

- **Highly aggressive**
  - Image Left: Dog (c. T. Hambrock)
  - Image Right: Microscope slide (Gleason 5)

**Pearson Correlation**

- $r = 0.73$
- $p < 0.01$

**DWI: ADC-value vs Gleason score**

- Hambrock, Radiology 2011,
- Alvares, Radiology, in press,
- Itou JMRI 2011
Two Patient Cohorts

33 MR-GB Patients
- Multimodality MRI-Localization
- MR-GB towards darkest part on ADC-map

64 TRUS-GB Patients
- 10-Core TRUS biopsy

TRUS-Bx & MR-Bx vs Prostatectomy

Hambrock 2010 SCBTMR “Lauterbur Award”

Hambrock 2010 SCBTMR “Lauterbur Award”
Improved localization and determination of aggression

→ **Active Surveillance**

→ **Screening?**

→ **Focal therapy**

**AS: exclusion of high grade tumors**

T2-w + MRSI

<table>
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<tr>
<th>Grade</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
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<tr>
<td>&gt;4+3</td>
<td>93%</td>
<td>98%</td>
<td>86%</td>
<td>85%</td>
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**G. Villiers: RSNA 2010**

Villers et al. J Urol December 2006
### AS (PRIAS) protocol

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### MRI

### Patients

<table>
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<th>MR-indicated patient exclusions</th>
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<tbody>
<tr>
<td>MR-GB: Gleason grade 4-5</td>
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<tr>
<td>7/25 (28%)</td>
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<td>2</td>
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</table>

### Case: 69 y.

PSA 6.7, T1, Gl. 3+3, 1/9 cores 5%

Candidate for Active Surveillance

6 x 4 x 6 mm (0.14 cc)
**Case: 69 y.**
PSA 6.7, T1, Gl. 3+3, 1/9 cores 5%

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**Case: 69 y.**
PSA 6.7, T1, Gl. 3+3, 1/9 cores 5%

all 5 biopsy cores 80%, Gleason 8
with extension in **periprostatic fat (T3a)**

→ Patient exclusion

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**Improved localization and determination of aggression**

→ **Active Surveillance**

→ **Screening?**

→ **Focal laser therapy**

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**Rationale screening**

ERSPC: **mortality reduction: 31%**

Goteborg trial: **mortality reduction: 44%**

Hanley *J Med Screen* 2010: **mortality reduction: 50-60%**

however at high cost: biopsies, overdiagnosis

• do not use PSA alone

• apply risk modifiers

• identify indolent disease

• develop better markers
Rationale screening

- **ERSPC:** mortality reduction: 31%
- **Goteborg trial:** mortality reduction: 44%
- **Hanley J Med Screen 2010:** mortality reduction: 50-60%

**However at high cost:** biopsies, overdiagnosis
- **do not use** PSA alone
- **apply** risk modifiers
- **identify** indolent disease
- **develop** better markers

Screening

- **ERSPC:** mortality reduction: 31%
- **Goteborg trial:** mortality reduction: 44%
- **Hanley J Med Screen 2010:** mortality reduction: 50-60%

**However at a high cost:**
- **do not use** PSA alone
- **apply** risk modifiers
- **identify** indolent disease
- **develop** better markers
- **add** mp-MRI
- **mp-MRI**
- **MRI will miss** MRI >>PCa3

Clinical questions in PCa

1. Improve detection & localization
2. Determine aggression
3. Improve local staging
4. Detect small nodal metastases
5. Detect recurrences

Patient 48 y, sexually active; PSA 9 Gl 4+3; DRE T1

3T ERC only when detecting minimal ECE is important: (se 87% sp 96%)
Clinical questions in PCa

1. Improve detection & localization
2. Determine aggression
3. Improve local staging
4. Detect **nodal** metastases
5. Detect **recurrences**

Are we there?
**“Yes we Scan!”**
even in non-academia at 1.5T without ERC

- T2WI
- ADC (900)
- DCE
- DWI b800

c. John Feller, Palm Desert

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**But we need**

Awareness and knowledge of MRI of:

- Radiologists
- Urologists
- Radiation Oncologists
- Patients

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**We need**

Awareness and knowledge of:

- Radiologists, Urologists,
- Radiation Oncologists, Patients

Guidelines for:

* standardized protocols:
  - simple, good, fast

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**Standardized Protocols:**

simple and good

1. **Detection / recurrence protocol**
   - (20-30 min, - ERC)

2. **Staging protocol**
   - (45-55 min, +/-ERC)

3. **Bone & node protocol**
   - (20-35 min, - ERC)
We need

Awareness and knowledge of:
Radiologists, Urologists, Radiation Oncologists, Patients

Guidelines for:
* structured reporting (PI-RADS)
We need also
- availability
- education
- certification
- multi-center trials
- sub-specialization in PCa?

Multi-parametric MRI shows where PCa is, it’s aggression, and if it grows outside the prostate.

This will decrease the number of needle cores, and improve its yield.

MRI opens the way to tailored (minimal invasive) therapy, which reduces side-effects.

Thank you for your attention.