Radiation for the Treatment of Cancer: the Most Common Cancer among Women

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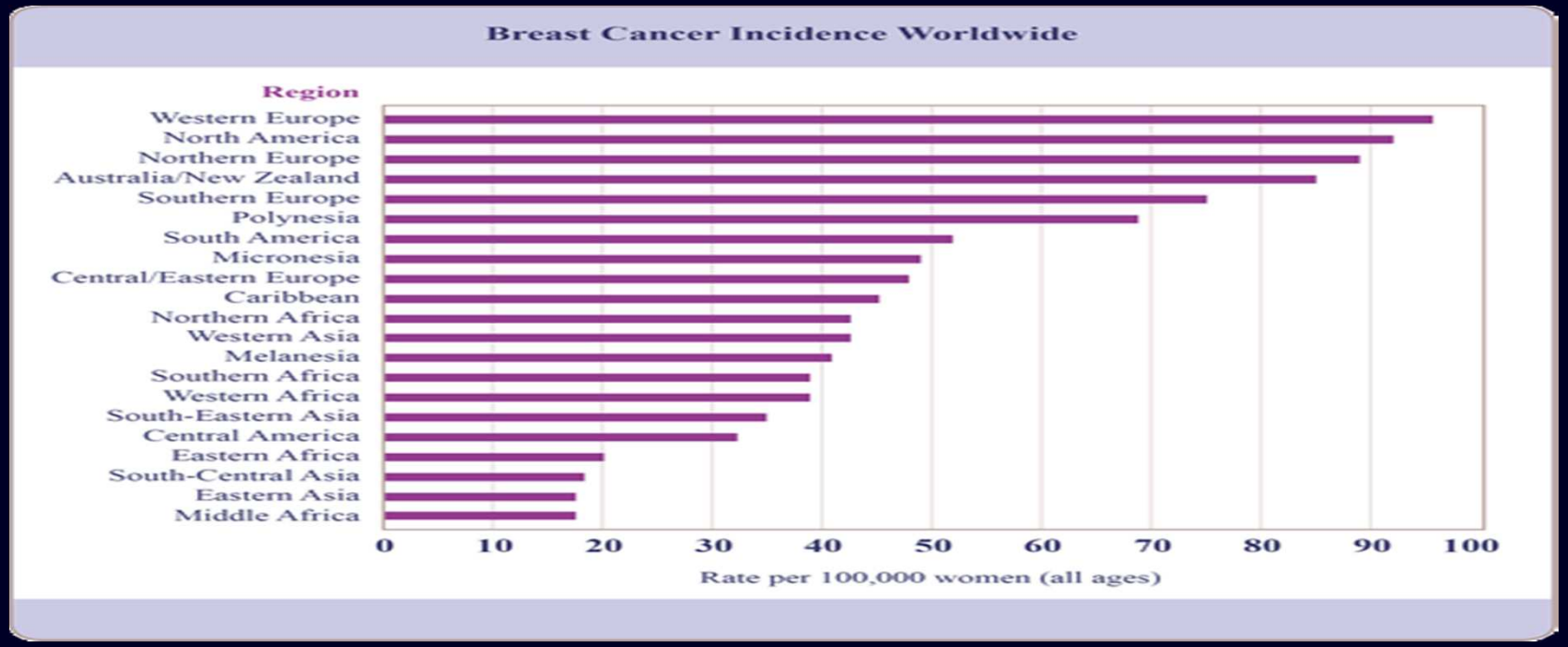
Breast Cancer Burden

- The most common cancer in women both in the developed and less developed world.
- It is estimated that more than 1.7 million new cases of breast cancer occurred among women worldwide in 2012



International Agency for Research on Cancer (IARC) and World Health Organization (WHO). GLOBOCAN 2012:

- Second leading cause of cancer-related death among women.
- About 40,290 women in the U.S. are expected to die in 2015 from breast cancer
- Death rates have been decreasing since 1989
- These decreases are thought to be the result of treatment advances, earlier detection through screening, and increased awareness

Treatment of breast cancer

- Surgery
- Radiation therapy
- Systemic treatment
  - Endocrine therapy
  - Chemotherapy
  - Targeted therapy
  - Immunotherapy

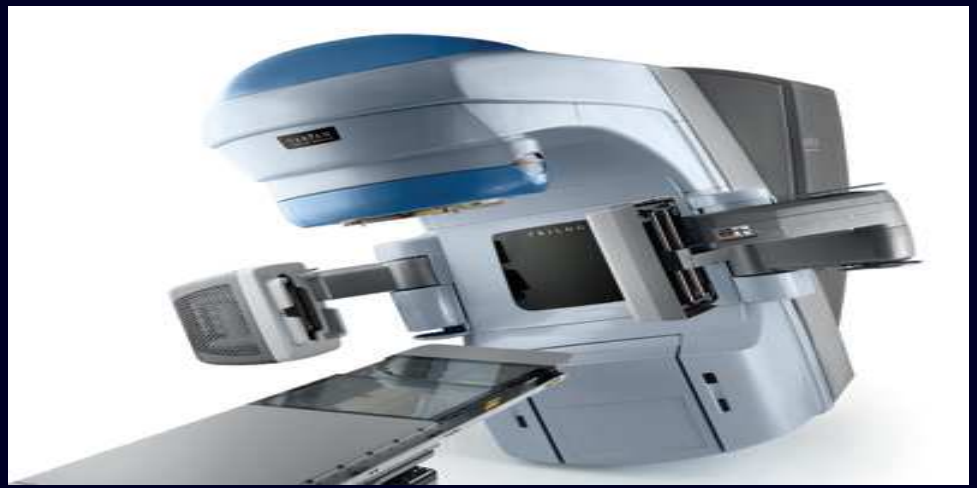
    Therapeutic Vaccines

    Checkpoint Inhibitors

    Adoptive T Cell Therapy

    Antibodies

- Radiation therapy is an essential component of breast cancer treatment
  - Early stage, locally advanced, metastatic setting



Postoperative RT increases OS

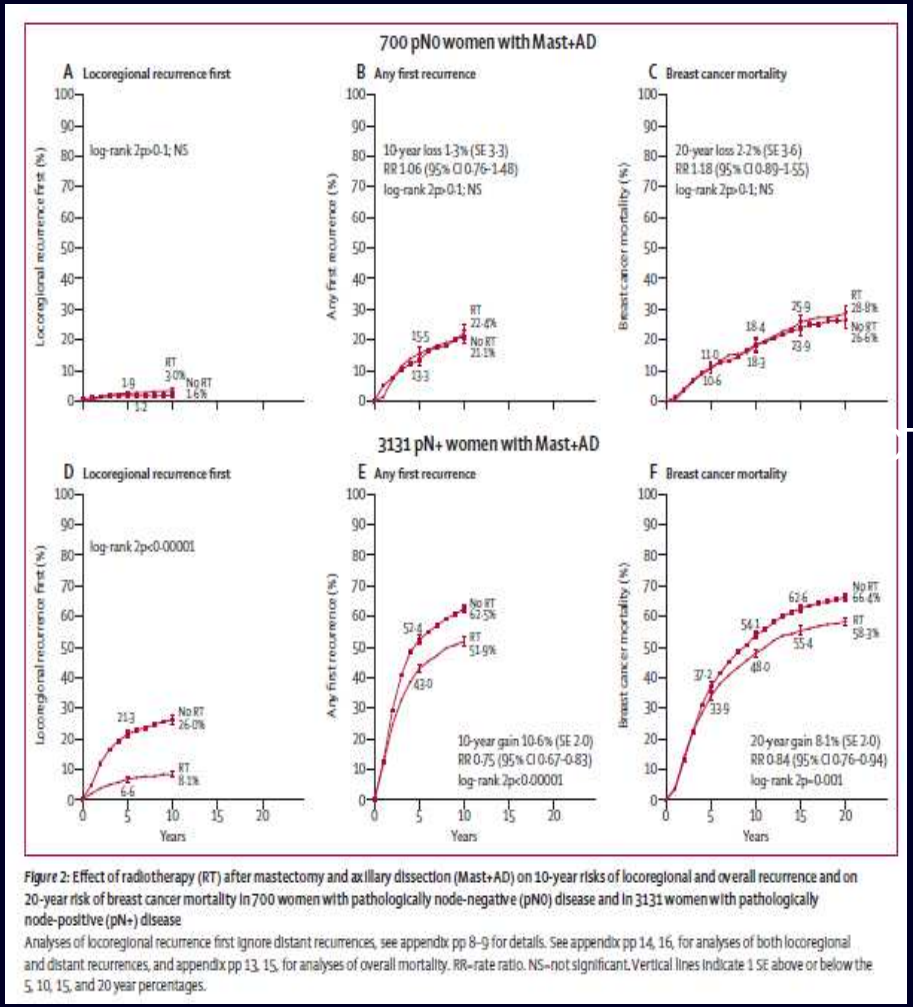
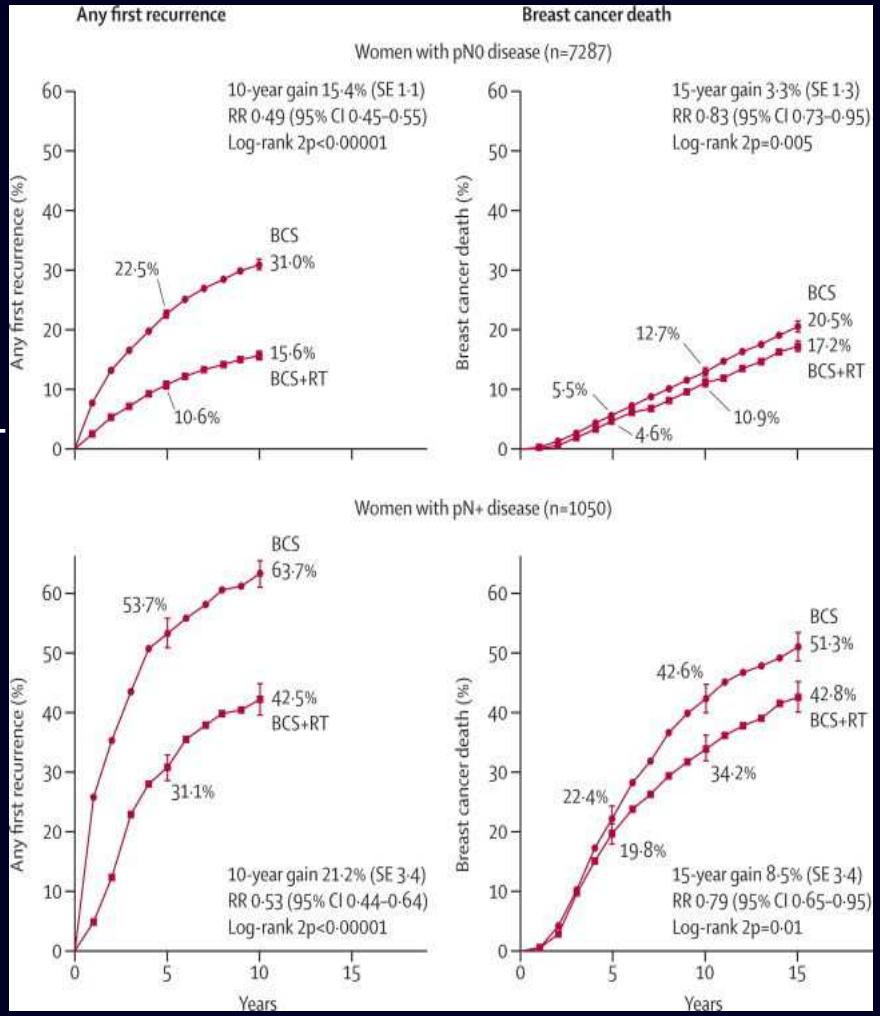


Figure 2: Effect of radiotherapy (RT) after mastectomy and axillary dissection (Mast+AD) on 10-year risks of locoregional and overall recurrence and on 20-year risk of breast cancer mortality in 700 women with pathologically node-negative (pN0) disease and in 3131 women with pathologically node-positive (pN+) disease

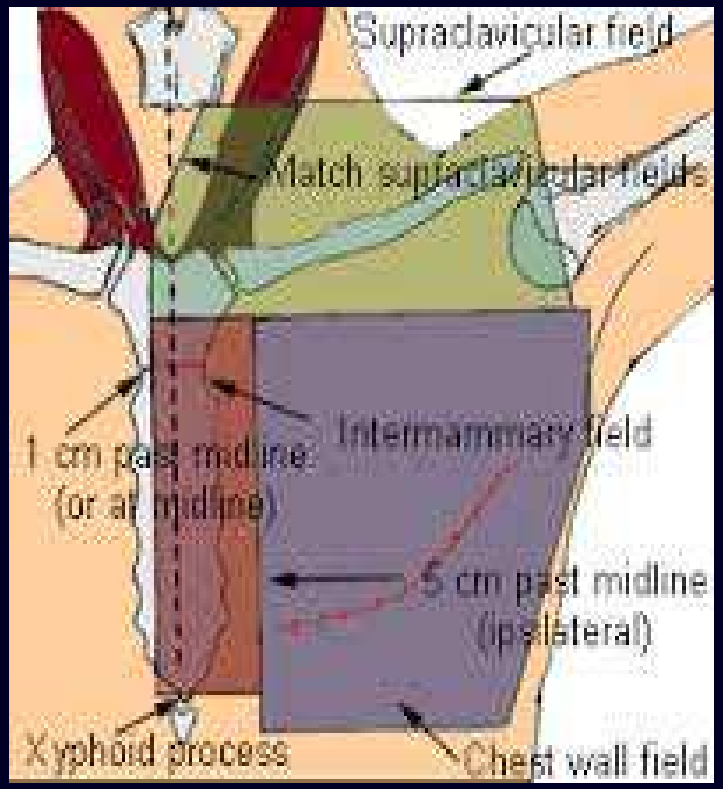
Analyses of locoregional recurrence first ignore distant recurrences, see appendix pp 8–9 for details. See appendix pp 14, 16, for analyses of both locoregional and distant recurrences, and appendix pp 13, 15, for analyses of overall mortality. RR=rate ratio. NS=not significant. Vertical lines indicate 1 SE above or below the 5, 10, 15, and 20 year percentages.



EBCTCG; Lancet 2014 Jun.21:318

EBCTCG:Lancet. 2011 Nov.12:378

Radiation dose to heart related with major coronary events



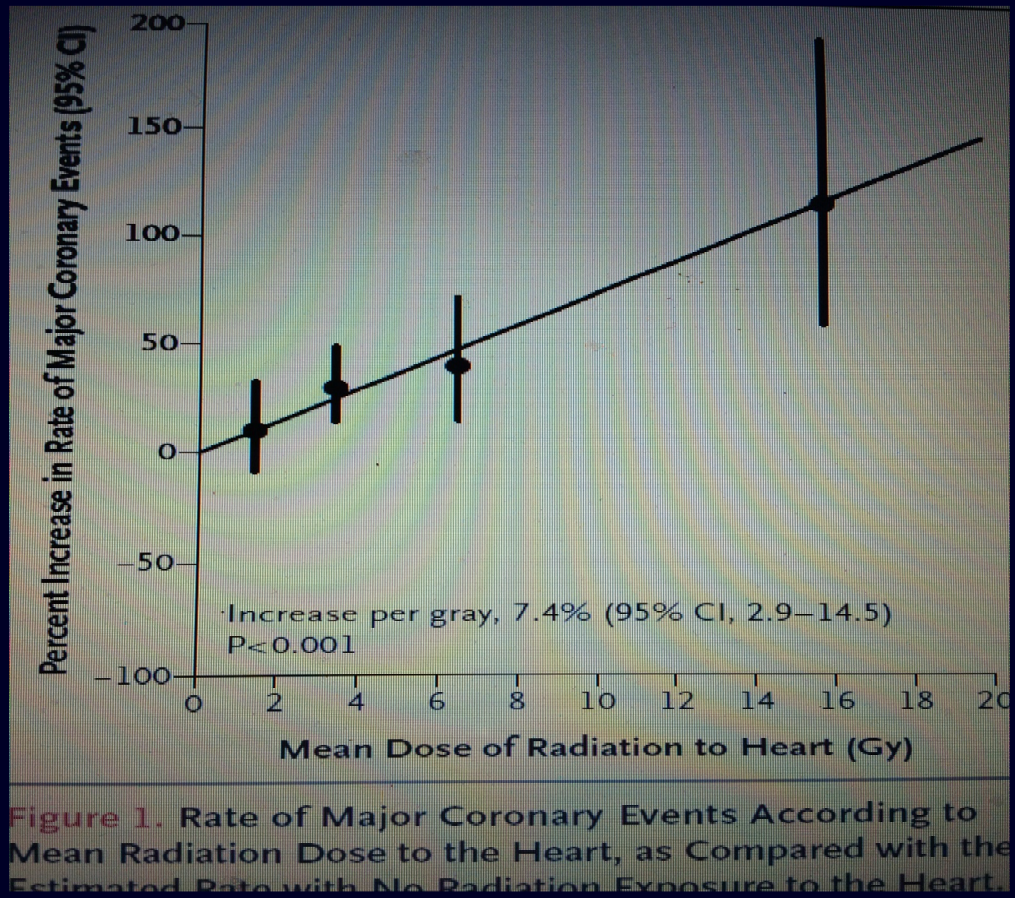
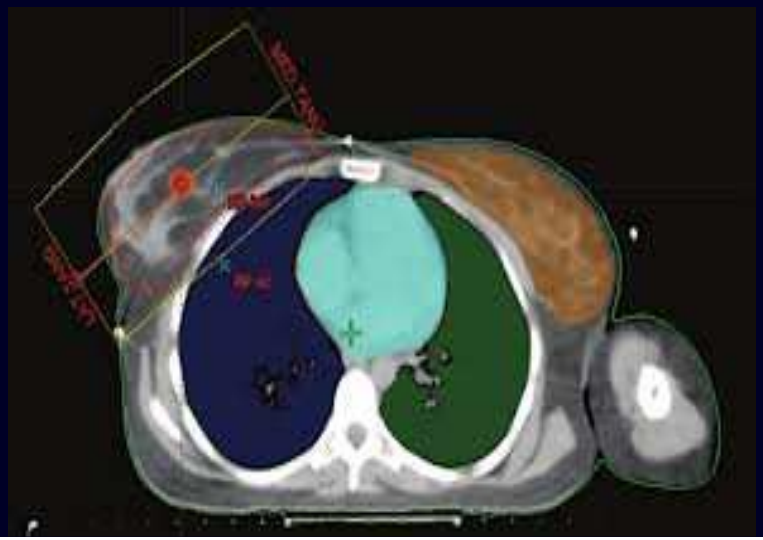


Figure 1. Rate of Major Coronary Events According to Mean Radiation Dose to the Heart, as Compared with the Estimated Rate with No Radiation Exposure to the Heart.

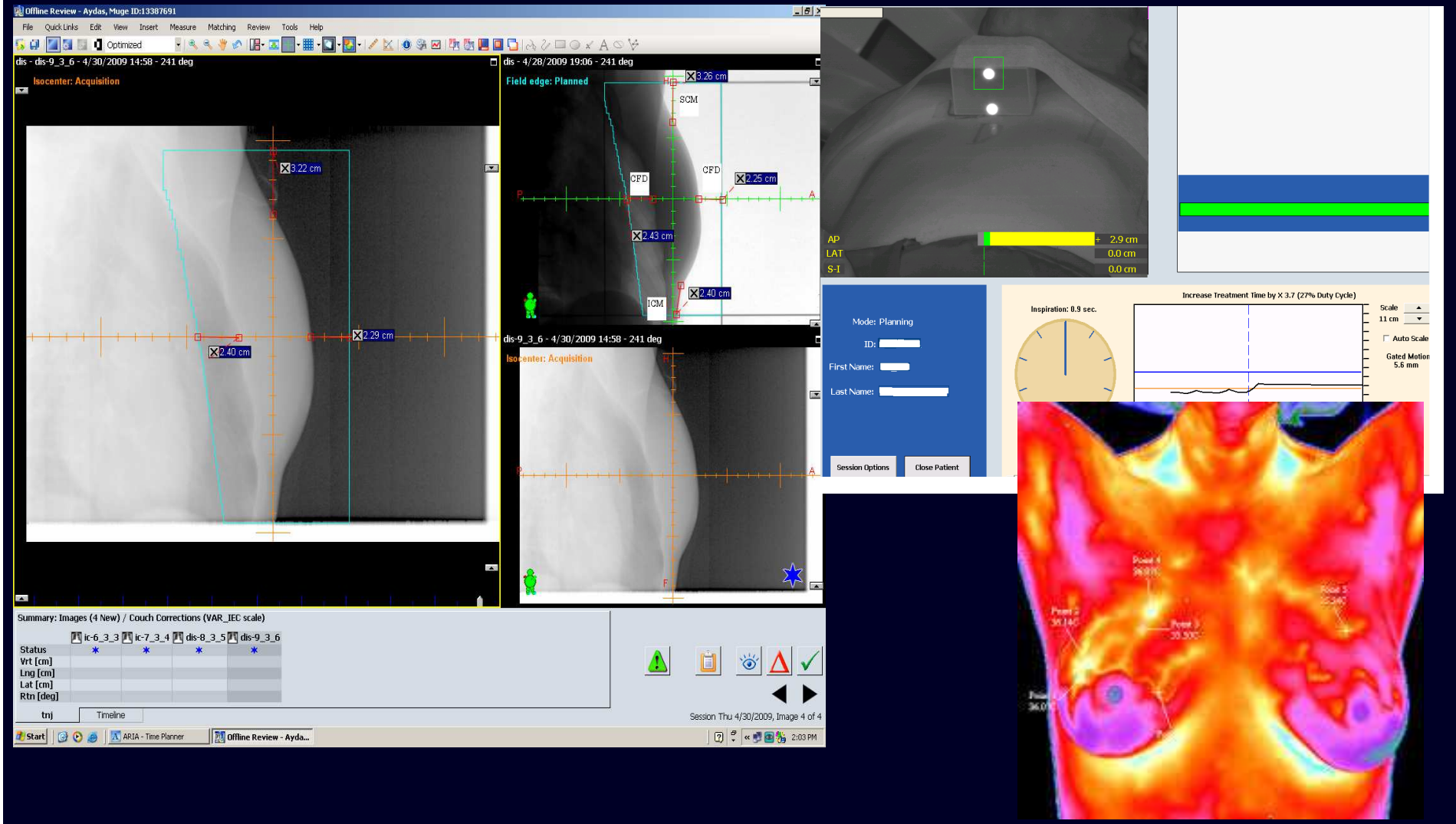
Darby et al, N Engl J Med , March 14:987

3-D RT is based on medical imaging techniques, three-dimensional dosimetry software, accessories, and verification procedures and multi-energy lineer accelerator with treatment verification procedures

- **Limit irradiation of healthy tissues**
- **Selection of best combination of beams**
- **Report the doses to TV and OAR**

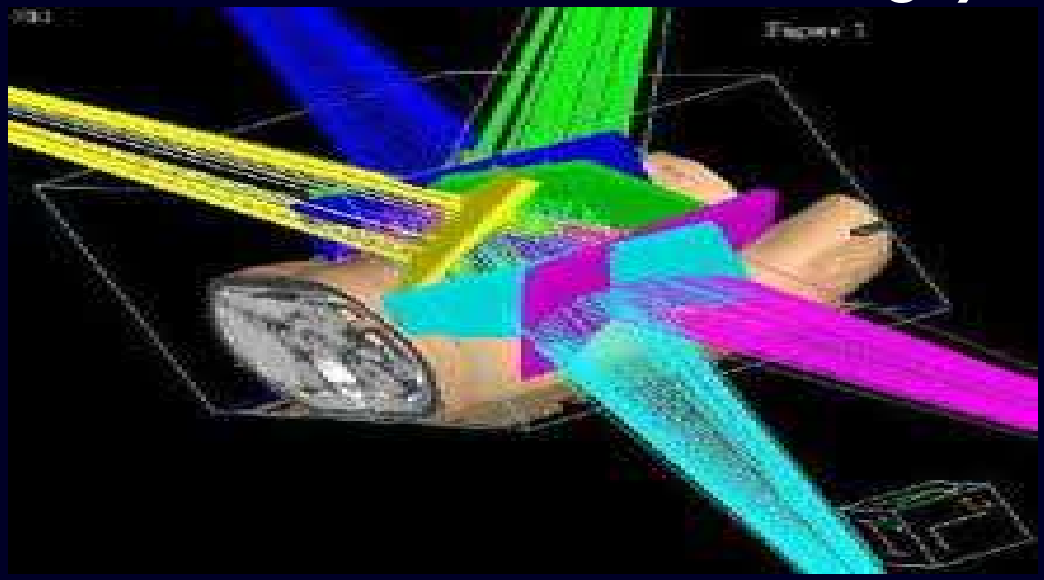


Set-up verification using portal imaging

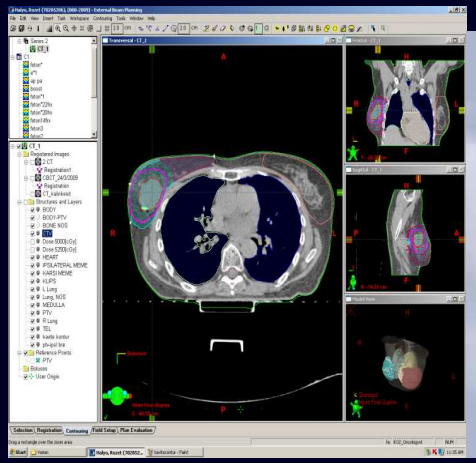


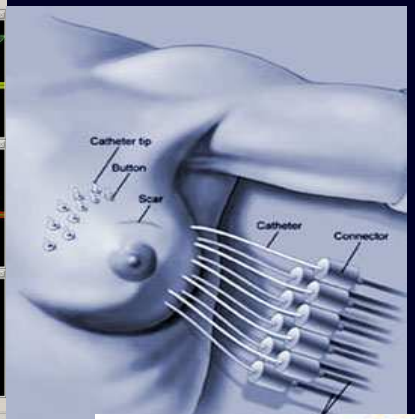
Techniques 3D+

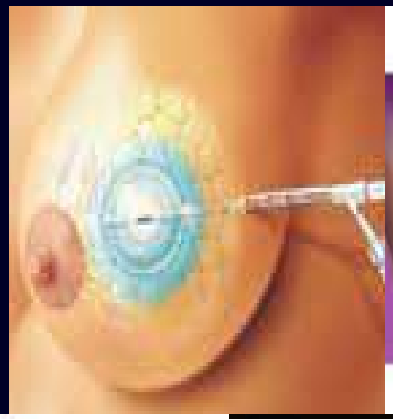
- **IMRT: Intentional variation of dose distribution, inverse planning**
- **Volumetric IMRT: Continuous rotation of the gantry**
- **iIMRT/vol IMRT: only needed (increased low dose bath outside TV contralateral breast and lungs)**

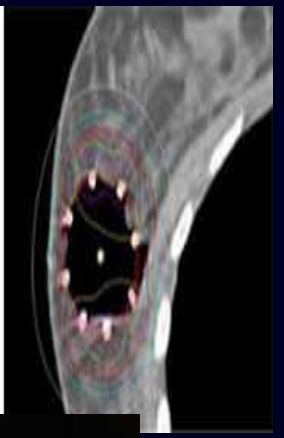


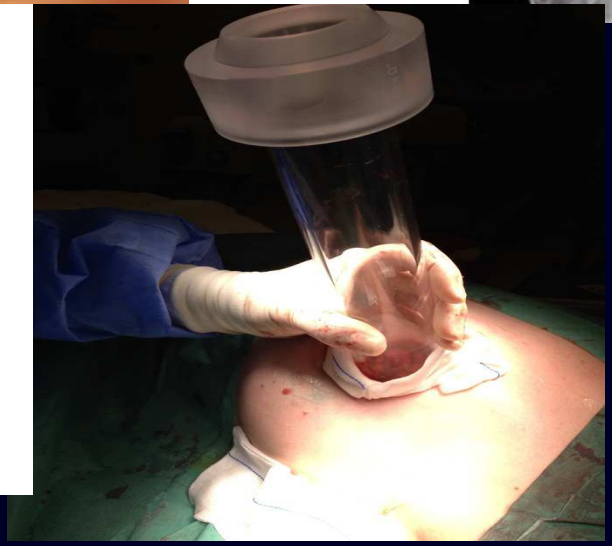
Partial Breast Radiotherapy











Radiation Therapy in Metastatic Breast Cancer

- Effective tool in the palliation of brain, bone and soft tissue metastases
- SBRT: Specially designed coordinate-system is used for the exact localization of the tumors in the body in order to treat it with limited but highly precise treatment fields.
- Cyberknife: Robotic radiosurgery for brain and body
- Gamma Knife: Noninvasive cerebral surgery for brain metastases using Co60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