Comparison of 3-dimensional conforming radiation therapy (3D-CRT) and Inverse Treatment Planning (I-IMRT) for Breast Carcinoma

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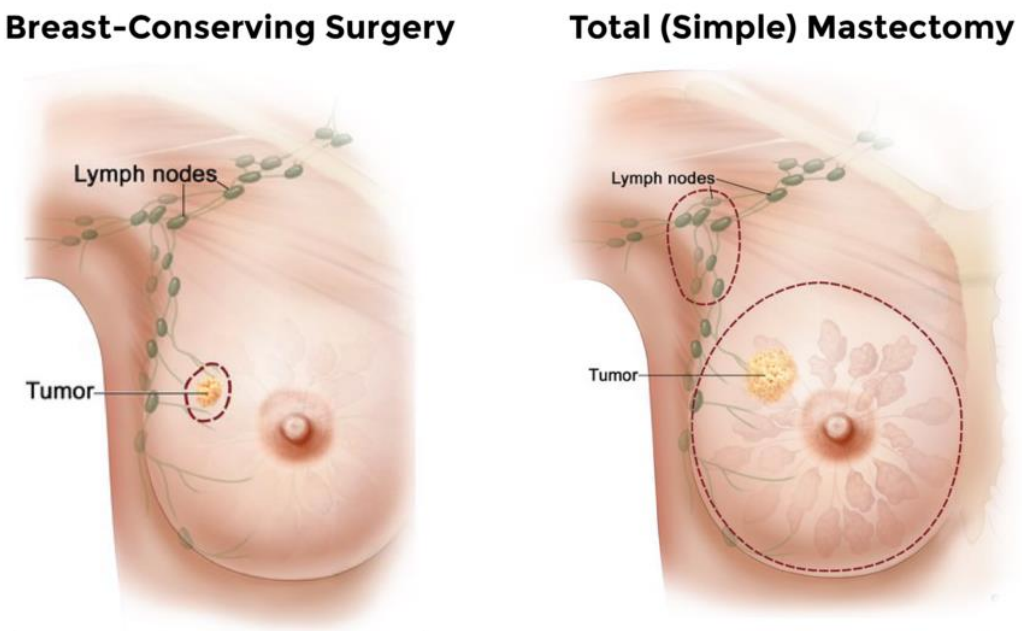
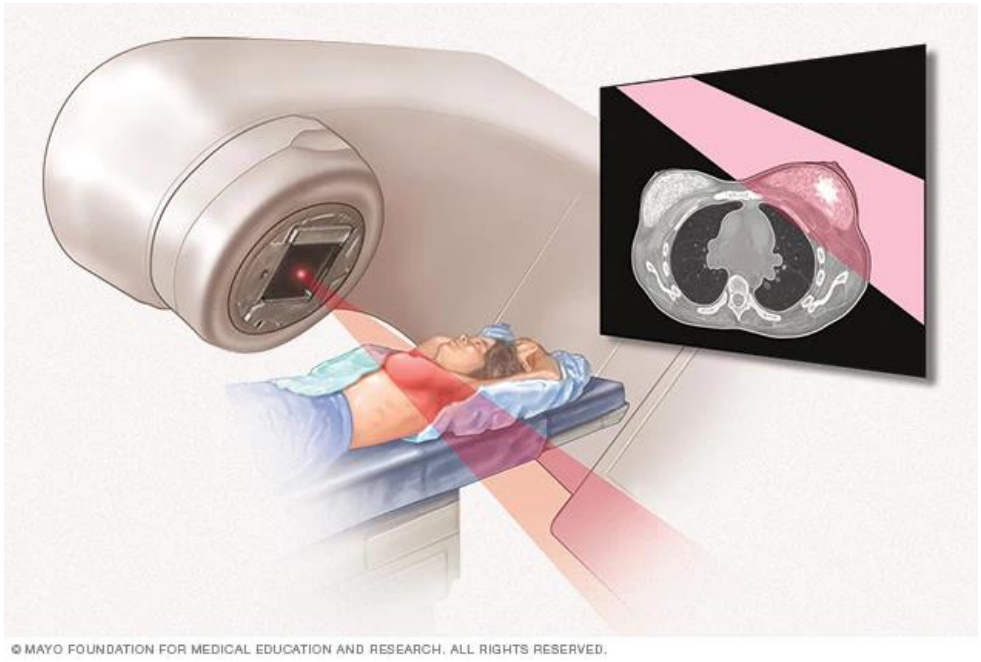
Introduction

- Breast cancer is the most diagnosed form of cancer among women globally and remains the leading cause of cancer-related deaths
- Radiation therapy (RT) and breast conservation surgery (BCS) has become a standard approach for treating early-stage breast cancer





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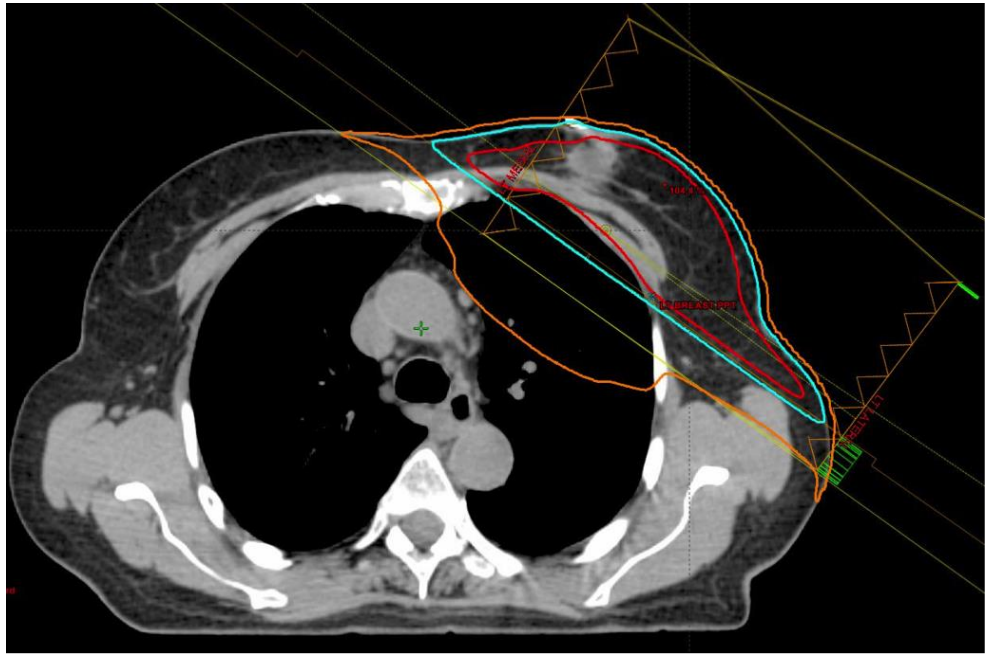
Whole Breast Radiation Therapy (WBRT)

- Tangential Breast Radiotherapy (TBRT) uses two opposing beams to irradiate the entire breast with 2-dimensional planning.
- Poor dose homogeneity within the planning target volume (PTV) during TBRT is common.
- Increased risk of tissue toxicity and undesirable physical appearances.



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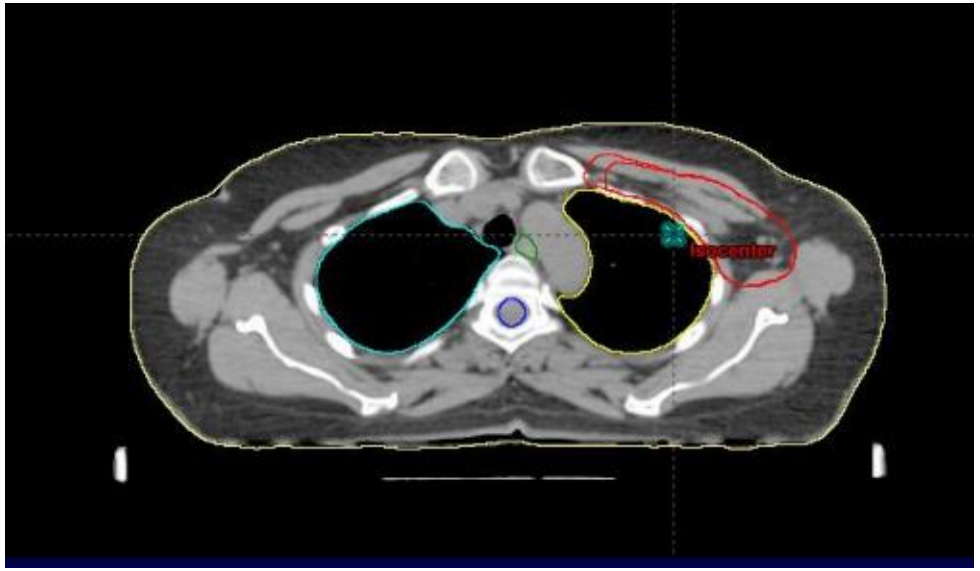
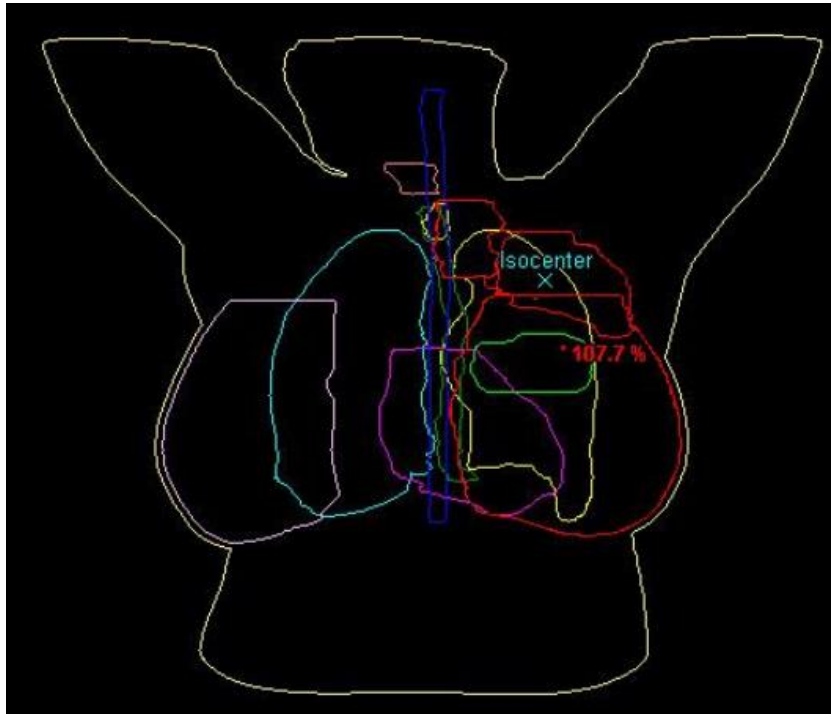
3-dimensional conforming radiation therapy (3D-CRT)

- 3-dimensional conforming radiation therapy (3D-CRT) has become the preferred method for breast cancer treatment, as it enables more accurate dose planning and compensation for missing tissue in all three dimensions
- 3D-CRT is typically based on the utilization of CT imaging and involves a treatment period of 7-8 weeks with fractionated doses with a boost





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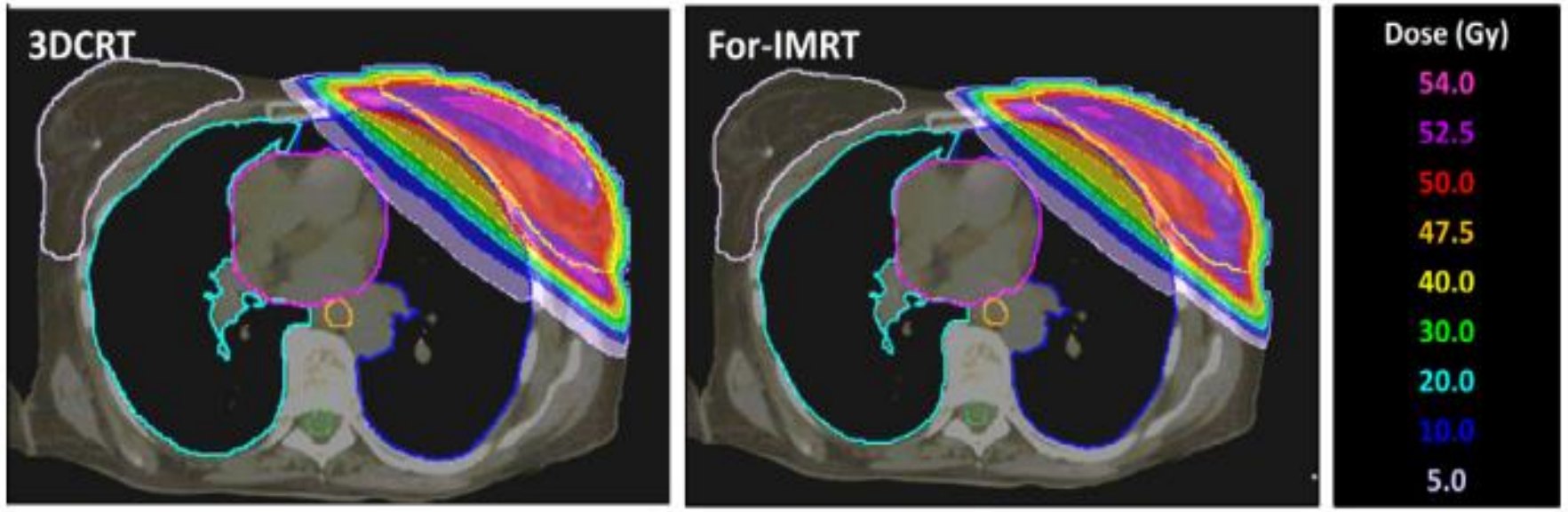
Forward Treatment Planning - 3D-CRT

- In forward planning, the planner determines the beam orientation, designs beam apertures, and calculates a 3D dose distribution based on the prescription dose
- The radiation oncology team evaluates and modifies the treatment plan as necessary until an acceptable plan is approved



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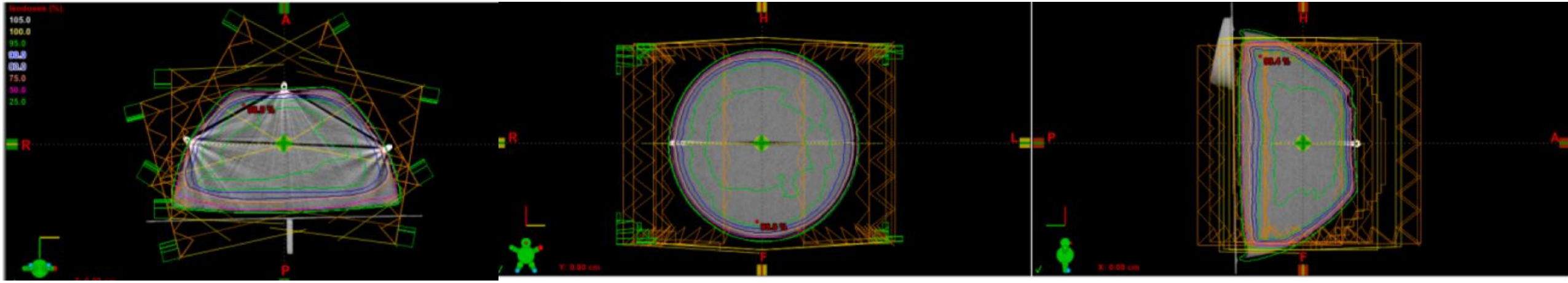
Inverse Treatment Planning – Inverse Intensity-Modulated Radiation Therapy (I-IMRT)

- Inverse planning involves specifying the desired dose to the target volume, setting constraints for OARs, and allowing the treatment planning system to optimize beam weights and angles
- Inverse planning can be used to achieve a more optimal dose distribution, but it requires greater computational power and longer planning times.
- Despite the longer planning times, inverse planning may be advantageous in complex cases where multiple PTVs and OARs are involved



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Conclusion

- Both forward and inverse planning techniques have advantages and disadvantages
- Forward planning is faster, simpler, and easier to implement but may result in suboptimal dose distributions
- Inverse planning may result in more optimal dose distributions but requires greater computational power, longer planning times, and may be less intuitive for radiation oncologists

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