RADIATION THERAPY: A BREAST CANCER CASE STUDY

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RADIATION THERAPY BASICS

- Uses beams of high doses of ionizing energy which damages DNA resulting in cell death of cancer cells.
- More than half of all cancer patients will receive radiation as part of their treatment plan.
- Used to treat a variety of tumor types.
- Used in all oncology settings
  - Curative
  - Adjuvant & Neoadjuvant
  - Palliative

IONIZING VERSUS NON-IONIZING

- Ionizing radiation – shorter wave lengths and has enough energy to ionize atoms and break chemical bonds damaging DNA. Examples include photons, gamma rays and protons (all are used in radiation therapy).

- Non-ionizing radiation - longer wave lengths and less energy, not enough to ionize or break chemical bonds in atoms/molecules. Examples of non-ionizing radiation are microwaves, radio waves and visible light.

GRAY / FRACTION

Gray is the unit of measurement to describe the ionizing dose of radiation.

Fraction is one dose of radiation.

TYPES OF RADIATION THERAPY

External Beam

- Photon radiation – Beams delivered by a machine called a linear accelerator (LINAC) which rotates around the body to deliver the radiation from different angles. Reaches the target organ by entering and exiting the body.
- Proton radiation – Beams delivered by a machine called a cyclotron. Enters the body and deposits dose. No exit dose, therefore, there is more normal tissue spared.

Internal

- Also called "brachytherapy"
- Radioactive devices are delivered or implanted directly to tumor site or tumor bed.
- Can be permanent or temporary. Permanent implants will lose radioactivity over time.
- Benefit: Allows for treatment of higher doses to a specific site.

PHOTON RADIATION

- Delivered by a machine called a linear accelerator (LINAC). Reaches the target organ by entering and exiting the body.


VARIAN
TrueBeam

MGH PROTON YOU-TUBE VIDEO

- https://www.massgeneral.org/cancer-center/radiation-oncology/treatments-and-services/proton-therapy?cmp=ccpti&utm_medium=cpc&utm_source=google&utm_campaign=MGH%20-%20Cancer%20-%20Proton%20Therapy&utm_content=Proton%20Radiation%20(Phrase)&utm_term=proton%20radiation%20machine&gclid=EAIaIQobChMImLCU16-L-wIVycfICh0nPwInEAAYASAAEgKUh_D_BwE

PREPARING FOR RADIATION

- Consent Form

- CT simulation – "Mapping Session". The CT scan is used to plan the treatment with the goal of targeting the tumor or tumor cavity while limiting exposure to surrounding tissue and organs. This is done by a team including the radiation oncologist, dosimetrists and physicists. A check list is followed before the treatment plan is finalized and executed.

- Teaching session with the patient including skin care, management of potential side effects, contact information and the patient is givena treatment schedule calendar.

SIDE EFFECTS/TOXICITIES

Radiation is a **LOCALIZED** treatment

Not systemic like chemotherapy, immunotherapy or hormonal therapy.

Side effects/toxicities are primarily localized to the area being treated.

RADIATION TOXICITY

ACUTE EFFECTS: occur during or immediately following a course of radiation therapy.

LATE EFFECTS: occur from 2 months to years following completion of treatment

TWO MOST COMMON TREATMENT SIDE EFFECTS

Incidence of **RADIATION DERMATITIS** is 90 to 95%.

- **Cumulative** and typically **worsens over the second half of the treatment course.**
- It may continue to worsen for up to 2 weeks following completion of radiation.
- It can be mild, moderate or severe.
- Once it reaches peak injury, the skin will begin to heal and usually this is a quick process.

Incidence of **FATIGUE** is 80 to 100%. Fatigue is the only treatment side effect that is not site specific.

RADIATION DERMATITIS: SKIN REACTION FROM RADIATION THERAPY

Grade 1- Faint Erythema/dry desquamation

Grade 2 - Moderate or brisk erythema/patchy moist desquamation confined to the skin folds and creases. Moderate edema.

Grade 3 - Moist desquamation other than skin folds or creases. Bleeding with minor trauma.

Grade 4 - Skin necrosis or ulceration of full thickness dermis, spontaneous bleeding from the affected site. Skin graft indicated.

- CTCAE 5.0

GRADE 1 RADIATION DERMATITIS

Grade 1- Faint Erythema/dry desquamation

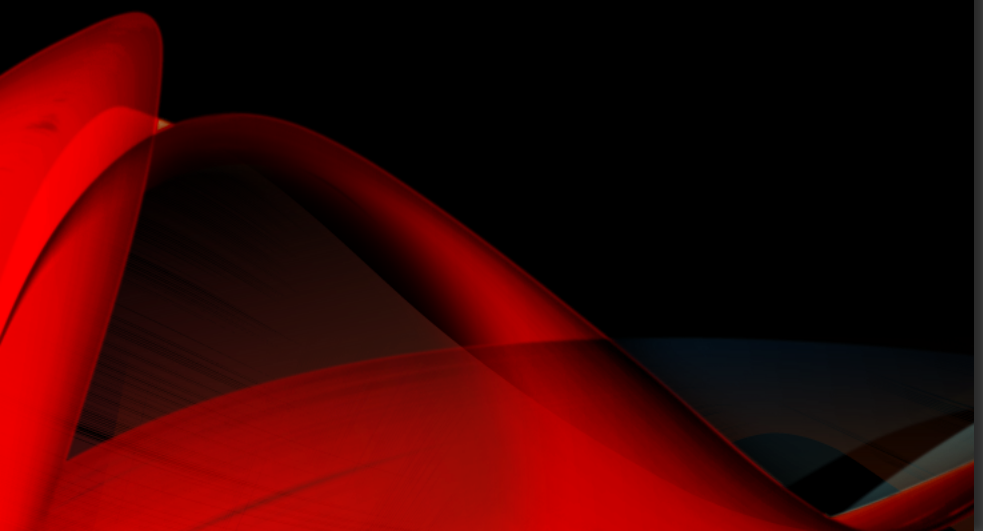
GRADE 2 RADIATION DERMATITIS

Grade 2 - Moderate or brisk erythema/patchy moist desquamation confined to the skin folds and creases. Moderate edema.

GRADE 3 RADIATION DERMATITIS

Grade 3 - Moist desquamation other than skin folds or creases. Bleeding with minor trauma.

CASE STUDY



- Mrs. S is a 50-year-old patient receiving adjuvant radiation for locally advanced breast cancer to her right breast. She is premenopausal and will start Tamoxifen post radiation.
- Mrs. S has a BMI of 30 and a history of Type II Diabetes, GERD and asthma. She also has a history of smoking cigarettes.
- She is nearing the end of her 4th week of a 6 week course of radiation to her right breast.
- She asks to be seen one morning because the skin under her right breast is “stinging” and she is unable to wear her bra.

CASE STUDY – ASSESSMENT AND EVALUATION

- Upon assessment you note her right breast is erythematous in the lower half and there is an open area in the right inframammary fold that appears moist.
- It is very tender to touch and is in an area of friction, where her bra may be rubbing against it.

PRACTICE QUESTION

Upon assessment you note Mrs. S's right breast is erythematous below the nipple and there is an open area in the right inframammary fold that appears to be peeling and moist.

What Grade Radiation Dermatitis does Mrs. S. have?

GRADE 2

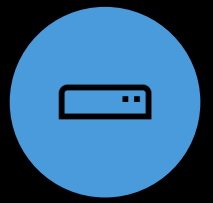
RISK FACTORS FOR RADIATION DERMATITIS

- Older age
- Malnutrition
- Chronic sun exposure
- Smoking history
- Comorbidities
  - Diabetes
  - Metabolic Syndrome

OTHER FACTORS THAT CONTRIBUTE TO RADIATION DERMATITIS:

Cumulative dose

Location of treatment field



Fractions (the number of treatments) and Duration of treatment

PRACTICE QUESTION

What are the comorbidities that may contribute to the risk and severity of Mrs. S's radiation dermatitis?

To review:

GERD

DM

Asthma

BMI >30

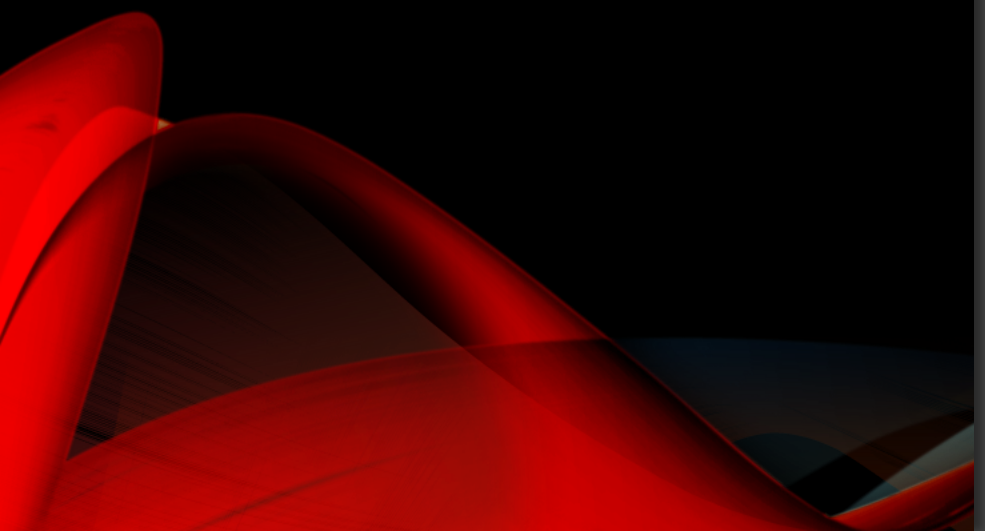
Hx of Smoking

Diabetes

Smoking

High BMI

SKIN CARE DURING RADIATION THERAPY



- Loose comfortable clothing, reduce friction
- Wash with a mild soap and apply a general moisturizing cream 3-4 times daily.
- Antiperspirants/deodorants allowed- studies have shown they do not cause harm and can decrease sweating.
- Topical steroids for pruritis (mometasone).
- Silver sulfadiazine for severe moist desquamation or any s/s infection.
- Zinc oxide for moist desquamation

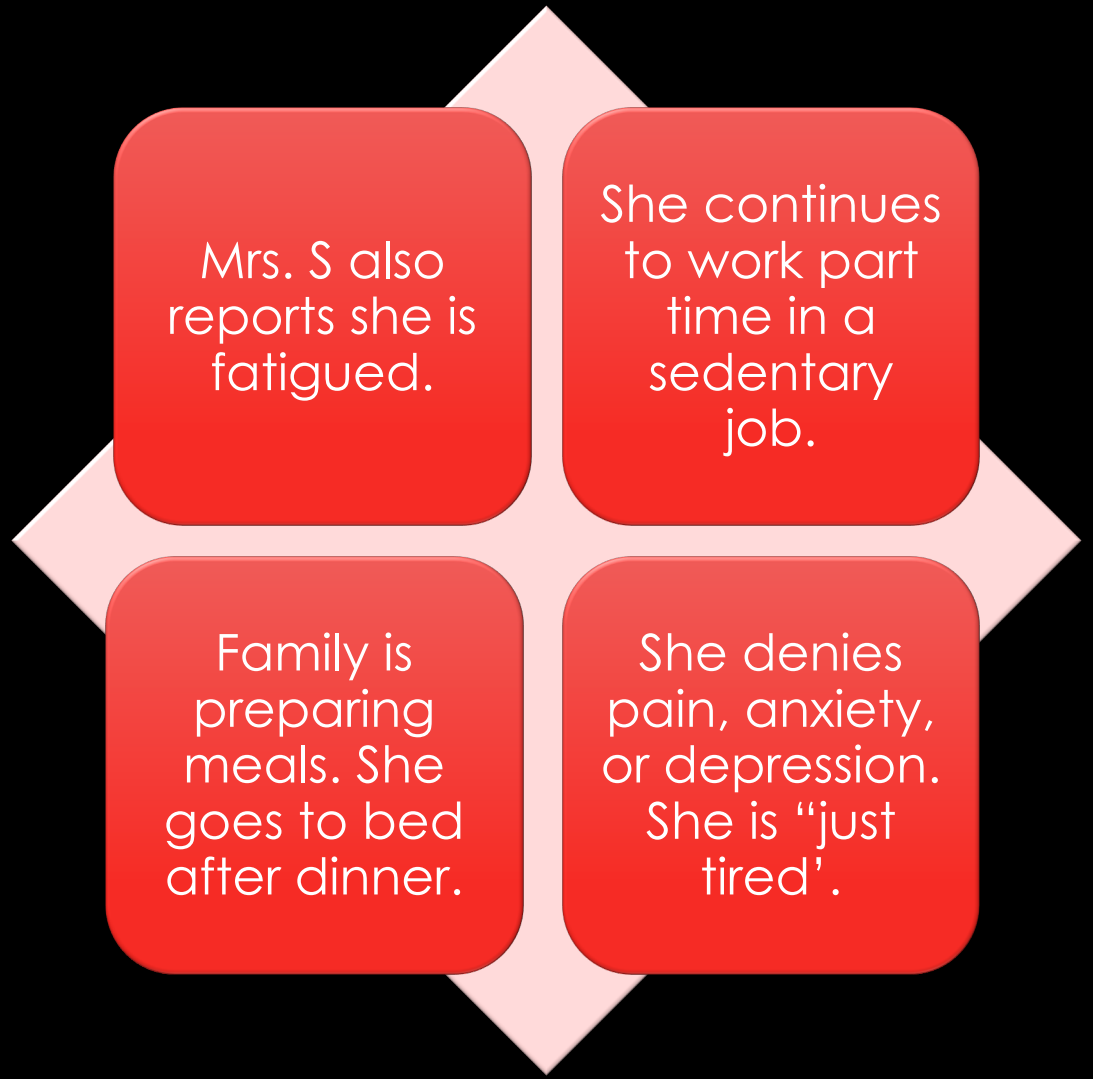
FATIGUE

- Cancer related fatigue: distressing, persistent, and subjective sense of tiredness or exhaustion. It is not proportional to activity and interferes with usual function.
- 80% to 100% of patients with cancer experience fatigue.
  - ONS PEP

FATIGUE – GRADING

Fatigue	Grade 1: fatigue relieved by rest
Fatigue	Grade 2: fatigue not relieved by rest, limiting instrumental ADLs
Fatigue	Grade 3: fatigue not relieved by rest, limiting self care ADLs

CASE STUDY


Mrs. S also reports she is fatigued.
She continues to work part time in a sedentary job.
Family is preparing meals. She goes to bed after dinner.
She denies pain, anxiety, or depression. She is "just tired'.

PRACTICE QUESTION

What Grade is Mrs. S's fatigue?

- Working part time in a sedentary job
- Family preparing meals
- Goes to bed after dinner.
- No pain, anxiety, depression

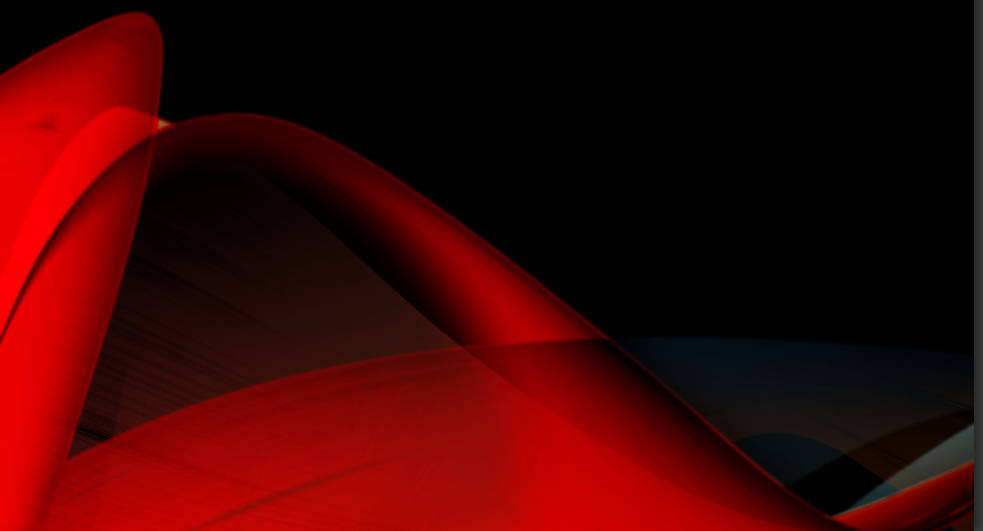
Grade 2

TREATMENT OF FATIGUE

Exercise

Research suggests that exercise will improve quality of life and can improve cancer related fatigue.

FATIGUE MANAGEMENT



Likely to be effective:

- Cognitive Behavioral Interventions
- Energy Conservation and Activity Management
- Management of Concurrent Symptoms
- Massage/Aromatherapy/Acupuncture
- Mindfulness-Based Stress Reduction
- Yoga

Likely to be ineffective:

- Modafinil - stimulant

- ONS PEP

LATE TOXICITIES

SITE SPECIFIC

- Fibrosis
- Radiation pneumonitis (can after treatment to the lung/breast/chest)
- Tenderness/discomfort in the area treated
- Bone fractures (for example rib fracture after treatment to breast/chest)
- Secondary cancers – very rare

IN SUMMARY

- Uses beams of high doses of energy (ionizing radiation)damaging DNA causing cell death.
- Used to treat all disease types for curative and palliative.
- Localized treatment
- External beam (photon and proton) and Internal (brachytherapy)
- Side effects (dermatitis and fatigue) usually resolve within a couple of months after treatment.
- Late side effects can occur but are rare.

Please feel free to email with any questions while studying.

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Good Luck!!