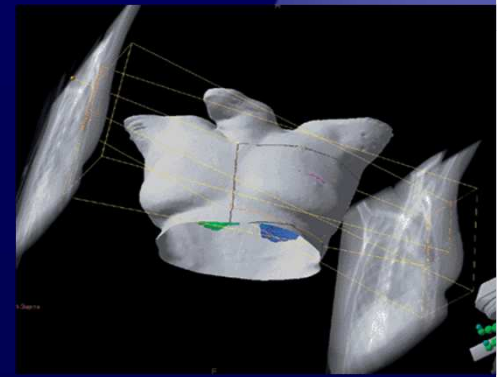




2 D Plan post BCS

Dr. R. K. Vyas

Prof. & Head,
Dept. of Radiation Oncology,
Gujarat Cancer & Research Institute,
Ahmedabad.



EPIDEMIOLOGY

- Incidence:
- Most common lethal neoplasm in women
- Incidence different among different populations.
- 1 out of 8 will develop BC in lifetime.
- 25 % women with cancer have BC
- Incidence of BC in males is 1 %

- 
- Increasing incidence in India
 - Multimodality approach
 - Radiotherapy – Major role
 - Adjuvant Radiotherapy – Post operative
 - External Beam Radiotherapy, Brachytherapy
 - Newer Concepts – IMRT, Partial Breast Irradiation, Mammosite, Internal Mammary Brachytherapy



Role of radiation in the management of breast cancer

- Has been in continual evolution since its inception, a century ago.
- Initially used for only palliating distressing symptoms
- As a routine post-op adjuvant therapy for all mastectomy patients
- Currently RT is used as adjuvant treatment and to palliate symptoms

Role of RT in Breast Cancer

- Preoperative RT.
- Post-mastectomy RT.
- Conservative surgery + RT.
- Palliative RT.

Conservative breast therapy (CBT)

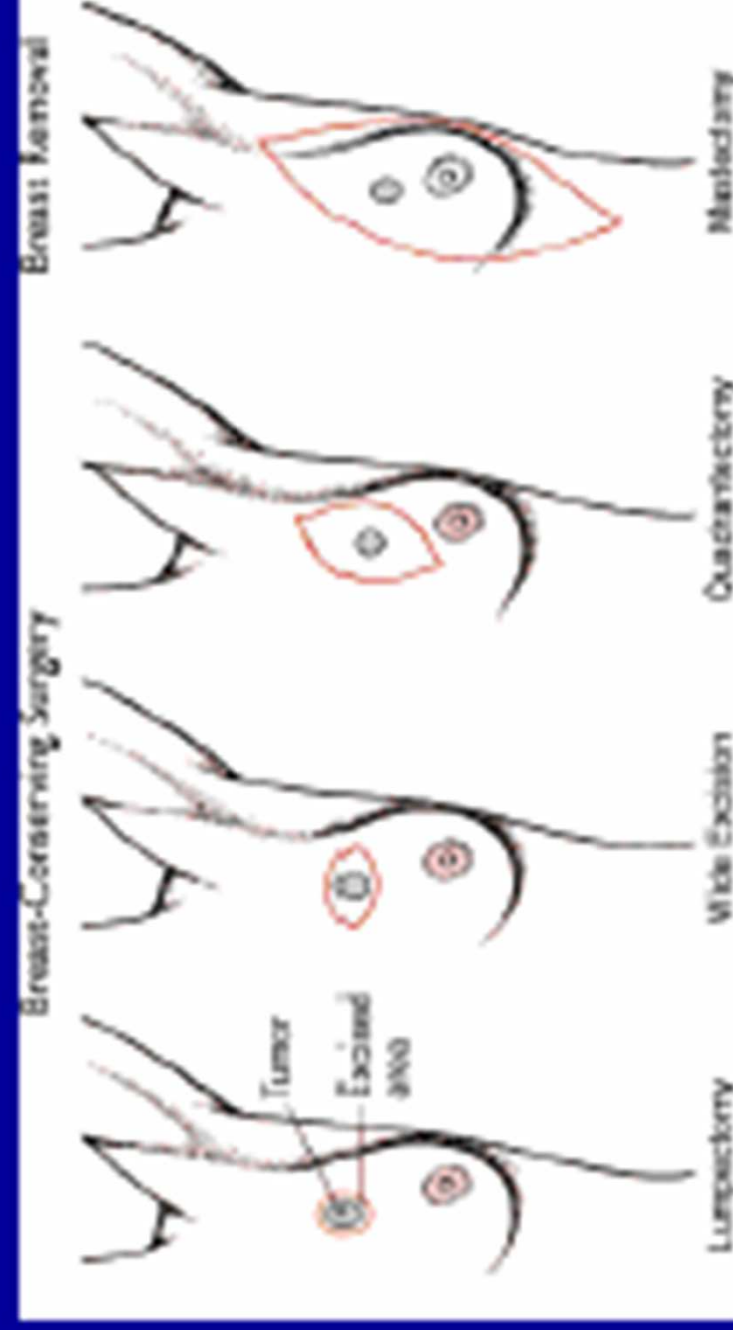
- Surgery (? Lumpectomy + ? axillary LN)
- + Radical RT.
- ± Adjuvant Systemic therapy.

Breast Surgery - History

- Amputation, Renaissance
- Radical mastectomy, 1882-*Halstead*
- Modified Radical Mastectomy (MRM), 1932 - *Paty*
- Breast Conservation/Lumpectomy, 1980s
- Reconstruction, 1980-90s



Breast Surgery - Options





Breast Conservation

- Excise tumor and surrounding margin
- Cosmetic result variable
- Radiation therapy post-operatively



Breast Conservation Versus Mastectomy

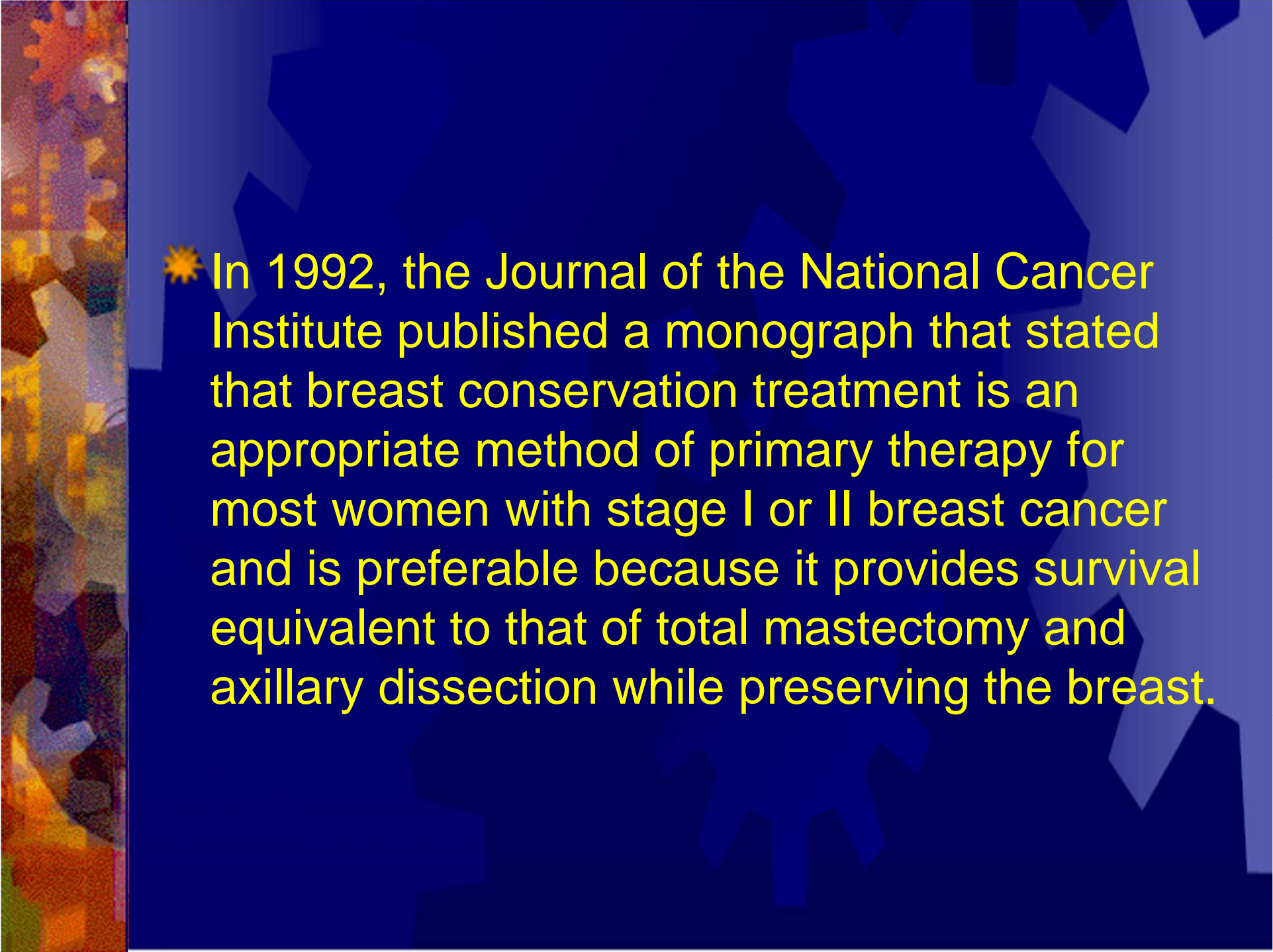
- For most women, breast conservation therapy is as good as mastectomy
- Contraindications remain
 - Multicentric disease
 - Inability to obtain negative margins
 - Breast lesion and breast size
 - Contraindication to radiation therapy
 - Patients' preference
 - Compliance

Breast Conservation/Radiation

Overview Analysis
of 9 Randomized
Controlled Trials
with 2400 patients
per arm confirms
equivalent survival
with Mastectomy



NEJM 1995;333,1444

- 
- ✱ In 1992, the Journal of the National Cancer Institute published a monograph that stated that breast conservation treatment is an appropriate method of primary therapy for most women with stage I or II breast cancer and is preferable because it provides survival equivalent to that of total mastectomy and axillary dissection while preserving the breast.

Skin Sparing Mastectomy

- Breast Conservation not available to all patients (approx 30%)
- Aesthetic Considerations:
 - Smaller Incisions
 - Skin Envelope Retained
 - Symmetry with opposite breast

The background of the slide is a dark blue field filled with faint, overlapping gear shapes. On the left side, there is a vertical strip of colorful, abstract, pixelated patterns in shades of orange, red, and yellow.

What to do with the lymph nodes ????

Sentinel Lymph Node Biopsy (SLNB)

- Definition
 - “gate-keeper” or first echelon node to drain a tumor, i.e. primary breast cancer
- Focuses on
 - Identify node-negative patients
 - avoid unnecessary node dissection
 - Identify node-positive patients
 - Complete node dissection
 - Systemic therapy
 - XRT



Sentinel Node Biopsy

- Conservative surgical procedure
- Remove one or few LNs (sentinel node)
- If cancer-free, other nodes left intact
- If sentinel node is +, other nodes removed mostly

Breast Reconstruction

- Options based on patient preference and available tissue
- Implants (Saline and Silicone)
- Autogenous Tissue (Rectus Muscle and Latissimus Dorsi Muscle)

Pre and Post Expander and Implant



TRAM Flap



Post-TRAM Flap





Gluteal Free Flap

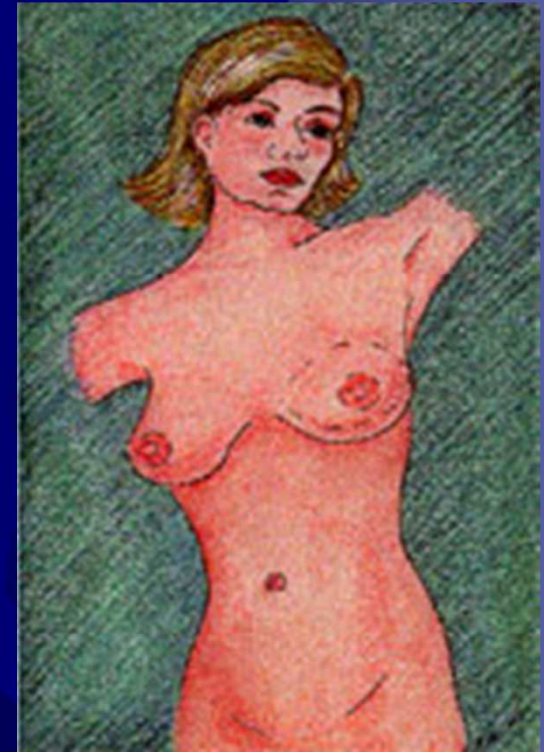
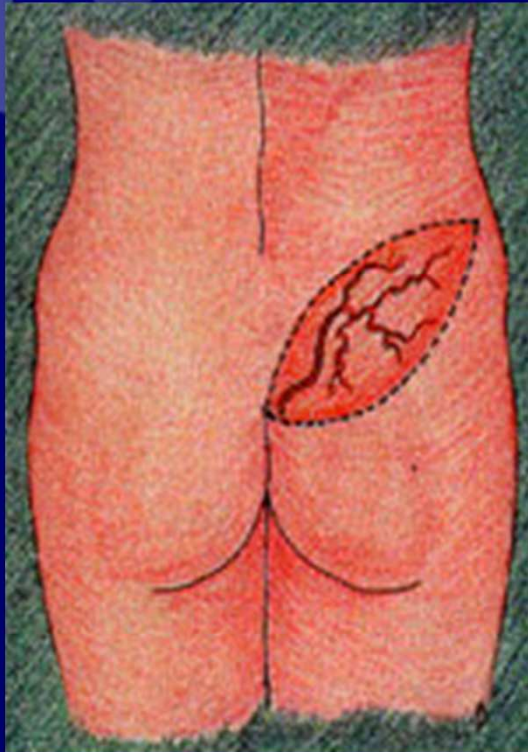
- If not candidate for TRAM
- Use tissue from upper or lower buttock
- Recommended for
 - ✓ < 45 years old
 - ✓ Flat abdomen
 - ✓ Scars
- Not candidate for implants



Gluteal Free Flap

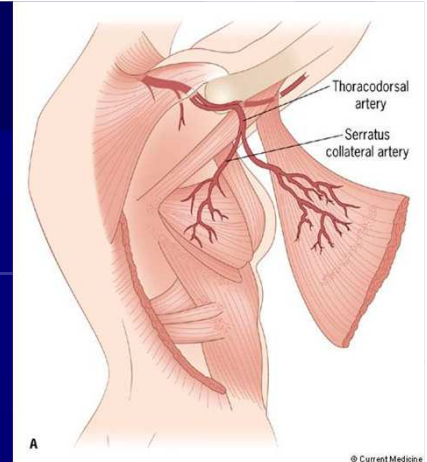
- Limited ability to create breast that is large
- Soft and natural slope
- Mild flattening at buttock donor site
- Gluteal muscle completely detached
- Microsurgery needed

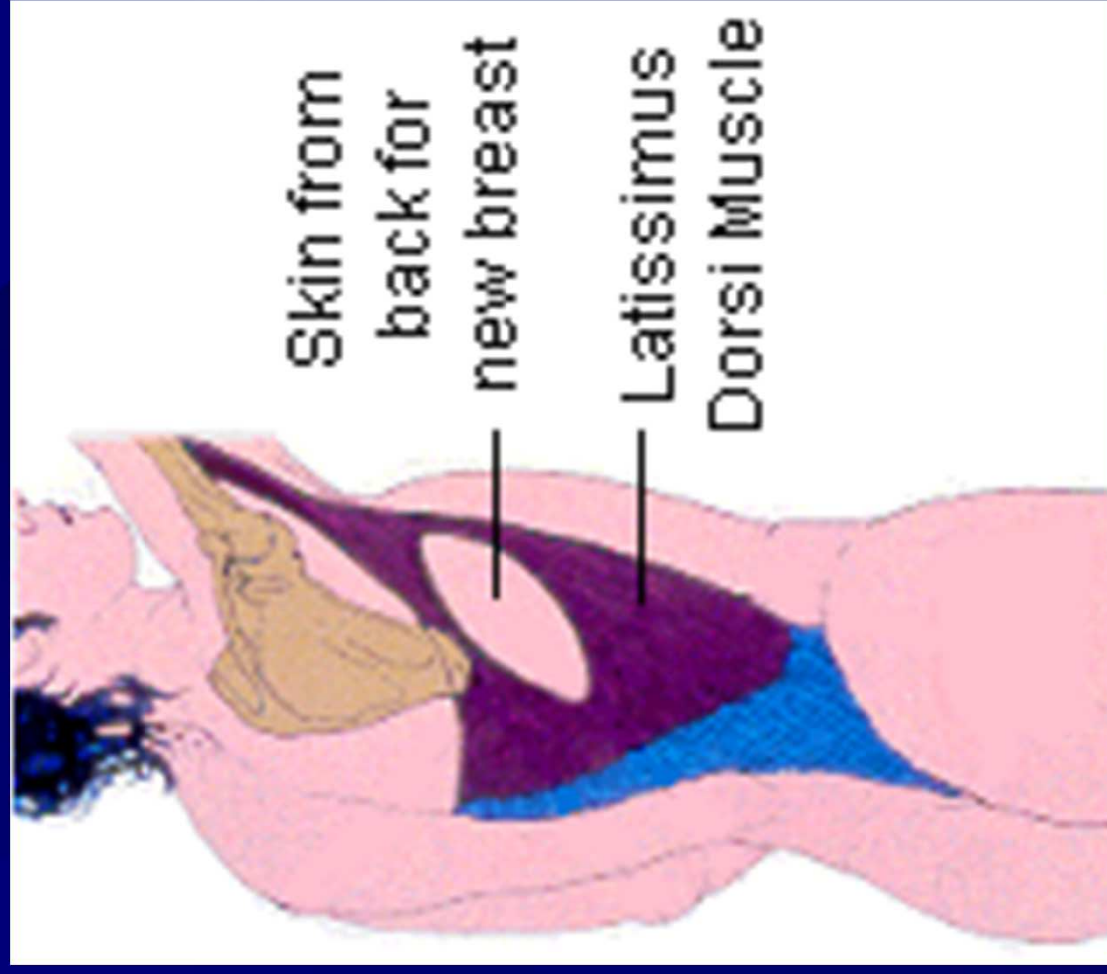
Gluteal Free Flap



Latissimus Dorsi Flap

- Alternative to TRAM flap
- Borrows skin and muscle from upper back
- While tissue partially attached, it is slid underneath the skin from back to front
- Provides much of the needed skin but not tissue volume
- Need tissue expander






LD FLAP



Whole Breast Radiotherapy

- Whole breast RT following lumpectomy has an important role in the treatment of early stage breast cancer
- Potential side effects:
 - Acute: painful erythema & desquamation
 - Chronic: hyper-pigmentation, fibrosis, fat necrosis, pain
- The incidence and severity of side effects is managed by minimizing “hot spots”



TECHNIQUES OF IRRADIATION

- Breast or Chest wall : Two tangential fields to prevent RT to lungs. Not > 2.5 cms
- Newer techniques like IMRT can spare lung
- Use of Breast Wedge Boards
- Wedge filters needed to decrease dose to nipple and for homogenous dose distribution
- Lower axilla included in tangential fields



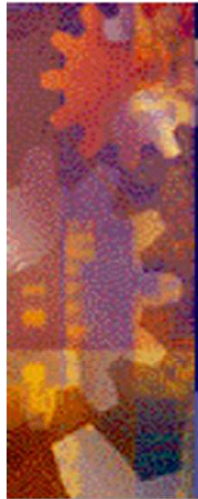
Basic necessity...

- Accurate Positioning
- Proper Immobilization

POSITION



- ✓ Supine position
- ✓ Arm (involved side) elevated
- ✓ Face turned away
- ✓ Symmetrical & straight
- ✓ Elevate both arms
- ✓ Head straight



Problems

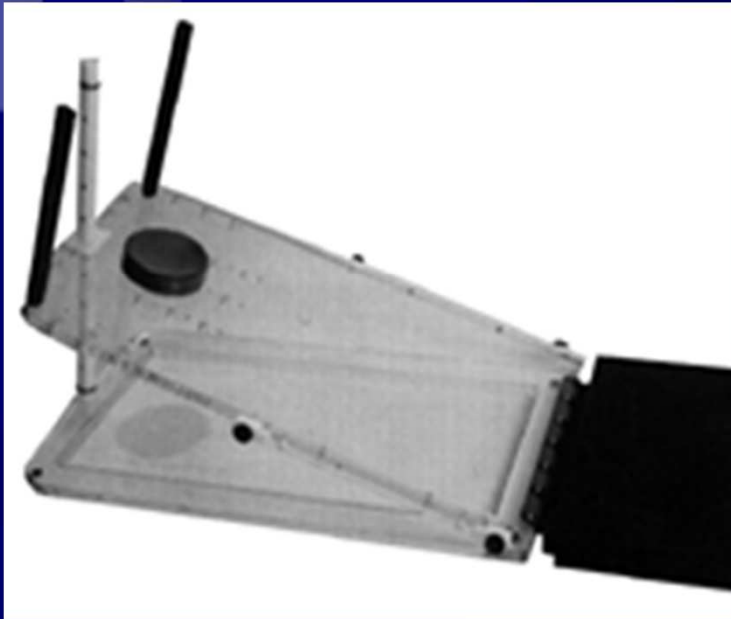
1. Ability to raise ARM
2. Skin folds
3. CT aperture



Orfit



Breast Board



Breast Wedge Board



Different Electron Applicators





Steps of Planning

- Marker Placement
- Simulation
- Contour
- 2 D Plan Generation
- Verification
- Execution of Treatment Plan

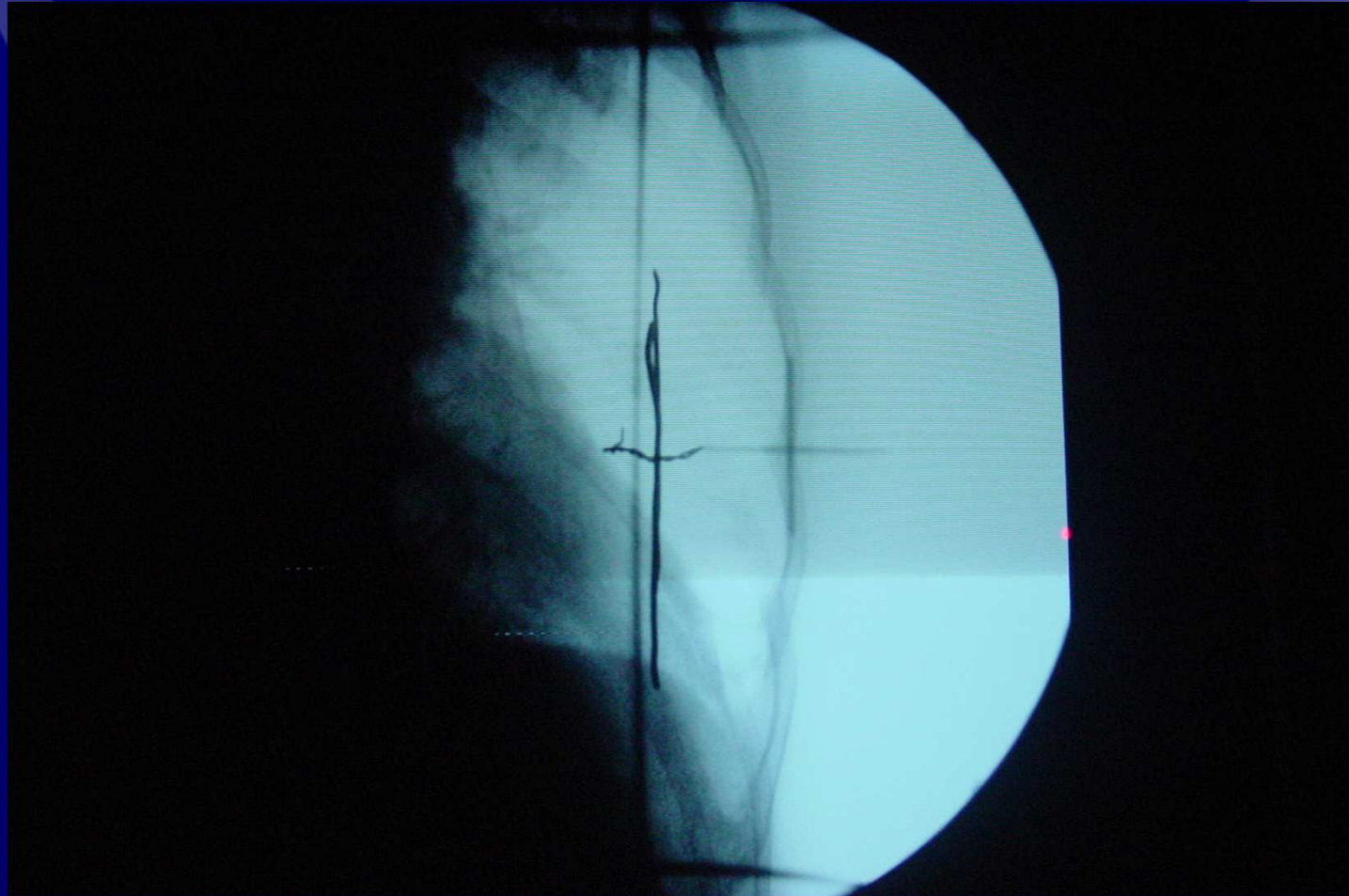
MARKER PLACEMENT



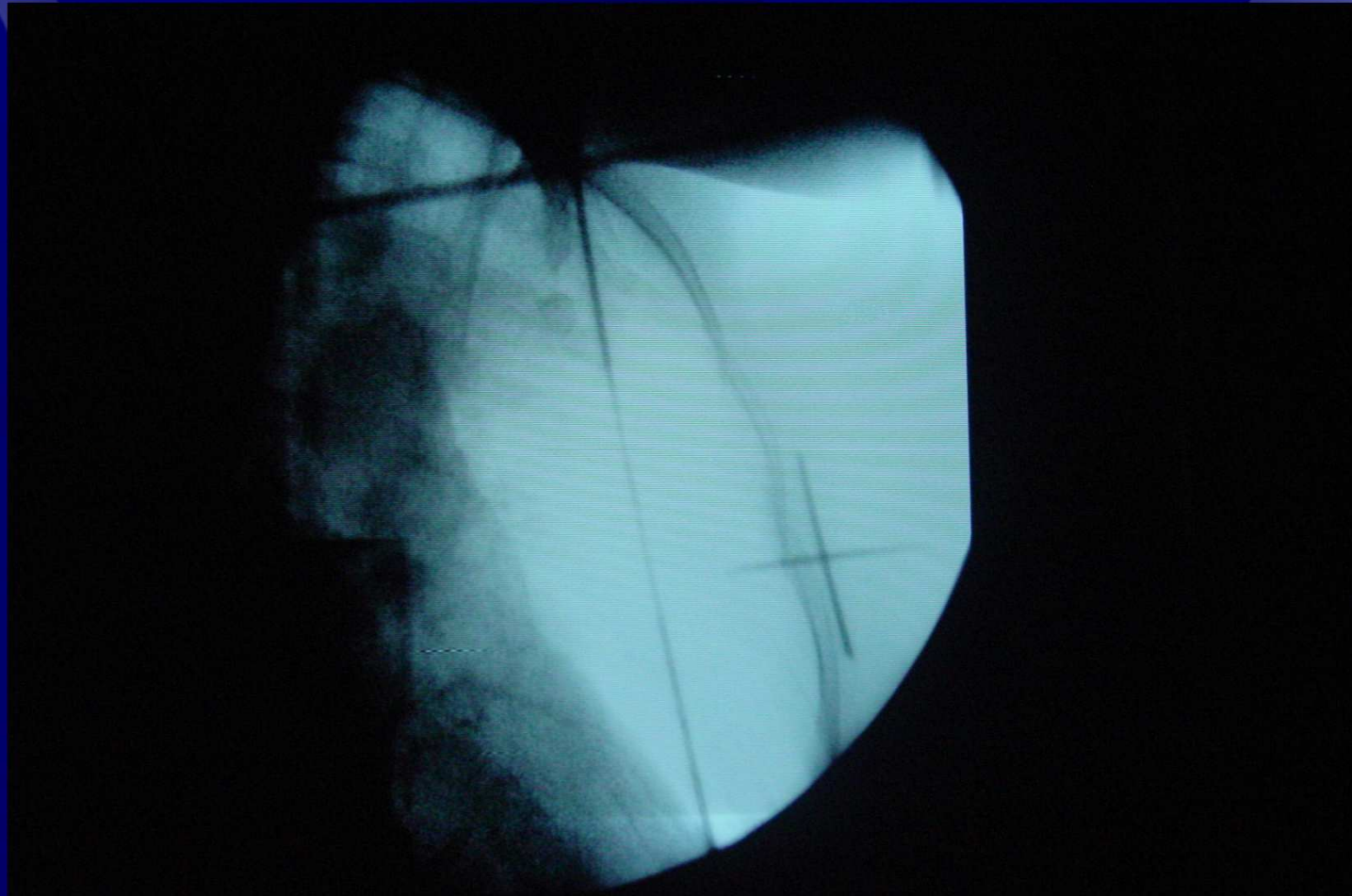
MARKER PLACEMENT



Marker Alignment



Collimation



WIRE FOR CONTOURING



POP CONTOUR



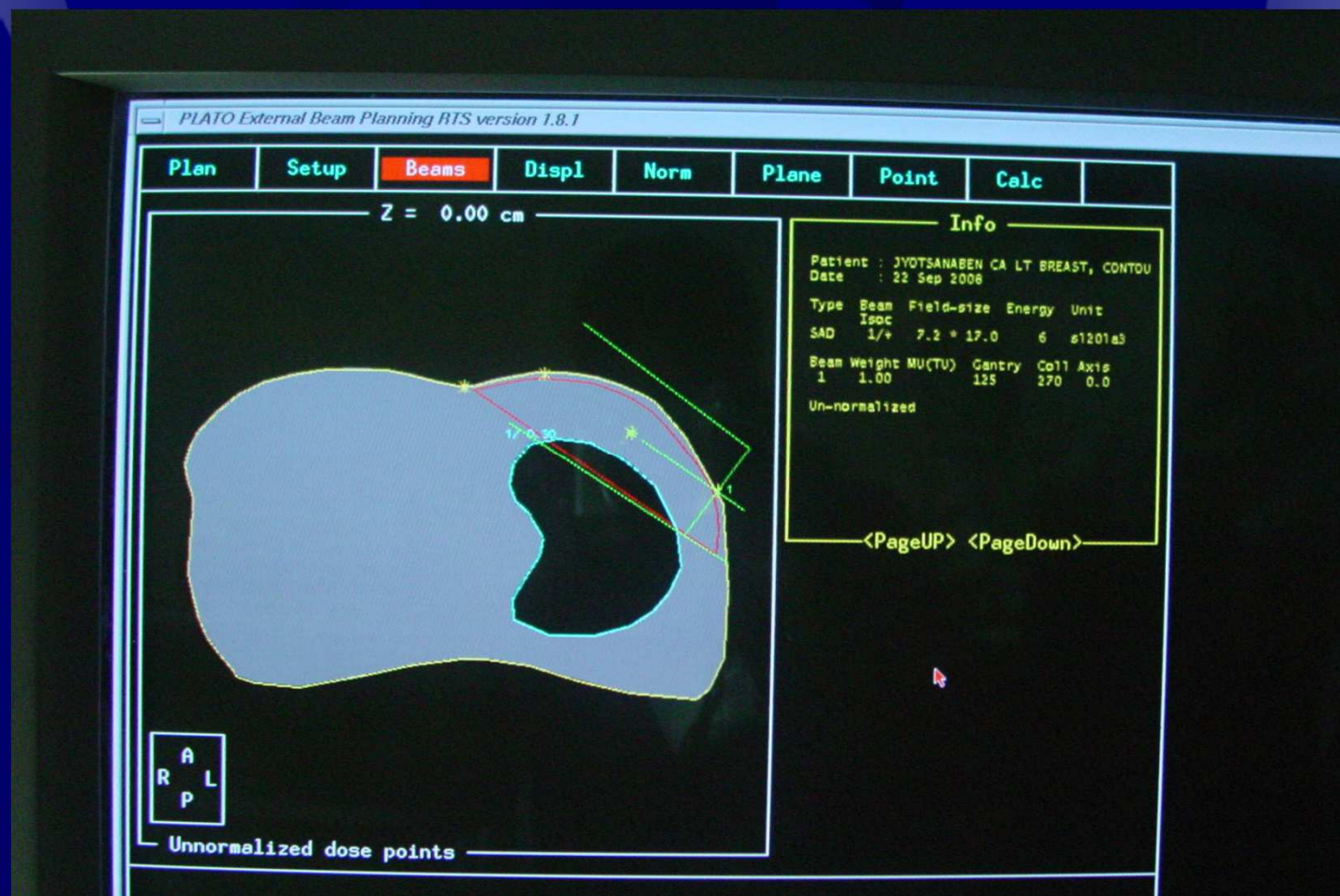
PORCUPINE



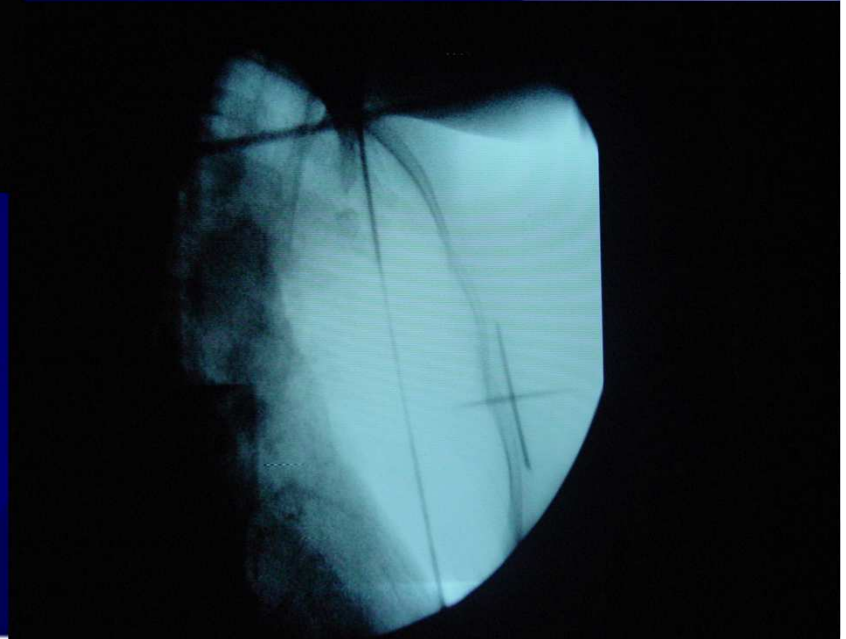
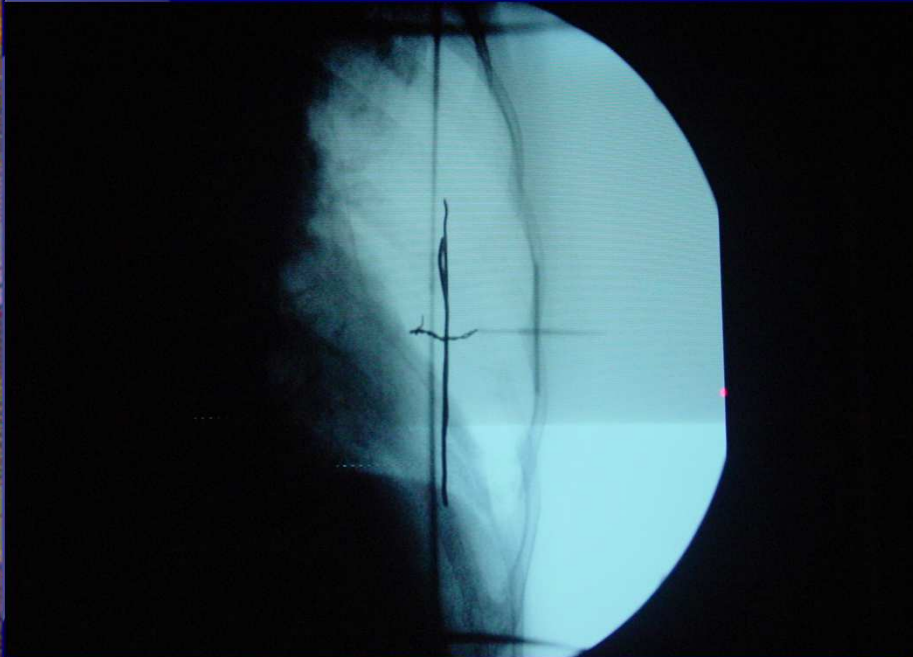
TPS Planning

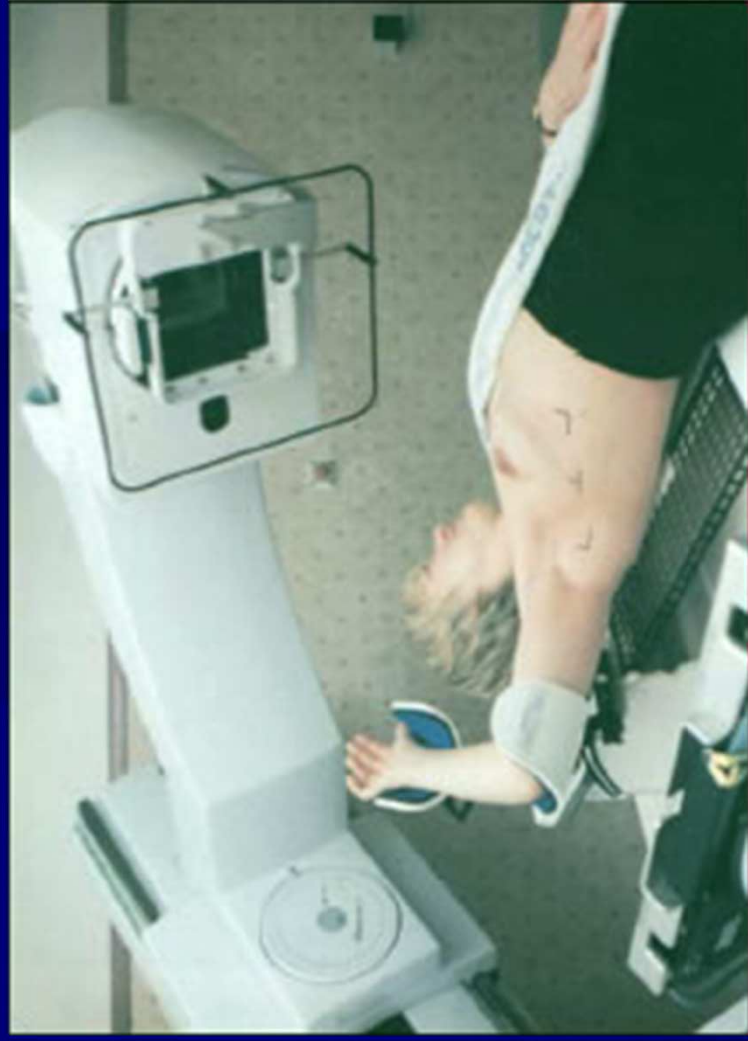


Beam Placement



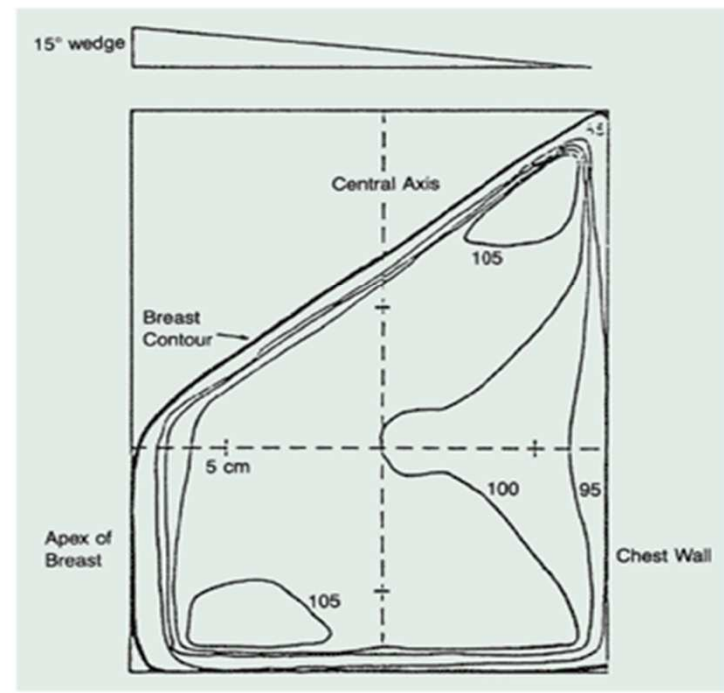
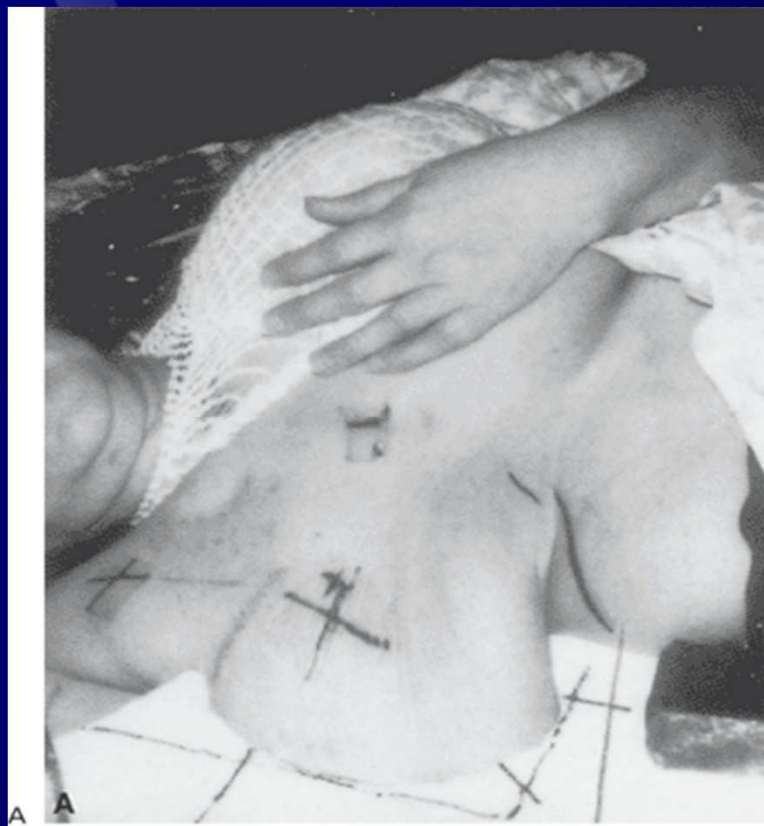
Verification of Plan





Marking up of breast area

Lateral Decubitus Position



Prospective trial of individual optimal positioning (prone vs supine) for whole breast radiotherapy: results of 224 patients

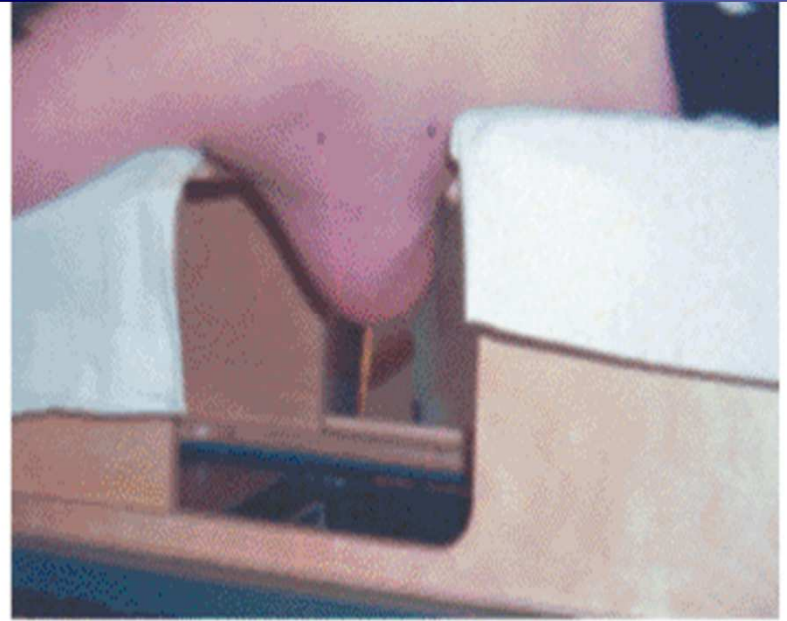
Abstract # 4082 Formenti, et al.



Prone Position



A



B

Prospective trial of individual optimal positioning (prone vs supine) for whole breast radiotherapy: results of 224 patients

Abstract # 4082 Formenti, et al.

IN FIELD VOLUME DATA (CC)

ALL PATIENTS					LEFT BREAST CANCER CARRIERS					RIGHT BREAST CANCER		
N= 224	HEART		LUNG		N= 117	HEART		LUNG		n=107	LUNG	
	prone	supine	prone	supine		Prone	Supine	Prone	Supine		PRONE	SUPINE
Mean	0.44	5.97	9.81	110.46	Mean	0.08	10.77	6.02	101.87	Mean	13.96	119.85
SD	(1.47)	(14.65)	(17.34)	(79.07)	SD	(1.91)	(18.33)	(13.23)	77.0	SD	(7.44)	(111.78)
Min	0	0	0	0	Min	0	0	0	0	Min	0	0
Max	10.12	134.75	127.67	464.77	Max	10.12	134.75	90.72	334.57	Max	127.67	464.77
P-value	P<0.001		P<0.001		P-value	P<0.001		P<0.001		P-value	P<0.001	

CONCLUSIONS:

Prone enables best sparing of heart and lung in most patients (204/224)
Most patients best treated supine (17/20) had left-sided lesions

When prone, heart is displaced anteriorly 5-19 mm (Duke)
May limit utility of prone technique

BCT

Role of RT

- I- Is RT essential?
- II- The RT volume.
- III- The RT dose.
- IV- The RT boost.

BCT

RT (cont.)

I-Is RT essential?

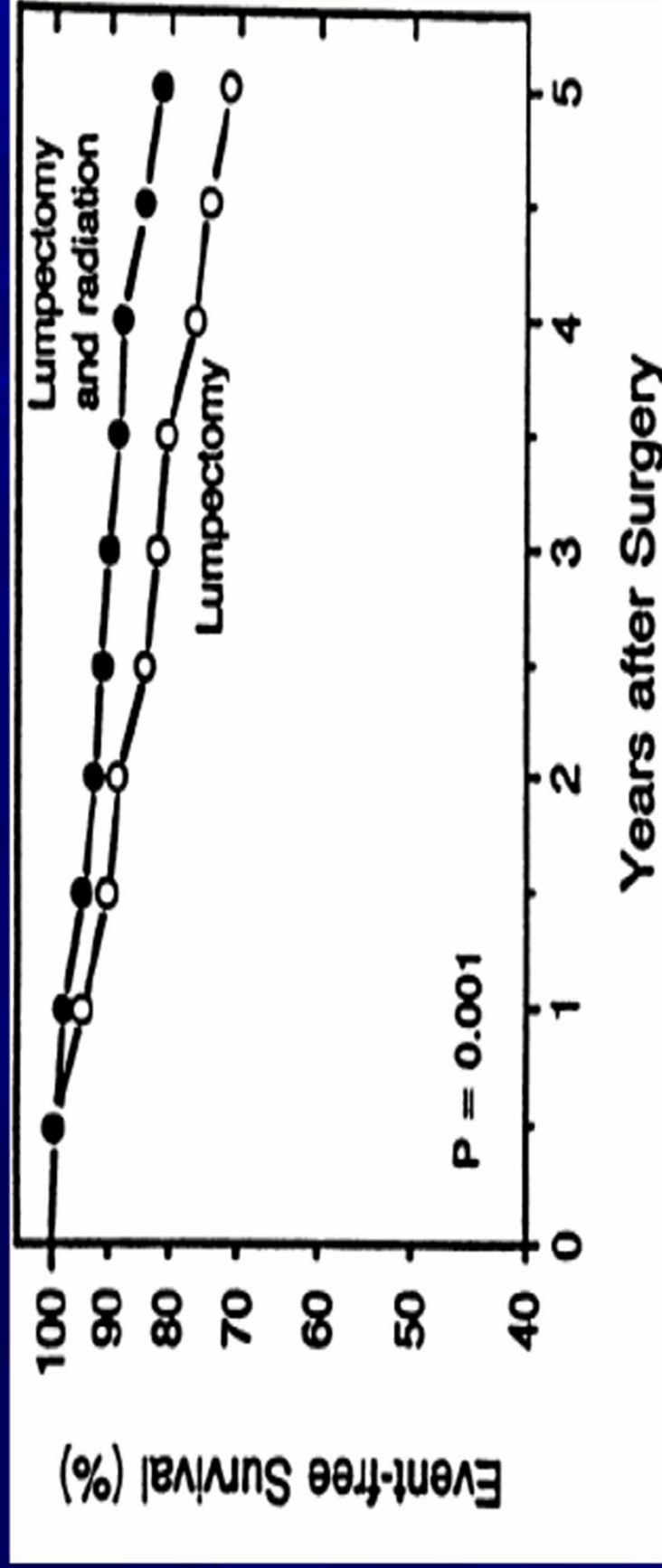
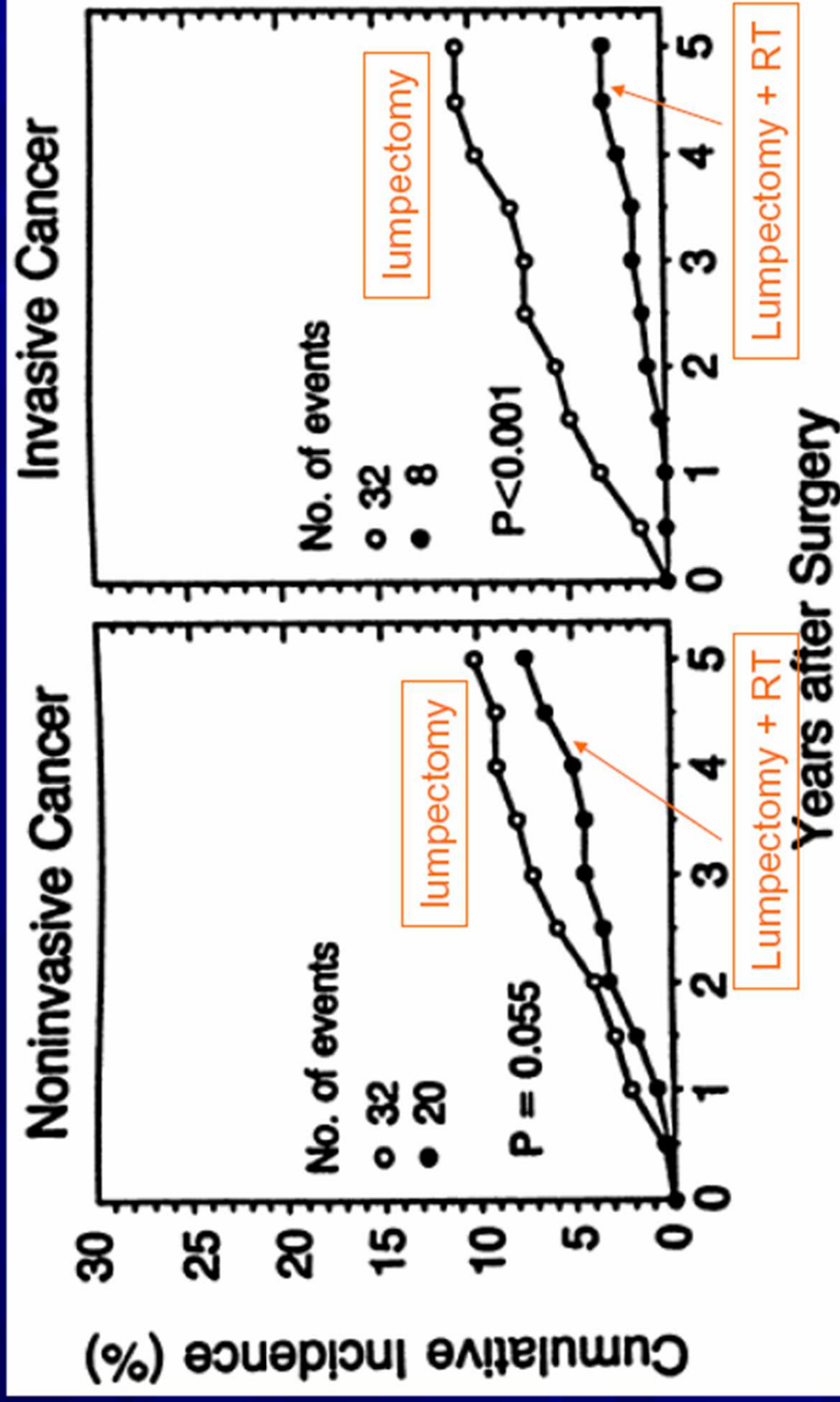


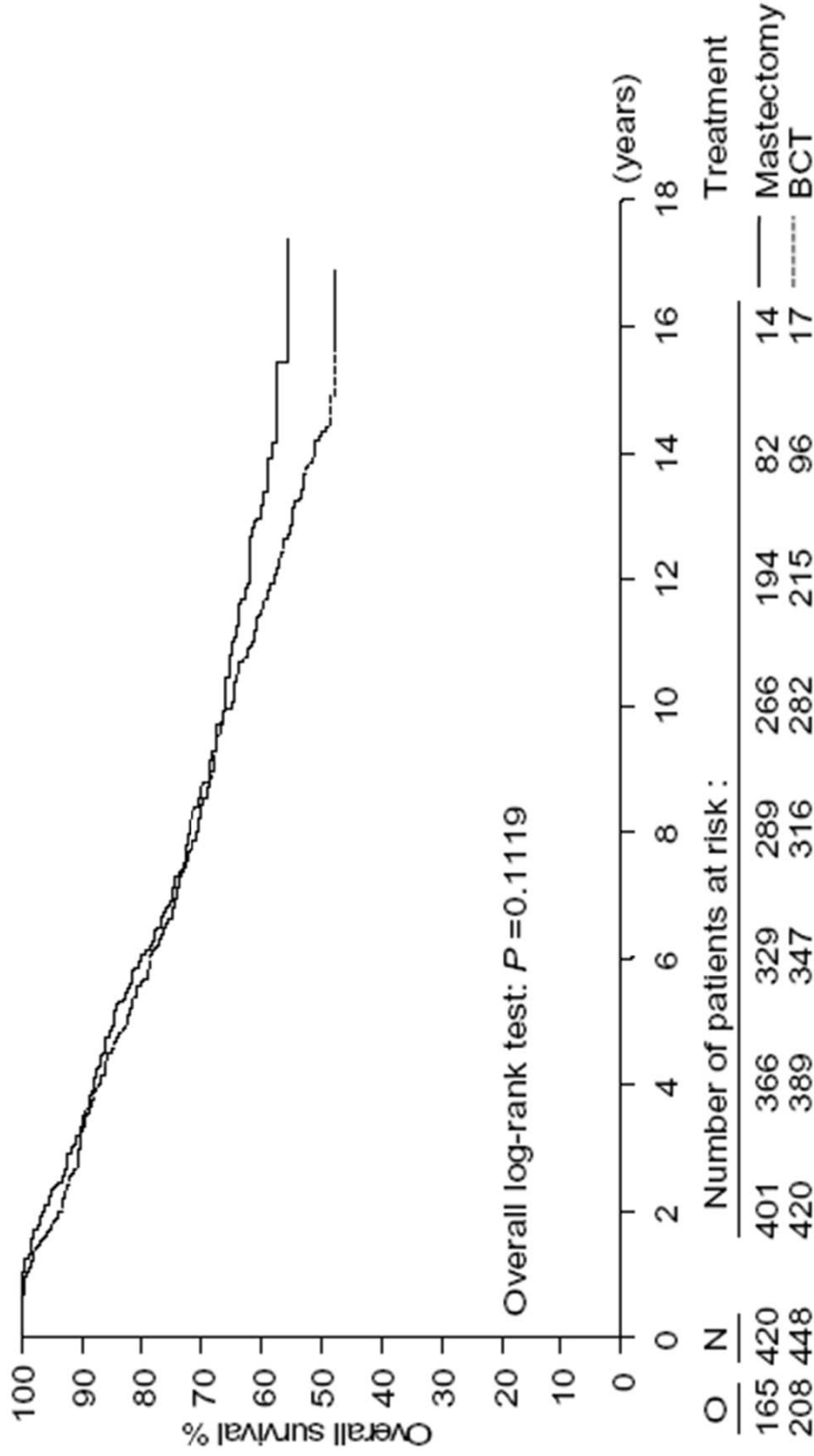
FIGURE 50-10B. Event-free survival of women treated by lumpectomy (open circles) or lumpectomy and radiation therapy (closed circles). (Fisher B, Costantino J, Redmond C, et al: Lumpectomy compared with lumpectomy and radiation therapy for the treatment of intraductal breast cancer. *N Engl J Med* 328:1581-1586, 1993)

P value	0.01	0.05	0.005	<0.001	0.002
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Cumulative incidence of noninvasive and invasive ipsilateral breast cancers in women treated by lumpectomy (open circles) or lumpectomy and radiation therapy (solid circles).



Overall survival in EORTC trial comparing breast-conserving with MRM in early stage

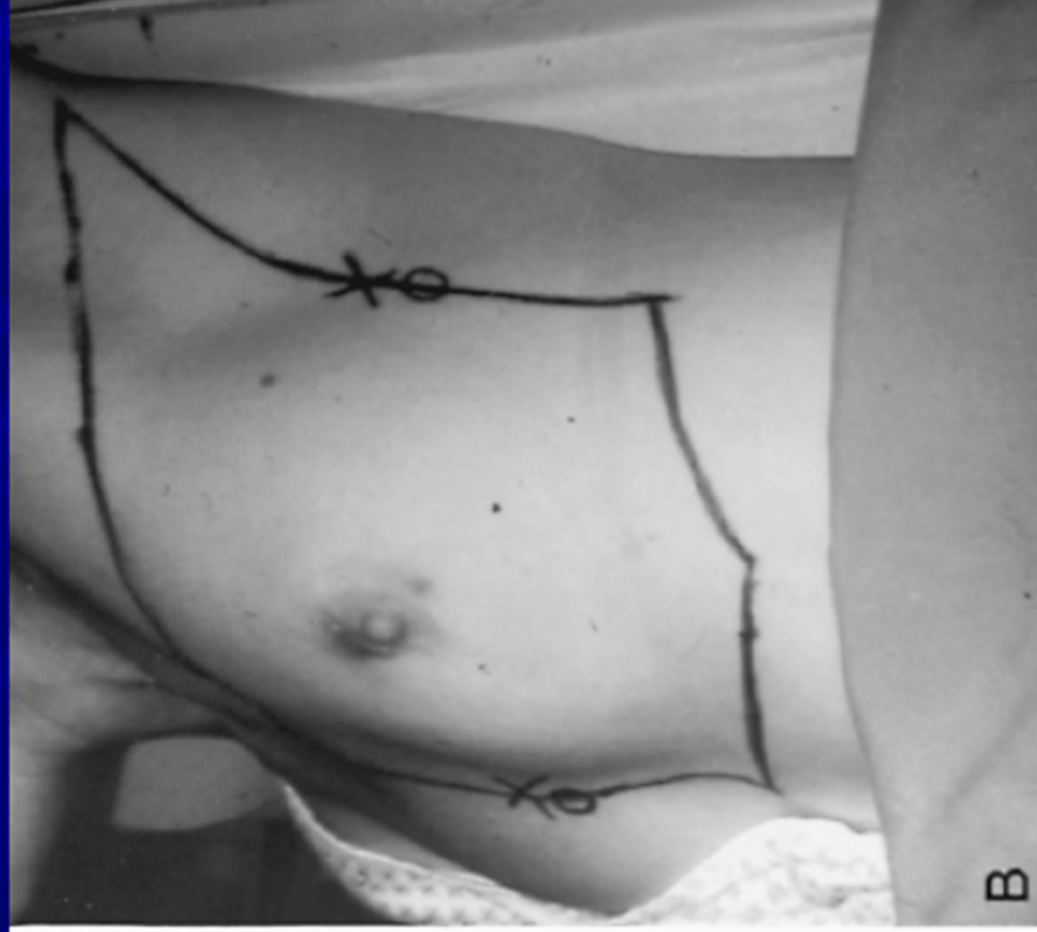
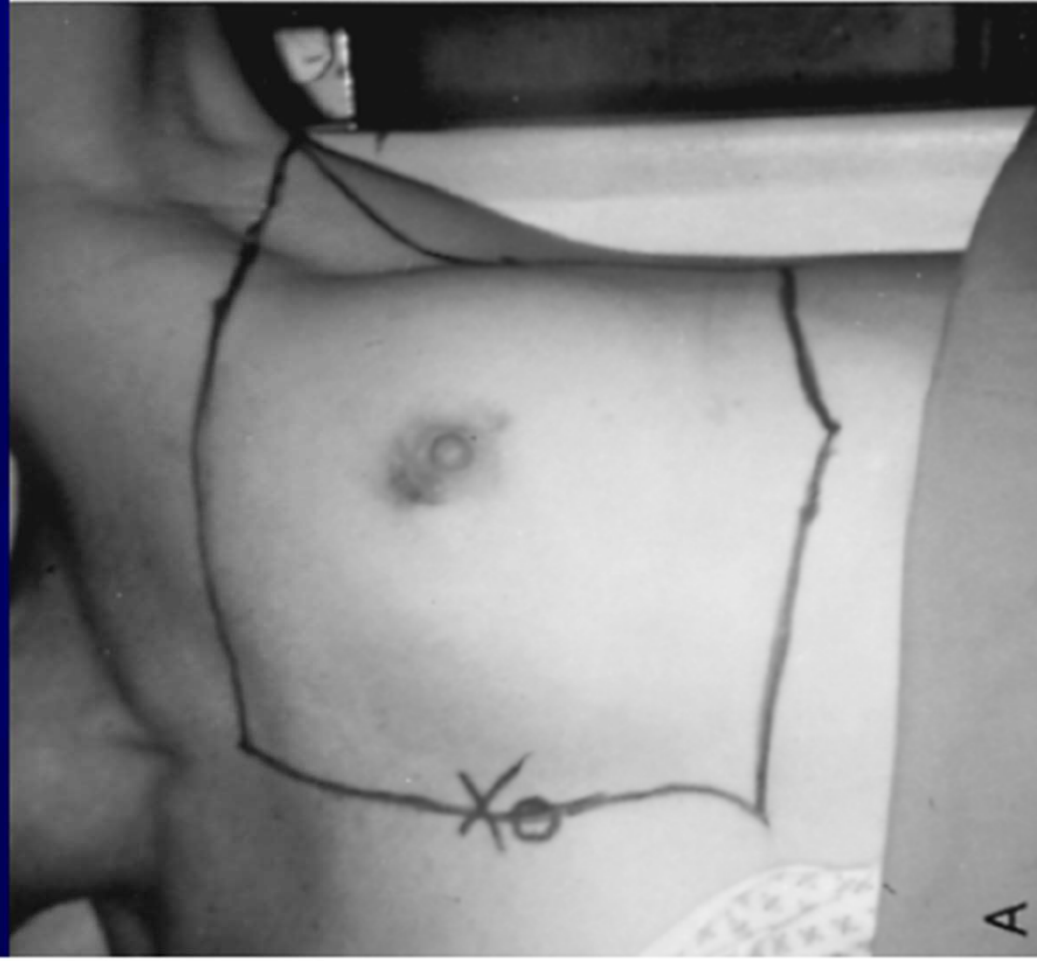


BCT

RT (cont.)

II- The RT volume:

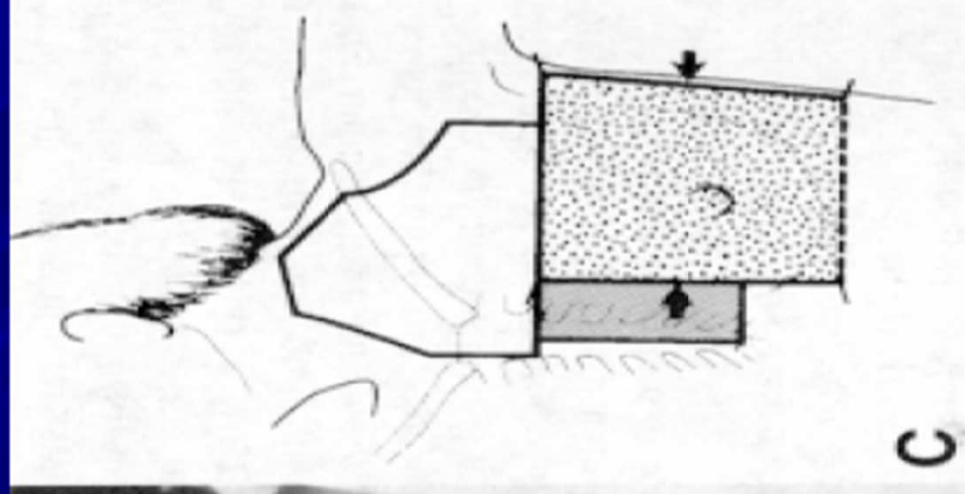
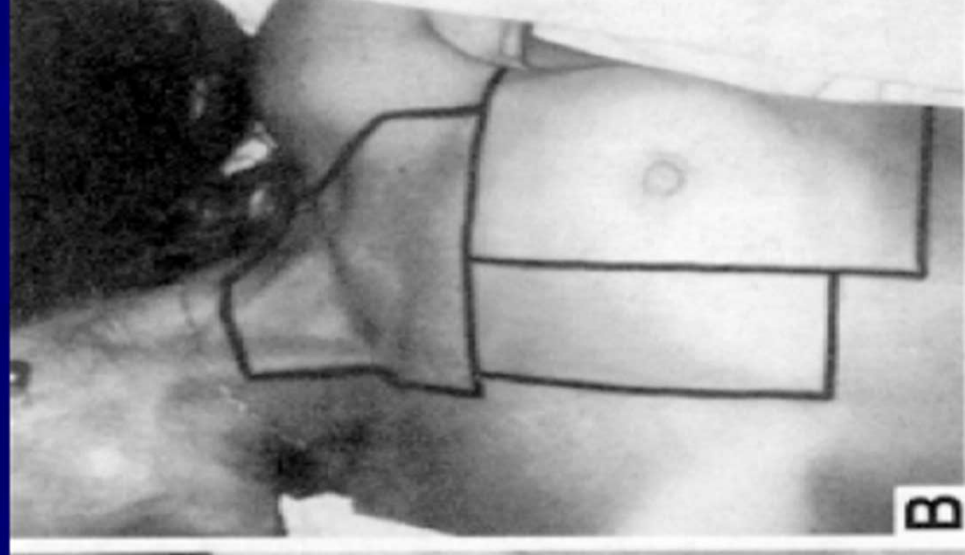
The treatment portal for the breast only, in patients with ≤ 3 + ve LN who receive adjuvant chemotherapy.

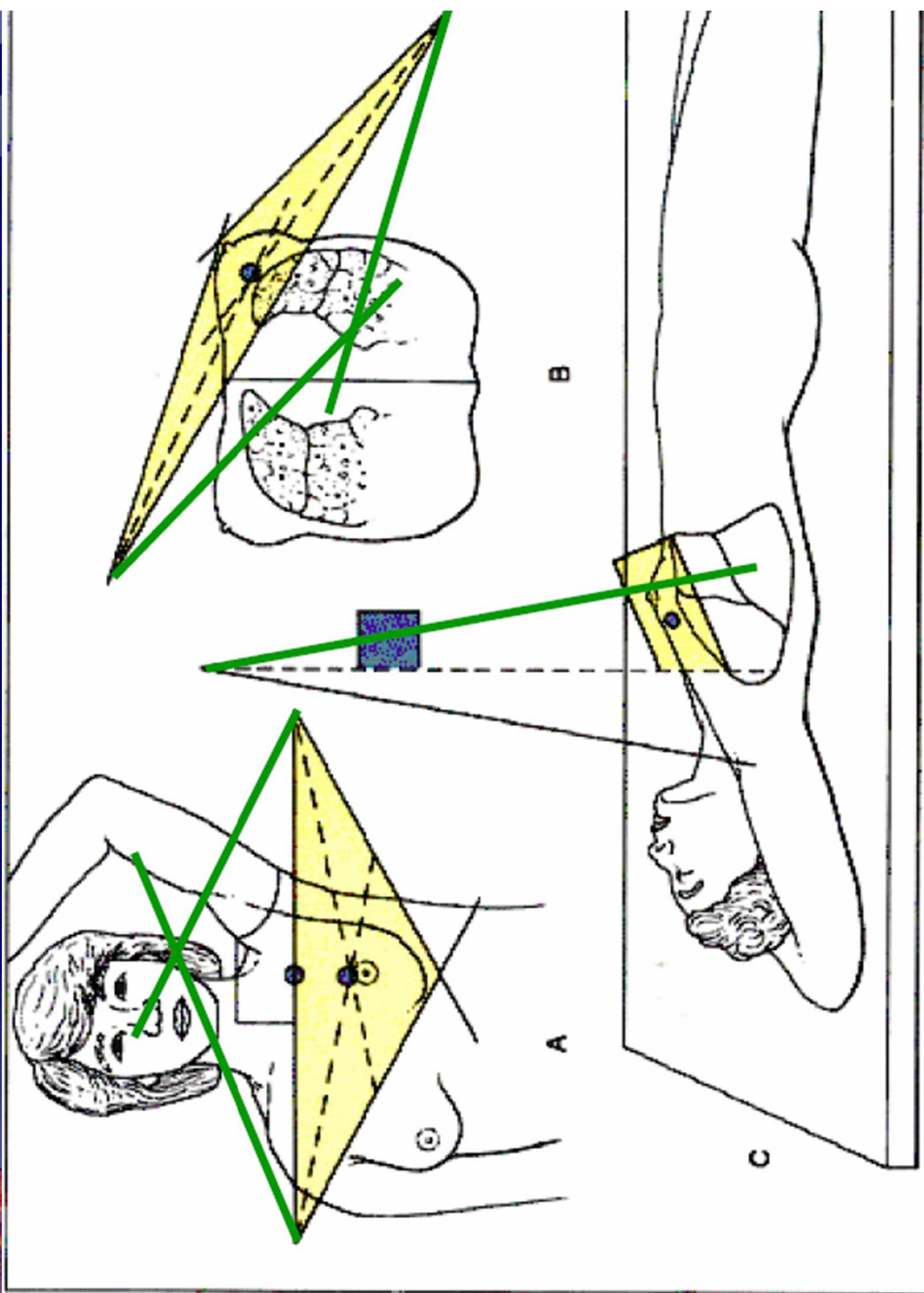


BCT

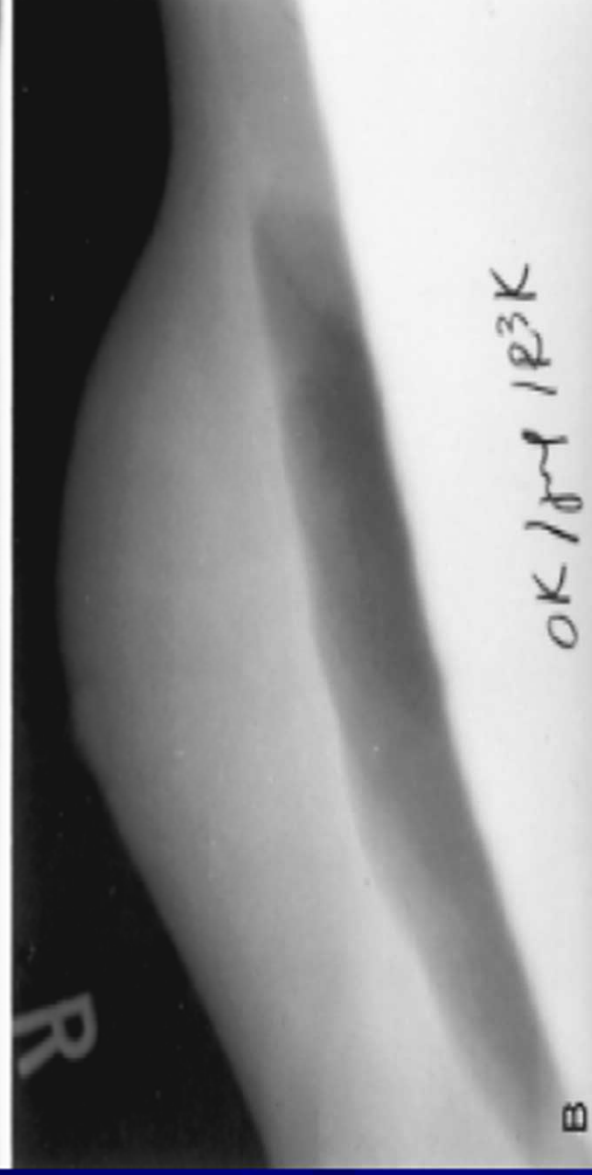
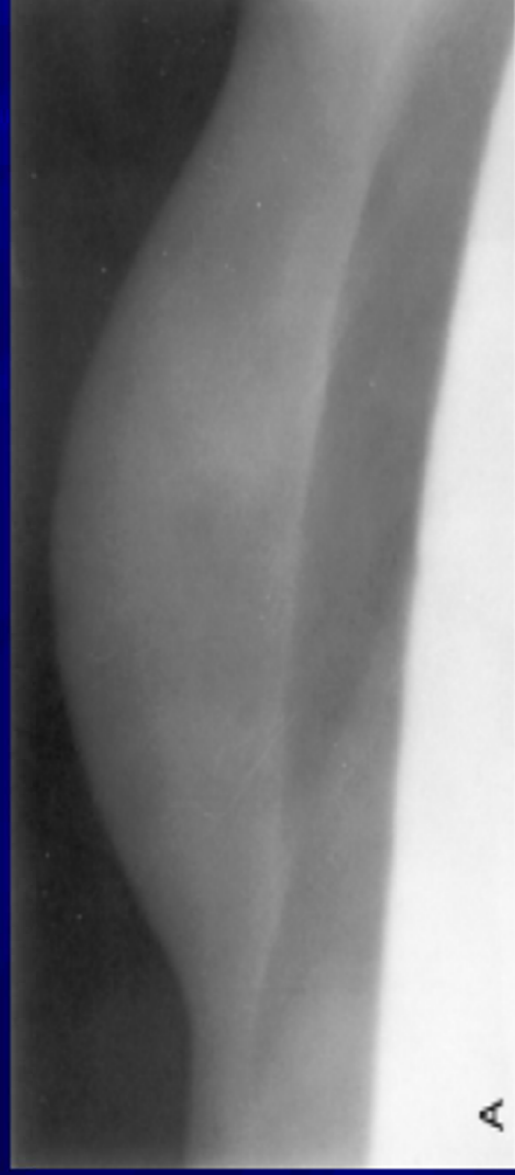
RT (cont.)

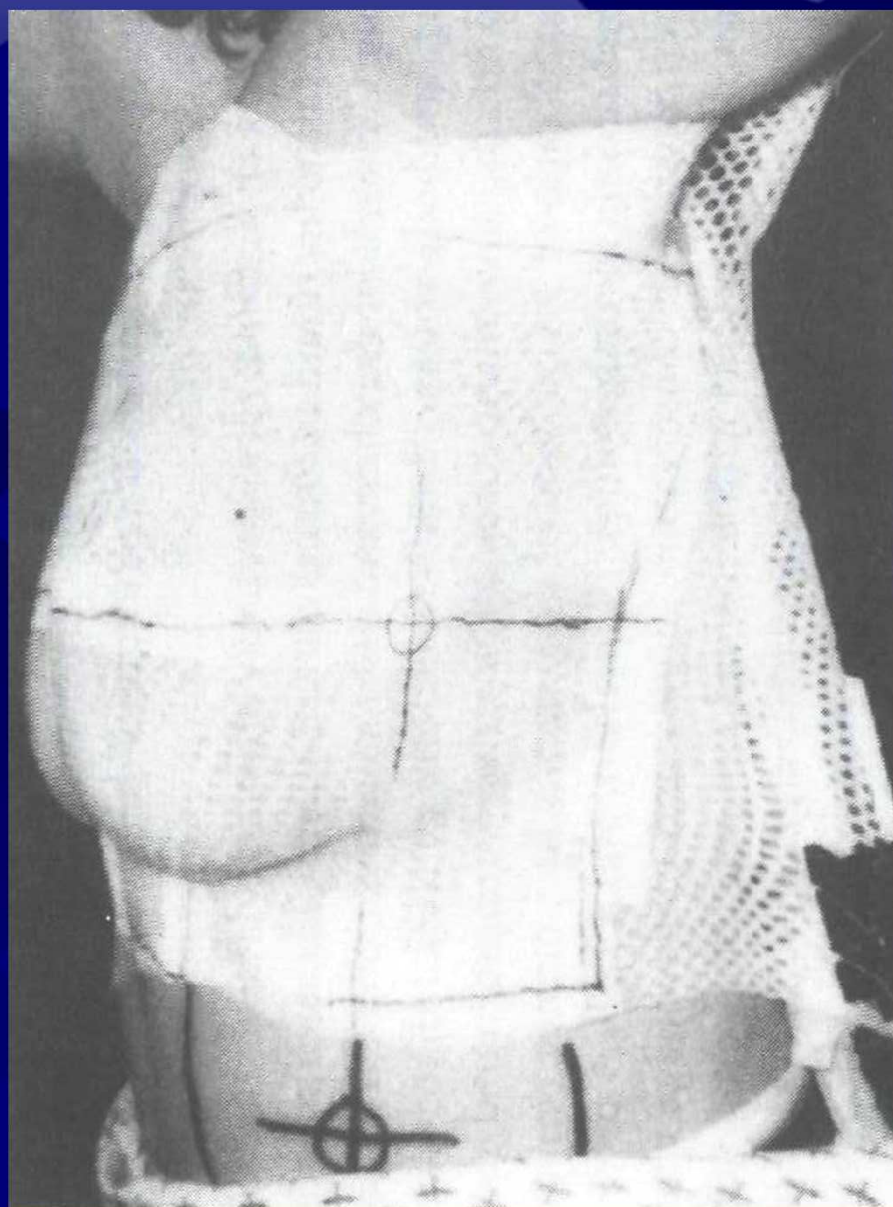
II- The RT volume (cont.).



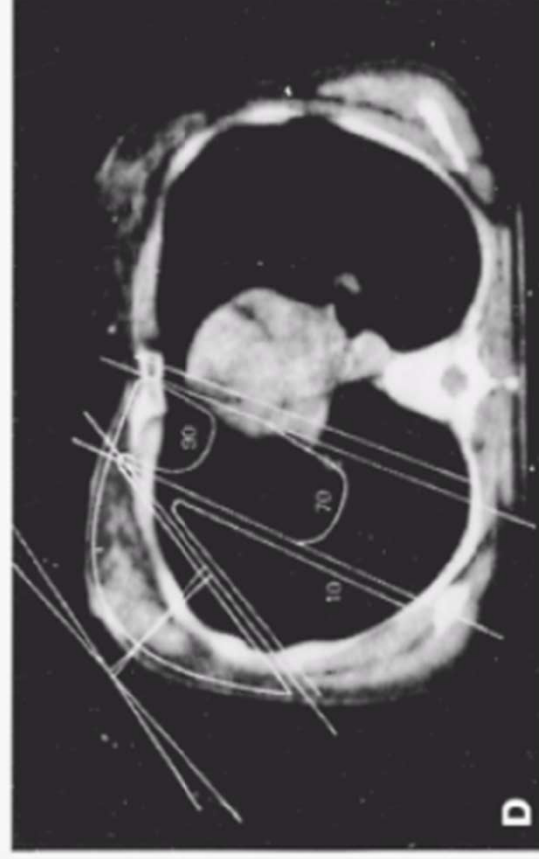
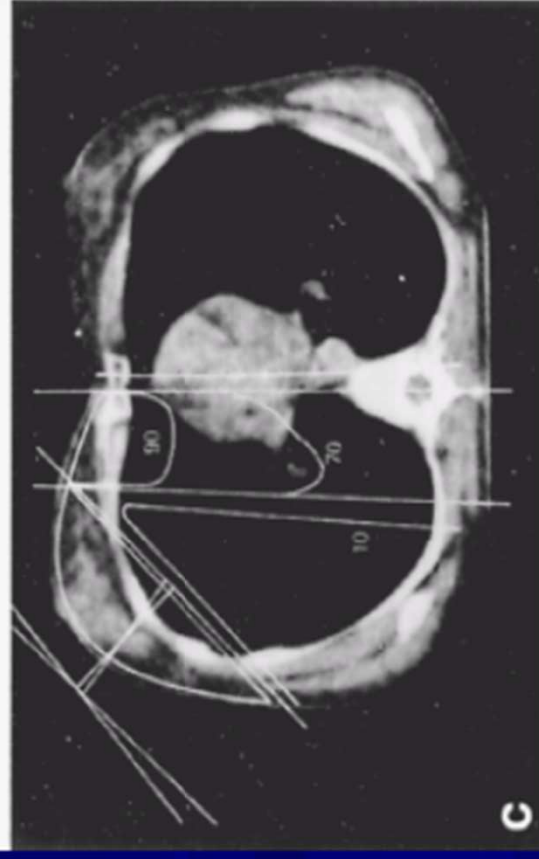
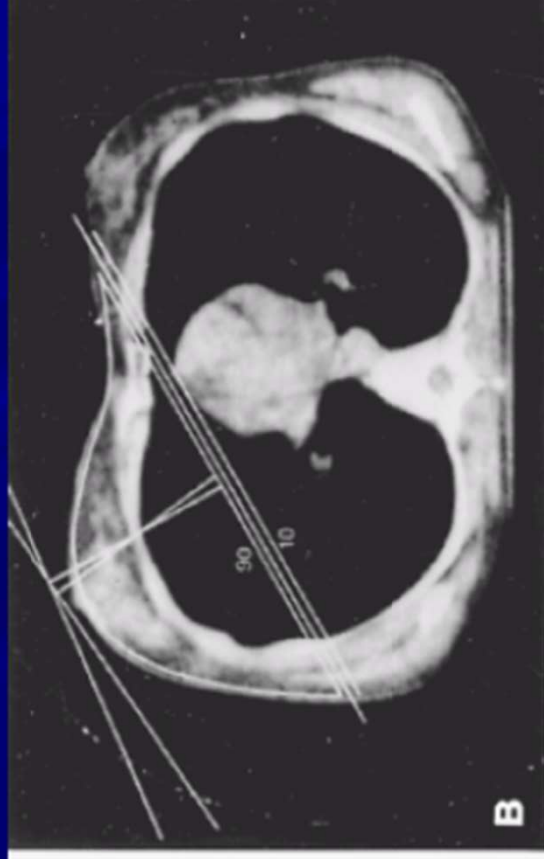
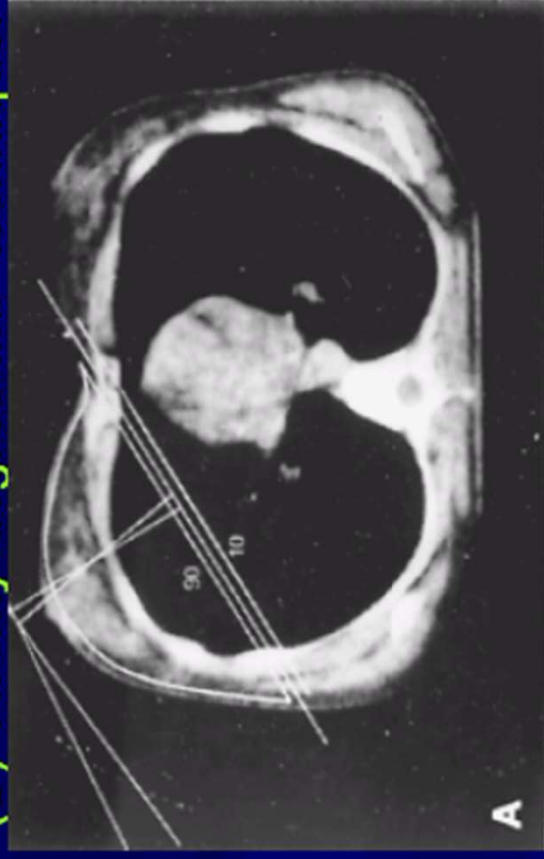


(A and B) Examples of localization films of tangential breast portals demonstrating the amount of lung to be included in the field.





Irradiation of the breast. Field configurations and isodose lines for 6-MV photons. (A) "Standard tangents" technique. (B) Deep tangents technique. (C) En face internal mammary field (IMF) technique. (D) Twenty-degree IMF technique.



BCT

RT (cont.)

III- The RT dose.

■ **Whole breast ± Peripheral lymphatics:**

5000 cGy / 25 fractions / 5 weeks

Or its biological equivalent dose.

BCT

RT (cont.)

IV- The RT boost.

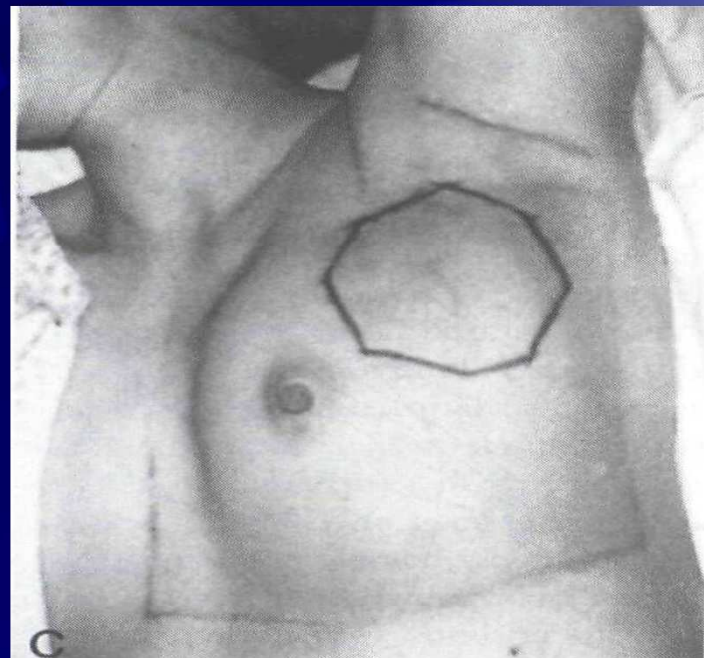
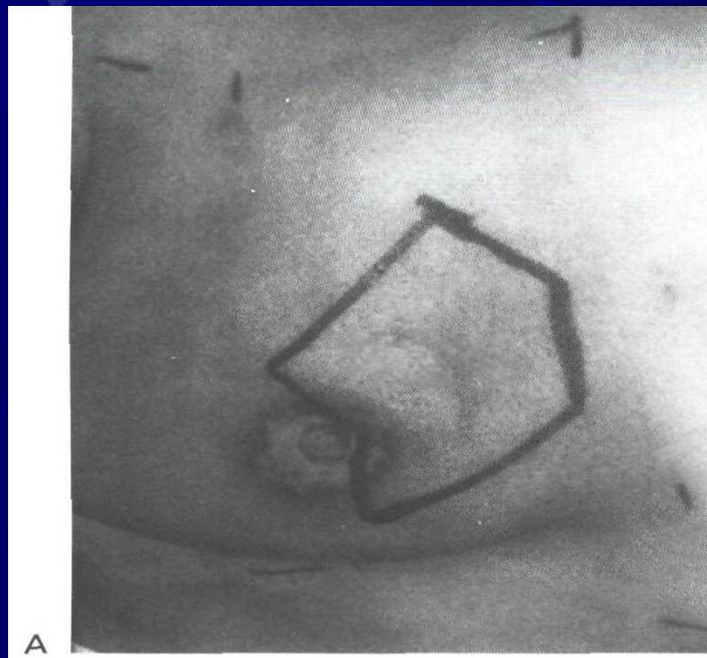
- Patients after Bt RT (n = 5318) were randomised between a boost of 15-16 Gy or no boost.
- Age: The most important prognostic factor.
 - Patients < 41: Local failure rate was reduced at 5 years from 19.5 to 10.2%.
 - Patients > 50: limited benefit of boost.



Brachytherapy as a boost

- Interstitial implant
- Plastic tubes or steel needles
- Two fractions per day with 6 hours gap in between
- 250 – 300 cGy X 5 – 6 fractions
- Iridium 192, Microselectron HDR

Electron Boost Field





TO SUMMARISE


TECHNIQUES OF IRRADIATION

- Chest wall or Breast : Two tangential fields to prevent RT to lungs. Not > 2.5 cms.
- Wedge filters needed to decrease dose to nipple and for homogenous dose distribution
- Lower axilla included in tangential fields



DOSES

- Post operative RT 50 Gray in 25 fractions is sufficient to eradicate microscopic disease
- Boost RT over recurrent disease or primary disease in conservative surgery is given 10 – 20 Gy
- Inoperable breast cancers 60 –70 Gy



Peripheral Lymphatic Irradiation

- Axillary, supraclavicular and internal mammary
- Not needed in outer quadrant disease & negative nodes in axilla
- With inner or central disease, RT to supraclavicular and internal mammary region is needed
- RT to all fields with +ve axillary nodes



Thank you