BRACHYTHERAPY FOR PROSTATE CANCER

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Why brachytherapy?

How do we do it?

What are the results?

Questions?
WHY BRACHYTHERAPY?

- Radioactive source inserted into tumour
- Can safely deliver higher radiation dose to tumour
- Lower radiation dose to bowel and bladder
- Improves local control of tumour and reduces toxicity of treatment
- Fewer treatments than external beam radiotherapy
- Shorter treatment time
STAGING DETERMINES WHICH TREATMENT IS APPROPRIATE TNM

- T1-confined to prostate, clinically undetectable
- T2a <1/2 1 side
- T2b ½ 1 side
- T2c > both sides
- T3a extends beyond the prostate capsule
- T3b into seminal vesicles
- T4 into other organs
- N1-into lymph nodes
- M1-distant spread (bones)
RISK GROUPING

- **D’Amico Criteria (USA)**
  - Low risk
    - PSA <10, Gleason <7, Stage <T2b,c
  - Intermediate Risk
    - 1 risk factor
    - PSA 10-15, Gleason ≥ 7, Stage > T2b,c
  - High Risk
    - > 2 risk factors and a
    - II PSA >15

- **NCCN Criteria (British)**
  - Low Risk
    - PSA <10, Gleason <7, Clinical Stage <T2b
  - Intermediate Risk
    - 1 factor
    - PSA 10-20, Gleason ≥ 7, Stage >T2b,c
  - High Risk
    - >2 factors and all PSA > 20
DOSE ESCALATION

- High dose (dose escalated) EBRT-conformal/IMRT
- EBRT with HDR brachytherapy boost
- Brachytherapy with intraprostatic boost
BRACHYTHERAPY ELIGIBILITY

- **Is it a Practical Treatment?**
  - Consent
  - Pubic arch acceptable
  - Able to hyperflex hips
  - Life expectancy > 10 yrs
  - Hip replacements (*poor CT visualisation, req MR*)
  - Obesity

- **Is Patient at Increased Risk of Complications?**
  - Anticoagulation
  - TURP (*size of TURP defect*)
  - AUA < 12, Flow rate > 12 (catheter risk)
  - Chronic prostatitis
HOW DO WE DO IT?

Delivery of brachytherapy using fine needles placed in the prostate
PRE-OP

- Volume study – awake patient, bowel prep
- Prostate volume, (ellipsoid + calculated)
- Correlation with CT and MR volume QA
- Pubic arch
- Anaesthetic assessment
VOLUME STUDY
**VOLUME STUDY**

- Images captured from base to apex at 5mm intervals
- Measurements taken and documented: width, height, length and volume
- Risk of pubic arch interference observed and documented
- Decision made as to suitability for treatment
- If suitable RFA consent and questionnaire filled out
- If not suitable, further discussion with patient. Possible extra 3 months of hormones and re-assess.
PRE-IMPLANT DIET AND BOWEL PREP

- Patient information sheet
- Low fibre diet commenced 3 days before implant
- Clear fluid diet commenced 1 day before implant
- Picolax bowel prep taken day before implant
- Fast from midnight day before implant
Patient arrives at 7.00am for enema.

Anaesthetics team arrives at 7.30am to set up their equipment and speak to patient.

Procedure starts at 8.00am.

Patient is anaesthetised (GA).

Stirrups are attached to the couch and legs are positioned according to documentation recorded at the volume study.
IMPLANT PROCEDURE

- Skin prepped and sterile drapes placed.
- Catheter inserted into bladder and contrast injected into bladder.
- C-arm with sterile cover positioned over patient.
- Stepper mounted on couch.
IMPLANT PROCEDURE CONTINUED...

- U/S probe is inserted into rectum.
- Stepper position optimised.
- U/S used to identify prostate from base to apex.
- Measurements documented on theatre worksheet.
Gold Seed Fiducial markers inserted. One at base of prostate, one at mid gland and one at apex.

Needle placement commences with 2 central stabilising needles.

C-arm used to verify placement of needles in relation to bladder.
IMPLANT PROCEDURE CONTINUED...

- Needle placement continues working from ant to post and the periphery of prostate before interior.
IMPLANT PROCEDURE

- Template sutured to perineum.
- End of bed replaced and legs taken out of stirrups.
- Charnley pillow placed between legs.
- Patient woken up from anaesthetic and taken to recovery where bladder irrigation is commenced.
CT SIM

- CT markers inserted.

- Bladder filling: 90ml of water + 10ml contrast.

- CT protocol – 1mm reconstruction over tips of needles.
PLANNING

- Contouring: PTV, bladder wall, rectal wall, urethra
- Needle reconstruction
PLANNING CONTINUED

- Plan optimisation (IPSA)
PLANNING CONTINUED

- Plan evaluation
3 Treatments over 2 days

Day 1
- Implantation procedure
- Planning
- Treatment 1

Day 2
- CT scan and replan
- Treatment 2
- Treatment 3
- Implant removed under sedation
- Catheter remains until bleeding settled

Day 3
- Discharge when urine clear and able to urinate without a catheter and passed bowel motion
POST OP

- Patient is not radioactive
- Low fibre diet to avoid bowel motions
- Pain relief - endone
- Country patients – bladder obstruction risk
- Followed by 46Gy EBRT
POST IMPLANT CARE

- Flomaxtra 0.4mg 1 month
- NSAID for 5-10 days
- Simple analgesia prn
- Norfloxacin 5 days (10 if diabetic)
- Hormones-continue if high risk
- Ural for dysuria (NSAID)
- Cranberry juice/tomatoes/orange juice acidity can exacerbate dysuria
- EBRT 46Gy/23f within 2 weeks
## HDR TREATMENT OUTCOMES

<table>
<thead>
<tr>
<th>Study</th>
<th>No.</th>
<th>Median PSA</th>
<th>Median Fup</th>
<th>bNED(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mate 1998 (Seattle)</td>
<td>104</td>
<td>12.9</td>
<td>45mo</td>
<td>iPSA&lt;20:84% iPSA&gt;20:50%</td>
</tr>
<tr>
<td>Ealau (Seattle)</td>
<td>104</td>
<td>12.9</td>
<td>6.3yr</td>
<td>OAS5 83% OAS 10 77%</td>
</tr>
<tr>
<td>Kestin</td>
<td>161</td>
<td>9.9</td>
<td>2.5yr</td>
<td>83%</td>
</tr>
<tr>
<td>Borghede 1997</td>
<td>50</td>
<td>NR</td>
<td>45mo</td>
<td>84% (18 mo)</td>
</tr>
<tr>
<td>Galalae 2002</td>
<td>144</td>
<td>12.15 mean25.6</td>
<td>8yr</td>
<td>69%(10yr) 74% (5yr)</td>
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</tbody>
</table>
ACUTE TOXICITY HDR BRACHYTHERAPY

- Pain, bleeding, urinary retention (10%)
- EBRT component
- Proctitis rare, dysuria, frequency, urgency
- Acute post RT symptoms
- Rectal symptoms settle early
- Urinary symptoms take 6-12 months to settle
# HDR Late Toxicity

<table>
<thead>
<tr>
<th>Study</th>
<th>GI</th>
<th>GU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mate (1998)</td>
<td>2% G2</td>
<td>6.7% urethral stricture</td>
</tr>
<tr>
<td>Kestin (2000)</td>
<td>No G3</td>
<td>4% stricture</td>
</tr>
<tr>
<td>Galalae (2002)</td>
<td>4% G3</td>
<td>2% G3 cystitis</td>
</tr>
<tr>
<td></td>
<td>7% G2</td>
<td>4% G2</td>
</tr>
<tr>
<td></td>
<td>10% G1</td>
<td>12% G1</td>
</tr>
<tr>
<td>Borhegde (1997)</td>
<td>8% G2 proctitis</td>
<td>12% G1-3</td>
</tr>
<tr>
<td></td>
<td>No G3</td>
<td>0 urethral strictures</td>
</tr>
</tbody>
</table>
LONG TERM

- Dysuria
- Bowels
- Perineal nerve function
- Impotence