

## Introduction to Radiation Oncology Nursing

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## Today's Outline

- History of radiation
- Define radiation
- Describe radiation approaches for patients with cancer
- Describe process and flow of a patient receiving radiation

- Discuss radiation safety precautions
- Review side effects and symptoms management of radiation therapy
- Discuss role of key member of the oncology team: The oncology nurse

## CancerProgress.net

- 1895 Roentgen discovers radiographs
- 1898 Marie Curie discovers radium
- 1903 Radiation to treat skin cancer
- 1930-1950's Hodgkin's disease
- 1970's Brachytherapy implantation
- 1975-1980 Glioblastoma (GBM)
- 1977 Breast Conservation Radiation
- 1981 Inoperable cancer with chemo/RT

### history continued

- 1985 Adjuvant chemo/RT
- Late 1990's IMRT
- 1999 Prophylactic Whole Brain RT
- 2004 Neoadjuvant treatment for Rectal Cancer
- 2007 Hypo fractionated breast radiation for early stage breast cancer

### Indications for Radiation Treatment

- Curative
- Neoadjuvant
- Adjuvant
- Palliative
- Sequential or concurrent or definitive

### Goals of Palliative RT

- Pain control
- Obstruction relief
- Cessation or slowing bleeding
- Bone stabilization

### What is Radiation Therapy ?

- High energy x-ray or particles transmitted in the form of waves or particles through a material
- Energy produced will disrupt anatomic structures.
- Direct damage of cells
- Damage causes formation of free radicals and reactive oxygenation and subsequent cell death
- Mitotic cell death in single and double-stranded helix so death occurs upon attempts to divide

## Dosing of Radiation

• *Dosing or measurement of amount of radiation exposure per fraction is known as a **Gray (Gy)***

- Small dose daily over several weeks
- Higher dose over shorter period of time
- Single fraction

## Radio-sensitive Cells

- Breast tissue
- Bone marrow cells
- Mucosal lining of small intestines
- Sebaceous glands of skin
- Immune response cells
- All stem cell populations
- Lymphocytes

• [http://www.orcbs.msu.edu/radiation/programs\\_guidelines/radmanual/15m\\_tissuecell.htm](http://www.orcbs.msu.edu/radiation/programs_guidelines/radmanual/15m_tissuecell.htm)

## Radio-resistant Cells

- Cardiac tissue
- Large arteries
- Large veins
- Mature blood cells
- Neurons
- Muscle cells

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Highly sensitive:  
Seminomas (25-30 Gy)  
Lymphomas (25-35 Gy)

More radio-resistant  
Head and Neck Cancers (70 Gy)  
Prostate Cancers (70-74 Gy)  
Glioblastomas (60Gy)

## Radio-sensitizers

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Hyperbaric oxygen  
 Carbogen  
 Nicotinamide  
 Metronidazole and its analogs (misonidazole, etanidazole, nimorazole)  
 Hypoxic cell cytotoxic agents (Mitomycin-C, Tirapazamine)  
 Membrane active agents (procaine, lidocaine, chlorpromazine)  
 Radiosensitizing nucleosides (5-Fluorouracil, Fluorodeoxyuridine, Bromodeoxyuridine, Iododeoxyuridine, Hydroxyurea, Gemcitabine, Fludarabine)  
 Texaphyrins (motexafin gadolinium)  
 Suppressors of sulfhydryl groups (N-Ethylmaleimide, Diamide and Diethylmaleate)  
 Hyperthermia  
 Novel radiosensitizers (paclitaxel, docetaxel, irinotecan)

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## Radio-protectors

- Radioprotective amifostine, mesna
  
- Antioxidants
  
- Omega-3 fatty acids

## External Beam Radiation Therapy

- X-rays given with Linear Accelerators: electrons and photons
- Cobalt- 60 machines: Gamma rays
- Large particle machines or cyclotrons can produce neutrons and protons

## Brachytherapy

- High dose
- Low dose
- Temporary or permanent implantation

### Radiopharmaceutical Therapy

- Ingested (Oral iodine- 131)
  
- Injected (IV Strontium)
  
- Instilled (peritoneal)

### Consultation

Disease process and treatment  
 Performance status  
 Experience with radiation (family, friends, internet)  
 Co-morbid conditions  
 Identify potential contraindications  
 Education of process  
 Informed consent  
 Coordination of care

### Simulation

Simulation    Localization (loc)    Planning Scan    Mapping Scan

Custom planning approach placing patient in a reproducible position using a CT scan

Along with :

Marks and or Tattoos

Molds, Guards, Blocks, Boluses

Masks or head holders      Vacuum bags (Vac-Locs)

### PLANNING

- \* Fusion with MRI or PET/CT
- \* Contouring of target structures
- \* Organs at risk identification
- \* Prescribe number of treatments
- \* Prescribe dose per fraction
- \* Prescribe energy of radiation
- \* Prescribe total dose of radiation

Dosimetrist, Radiation Oncologist, Physicist

Quality Assurance  
Setup  
Initiation of treatment  
Delivery of RT  
Weekly On Treatment Visits  
Follow up visits

Breast Cancer Simulation

Prostate Cancer Simulation

Prostate Cancer Brachytherapy

## Radiation Safety

- Radiation exposure related to distance of radioactive source
- External beam: patient is not radioactive so no risk to patient, family, personnel or public
- Shielding (lead, monitoring badges) for patient and personnel
- Brachytherapy (prostate → 6 feet away from pregnant women and do not hold small children or babies in lap for 4 months)

## Nursing Role in Symptom Management and Radiation Side Effects

- Fatigue
  - Causes include anemia, nutritional deficits, dehydration, pain, poor sleep quality, psychological stressors (depression, anxiety, confusion), concurrent treatment, medications, infections, hypothyroidism, renal dysfunction, disease progression)

## Treating Fatigue

- Identify source
- Exercise
- Rest periods
- Good sleep hygiene
- Pacing one-self
- Delegation of activities/tasks
- Nutrition and hydration
- Recharge (meditate, fun or relaxing activities)

## RTOG Radiation Dermatitis Grading

- 0 No change
- 1 Erythema; dry desquamation, epilation
- 2 Bright erythema, moist desquamation, edema
- 3 Confluent moist desquamation, pitting edema
- 4 Ulceration, hemorrhage, necrosis

Reference: GOF/2016 2017

## Photos of Radiation Dermatitis

## Treatment of Radiation Dermatitis

- General skin care for patients undergoing radiation therapy includes:
- Keep the irradiated area clean and dry
- Wash daily with lukewarm water and mild soap
- Apply unscented, moisturizer, which you know that your skin tolerates (such as Cetaphil, Lubriderm, Eucerin, Keri, Vaseline Intensive Care, Aquaphor).

- Please DO NOT apply any lotion, cream etc. to the skin, which will be irradiated 3 hours before your radiation treatment. If you forget and do so occasionally, please DO NOT SCRUB IT OFF, as you may tear your skin.
- Please DO NOT apply sun screen/block to the radiation treatment field prior to daily radiation therapy.
- Wear loose-fitting clothes to avoid friction injuries.
- Avoid skin irritants such, as perfumes and alcohol-based lotions.

- Avoid using tape on the irradiated skin, as this can tear the skin.
- Avoid metal-based topical products, such as zinc oxide creams or deodorants containing aluminum salts.
- Avoid corn starch or baby powder in skin folds.
- Avoid sun exposure.

### Production Selection for Dermatitis

- Prophylactic steroids (mometasone)
- Petroleum-based ointment (Aquaphor, Vaseline, Cerave)
- Aloe vera
- Sucralfate
- Hyaluronic acid silver dressing
- Silver sulfadiazine
- Vitamin A and E ointment/cream
- TheraCare
- Trolamine (Biafene)
- Aloe vera gel or plant
- Chamomile, almond oil, emu oil, olive oil

- Telfa dressings
- Vaseline soaked gauze
- Pain control
- Moisture control
- Refer back to Radiation Oncology versus Urgent Care if infection is suspected.

### Duration of Radiation Dermatitis

- Occurs 2-3 weeks from start of treatment and can last 2-3 weeks
- Late effects include telangiectasia, atrophy, fibrosis, edema and ulceration (greater than 90 days out from radiation)

### Gastrointestinal Side Effects

- Anorexia, nausea, vomiting, esophagitis, mucositis, dysphagia
- Appetite stimulants (steroids, megestrol, CBD)
  - Anti-emetics
  - Small, frequent meals, soft foods or liquids
  - Avoid strong odors
  - Treat constipation
  - Calorie dense meals
  - Sip sip sip nibble nibble nibble nudge nudge nudge

## Gastrointestinal side effects

- Diarrhea (several semiformal BMs each day OR watery BMs):
  - 1. Start a BRAT diet for 1-2 days until the diarrhea improves.  
Bananas, Rice, Applesauce, Toast), juices without pulp, broths, popsicles etc.
  - 2. Low fiber diet
  - 3. If diarrhea continues despite the low fiber diet, start over the counter Imodium-AD. Take ONLY 1 PILL with each episode of diarrhea, no more than 8 pills in a 24 hour period.

## Gastrointestinal Side Effects

- Diphenoxylate-atropine: Lomotil
- Avoid bismuth (dark stools)
- Note if on recent antibiotics? Rule out c.diff before starting on anti-diarrheals to avoid development of toxic megacolon

## Perianal care

- Sitz baths
- Non-scented baby wipes
- Moisture barriers
  - petroleum jelly
  - zinc oxide