

Exploring Cancer

Examining the Role of Biology, Race, Class, and Socioeconomics



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UNC Lineberger Cancer Network's
live webinar

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1

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Exploring Cancer

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3

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Fridays

11:00 - 11:50 AM EST/EDT

August 25

Welcome to Cancer(s) and Health Disparities 101 - The Introduction

October 13

Breast Cancer Health Disparities

November 10

Precision Medicine and Immunotherapy

September 1

Radiation Oncology - What Is It, and What Is It Good For?

October 20

Pancreatic Cancer

November 17

Expanding Cancer Care Quality and Delivery in Sub-Saharan Africa: a collaborative approach

September 8

New Strategies in Treating GI Cancers

October 27

Career Panel

4

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September 1, 2023

Radiation Oncology What Is It, and What Is It Good For?



Gaorav Gupta, MD, PhD

5



Gaorav Gupta, MD, PhD

Gaorav Gupta was raised as a Midwesterner - in DeKalb, IL. He majored in Biological Chemistry at the University of Chicago, then matriculated in the Cornell/Rockefeller/Sloan-Kettering MD/PhD Program, where he completed his graduate work in breast cancer metastasis pathways with Joan Massague.

He went on to complete his residency in radiation oncology at Memorial Sloan Kettering, and postdoctoral studies in DNA double strand break repair programs with John Pettrini. He opened his lab at UNC in 2015, where his laboratory focuses on DNA damage responses in cancer pathogenesis, therapeutic response mechanisms, and circulating biomarkers for precision oncology.

He is currently Associate Chair for Research in the Department of Radiation Oncology and Co-Leader of the Breast Cancer Research Program at the UNC Lineberger Comprehensive Cancer Center.

6

Professional Highlights

7

Professional Highlights

- 5.** I love to travel - including the land of fire and ice (Iceland) earlier this month

8

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9

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10

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11

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- 2. My cancer patients inspire me and are the guiding light for my laboratory research team
- 1. I have my dream job!

12

Radiation Oncology: *What is it, and what is it good for?*



Gaorav Gupta, MD PhD
Exploring Cancer, Sept 1, 2023

**Slides adapted from ASTRO Resource Library

13

How did I get here?



Gaorav Gupta, MD PhD
Associate Professor
Associate Chair for Research, Dept of Radiation Oncology
Co-Leader, Breast Cancer Research Program
Lineberger Comprehensive Cancer Center

Serendipity in finding good mentors was a big part of my journey!

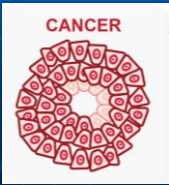
14

Poll: Which of the following is most correct?

⚡

- a) Radiation can cause cancer
- b) Radiation can cure cancer
- c) Both are true

CANCER



15

SLINC
The Cancer Center

Which of the following is most correct?

- Radiation can cause cancer 0%
- Radiation can cure cancer 0%
- Both are true 0%

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16

What is Radiation Oncology?

- Radiation therapy, or radiotherapy, is the use of various forms of radiation to safely and effectively treat cancer and other diseases.
- Radiation therapy has been an effective tool for treating cancer for more than 100 years.
- About two-thirds of all cancer patients will receive radiation therapy as part of their treatment.
- Radiation oncologists are doctors trained to use radiation to treat cancer.



Patient being treated with modern radiation therapy equipment.

17

Brief History of Radiation Therapy

- The first patient was treated with radiation therapy in 1896, just two months after the discovery of the X-ray.
- Rapid technology advances began in the early 1950s, with the invention of the linear accelerator.
- Planning and treatment delivery advances have enabled radiation therapy to be more effective and precise, while decreasing the severity of side effects.



The linear accelerator is still used today to deliver external beam radiation therapy.

18

How Does Radiation Therapy Work?

- Radiation therapy works by damaging the DNA within cancer cells, destroying their ability to reproduce and causing the cells to die.
- When the damaged cancer cells are destroyed by radiation, the body naturally eliminates them.
- Normal cells can be affected by radiation, but they can repair themselves in a way cancer cells cannot.



19

POLL

True or False: Radiation can sometimes be used as an alternative to surgery to treat cancer



20



21

When is radiation used?



Tumor boards meet to discuss comprehensive patient treatment plans

- The best treatment plan for each patient is frequently determined by a team of doctors, including a radiation oncologist, a medical oncologist and a surgeon.
- Sometimes radiation therapy is the only treatment a patient needs.
- Other times, it is combined with other treatments, such as surgery and chemotherapy.

22

Is Radiation Therapy Safe?

- New advances in technology and treatment delivery continue to make radiation safe and effective.
- A team of medical professionals develop and review the treatment plan for each patient to minimize side effects and assure that the area where the cancer is located is receiving the dose of radiation needed.
- The treatment plan and equipment are constantly reviewed to ensure the proper treatment is being given.



23

Why Use Radiation Therapy?

- To cure cancer:
 - Destroy tumors that have not spread to other body parts.
 - Reduce the risk that cancer will return after surgery or chemotherapy.
 - Shrink the cancer before surgery.
- For palliation (to reduce symptoms):
 - Shrink tumors affecting quality of life, like a lung tumor that is causing shortness of breath.
 - Alleviate pain or neurologic symptoms by reducing the size of a tumor.

24

Meet the Radiation Oncology Team

A team of highly trained medical professionals work together to make sure you receive the best possible care while you are undergoing radiation therapy.

- **Radiation Oncologist**
 - Oversees the radiation therapy treatments, including working with other members of the radiation therapy team to develop the treatment plan and ensure that each treatment is given safely and accurately.
- **Medical Radiation Physicist**
 - Ensures that complex treatment plans are properly tailored for each patient and directs quality control programs for equipment and procedures.

25

Meet the Radiation Oncology Team, cont.

- **Dosimetrist**
 - Works with the radiation oncologist and medical physicist to calculate the proper dose of radiation given to the tumor.
- **Radiation Therapist**
 - Administers the daily radiation under the radiation oncologist's prescription and supervision.
- **Radiation Oncology Nurse**
 - Cares for the patient and family by providing education, emotional support and tips for managing side effects.
- **Additional Members of the Team**
 - Social workers, nutritionists, dentists, physical therapists and patient navigators may also assist in a patient's care during their treatment.

26

What to Expect

- Referral
- Consultation
- Simulation
- Treatment Planning
- Treatment Process

27

Referral

- A cancer is diagnosed.
- The diagnosing or referring physician reviews potential treatment options with patient.
- Treatment options may include radiation therapy, surgery, chemotherapy or a combination.



It is important for a patients to ask their referring physician about all possible treatment options available to them

28

Consultation

- Radiation oncologist discusses the radiation therapy treatment options with patient.
- A treatment plan is developed.
- Care is coordinated with other members of patient's oncology team.



The radiation oncologist will discuss with the patient which type of radiation therapy treatment is best for their type of cancer

29

Simulation

A CT scan of the area of the body to be treated with radiation. The CT images are reconstructed and used to design the best and most precise treatment plan.

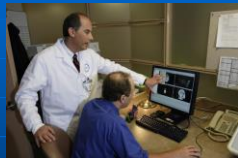


- Patient is set up in treatment position on a dedicated CT scanner.
 - Immobilization devices may be created to assure patient comfort and daily reproducibility.
 - Reference marks or "tattoos" may be placed on patient.
- CT simulation images are often fused with other scans such as MRI or PET scans to create a treatment plan.

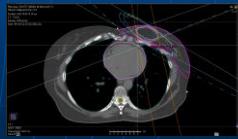
30

Treatment Planning

- The radiation oncologist works with the medical physicist and dosimetrist to create an individualized treatment plan for the patient.
- The treatment is mapped out in detail including the type of machine to be used, the amount of radiation that is needed and the number of treatments that will be given.



Radiation oncologist and dosimetrist creating a treatment plan



31

Treatment Process

- Each day the patient will check in at the cancer center for treatment.
- They will then be verified as the correct patient and be set up for their treatment.
- The radiation oncologist will monitor the treatments and the patient will meet with them weekly to discuss their treatment.



During their check-in at the cancer center, a patient's identity will be verified.

32

How is Radiation Therapy Delivered?



The type of treatment used will depend on the location, size and type of cancer.

- Radiation therapy can be delivered either externally or internally.
 - *External beam* radiation therapy typically delivers radiation using a linear accelerator.
 - Internal radiation therapy, called *brachytherapy*, involves placing radioactive sources into or near the tumor.

33

Types of External Radiation Therapy

The type of equipment used will depend on the location, size and type of cancer.

- **Three-dimensional conformal radiation therapy (3D-CRT)**
 - A technique where beams of radiation used in treatment are shaped to match the tumor and are delivered accurately from several directions.
- **Intensity modulated radiation therapy (IMRT)**
 - A form of 3-D CRT in which the physician designates specific doses of radiation that the tumor and normal surrounding tissues receive.



A multileaf collimator is used to shape the radiation beam to match the tumor, sparing surrounding healthy tissue

34

Types of External Beam Radiation Therapy



- **Proton Beam Therapy**
 - A type of radiation therapy that uses high-energy beams (protons) rather than X-rays to treat certain types of cancer.
 - Most commonly used in the treatment of pediatric, CNS and intraocular cancers.
- **Stereotactic Body Radiotherapy or Stereotactic Radiosurgery**
 - A specialized form of radiation therapy that focuses high-power energy on a small area of the body. Despite its name, radiosurgery is a treatment, not a surgical procedure.
 - Radiosurgery generally implies a single high dose or just a few high dose treatments.

35

Internal Radiation Therapy

- Radioactive material is placed into tumor or surrounding tissue.
 - Also called brachytherapy.
 - Radiation sources are placed close to the tumor so large doses can damage the cancer cells.
 - Allows minimal radiation exposure to normal tissue.
 - Radioactive sources used are thin wires, ribbons, capsules or seeds.
 - These can be either permanently or temporarily placed in the body



Radioactive seeds for a permanent prostate implant, an example of low-dose-rate brachytherapy.

36

Permanent vs. Temporary Implants

- Permanent implants release small amounts of radiation over a period of several months
 - Examples include low-dose-rate prostate implants ("seeds"),
 - Patients receiving permanent implants may be minimally radioactive and should temporarily avoid close contact with children or pregnant women.
- Temporary implants are left in the body for several hours to several days
 - Patient may require hospitalization during the implant depending on the treatment site ,
 - Examples include low-dose-rate gynecologic implants and high-dose-rate prostate or breast implants

37

Side Effects of Radiation Therapy

- Most side effects begin during the second or third week of treatment. Doctors and nurses may prescribe medications to help with these side effects.
- Side effects, like skin redness, are generally limited to the area receiving radiation.
- Fatigue is a common side effect for all cancer patients.
- Side effects may last for several weeks after the final day of treatment.



Side effects vary based on a patient's medical profile or diagnosis.

38

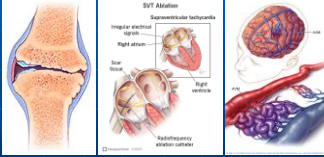


39

POLL

Can radiation be used to treat non-cancer ailments?

A) Yes
B) No



43

Can radiation be used to treat non-cancer ailments?

Yes 0%

No 0%

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44

New applications of radiation therapy

- Immune boosting – can radiotherapy stimulate the immune system to target cancers?
- Salvage therapy for medically-resistant osteoarthritis
- Cardiac ablation for ventricular tachycardia
- Aggressive treatment of metastatic disease, combined with new drugs

45

Summary

- Radiation therapy is a highly effective cancer therapy, used for nearly half of all cancer patients
- Radiation can offer a non-surgical treatment option for some cancer patients
- Radiation planning and delivery requires a team of physicists, therapists, and clinical providers
- Technological advances in radiation oncology have made treatments safer, more convenient, and created new opportunities for clinical benefit

46

For More Information...

Visit www.rtanswers.org

- To view information on how radiation therapy works to treat various cancers
- Contact me at: gaorav@med.unc.edu



47

Questions/Comments?

Nobody has responded yet.
Hang tight! Responses are coming in.

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48

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Exploring Cancer is a webinar series taught by cancer biologists, physicians, public health experts, and other cancer specialists from NCCU, UNC-Chapel Hill, and NC A&T.

We hope to see you next time!

UNC Lineberger Cancer Network



49

Exploring Cancer

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Upcoming Live Webinar



September 8
11:00 AM

New Strategies in Treating GI Cancers



Ashwin Somasundaram, MD
Assistant Professor of Medicine
Division of Oncology
UNC Lineberger Comprehensive Cancer Center
UNC School of Medicine
University of North Carolina at Chapel Hill

50

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51