



RADIOTHERAPY IN BREAST CANCER : PAST, PRESENT, FUTURE

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- Breast cancer is the classic paradigm of the multi-disciplinary management of cancer.
- The Breast Cancer Management Team:
 - Surgeon
 - Radiation Oncologist
 - Medical Oncologist
 - Radiologist
 - Pathologist



BASIC PLAN OF MANAGEMENT OF BREAST CANCER

- Early Breast Cancer (EBC): Surgery +/- RT, Chemotherapy & Endocrine therapy
- Locally Advanced Breast Cancer (LABC): Surgery + RT + Chemotherapy +/- Endocrine therapy
- Metastatic Breast Cancer (MBC): Chemotherapy/Endocrine therapy +/- palliative surgery & RT



RADIOTHERAPY IN BREAST CANCER: A STORY OF CHANGE

The more things change, the more they remain the same:

- ❖ The target, dose, fractionation and delivery modalities are all changing in breast cancer.
- ❖ Yet, some of the key questions of yesterday still remain!



NEW STANDARDS OF CARE IN RADIOTHERAPY OF BREAST CANCER

- Whole breast RT followed by tumor bed boost
- APBI
- Conformal RT & IMRT
- Hypofractionated RT
- Changing indications for post-mastectomy radiotherapy (chest wall & nodal)



RADIOTHERAPY AS PART OF BREAST
CONSERVATION THERAPY



BCS+RT

- Mastectomy is no longer a standard of care in breast cancer surgery
- BCS is possible in all EBC and is also practised in LABC
- Whole breast RT is compulsory in BCT



BCS+RT VS MASTECTOMY

Institute	IGR	Milan	NSABP B-06	NCI	EORTC	Danish
Stage	1	1	1,2	1,2	1,2	1,2,3
Surgery	2cm gross margin	Quad-rantectomy	Lump-ectomy	Gross excision	1 cm gross margin	Wide excision
Follow-up(y)	15	20	20	18	10	6
OS:BCS+RT(%)	73	42	46	59	65	79
M(%)	65	41	47	58	66	82
LR: BCS+RT(%)	9	9	14	22	20	3
M(%)	14	2	10	6	12	4

Results of BCS+RT and mastectomy are equivalent



BCS+RT vs BCS

Pooled meta-analysis of 15 RCTs :

- Threefold reduction in local failure

&

- Small but significant improvement in OS with RT after BCS



EARLY BREAST CANCER TRIALISTS
COLLABORATIVE GROUP
(EBCTCG) META-ANALYSES



EFFECT OF RT ON LOCAL RECURRENCE

- Local recurrence after BCS was reduced by approximately 2/3 with RT, irrespective of type of RT and stage.



EFFECT OF RT ON MORTALITY

- Breast cancer mortality was significantly reduced
- However, mortality due to other causes was significantly increased.
- Overall long-term mortality reduction with RT is around 4-5%.
- Similar proportional benefit of RT in ALL stages.
- Absolute benefit varies with the actual risk, according to stage.

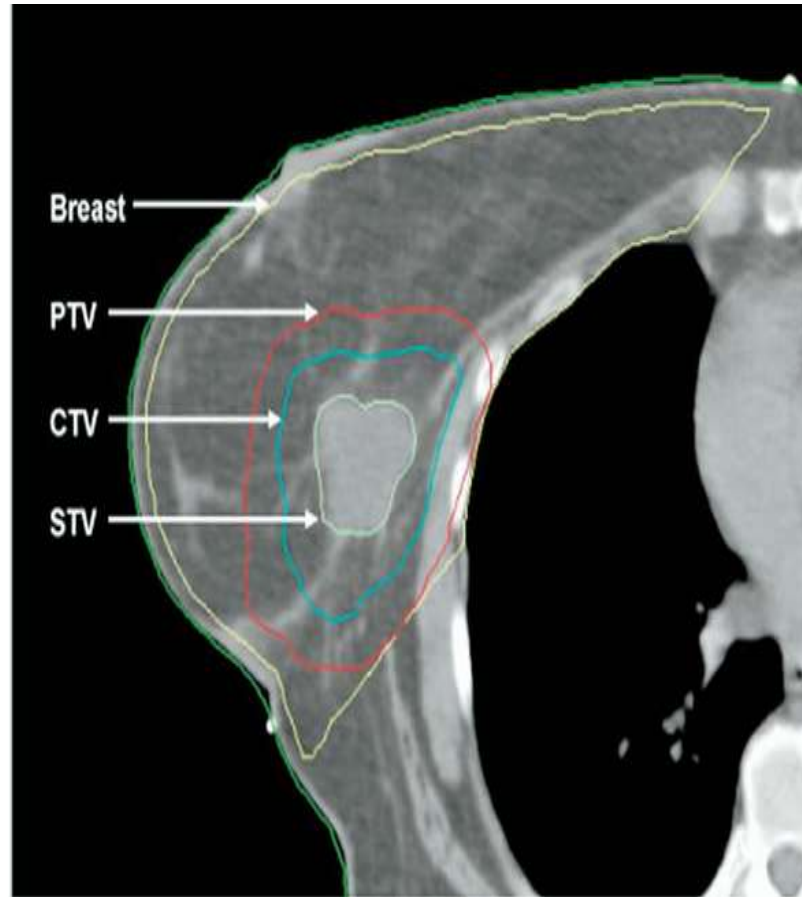


BOOST

- Boost denotes an extra dose delivered, following whole breast radiotherapy, to the tumor-bearing portion of the breast.
- Boost dose has been found to increase the local control rates.
- There are various modalities of delivering the boost dose.
- CT-based localisation & planning are preferable.



- STV (Seroma Target Volume)= tumor cavity
- CTV= STV+1cm
- PTV=CTV+1cm
- STV to EXclude breast tissue stranding, but INclude surgical clips (if present)



BOOST MODALITIES

- Electrons
- HDR brachytherapy
- 3DCRT/IMRT/VMAT
- Protons



PARTIAL BREAST IRRADIATION



Twin rationale:

- Most (85-90%) breast cancer recurrences occur in the index quadrant.
- Many patients cannot come for prolonged 5-6 week adjuvant radiotherapy for logistic reasons.



APBI: INDICATIONS (AMERICAN SOCIETY OF THERAPEUTIC RADIOLOGY & ONCOLOGY RECOMMENDATIONS)

Suitable outside clinical trial (ALL of)

- Age > 60 years
- BRCA negative
- T1N0M0 (Tumor size < 2cm, with negative axillary lymph nodes)
- EIC (Extensive intraductal component) negative
- Unifocal
- IDC (Infiltrating ductal carcinoma)/ favourable histology
- Margin negative (> 2mm)
- LCIS (Lobular Carcinoma-in-situ) negative
- ER (Estrogen Receptor) positive



ASTRO: “UNSUITABLE” FOR APBI

ANY OF:

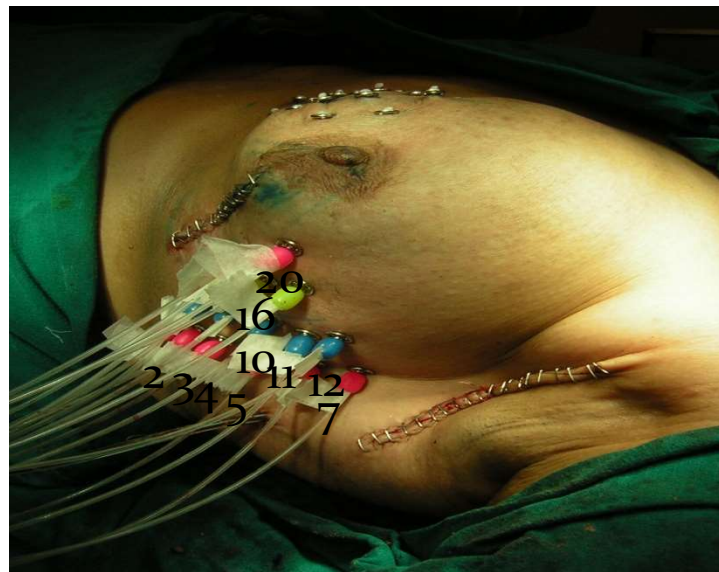
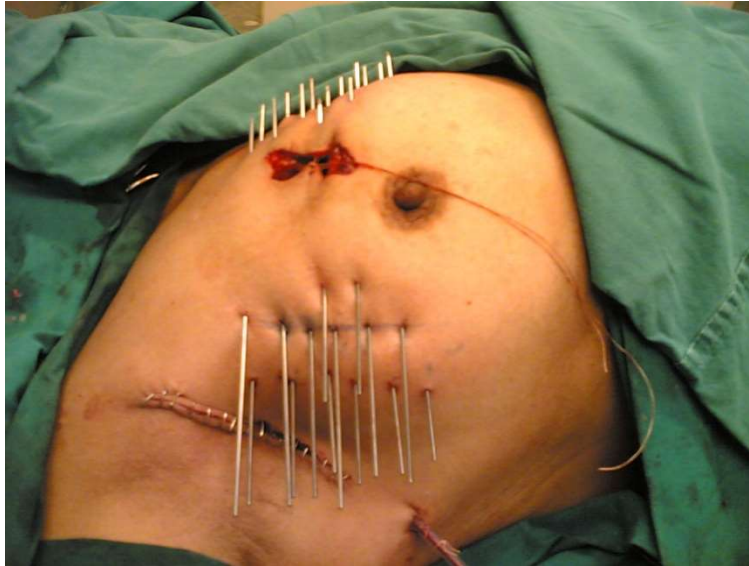
- T>3cm/T4 or N+
- BRCA mutated
- High grade
- LVSI extensive
- EIC+ve (>3cm)
- Multifocal disease (contraindication to BCS per se)
- Margin positive
- Received neoadjuvant chemotherapy



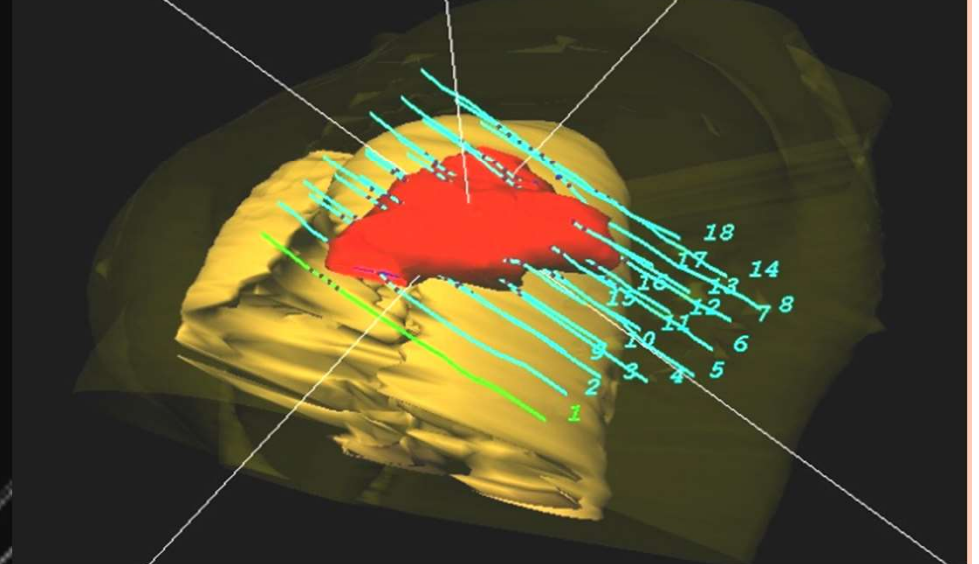
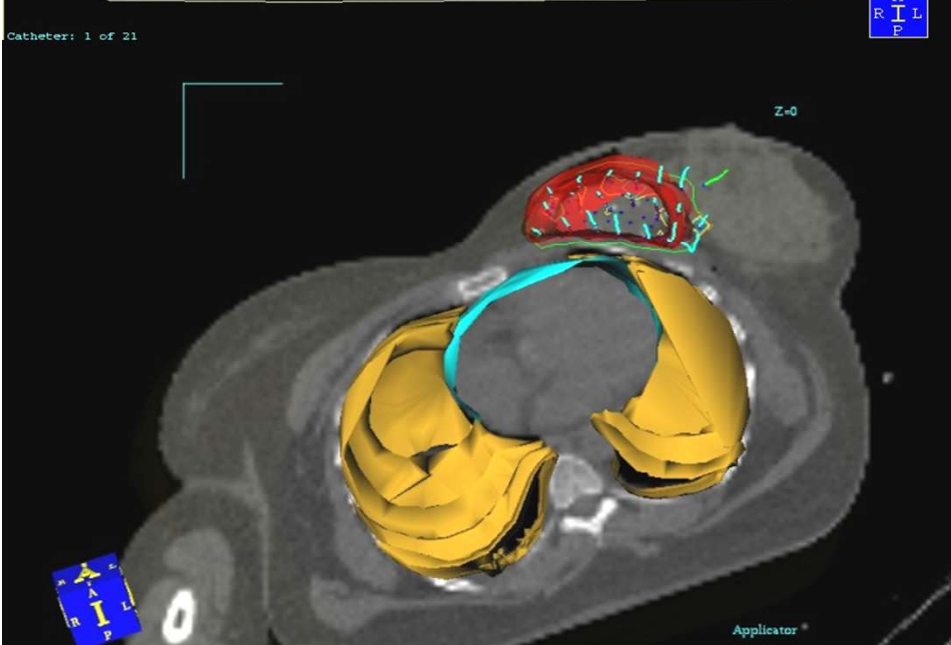
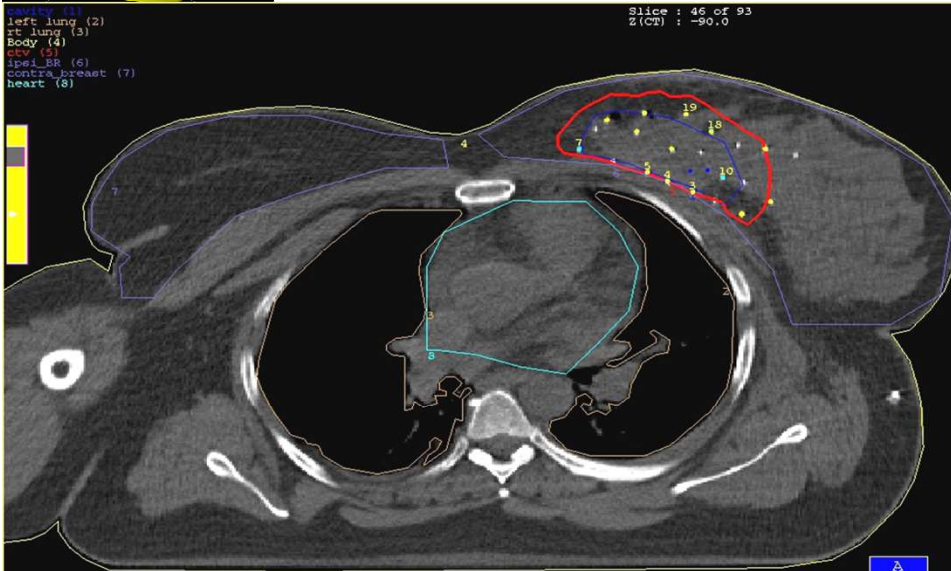
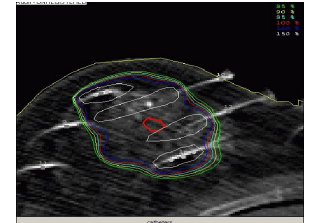
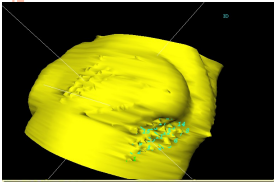
APBI: MODALITIES

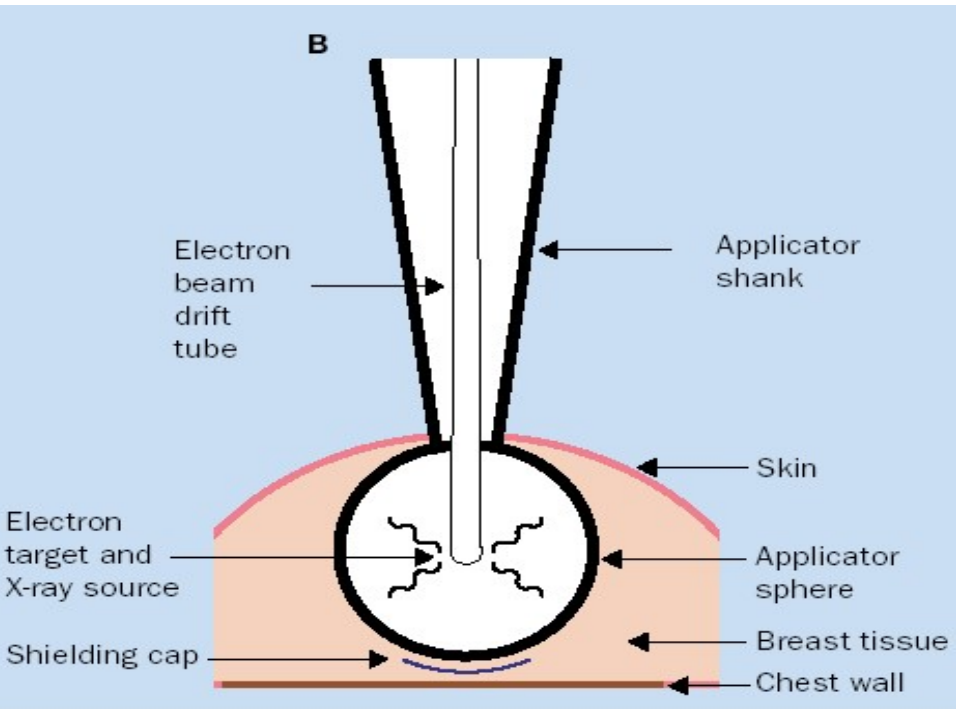


INTERSTITIAL BRACHYTHERAPY

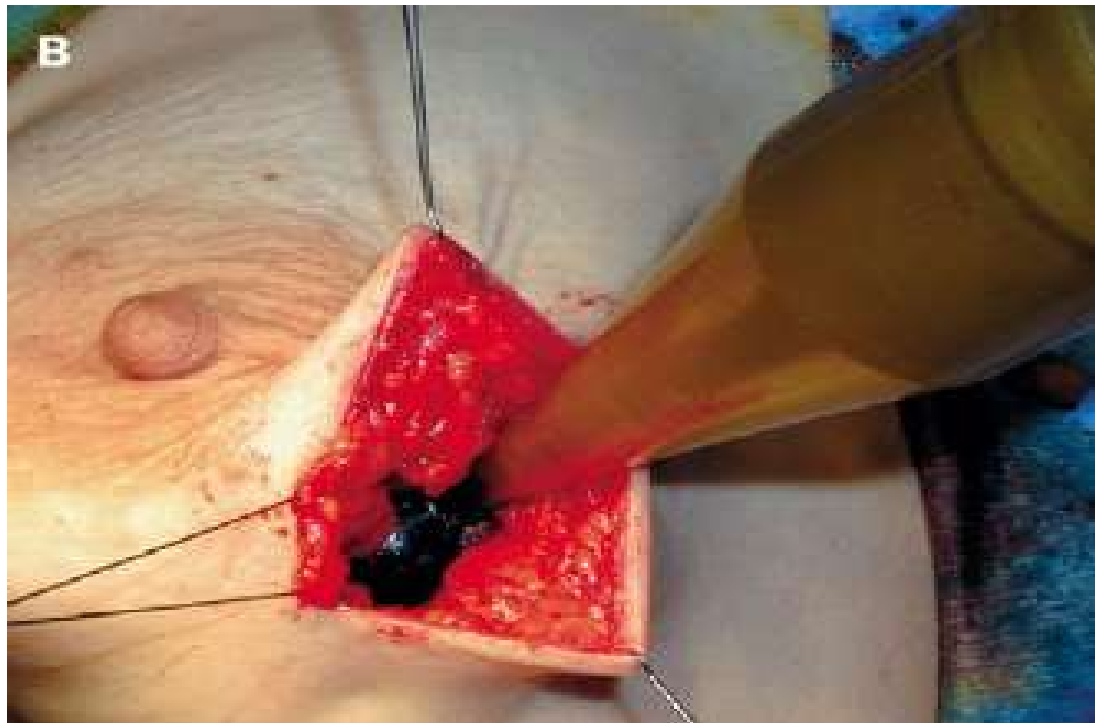


3D CONFORMAL BRACHYTHERAPY





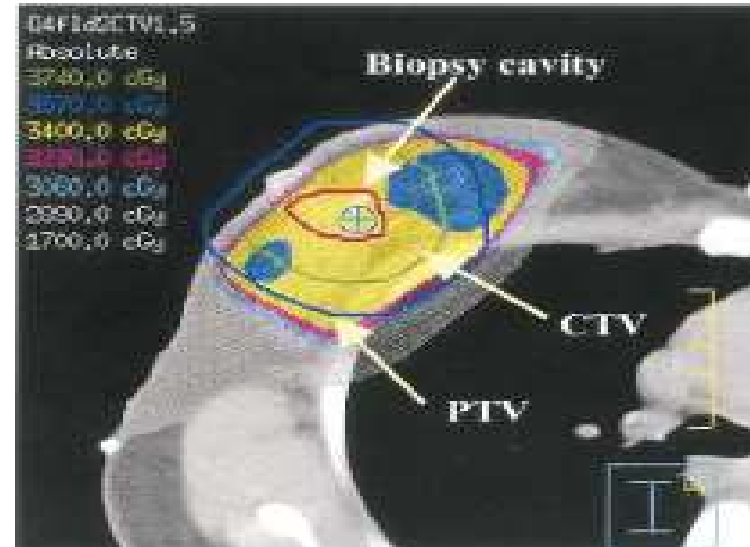
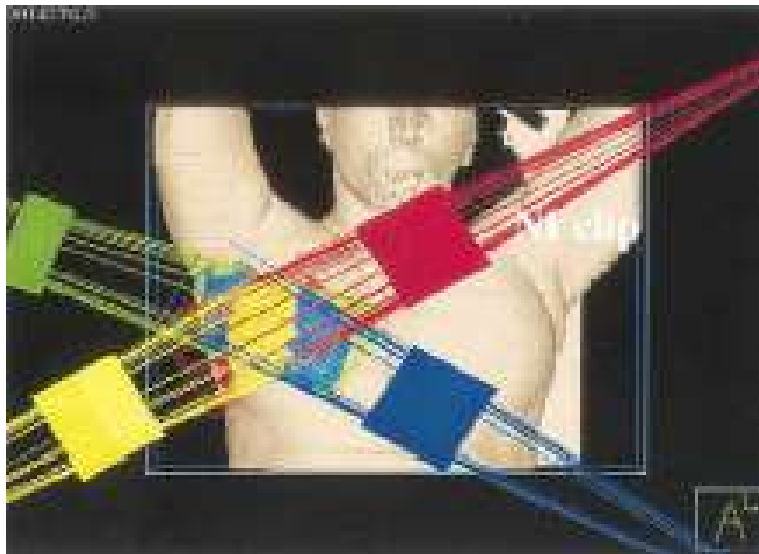
TARGET



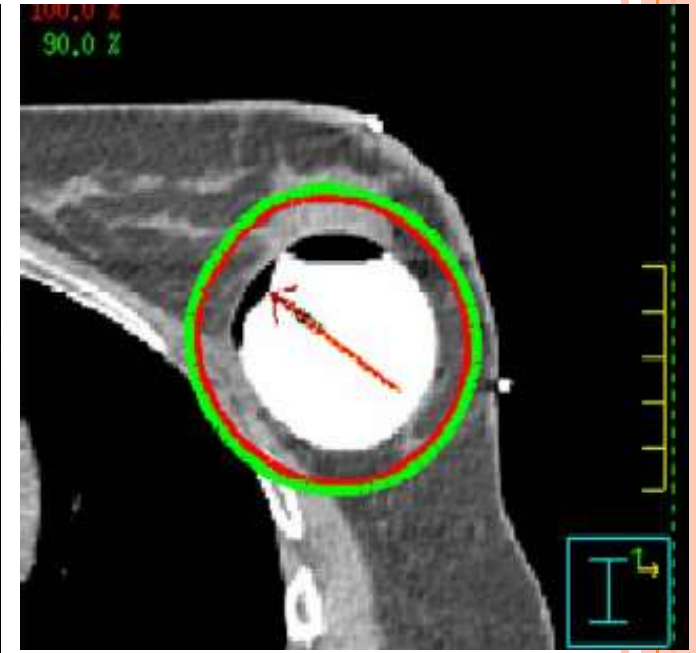
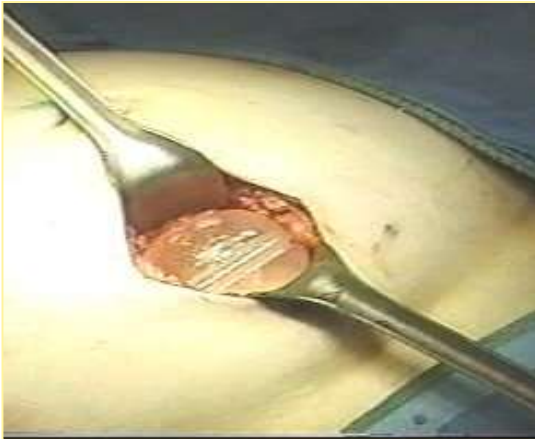


ELIOT

3DCRT AND IMRT



MAMMOSITE



INTENSITY MODULATED RADIOTHERAPY



IMRT BREAST: WHY?

Advantages :

- ❑ better dose homogeneity for whole-breast RT
 - ❑ better coverage of tumor cavity
 - ❑ feasibility of simultaneous integrated boost to tumor cavity
-
- Forward planned IMRT (field-in-field) is preferred as it is simple and effective.



ALTERED FRACTIONATION



FRACTIONATION

- Fractionation describes how we divide up the total dose into daily packets or fractions
- Conventional fractionation means delivering 2Gy/#, 1#/day, 5 days/week
- Usual dose of RT for whole breast RT is 50Gy/25#/5 weeks
- Hypofractionation means reducing the number of fractions, while increasing the dose/#, and usually reducing the total duration of therapy



HYPOFRACTIONATED RT

- Started as an empirical practice in government-run health care systems of UK and Canada
- Initially, a purely logistical exercise to reduce treatment duration & create machine space
- Recently, 2 large trials, START-A and START-B, have validated that clinically as well, hypofractionated RT is safe and effective
- As a result, schedules like 40Gy/15#/3 weeks have now become standard of care.



CHANGING INDICATIONS OF POST-MASTECTOMY RADIOTHERAPY



- 1-4 positive axillary nodes
- High grade tumors
- Lymphovascular emboli
- Perineural invasion
- Age <45-50 years
- Tumor size >2cm

Presence of many/all of these factors would be an indication for post-mastectomy RT

- Scoring systems (eg Cambridge post-mastectomy score) are often used.



IS THERE A ROLE OF AXILLARY NODAL RT?

- Axillary nodal RT is no longer indicated if complete axillary dissection (>10 LN sampled) has been performed.
- Axillary nodal RT significantly adds to the lymphoedema morbidity
- The only possible indications today are:
 - ❖ incomplete/ no axillary dissection
 - ❖ positive axillary nodes WITH extracapsular extension (ECE)/ perinodal extension (PNE)



TAKE HOME MESSAGES

- Radiotherapy is an invaluable part of the multi-disciplinary management of breast cancer
- Radiotherapy is often necessary to prevent local failure in post-mastectomy patients & is essential for breast conservation therapy
- New techniques (3DCRT/IMRT), new fractionation schedules (hypofractionation) & new targets (partial breast irradiation) have meant that breast radiotherapy has remained a vibrant, ever-changing modality.



THANK YOU

