Teaching LDR Prostate Brachytherapy

Prostate Cancer Institute
NUI Galway experience

Prof. Frank Sullivan
UK Ireland Brachy User Group
May 2017
Training and physical simulation

- No requirements in UK and Ireland only recommendations for brachytherapy training
  - American Council of Graduate Medical Education (ACGME) requires only that residents treat 5 interstitial brachytherapy cases (non-specific) to graduate from a radiation oncology
- No specific competency based model to evaluate performance
- Surgical practice requires significant cognitive functions and high skill level to ensure safety of patient care.
  - Evidence of the benefit of simulation on performance quality and of skill improvement using simulation training in medicine

 PCI Prostate Brachytherapy Programme (initiated at GUH)

- 2007-2015
- Multidisciplinary/inter-departmental effort
- Implanted 1400 patients to date (GUH+GC+HMC)
- Evidenced based approach (Stone & Stock et al)
- Single operator (FS) 2007-2012
- Graduated first national prostate brachytherapy Fellow (Dr. Jam Khalid)
- Run ahead for national programme
Technique and toxicities at a glance

• Outpatient/Minimally invasive
  – Under GA or spinal
  – 30-60 minutes (2-4 per session)
• MRI all patients
• LDR (Stone and Stock)
  – Iodine 125 seeds
  – T1/2 = 60 days
  – 1 Year life of implant
• Home same day/following
• 3-6 months urinary bother
• <5% any catheter use (mostly ISC up to 1 year)
• 0-1% incontinence
• 0.1% serious rectal injury
• 30% ED
RISK STRATIFICATION DEFINITIONS:

D’Amico:
Low Risk: cT1c-cT2a and Gleason</=6 and iPSA </=10
Intermediate Risk: >/=T2c and/or Gleason7 and/or iPSA >/=10 - </=20
High Risk: >/=cT2c and/or Gleason 8-10 and/or PSA>20

Galway (Modified D’Amico):
Low Risk: cT1c-cT2a and Gleason</=6 and iPSA </=10
Low Intermediate Risk: Gleason3+4=7 or iPSA >/=10 - </=20
High Intermediate Risk: Gleason 4+3=7 and/or iPSA >/=15 - </=20
High Risk: >/=cT2c and/or Gleason 8-10 and/or PSA>20
## Galway Treatment Selection

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<tr>
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<th>Low risk</th>
<th>Low intermediate</th>
<th>High intermediate</th>
<th>High</th>
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<tbody>
<tr>
<td>RRP</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>EBRT alone</td>
<td>+</td>
<td>+/-</td>
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<td>EBRT/ADT</td>
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<td>Brachy alone</td>
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<td>EBRT/Brachy</td>
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<tr>
<td>Triple therapy</td>
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EBRT = 74-78 Gy to small fields (6-7 field CRT or IMRT)
Brachy = LDR Iodine125, 160 Gy to the GTV
EBRT/Brachy = 46Gy CRT plus 106 Gy brachy boost
Triple therapy ADT duration 3-12 months
Salvage BT = 120Gy
National expansion: principles

- Choose a single/uniform technique (Stock/Stone, intraoperative planning)
- Established, evidence based, peer reviewed
- Establish a structured mentoring programme
- Buy in from colleagues and NCCP
- Develop a QA and QI programme
- Audit, refine, change
- Publish
QA foundations... into the void

- UK colleagues established UK and Ireland QA committee

Generated Guideline template
- International best practice
- Minimum requirements for team member, hospitals
- Mentoring and credentialing standards

- Guidelines adopted by UK Faculty Radiology 2012
- Template for Irish Prostate Brachy Guideline (NCCP)

Guidelines Committee
Robert Leith, Consultant Clinical Oncologist (Chair)
Frank Sullivan, Professor and Chairman, Radiation Oncology
James Wylie, Consultant Clinical Oncologist
Peter Bowes, Consultant Physicist
Sarah Aldridge, Consultant Physicist
Henry Taylor, Consultant Clinical Oncologist
Training requirements

Training should be undertaken that is appropriate to the role of the individual in the team. It is the responsibility of the lead radiation oncologist and MPE to ensure that all staff within their group has undergone the appropriate training.

Clinical oncologist

The clinical oncologist should undergo a period of supervised cases before performing the procedure solo. The recommended training of the clinical oncologist is as follows:

- Mentored planning cases: 5
- Observation cases: 5
- Mentored implant cases: 10
- Monitored solo cases: 10.

Post-implant dosimetry of the solo cases should be assessed by the mentoring team. Established brachytherapy centres should adopt these recommendations for new members of staff. Proctors involved in mentoring should have completed 100 cases in the last three years and have experience in the specific technique being mentored.
About Prostate Seed Brachytherapy

and what it means for you
Leadership Structure National Prostate Seed Programme

NCCP Director
Dr Susan O’Reilly

National Radiation Oncology Network Manager
Ms Ann Doherty

CUH
Dr Paul Kelly
- RO #2
  Site Specialised Prostate

GUH
Prof Frank Sullivan
- RO #2
  Site Specialised Prostate

SLRON
Dr Gerard McVey
- RO #2
  Site Specialised Prostate

National Seed Programme Lead
Prof Frank Sullivan
Launch

Galway leads the way in high-tech treatment for prostate cancer

Increased numbers put pressure on Galway rapid-access clinic

Launching a new, low-cost technique at Galway University Hospital (GUH) is likely to boost the number of men receiving treatment for prostate cancer. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months. A new, low-cost technique, known as urological brachytherapy, has been successfully rolled out in GUH in recent months.

PROSTATE SERVICE LAUNCHED: Prof Frank Sullivan, Consultant Radiation Oncologist and Head Clinician, Department of Radiation Oncology, Galway University Hospitals (GUH), Peter Keane, who received Prostate Brachytherapy treatment at GUH in 2010, and Dr Susan O'Reilly, National Director of the National Cancer Control Programme, at the launch of the National Prostate Brachytherapy Service at GUH on Monday. Photo: Joe Travers
Programme design:

- Single technique, Stock & Stone
- Single mentor
- Real time intra-operative dosimetry
- UK & Ireland Guidelines
- Trainee didactics and planning 10 cases
- Trainee observe 10 ‘mentor’ cases
- Trainee performs 10 cases
- QA reporting
National expansion outcomes:

- Hospital sites: 1 to 3
- Initiated April 2012 to date (<2 years)
- Patients implanted in programme n=201
- QA programme established
- MD’s trained:
  - 4 Consultant/Attending level
  - 3 in training
Programme highlights (2012-2015)

- Consultants interested 2012
- Steering committee appointed (NCCP) Kiliam McGrane (Chair)
  - Juliet Kelly RIP
- Didactic training sessions (2012)
  - Site visit to SLH and CUH (equipment/physics)
- Consultants “graduated” (4)
  - SLH x 2
  - CUH x 1
  - GUH x 1
  - SpR x 2
  - 133 Patients implanted (2013)
- Onsite training 10/10/10 per consultant
- Post implant dosimetry review
- Quarterly QA national committee meeting (2015)
Technical aspects of teaching LDR-PBT

• Components
• Didactic: evidence, case selection, post treatment care
• Need for TRUS ultrasound training pre op (volume assessment)
• Need for hands on operative experience
  – Equipment, choice, utilization
  – Patient set up
  – Manual handling skills (Mick, needles, template, stepper)
  – TRUS skills intra operative
  – Dosimetry set up/image registration (Variseed)
  – Dosimetry and planning aspects
  – Audit
  – Difficult cases?
  – Masterclass?
## Quality comparison of 3 centres (2013 audit)

<table>
<thead>
<tr>
<th></th>
<th>Year 2013</th>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Hospital C</th>
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<tbody>
<tr>
<td>No. of Cases</td>
<td></td>
<td>94</td>
<td>58</td>
<td>31</td>
</tr>
<tr>
<td>Mono-Boost-Salvage</td>
<td></td>
<td>58 - 32 - 4</td>
<td>54 - 4 - 0</td>
<td>25 - 6 - 0</td>
</tr>
<tr>
<td>Prostate - D90 Gy</td>
<td></td>
<td>176.5 ± 6.2</td>
<td>167.8 ± 6.9</td>
<td>175.5 ± 6.4</td>
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<tr>
<td></td>
<td>(mean ± SD)</td>
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<tr>
<td>Prostate - V100 %</td>
<td></td>
<td>96.6 ± 1.7</td>
<td>92.4 ± 2.3</td>
<td>94.9 ± 2.1</td>
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<tr>
<td></td>
<td>(mean ± SD)</td>
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<tr>
<td>Urethra - D30 Gy</td>
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<td>178.7 ± 8.4</td>
<td>177.4 ± 3.8</td>
<td>182.2 ± 11.9</td>
</tr>
<tr>
<td></td>
<td>(mean ± SD)</td>
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Comparison of 3 centres (2013 audit)
Prostate Volume vs. Total Activity

- Hospital A
- Hospital B
- Hospital C

Prostate Volume vs. Total Activity (MBq)

Graph showing the relationship between prostate volume and total activity for different hospitals.
Proctored

$V_{100} = 95.03\%$

$D_{90}=175.79\text{Gy}$

$D_{u30}=178.57\text{Gy}$

Proctored

$V_{100} = 96.155$

$D_{90}=173.16\text{Gy}$

$D_{u30}=178.415\text{Gy}$

Solo

$V_{100} = 92.61\%$

$D_{90}=169.15\text{Gy}$

$D_{u30}=177.73\text{Gy}$

Solo

$V_{100} = 90.31\%$

$D_{90}=160.77\text{Gy}$

$D_{u30}=179.85\text{Gy}$
% Cases where Implant V100 Target of 95% met

% Cases where D90 Target of 160Gy was met at Implant (Mono Only)

Avg Variance to Implant V100 target of 95%

Avg Variance to D90 target of 160Gy
The future...
High Quality Brachytherapy Procedure

Education and Training

Gamification

Clinically Relevant Devices

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Why use complex anthropomorphic models for training?

• Medical Education

• There are four overall benefits to using medical simulators as a component of medical training:

  i. Improved educational experience
  ii. Increased patient safety
  iii. Cost efficiency
  iv. Ongoing training opportunities
Current Training Device

CIRS training Ultrasound CIRS phantom image

Ultrasound prostate image

IRISH SOCIETY OF UROLOGY
Complex anthropomorphic models for training?

• Through use of complex anthropomorphic models:

  • Operator gets hands-on training
    - self-directed learning
    - unpressurised environment
    - improve their clinical competency in live-patient scanning
    - Operator’s improves their ultrasound scanning skills
    - hand-eye coordination
    - Operator improves their ability to optimise the image quality

• Project: 3D print individual prostate model for comparison with achieved vs ‘training’ implant, using live plan US Variseed programme
  • Andrea Doyle, FS et al
Acknowledgements

NCCP National Prostate Brachytherapy Team (Dr. Susan O’Reilly)

GUH Department of Radiation Oncology
Management Team GUH: Juliet kelly
Ger O’Boyle RN
Sinead Carr RN
Mary Hodkinson RN
Anysja Zuchora Physics
Margaret Moore Physics
Louise Fahy Physics
Dr. Jam Khalid Brachytherapy Fellow

Drs. Cormac Small, Maeve Pomeroy, Joe Martin
Oncura (John Alden, Saheed Rashid, Jennifer Uribe)
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Sarah Madden CRF
Amy Burke Laboratory
Dr. Teresa McHale Pathology