Understanding HDR Brachytherapy

Friday, May 18 • 2:45–4 pm

Note one action you’ll take after attending this session: ____________________________________________

Lorry Lewis, RN, OCN
RN
Moffitt Cancer Center
lorry.lewis@moffitt.org

Michelle Levinson, RN, BSN
Staff RN/Radiation Oncology Procedures
Moffitt Cancer Center
michelle.levinson@moffitt.org

Key Session Takeaways
1. High-dose radiation (HDR) brachytherapy is a method to treat many types of cancer with a special type of radiation given internally and is sometimes used in conjunction with external beam radiation and/or chemotherapy.

2. HDR brachytherapy utilizes many type of devices to deliver treatment, such as interstitial catheters, intracavitary applicators, and surface molds.

3. HDR brachytherapy delivers high doses of radiation to the target area while minimizing the dose to surrounding organs, reducing short- and long-term side effects normally associated with external beam radiation.
Understanding HDR Brachytherapy

Lorry Lewis, RN, OCN
Michelle Levinson, RN, BSN
Department of Radiation Oncology
Moffitt Cancer Center

Disclosures

The original signed permission for pictures included in this presentation are being held at Moffitt Cancer Center 12902 Magnolia Drive, Tampa, Florida 33612, and can be obtained, if needed, upon request.
Objectives

- Define brachytherapy
- Explain brachytherapy dosing and application
- Discuss nursing plan of care for patients undergoing brachytherapy
- Compare pre and post procedural nursing care for the brachytherapy patient

What is “Brachytherapy”?

- Type of localized radiotherapy given internally
- Kills cancer cells and shrinks tumors
- Can be given as low (LDR) or high dose rate (HDR)
- Can be given as monotherapy or dual therapy
- Temporary (catheters, applicators, cylinders, molds) or permanent (seeds/mesh)
- Radioactive seed(s)
- The tumor (or cancerous tissue) can be treated with very high doses while reducing the risk of side effects

Brachytherapy Indications

- Cervical
- Prostate, penile, urethral
- Endometrial (uterus)
- Vagina
- Sarcoma
- Head And Neck
- Lung
- GI cancers (esophagus, rectum, gallbladder and biliary)
- Breast
- Eye
- Skin
- Brain
External Beam Radiation Therapy

Local treatment when a machine outside your body aims radiation beams at cancer cells

- High energy X-rays which produces ionizing radiation
- Cures, stops or slows the growth of cancer cells
- Takes days to weeks of treatment before cancer cells start to die-continues for weeks or months after treatment ends
- May be combined with surgery, chemotherapy and/or brachytherapy
- Usually given Monday through Friday - lasts for days or weeks
- Takes several days to prepare using a CT, MRI and PET Scan Simulation (planning session)

Radiation Terms

- Iridium-192: sealed radiation source most commonly used in brachytherapy. Short half-life of 74 days (sources typically replaced every three to four months)
- Linear accelerator: A machine that produces photons and delivers EBRT
- Photons: A tiny particle of light or electromagnetic radiation produced by a linear accelerator for EBRT
- Fraction: One treatment session of EBRT or HDR
- cGray (cGy): metric measurement unit of absorbed radiation dose of ionizing radiation
- Boost: An extra dose of radiation given after initial course of EBRT
- OTV: On treatment visit-weekly visit with a radiation oncologist
- Simulation: CT/MRI/PET images used to plan area to be treated

What is High Dose Rate?

Measurement of the speed at which a patient is exposed to radiation

High Dose Rate delivers the dose at $\leq 1200$ cGray/hour

Low Dose Rate delivers the dose at $40-200$ cGray/hour
HDR Treatment Sources are “Radionuclides”

1. Iridium 192 (78 day half life)
2. Palladium103
3. Cesium 131
4. Iodine 125

Biological Effects of HDR Radiotherapy

- Dose distribution
- Treated volume
- Dose rate
- Fractionation
- Treatment duration (seconds to minutes)

Brachytherapy Types

- Interstitial
- Contact
  - Intracavitary (body cavity)
  - Intraluminal (in an organ lumen)
  - Surface (skin)
Brachytherapy Devices

1. Interstitial: prostate, GYN, sarcoma, head and neck, rectal, breast
2. Intracavitary: vaginal cylinder, tandem and ring, tandem and ovoid, vienna
3. Intraluminal: bronchial, esophageal, bile duct
4. Molds: skin

Afterloader

- A computer-controlled machine which houses a tiny radioactive seed on a wire in a non-radioactive capsule
- During treatment, the radioactive source is driven remotely under computer control from the afterloader, one by one, through each catheter or into the applicator or cylinder
- Specialized software is used to calculate the source positions and the amount of time needed to deliver the radiation dose to the tumor
- A camera and intercom are used to observe and communicate with the patient

Vaginal Cylinder

Typically adjuvant treatment for endometrial cancer (s/p hysterectomy) directed at the vaginal cuff to decrease risk of recurrence
Tandem and Ring Applicator

Used in cervical cancer as boost treatment – s/p EBRT

Tandem and Ovoid Applicator

Applicators are chosen based on anatomy

Vienna Applicator

Used with larger residual tumors when tumor invades the parametria
GYN Interstitial Implant

Interstitial Examples
Prostate

Interstitial Examples
Lip, buccal mucosa, oral tongue, base of tongue, palate
Typical Brachytherapy Treatment Schedules

- **VAGINAL CYLINDER**: Three fractions / 3 weeks
- **CERVIX**: 5 fractions twice weekly / 2.5 weeks
- **INTERSTITIAL IMPLANTS**: 5 fractions / 3 days
- **PROSTATE HDR**: 2 fractions / 3-4 weeks*
- **GI**: 2-3 fractions / 2 weeks
- **LUNG**: 3-5 fractions / 1-3 weeks
- **SARCOMA**: 10 fractions / 5 days*

3D Treatment Planning

3D projection of anatomy with 100% dose cloud surrounding prostate

HDR Prostate Case Study

- Age 60
- Low Risk Gleason 6
- PSA 4.2 ng/ml (<5.0)
- Co-morbidities (HTN, GERD)
- Prostate volume 30cc (<60cc)
- Colonoscopy (rule out cancer, inflammatory etiologies such as Crohn’s, colitis, etc.)
- AUA < 10
Prostate Brachytherapy NCCN Guidelines

- Monotherapy: HDR – 1 or 2 procedures
  - Low risk
- Dual Therapy: EBRT + HDR (+/- hormones)
  - Intermediate-risk, high-risk, very high risk

Clinic Radiation Nurse Role

- Patient education (over weeks-anxiety)
- Care coordination with med/surg onc, PCP, cardiologist, social work, supportive care, research, PT/OT, nutrition
- Cardiac/medical clearance
- Support (previous patient advocates)

Pre-op Prostate HDR Treatment

- PAT (pre-admission testing with anesthesia)
- Radiation oncology - ARNP consult
- Medication recommendations
- NPO guidelines
- Bowel prep
  - Smoking cessation
- Skins assessment
- Social concerns
- Lab work
- Cardiac/medical clearance
Prostate HDR Brachytherapy

- Given in 1-6 fractions, sometimes as outpatient in 1 or 2 fractions per visit, or can be a 2 day inpatient stay, given twice daily.
- Under general or spinal anesthesia, interstitial catheters are inserted using transrectal ultrasound guidance.
- Perineal template used to guide placement.
- 14-18 catheters are placed.
- Catheter placement confirmation and treatment planning can be CT, MRI and/or ultrasound based.

Patient Positioning

Intra-op Transrectal Ultrasound
Perineal Template
Planning Phase

Nursing Assessment/Considerations
- Pain
- Anxiety/restlessness
- Patient positioning
- Past medical history
- Respiratory depression
- Foley securement and output
- Bleeding
- Circulation – SCD’s

Brachytherapy Planning
- Physician
- Dosimetrist
- Physicist
- Specialized software
Post Implant Removal

- Recovery
- Urination
- Ice pack please!!

Prostate HDR Discharge Instructions

- Symptom management
  - Perineal pain/bruising – ice pack, pain medications
  - Urinary symptoms:
    - hematuria
    - frequency/dysuria
    - retention
- Diet recommendations – avoid bladder irritants
- Activity restrictions/recommendations
- When to seek medical attention:
  - fever > 100.5
  - severe pain
  - inability to urinate

Prostate HDR Follow Up

- 3 weeks for post procedure evaluation
- Every 3 months x 2 years-with PSA, total and free testosterone levels
- Every 6 months for 3 years
- Survivorship after 5 years
Case Study #2 – Cervix Cancer

- 57 year old newly diagnosed with locally advanced IIB SCC cervix, no adenopathy or mets on PET/CT, however, MRI demonstrates left parametrial invasion
- Treatment recommendations include definitive chemoradiotherapy, one week boost to L parametria, followed by 5 fractions of intracavitary or interstitial brachytherapy HDR implant (depending on tumor response to EBRT)

Clinic Nursing Role

- EBRT for 5 weeks (plus 1 week “boost”)
- OTV’s weekly (weekly patient education)
- Skin care
- Side effect management
- Nutrition and/or dietary consult
- Care coordination
- Social concerns
- Symptom management - labs PRN
- Anxiety
- Pain
- Bleeding
- Disability/FMLA

Cervical HDR Brachytherapy Schedule

- Patients begin with daily external beam radiation, with weekly cisplatin (radio-sensitizer)
- Typically receive 5-6 weeks total treatment (including boost)
- Brachytherapy is usually started around week 4 or 5 to allow time for EBRT to shrink the tumor.
- Typically given in 4-5 fractions over 2-4 weeks.
Patient Population

- Often low socio economic background
- Lack of access to healthcare
- Present with advanced stage symptoms
- High incidence of smoking
- Transportation/financial issues
- Language and educational barriers
- Lack of support and/or coping skills

GET YOUR PAP!!

Cervical HDR Brachytherapy Process

- Arrive to radiation oncology clinic or OR / Procedure Suite
- Pre-procedure assessment / labs / IV access
- Anesthesia evaluation
- Device insertion with sedation
- Simulation – CT and / or MRI
- Treatment planning
- HDR treatment delivery
- Device removal
- Recovery and discharge

Pre-Procedure Assessments/Considerations

- Responsible driver and caretaker
- Anxiety
- Past medical history
- GI/GU
  - diarrhea, n/v, dysuria, vaginal bleeding
- Respiratory
- Cardiovascular
  - dehydration, edema
- Integument
- Labs
Tandem and Ring/Ovoids

- Performed in clinic, brachytherapy suite or operating room
- Lithotomy position, prepped and draped
- Foley insertion
- Cervical OS (opening) visualized and gradually dilated
- Uterus sounded
- Tandem placed through the cervix into uterus
- Trans rectal ultrasound confirms and assists with placement
- Ring or ovoids are positioned and anchored to tandem
- Gauze packing is used to stabilize applicator and push away the bowel and bladder (OAR-organs at risk)

Tandem and Ring/Ovoid Insertion
Smit Sleeve Placement

- Inserted and sutured into cervical os before or at the time of 1st procedure
- Allows for easier Tandem insertion in subsequent procedures
- Sutures are cut and removed with device after last HDR

HDR GYN Applicator Placement

Applicator Positioning with Packing
Vaginal Packing

- (Compress video here)

Post Applicator Insertion

- Patient positioning
- Pain, anxiety and nausea management
- Monitoring:
  - VS, O2 sat, ETCo2, bleeding, urine output
- Simulation (CT and/or MRI at some facilities)
- Planning phase (1-3 hours)
- Treatment

HDR Brachytherapy Treatment
Applicator Removal

- Applicator and Foley removed immediately after treatment
- No sedation – minimal pain; can pre-medicate patient before treatment
- Consider bleeding risk (low platelets, significant bleeding at time of insertion)

Post-GYN HDR Nursing Considerations

- Bleeding
- Pain
- Vital signs – level of consciousness
- Urination
- Driver and caretaker

GYN HDR Discharge Instructions

- Symptom Management
  - pain: ice pack / pain medications
  - dysuria: AZO, avoid bladder irritants
  - constipation or diarrhea
- Activity Restrictions
  - no lifting > 10lbs, or strenuous activity
  - walking encouraged
- Call for:
  - temp >100.5
  - severe or worsening pain
  - no BM > 3 days or uncontrolled diarrhea
  - heavy vaginal bleeding
**GYN Follow Up**

- 3 weeks for vaginal dilator instruction
- Imaging @ 3 months, then PRN
- Every 3 months x 2 years
- Every 6 months x 3 years
- Labs: CA125, CEA
- Pap q 6 months
- Long term: skin, fatigue, vaginal stenosis and dilator use

**Wrap Up / Questions**

- HDR brachytherapy is a very specialized, evidenced-based, innovative form of radiation treatment that is utilized for multiple types of cancers, and allows for collaboration with multi-disciplines and departments across the cancer care continuum.
- Understanding how these particular patients are cared for and managed increases patient care continuity, patient satisfaction, improved patient outcomes and potential for cure.

**Acknowledgments**

- Dr. Daniel C. Fernandez, MD, PhD, Brachytherapy Service Chief, Moffitt Cancer
- Dianne Cirillo, MS, RN-BC
- Peg Hutt, Management Assistant, Radiation Oncology, Moffitt Cancer Center
- Brenda Howard, MA, BSN, RN, OCN
References


