TRUS biopsies in a world without imaging:

Results and limits

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How to biopsy?

Core number?

Core location?
How to optimize detection?

- The objectives:
  - To detect *significant cancers*
  - To ignore *non significant cancers*

- The variables:
  - Biopsy scheme
  - Patient
  - Suspected tumor
Biopsy scheme

• Cores number
  • 6 Bxs → Detection rate <30%\textsuperscript{Cattoni et al, Eur Urol 2010}
  • >12 Bxs → Similar detection rate\textsuperscript{Eichler et al, J Urol 2006}

• Cores location
  • Lateral PZ +++\textsuperscript{Haas et al, JNCI 2007}
  • Base and apex +++
  • TZ : less important\textsuperscript{Patel et al, Urology 2004, Scattoni et al, Eur Urol 2010}

Detection rates = 30-45%
Biopsy scheme

- **Whitch approach?**
  - Trans perineal: apex and anterior zone
  - Trans rectal: posterior zone

- **Similar detection rates**

  Abdollah et al, Urology 2011
To be adapted to each patient...

- Prostate volume
- Age
- DRE
- \( \text{PSA}_t / \text{PSA}_{1/t} \)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Prediction form</th>
<th>Patients, n</th>
<th>Variables</th>
<th>Mean No. of cures</th>
<th>Cancer detection, %</th>
<th>Accuracy, %</th>
</tr>
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<tbody>
<tr>
<td>Kawalami et al. [126]</td>
<td>Probability nomogram development (n = 1220) and validation (n = 544) (referral cohort) PSA, cut-off: 2.5 ng/ml</td>
<td>1764</td>
<td>Age, PSA &lt;10 ng/mL, DRE, family history, No. of previous malignancies other than PCA</td>
<td>≥12</td>
<td>37.5</td>
<td>66.6</td>
</tr>
<tr>
<td>Kawamura et al. [117]</td>
<td>Probability nomogram development (80%) and validation (20%) (referral cohort)</td>
<td>1037</td>
<td>Age, DRE, PSA &lt;10 ng/mL, mpPSA, prostate volume</td>
<td>≥10</td>
<td>22.8</td>
<td>73.0</td>
</tr>
<tr>
<td>Idr et al. [31]</td>
<td>Probability HGPCa (Gleason ≥7) nomogram development (n = 396), and validation (n = 174) (referral cohort) PSA (0.1–&gt;500 ng/mL), FSH, testosterone</td>
<td>570</td>
<td>PSA (0.1–&gt;500 ng/mL), FSH, testosterone</td>
<td>14</td>
<td>Any PCA: 25.6; HGPCa: 45.2</td>
<td>HGPCa prediction: 70.0</td>
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</table>
| Kim et al. [32]    | Probability any cancer and HGPCa (Gleason ≥7) nomogram development (n = 2108) and validation (n = 1000) (screening cohort) | 3108        | Age, ethnicity, PCA family history, AUA symptom score, PSA, mpPSA, DRE    | 8                 | Any PCA: 42.0; HGPCa: 57.6 | Any cancer: 
  740; high-grade cancer: 77.0 |
| Chun et al. [35]   | Probability nomogram development (n = 1122) and validations (n = 1731) (referral cohorts) | 2500        | Age, DRE, PSA, mpPSA, sampling density                                    | 11 (10–20)        | 41                  | 77          |
Prostate volume...

- Detection rates associated with volume
  - $\uparrow$ nb bxs $\rightarrow$ $\uparrow$ detection rate
  - <30cc $\rightarrow$ 8 bxs
  - 30-50 cc $\rightarrow$ 12 bxs
  - >50 cc $\rightarrow$ >14 bxs ?

Ficarra et al, Eur Urol 2005
Prostate volume...

- But to what extent?
- ↑ complication rates
- Detection benefit?

**Conclusions:** The hospital admission rates for complications following transrectal ultrasound guided prostate biopsy have increased dramatically during the last 10 years primarily due to an increasing rate of infection related complications.

Nam et al, Eur Urol 2010
Evaluate individual risk...

Chun et al, Eur Urol 2007
...to adapt and personalize biopsy scheme

Scattoni et al, Eur Urol 2010
Undetected cancers?

- True detection rate?
- Characteristics of missed tumors?

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<tr>
<td>Screening</td>
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<tr>
<td>PSA&gt;4 / susp. DRE</td>
</tr>
<tr>
<td>PSA&lt;4 / NI DRE</td>
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BX +

BXS -
A few tracks...

- Autopsy studies

6 bxs in the median PZ
6 bxs in the lateral PZ
6 biopsies in the TZ

Haas et al, JNCI 2007
Bxs médian and lateral PZ +++

But:

- 70 missed tumors: 64%
- 28 missed cancers: 47%
Characteristics of missed tumor foci

- Detection rates according to volume:
  - Volume <0.2 cc: 30%
  - Volume >0.5 cc: 81%

↑ bxs → ↑ detection of small foci

Unpublished data
Characteristics of missed cancers

63 missed tumors = 29% of total tumor volume

Bxs TZ → 7 additional tumors = 22% of total tumor volume

27 missed cancers = 16% of total tumor volume
  • 22 insignificant cancers
  • 5 significant cancers

Cumulative volume of the 32 detected cancers
Characteristics of missed cancers

- 12 bxs median and lateral PZ
- Bxs TZ: for stadification?

Limitations:
- No pre-mortem PSA
- No known history of cancer

57% missed tum = 29% of cumulative tum vol

47% missed index tum = 19% of cumulative tum vol

46% missed cancers = 16% of cumulative tum vol
What to expect from systematic biopsies?

- **Diagnosis:**
  - Cancer?

- **Prognosis:**
  - Gleason score?
  - Tumor volume?
  - Tumor location?
  - Bilaterality?
  - Capsular extension?
Diagnosis limitations

- Over detection of insignificant cancers
  - Stage T1c: 80%
  - « Insignificant » cancers:
    - 23 à 42% (USA)

Migration of D’Amico groups at diagnosis (USA)

*Draisma et al, J Natl Cancer Inst 2009*
Diagnosis limitations

- Over detection of insignificant cancers

- 1 death avoided for 48 treated patients and 1410 screened men !!!

Limitations in characterization

- Sub stadification

  - PCPT trial: PCa avec PSA [2,6-4] → pT3 &/or Gl.8 in 20% of cases
    

  - 1/12 biopsie + Gl.≤ 6 → pT 3 &/or Gl.8 in 11% of cases
    
    Chun et al, Eur Urol 2008
Technical limitations

- Poor spatial reliability
- Poor reproducibility
Solutions...without vision?

- Saturation biopsies
- Template-guided biopsies
Perspectives...with vision

Looking for a target

**Pre-screening ?**
Patients selection ?
No more systematic biopsies ?

**Post-screening ?**
Pre-treatement characterization
Tumor vol, focality, Gleason score ?

![Bilateral Gleason 7 Ca](image)

**ADC**

**T2**

**Ktrans**

**AUGC**

**Kep**