Introduction to Radiation Oncology Nursing
Amy C. Lynes, ARNP, ANC-BC
Radiation Oncology
Kaiser Permanente of Washington

Today’s Outline
• History of radiation
• Define radiation
• Describe radiation approaches for patients with cancer
• Describe process and flow of a patient receiving radiation

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
  - [Link](http://www.orcbs.msu.edu/radiation/programs_guidelines/radmanual/15rm_tissuecell.htm)

Radio-resistant Cells

- Cardiac tissue
- Large arteries
- Large veins
- Mature blood cells
- Neurons
- Muscle cells
  - [Link](http://www.orcbs.msu.edu/radiation/programs_guidelines/radmanual/15rm_tissuecell.htm)

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

- Hyperbaric oxygen
- Carbogen
- Nicotinamide
- Metronidazole and its analogs (mitomidazole, otanidazole, nimorazole)
- Hypoxic cell cytotoxic agents (Mitomycin-C, Tipazamidine)
- Membrane active agents (procaïne, lidocaine, chlorpromazine)
- Radiosensitizing nucleosides (β-Fluorouracil, Fluorodeoxyuridine, Bromodeoxyuridine, Iododeoxyuridine, Hydroxyurea, Gemcitabine, Fludarabine)
- Texaphyrin (gemtuzumab geltadilum)
- Supressors of sulfhydryl groups (N-Ethylmaleimide, Diamide and Dicethylmaleate)
- Hyperthermia
- Novel radiosensitizers (paclitaxel, docetaxel, irinotecan)

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 \(\rightarrow\) 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: UpToDate 2017
## 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

- 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, megesterol, 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 semiformed 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