Establishing, developing and maintaining training in HDR

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Christie NHS Trust
Multi-tiered training in HDR – ideally!

- Promote better awareness amongst potential referrers about suitable patients for HDR prostate brachytherapy
- Recognise and address individual training needs of multi-skilled HDR brachytherapy teams
- Maintaining competencies
- QA processes
“Training” referrers
Results: Biochemical PFS
Intent-to-treat analysis of the primary endpoint

<table>
<thead>
<tr>
<th>Kaplan-Meier (95% CI)</th>
<th>Randomization (N=398)</th>
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<tbody>
<tr>
<td></td>
<td>DE-EBRT (N=200)</td>
</tr>
<tr>
<td></td>
<td>LDR-PB (N=198)</td>
</tr>
<tr>
<td>5 yr</td>
<td>83.8 (±5.6)</td>
</tr>
<tr>
<td>7 yr</td>
<td>75.0 (±7.2)</td>
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<tr>
<td>9 yr</td>
<td>62.4 (±9.8)</td>
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</tbody>
</table>

time since first LHRH injection (yrs)
Training referrers- NICE guidance 2014

1.3.22

• Consider high-dose rate brachytherapy in combination with external beam radiotherapy for men with intermediate- and high-risk localised prostate cancer. [new 2014]

1.3.23

• Do not offer brachytherapy alone to men with high-risk localised prostate cancer. [2008]
Other guidance

**EAU 2016**
- no specific recommendation to HDR - references GEC/ESTRO guideline

**AUA 2017**
- no specific recommendation about HDR
  - Clinicians may offer external beam radiotherapy or brachytherapy alone or in combination for favorable intermediate-risk localized prostate cancer.
  - Clinicians should offer 24-36 months of ADT as an adjunct to either external beam radiotherapy alone or external beam radiotherapy combined with brachytherapy to patients electing radiotherapy for high-risk localized prostate cancer.
ASCO guidelines - March 2017

• Intermediate risk CaP
  • EBRT with or without androgen-deprivation therapy (ADT), brachytherapy boost (LDR or high–dose rate [HDR]) should be offered to eligible patients.

• High risk CaP
  • For patients with high-risk prostate cancer receiving EBRT and ADT, brachytherapy boost (LDR or HDR) should be offered to eligible patients.
Training a multi-disciplinary HDR team

- Clinical Oncologist (s)
- Medical Physicist (s)
- Brachytherapy radiographer (s) and dosimetrist (s)
- Consultant Anaesthetist (s)
- Theatre nurses
- Data manager
- Scheduler
Multi-disciplinary HDR team training needs

• Clinical Oncologist

• Needle placement straightforward and pre-planned
• Dose fractionation schedules/normal tissue tolerances easily available (GEC ESTRO, ABS)
• But prostate and normal tissue contouring (esp urethra) with TRUS can be more challenging than LDR
  • Significant artefact created by metal needles
  • Further image degradation by haemorrhage and/or hitching of gland causing loss of contact with u/s
  • Arch (must less a problem than LDR)
• Dose constraints to prostate and normal tissues rarely not met
Multi-disciplinary HDR team training needs

• Ultrasound acquisition

  • Initial set up
  • Optimising image acquisition initially and throughout procedure (haemorrhage, needle artefact, hitching)
  • Difficulty defining base as procedure progresses due to oedema, haemorrhage and artefact
  • Assessing arch
Multi-disciplinary HDR team training needs

• Planners/physicists
  • Familiar with planning software
  • Understanding of optimal needle placement
  • Needle tracking and reconstruction
  • Plan optimisation and evaluation
  • Servicing, calibration and QA of all equipment
  • Demonstrate comprehensive QA of the whole process including imaging, planning, delivery and verification

• Theatre nursing team
  • Initial procedures 3.5 hours in a high lithotomy position
  • Attention to pressure areas
  • DVT prophylaxis
Training of the multi-disciplinary HDR team

• At present most UK HDR teams have developed out of teams with extensive LDR experience and already have core brachytherapy skills

• Relies heavily on in-house training/mentorship of new colleagues

• In the future stand alone HDR teams could develop who will need training
  • Site visits
  • Dedicated courses
  • Mentorship
# In-house training

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Subject</th>
<th>Tutor</th>
</tr>
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<tbody>
<tr>
<td>Monday 8/2/16</td>
<td>pm</td>
<td>Overview whole process - watch implant + treatment</td>
<td>DAW/LL</td>
</tr>
</tbody>
</table>
| Tuesday 9th   | 9:30am | Oncentra Prostate overview  
1) Equipment set up, Image acquisition, Contouring  
Needle positioning  
Pre-planning | LL    |
| Wednesday 10th| pm   | Repeat/Practice 1                                            | DAW   |
| Thursday      | 9am  | 2) Needle tracking & reconstruction                          | LL    |
| Friday        | PM   | Practice needle reconstruction                                |       |
| Monday 15th   | pm   | Overview whole process - watch implant + treatment           |       |
| Tuesday       | 1:00pm | Practice pre planning                                        | DAW   |
| Friday        | 1:00pm | Practice needle reconstruction                                | DAW   |
| Monday 29th   | pm   | Overview whole process - watch implant + treatment           |       |
| Tuesday       | 3) Optimisation and plan evaluation                          | LL    |
| Thursday      | 1:00pm | Practice optimisation                                        | LL    |
| Friday        | 9am  | Practice 1+2+3                                              | DAW   |
| Monday 6th    | pm   | Overview whole process- watch implant + treatment            |       |
| Thursday      | am   | Go through whole procedure - Jelly                           | DAW   |
| Monday        | am   | Assist /do implant                                           |       |
| Monday        | am   | Assist /do implant                                           |       |
| Monday        | am   | Assist /do implant                                           |       |
Brachytherapy for Prostate Cancer

29 June - 1 July 2017
Brussels, Belgium

TARGET GROUP
This course is aimed at all those who may be part of a prostate brachytherapy team and for those wishing to up-skill in prostate brachytherapy such as: urologists, radiation oncologists, radiation therapists (RTTs) and other specialists.

COURSE AIM
- Provide an overview of the epidemiology and treatment options for localized prostate cancer
- Discuss patient selection and contra-indications for brachytherapy
- Provide an overview of the techniques, equipment and staffing for a prostate brachytherapy unit, including the physical background and regulatory requirements
- Give an overview of the results, side effects and their management
- Discuss new developments relevant to brachytherapy in imaging, real-time therapy and salvage.

COURSE CONTENT
This course aims to provide an overview on the epidemiology and treatment options for localized prostate cancer and gives an adequate introduction to brachytherapy. Patient selection for both HDR and LDR implants will be discussed with treatment indications and contra-indications. A review of the equipment and staffing for a brachytherapy unit is included in the programme for those yet to embark on this area of activity. Practical examples of grade-dose-voltage in the treatment planning, different implant techniques and post implant planning are presented in the context of videos and interactive discussions between participants and the teaching staff. New approaches are discussed (including salvage brachytherapy) and between brachytherapy and other treatments available for prostate cancer.

PREREQUISITES
Before commencing this course, participants should:
- Have a good understanding of the basic concepts of prostate cancer, pathology, diagnosis and staging
- Read the published UKCSP guidelines in LDR and HDR prostate brachytherapy
- Complete the FALCON exercise which is distributed prior to the course.

TEACHING METHODS
- 13 hours of lectures
- 1 hour of anatomy
- 2 hours of practical workshop
- 3 hours of interactive discussions

EDUCATIONAL WORKSHOP
Real-time image guided HDR brachytherapy for prostate cancer
St James’s Institute of Oncology, Leeds, UK, 6-7 December 2016

St James’s Institute of Oncology
Support by:
American Brachytherapy Society consensus guidelines for high-dose-rate prostate brachytherapy

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ABSTRACT

PURPOSE: A well-established body of literature supports the use of high dose-rate (HDR) brachytherapy as definitive treatment for localized prostate cancer. Most of the articles describe HDR as a boost with adjuvant external beam radiation, but there is a growing experience with HDR monotherapy.

METHODS AND MATERIALS: The American Brachytherapy Society has convened a group of expert practitioners and physicians to develop guidelines for the use of HDR in the management of prostate cancer. This involved an extensive literature review and input from an expert panel.

RESULTS: Despite a wide variation in dose and fractionation reported, HDR brachytherapy provides bioclinical control rates of 85–90%, 81–100%, and 45–95% for low-, intermediate-, and high-risk prostate cancers, respectively. Severe toxicity is rare, with most authors reporting less than 5% Grade 3 or higher toxicity. Careful attention to patient evaluation for appropriate patient selection, meticulous technique, treatment planning, and delivery are essential for successful treatment.

CONCLUSION: The clinical outcomes for HDR are excellent, with high rates of bioclinical control and low morbidity. HDR monotherapy, both for primary treatment and salvage, are promising treatment modalities. © 2012 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

Keywords: High-dose-rate brachytherapy; Prostate cancer; American Brachytherapy Society; Guidelines

Introduction

There is mounting evidence that the outcome of patients with localized prostate cancer is related directly to local tumor control, even for patients with high-risk features (1). For example, the risk of distant metastases is closely tied to local control (2). Dose-escalation strategies, particularly with intermediate- and high-risk prostate cancer, have improved local control, and higher doses of radiation, whether with brachytherapy, external beam radiation, or a combination, have consistently demonstrated improved outcomes (2–11).

High-dose-rate (HDR) brachytherapy is a vehicle for absolute and radiobiologic dose escalation that has resolved in high tumor control and low toxicity rates. As with all advanced technology, meticulous treatment planning and carefully executed methods are essential to the accurate delivery of high-dose radiation to complex volumes such as the prostate and seminal vesicles while avoiding excessive dose to the rectum, bladder, and urethra. The following

Brachytherapy using both permanent seed implants and temporary high dose-rate (HDR) afterloading technologies play an important role in the treatment of localized and locally advanced prostate cancer. In recent years there has been a substantial increase in the use of HDR brachytherapy (HDRBT) most commonly as a dose escalating boost delivered in combination with external beam radiotherapy. There is also increasing experience in HDRBT used alone to deliver a radical dose of radiation. Recommendations on temporary transperineal prostate brachytherapy, were first published on behalf of the GEC/ESTRO-EBU Prostate Brachytherapy Group (PRMATE) in 2001 (1); an update of these recommendations is now presented in this paper.

The use of image-guided needle or needle placement enables accurate implantation which can be extended to include extracapsular disease and seminal vesicles.

The use of a single source for all patients using a multipurpose facility makes HDRBT highly cost-effective.

Disadvantages of HDRBT include the use of a fractionated schedule which results in more acute side effects and logistic issues related to quality assurance across several radiation exposures. To allow relevant comparative information on clinical results, it is essential that patient data and treatment parameters are described in a similar way for permanent and for temporary implants as defined in these guidelines.

Development in remote afterloading brachytherapy (temporarly RT) technology and dedicated treatment planning systems as well as transrectal ultrasonography have resulted in highly sophisticated tools being available in the field of interstitial
Core qualities of the team

• Time efficient and competent
• Poor initial needle placement can often be optimised sufficiently to still produce an acceptable plan meeting all dose constraints
• Inaccurate needle reconstruction, inaccurate tip recognition, excessive dwell times lead to poor plans with potential hot spots
• Biggest limitation with real-time HDR is TIME
  • Time and motion studies throughout the procedure. Adapt a lean model
  • Inherent qualities of “quick” planners/implanters
    • Better communicators, intuitive, decisive
  • Off line training +++
  • Challenge anaesthetic “rituals”
Quality assurance

• Less operator dependent than LDR but still liable to systematic and random errors
• Less training/experience required to deliver HDR boost
• Do teams delivering HDR monotherapy needed additional training?
• Test cases?
• Agreed mentorship of early cases?
• Minimum no. of cases per clinician to maintain competency
The role and development of afterloading brachytherapy services in the United Kingdom

Quality assurance practice guidelines for transperineal LDR permanent seed brachytherapy of prostate cancer

Board of the Faculty of Clinical Oncology
The Royal College of Radiologists
Conclusion

• HDR like LDR requires a multi-professional team
• Need to recognise the individual needs of the team and address training accordingly
• In-house training within large teams works well
• In the future stand alone HDR brachytherapy teams may develop and need to consider how such teams can be supported in their training
  • Training courses
  • Mentorship
• Is there a need for an HDR prostate brachytherapy QA document