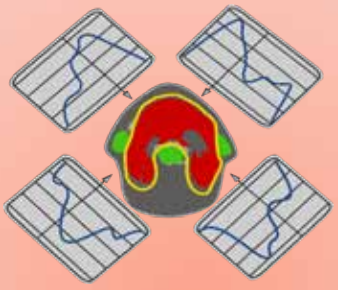


Radiation Therapy in the Management of Breast Cancer

Wilson Apollo, MS, CTR, RTT
WHA Consulting

December 6, 2018

1

Target Delineation

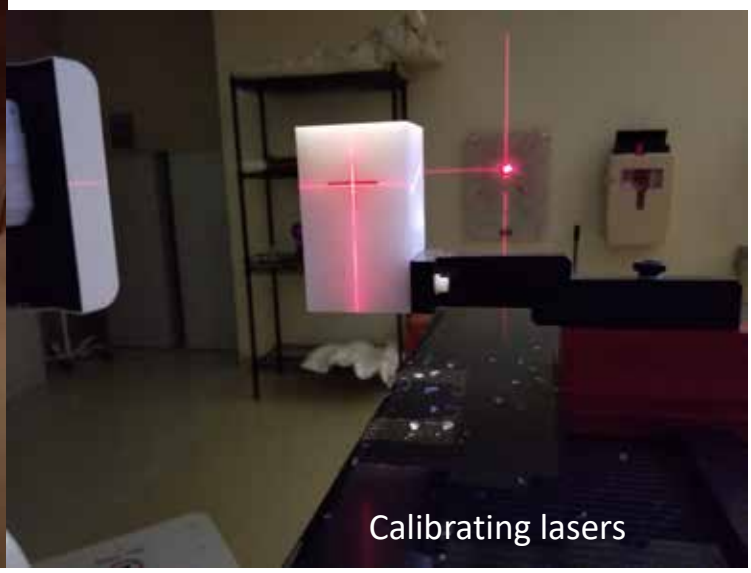
- *"If you can't see it, you can't hit it, and if you can't hit it, you can't cure it"*

Harold Johns, inventor of the Cobalt 60 Teletherapy unit.

Objectives

- Describe the various radiation therapy delivery systems for treating breast cancer,
- Distinguish between 3D-Conformal, IMRT,
- Describe tangential breast EBRT,
- Explore NCCN Guidelines for EBRT for breast cancer,
- Apply the 2018 STORE Manual RT coding rules to clinical scenarios.

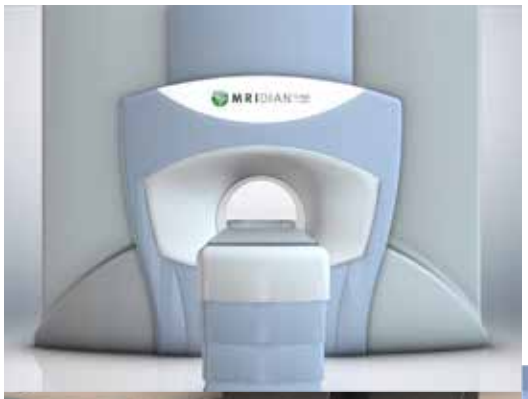
Door to treatment room

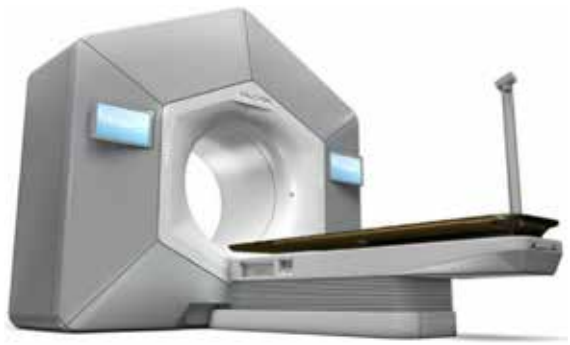


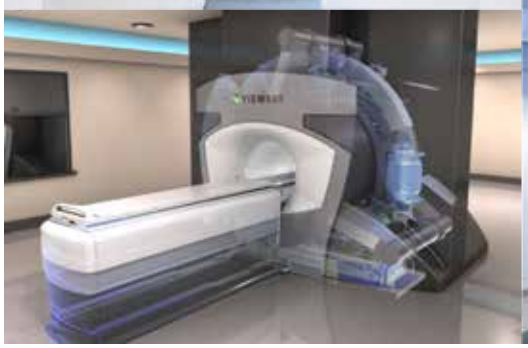
Calibrating lasers

Equipment used to deliver RT to Breast

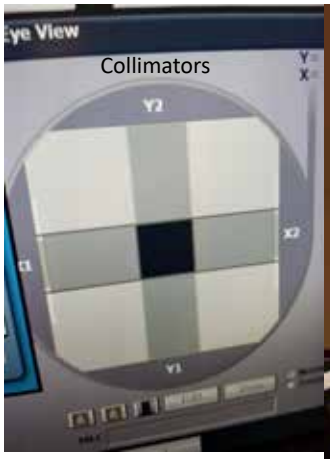
- EBRT
  - photons,
  - Electrons,
  - Gamma rays,
  - Gamma Pod
  - Low-energy Kv photons (Zeiss Intrabeam, XOFT Axxent)
- IORT:
  - HDR brachytherapy,
  - electron,
  - electronic brachytherapy
  - Low-energy Kv photons (Zeiss Intrabeam, XOFT Axxent)





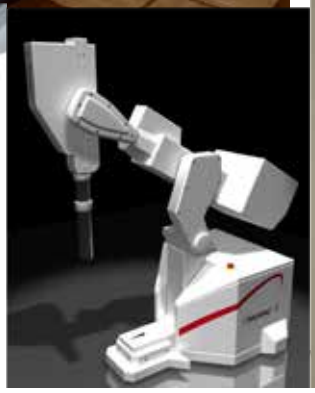


LINACS



Linac Console

Gammapod



GAMMAPOD

By Xcision Medical Systems

GAMMAPOD

By Xcision Medical Systems

- Granted FDA clearance in December 2017,
- Invented & developed by Xcision founder, Cedric Yu,
- Optimized for non-invasive partial breast treatments, SBRT,
- Powered by multisource Cobalt-60 SRS system,
- Rotates about the target, allowing targeting by thousands of beam angles, consisting of gamma rays,
- Treatment couch can be manipulated during treatment for dose painting,
- Can deliver treatment w/in a few fractions only.

GAMMAPOD
By Xcision Medical Systems

Pt immobilization is critical.

- Vacuum-assisted, dual cup system,

GAMMAPOD
By Xcision Medical Systems

- Uses gamma rays; **Code as 02, External beam, photons.**
- Planning Technique for SBRT is **06, Stereotactic Radiotherapy** or Radiosurgery, NOS.

IORT

INTRAOPERATIVE RADIATION THERAPY

Zeiss INTRABEAM System

- It is an intraoperative (IORT) brachytherapy platform,
- FDA approved for IORT since 1999,
- It is basically a small version of a linac & operates @ **50 kVp for breast IORT and 40 kVp for brain IORT,**
- Miniature X-ray source with a gold target @ tip of probe,
- Typical prescribed dose of 20 Gy to lumpectomy cavity,
- Can take 20-40 minutes for single fraction,
- Also known as **electronic brachytherapy**.

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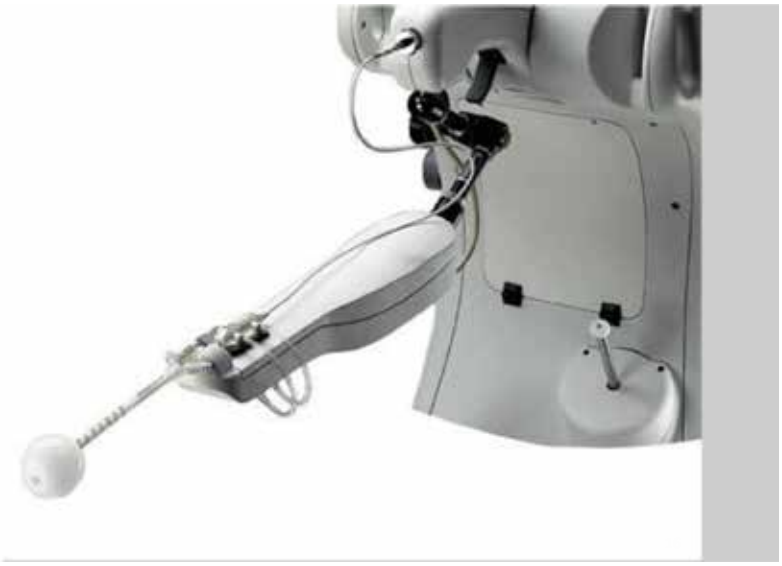
Zeiss INTRABEAM

Because of the manner in which the x-rays are generated in this system (very much like a linac), and taking into account the low energies produced, this treatment modality ***should be coded 12, Brachytherapy, electronic***.

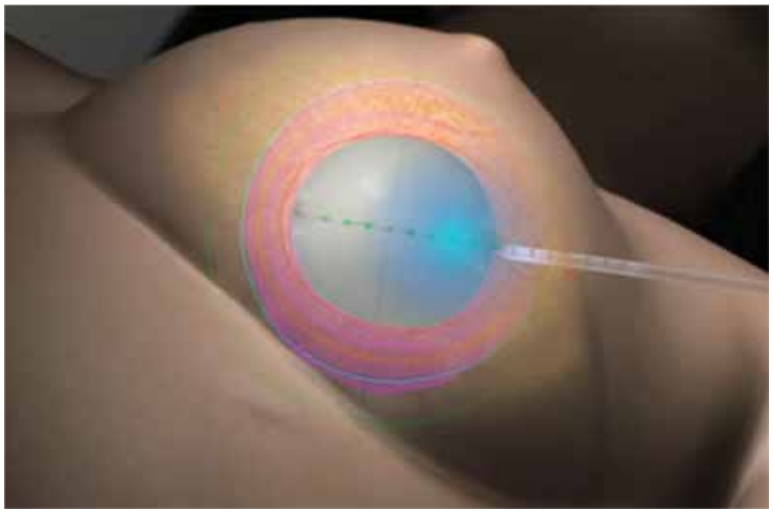
XOFT Axxent eBx System

- Another system used to deliver IORT treatments. Also known as electronic brachytherapy.
- Works similarly to Zeiss Intrabeam,
- Miniature x-ray unit used to generate low energy (KV) photons.



XOFT Axxent eBx System

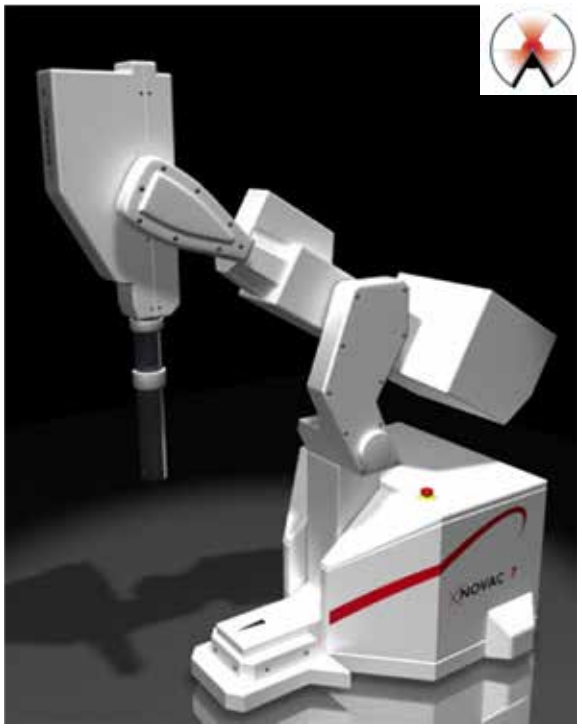
- Treatment is delivered via a miniature linac with energy in the KV range.
- Should be coded ***12, Electronic Brachytherapy***.



17

LIAC & NOVAC Linear Accelerators

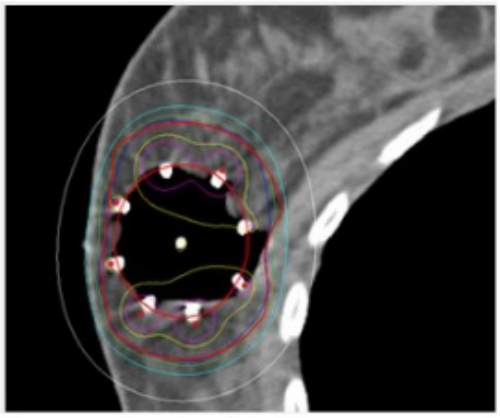
- Electron linear accelerators
- Used for IORT or IOERT
- Since treatment modality is electron, code to 04, External beam, electrons.



Strut assisted volume implant (SAVI)

Device has 7-11 "struts" or catheters through which the **iridium seed** travels.
The struts are expanded after the device is inserted into the lumpectomy cavity.

SAVI: Strut Adjusted Volume Implant *(not balloon)*



CT image of a SAVI applicator inside of a lumpectomy cavity.

Single-entry
multi-channel catheter system

- HDR Intracavitary Brachytherapy.

  Uses Ir-192 HDR seeds.

  Look for multiple sessions (fractions).

- Dose modulation up to 11 channels
- Improved skin dose sparing as compared with Mammosite and Contoura*

Mammosite

- Balloon is inserted into the lumpectomy cavity and inflated. The original Mammosite balloon had a single lumen (catheter). The Mammosite ML has four lumens through which the **iridium seed** travels. After each treatment the 'seed' is removed from the balloon, and the patient does not receive radiation until the next seed is inserted during the next session.
- If she undergoes MammoSite brachy twice a day (BID) for five days, it means she receives 10 SEPARATE FRACTIONS (important for coding).

Mammosite

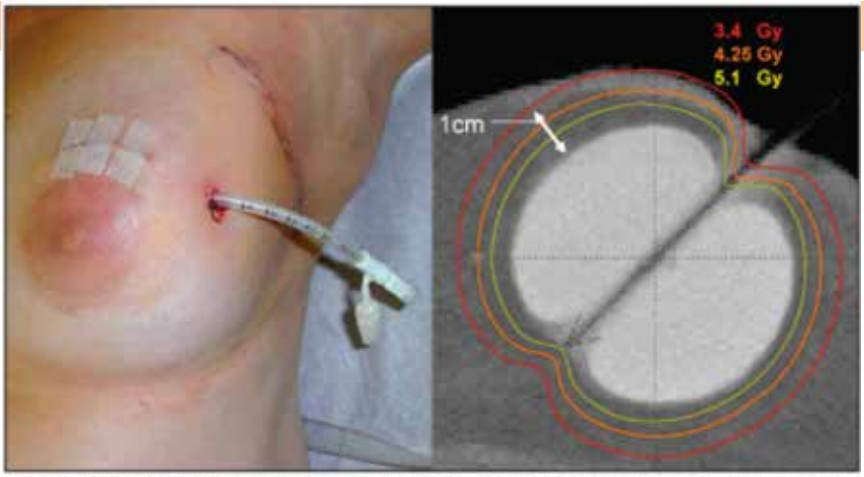
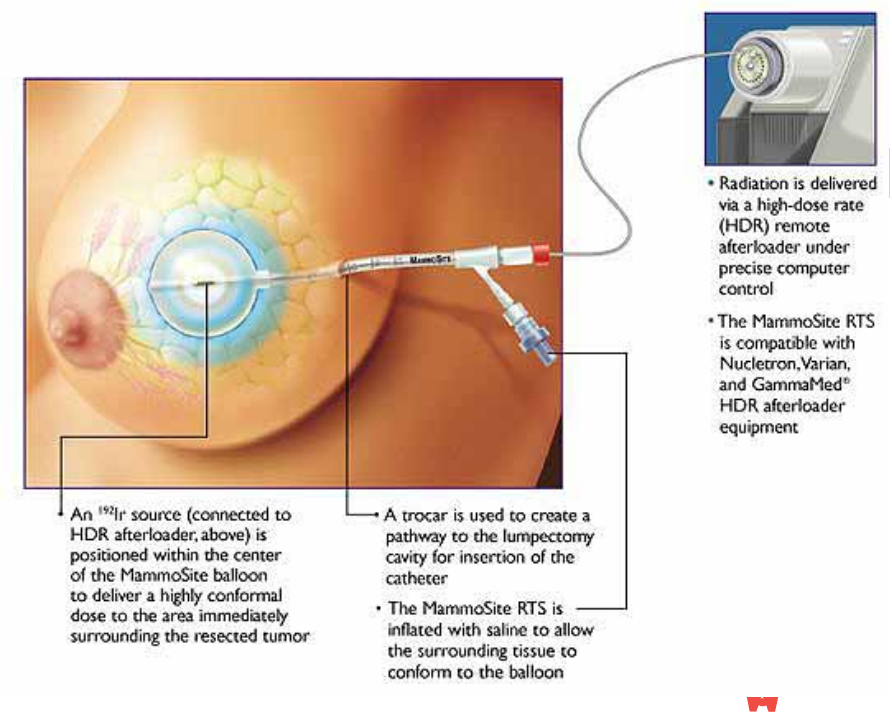


Figure 2: MammoSite Balloon Brachytherapy—External (left) and sagittal (right) views of balloon with dosimetric target coverage. Photographs courtesy of Douglas Arthur, with permission from the *Journal of Clinical Oncology*.

mammosite



Contura MLB

Accelerated partial breast irradiation

Regional Tx Modality Code	Modality
09, Brachytherapy, Intracavitary, HDR	SAVI, Contura MLB, MammoSite

IORT Delivery Technology & Coding

Based on FORDS Manual

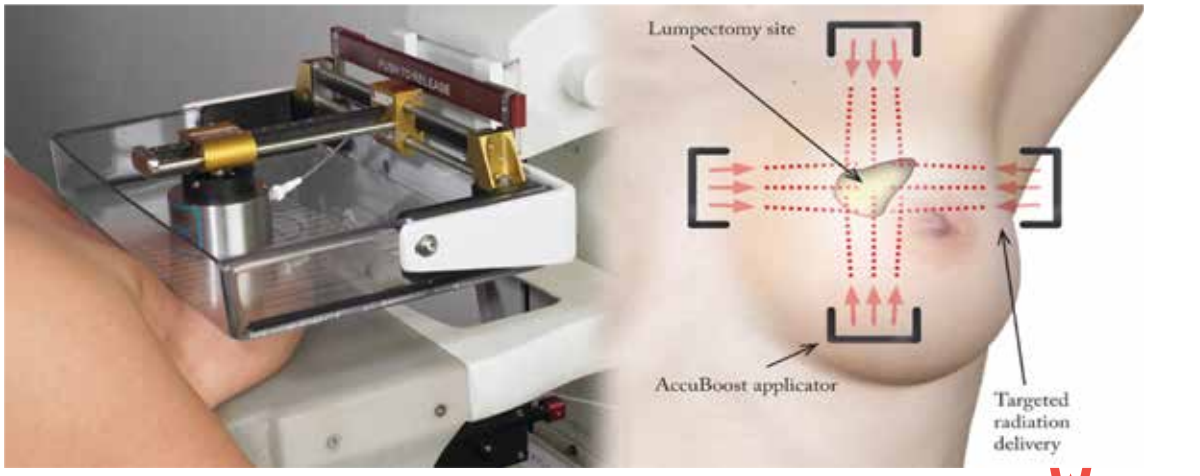
Equipment	Dose Delivery Method	Modality	Code	Comments
Zeiss Intrabeam	50 kVp Linac	Orthovoltage	21	Isotope-free. No radioactive source used.
XOFT Axxent	50 kVp Linac	Orthovoltage	21	Isotope-free. No radioactive source used.
LIAC 10 by Sordina IORT	Electron Accelerator	Electron	28	Max energy is 10 MeV
LIAC 12 by Sordina IORT	Electron Accelerator	Electron	28	Max energy is 12 MeV
NOVAC by Sordina IORT	Electron Accelerator	Electron	28	
Mobetron	Electron Accelerator	Electron	28	Electron energies of 6 MeV, 9 MeV, 12 MeV
Strut Assisted Volume Implant (SAVI)	Ir-192 source	HDR	52	Most applications are HDR, intracavitary
Mammosite	Ir-192 source	HDR	52	Most applications are HDR, intracavitary
Contura MLB	Ir-192 source	HDR	52	Most applications are HDR, intracavitary

IORT Delivery Technology & Coding

Based on STORE Manual

Equipment	Dose Delivery Method	RT Modality	Planning Code	Comments
Zeiss Intrabeam	50 kVp Linac	12, Brachytherapy, electronic	02	Isotope-free. No radioactive source used.
XOFT Axxent	50 kVp Linac	12, Brachytherapy, electronic	02	Isotope-free. No radioactive source used.
LIAC 10 by Sordina IORT	Electron Accelerator	04, Electron	01	Max energy is 10 MeV
LIAC 12 by Sordina IORT	Electron Accelerator	04, Electron	01	Max energy is 12 MeV
NOVAC by Sordina IORT	Electron Accelerator	04, Electron	01	
Mobetron	Electron Accelerator	04, Electron	01	Electron energies of 6 MeV, 9 MeV, 12 MeV
Strut Assisted Volume Implant (SAVI)	Ir-192 source	09, Brachytherapy, intracavitary, HDR	88	Most applications are HDR, intracavitary
Mammosite	Ir-192 source	09, Brachytherapy, intracavitary, HDR	88	Most applications are HDR, intracavitary
Contura MLB	Ir-192 source	09, Brachytherapy, intracavitary, HDR	88	Most applications are HDR, intracavitary

Accuboost: Non-invasive Breast Brachytherapy (NIBB)



Accuboost: Non-invasive Breast Brachytherapy (NIBB)

- Allows for non-invasive approach to delivering a boost dose to lumpectomy cavity for breast cancer pts,
- Dose is delivered via **Ir-192 HDR** sources,
- Note that sources are not inserted into patient,
- Utilizes mammography for treatment planning,
- Advantage of technique is that it avoids irradiating lung, heart,
- Cosmesis is comparable to that of conventional electron & photon boost.
- How do you code this modality? Best choice: 07, Brachytherapy, NOS.

J. Schuster, *et al*. Updated feasibility and reproducibility results of multi-institutional study of noninvasive breast tumor bed boost. *Brachytherapy* 2016; 2-8.

Objectives

- Describe the various radiation therapy delivery systems for treating breast cancer,
- Distinguish between 3D-Conformal, IMRT,
- Describe tangential breast EBRT,
- Explore NCCN Guidelines for EBRT for breast cancer,
- Apply the 2018 STORE Manual RT coding rules to clinical scenarios.

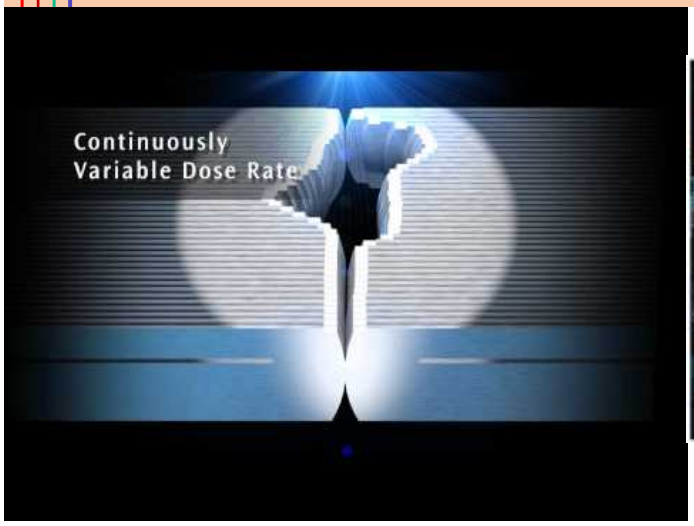
Treatment Approaches/Techniques for Breast Cancer

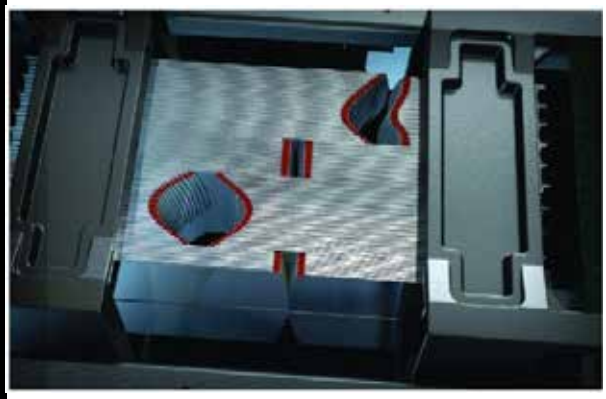
- VMAT
- RapidArc
- 3D-Conformal
- HT: Helical Tomotherapy
- Electronic brachytherapy
- HDR brachytherapy
- GammaPod SRS,
- Proton

3D-Conformal

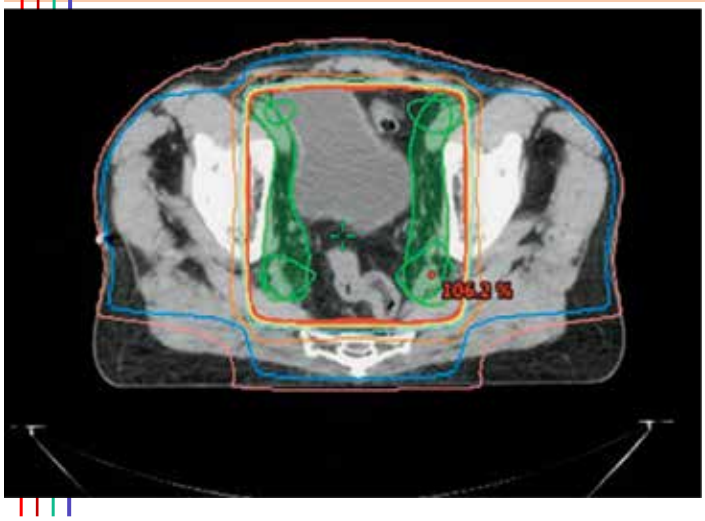
- 3D-Conformal RT is essentially the predecessor to IMRT. Using MLC leaves, treatment planners can sculpt the shape of the beam to conform to the shape of the target volume.
- The main difference between IMRT and 3D-Conformal plans is that when the latter is used, the ***MLC leaves remain stationary***. It still uses multiple fields as with IMRT, and each field conforms to the shape of the target as seen from various angles, but the collimator leaves are static through the duration of treatment.

Dynamic MultiLeaf Collimators (DMLC)



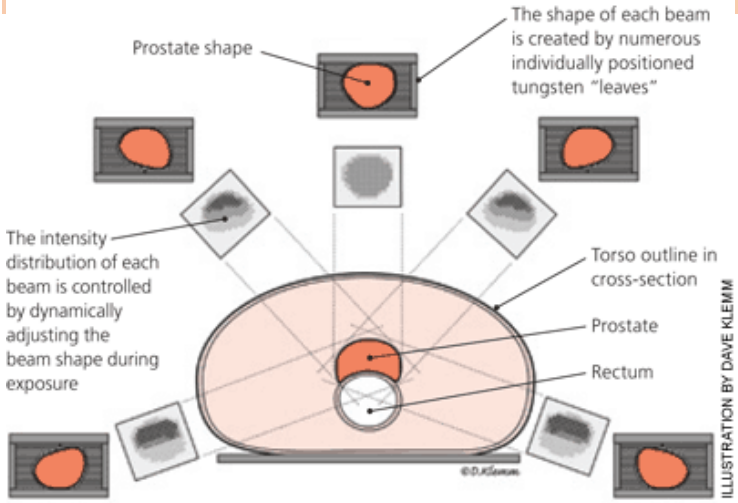


Target Delineation-3D



- **<u>Treatment Modality Code</u>**: 02, External beam photons.
- **<u>Planning Technique</u>**: 04, Conformal or 3D Conformal.

IMRT



- Technology made possible by DMLC,
- IMRT not always mentioned in RT Treatment Summary. Important to look in Treatment Plan.

Fraction size

- **Standard fraction size** = 180-200 cGy/fx, typically seen when prescription calls for multiple fractions (anywhere from 10 to 40+).
- **Hypofractionation** = > 200 cGy/fx, ex: 500 cGy x 5 fx, often used for SBRT treatments, which calls for large fraction size and only a few fractions (1-6 max).
- **Hyperfractionation** = < standard fractionation. Ex: 125 cGy/fx. Sometimes used for H&N treatments.

Hypofractionation-catching on

- Remember, standard fractionation = 180-200 cGy/fx
- **Hypofractionation > 200 cGy/fx**
- Ablative doses delivered in a shorter period of time, 1-2 wks,
- Must use restrictive pt immobilization techniques or adjust to patient/organ motion (Stereotactic Body Radiation Therapy, SBRT, or Stereotactic Ablative Radiotherapy, SABR),
- High degree of certainty of tumor volume extent,

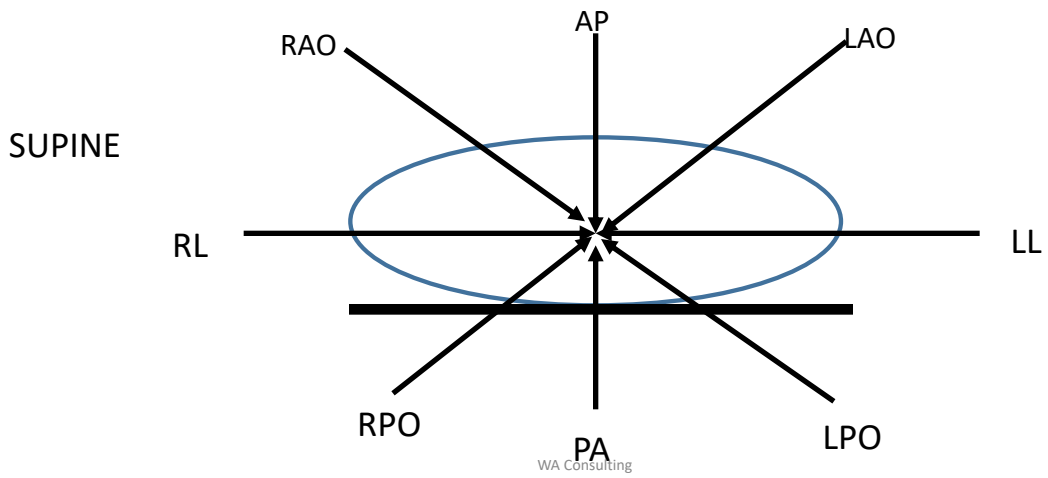
Objectives

- Describe the various radiation therapy delivery systems for treating breast cancer,
- Distinguish between 3D-Conformal, IMRT,
- Describe tangential breast EBRT,
- Explore NCCN Guidelines for EBRT for breast cancer,
- Apply the 2018 STORE Manual RT coding rules to clinical scenarios.

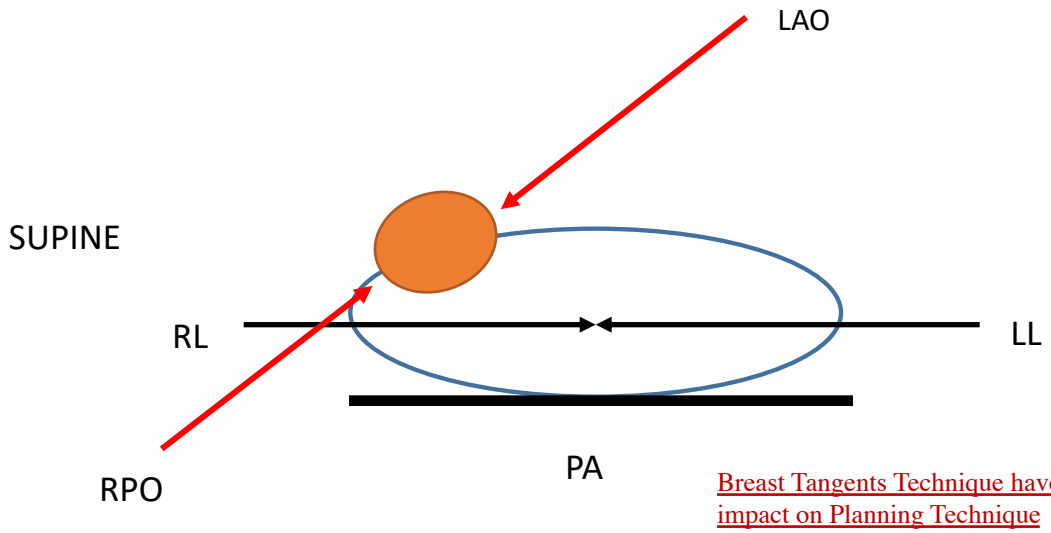
Breast Tangent Technique

- Typically two tangential fields when no LN involvement,
- A third supraclavicular (S'clav) field added with LN involved,
- Concern w/ cardiac toxicity when LT breast treated.
- Risk of cardiac disease increases by 7.4% and 4% per Gy in mean heart dose. Darby, S.C.; Ewertz, M.; McGale, P.; *et al*. Risk of ischemic heart disease in women after radiotherapy for breast cancer. *N. Engl. J. Med.* **368**(11):987–98; 2013.
- Among approaches used for heart-sparing RT are DIBH, IMRT, VMAT, 3D-conformal, prone technique.

Beam orientation



Tangential beam orientation

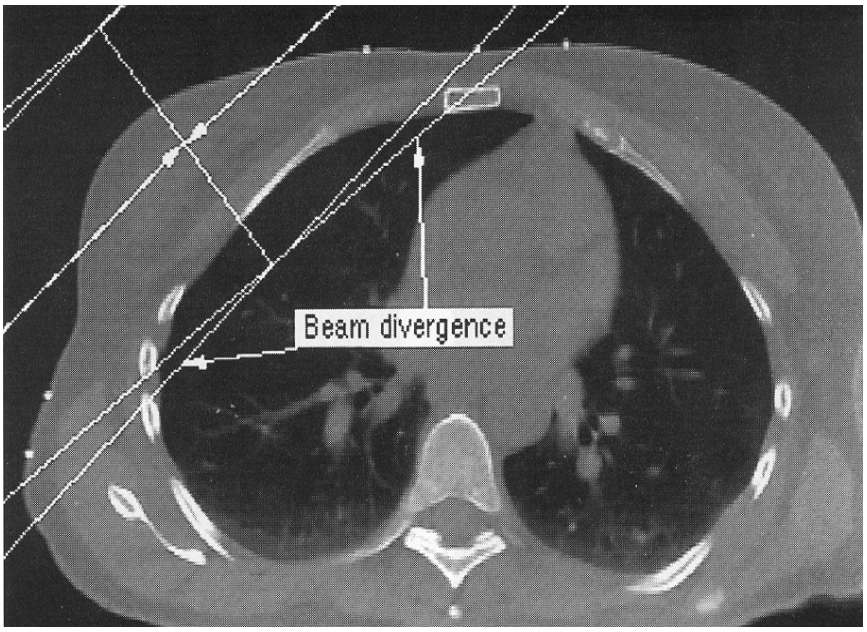


Breast Tangents Technique have no impact on Planning Technique coding!

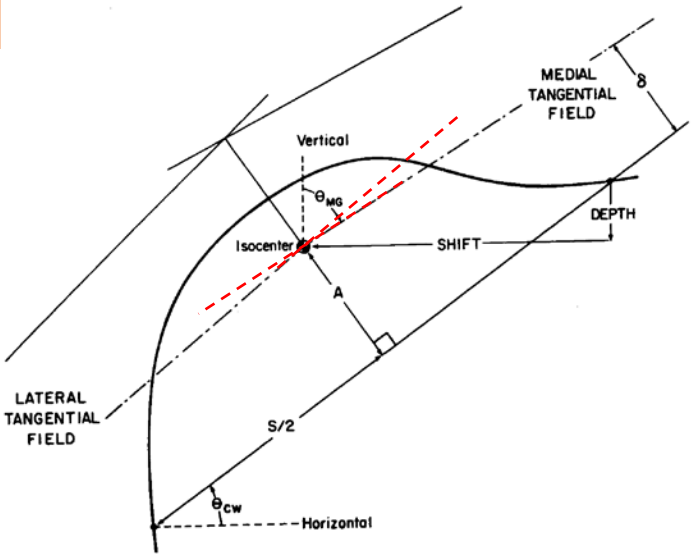
WA Consulting

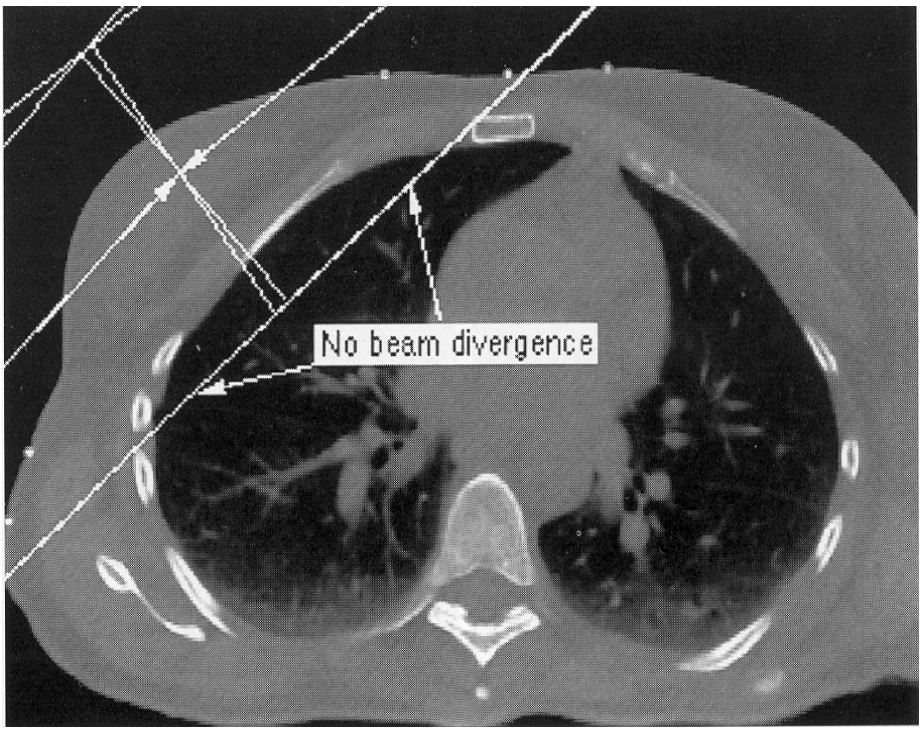
Breast Tangents

Parallel-Opposed Fields

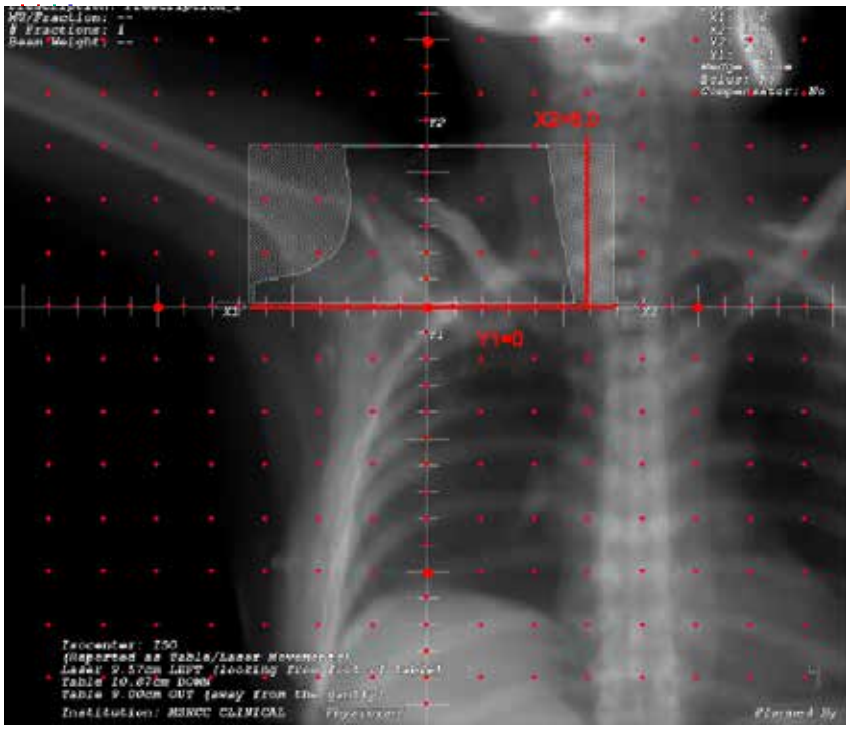


Breast Tangent Simulation





Oblique Angles



Supraclavicular Field(S'clav)

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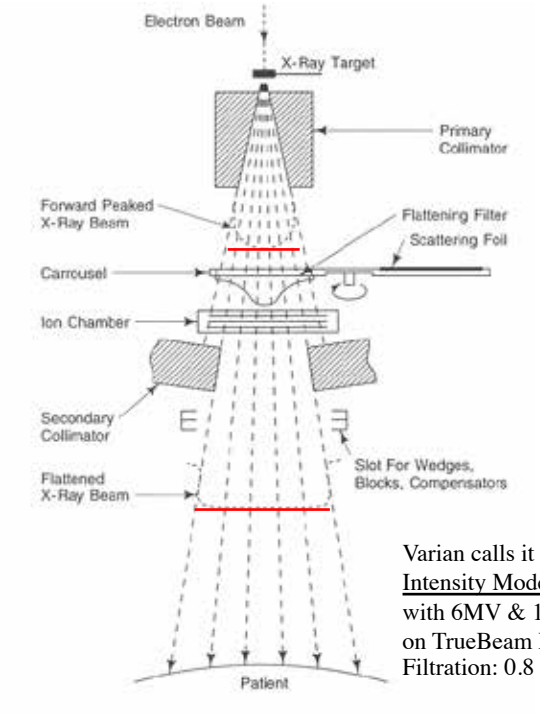
EBRT: IMRT/3D-Comformal

- Standard EBRT generally includes a regional dose in the range of 4680 cGy to 54 Gy with a boost (typically electron) in the range of 700 cGy to 14 Gy, with standard fraction size of 180-200 cGy.
- Canadian Protocol (Accelerated Partial Breast Irradiation-APBI): 266 cGy x 16 fx= 42.5 Gy, over 21 days.
  - 10-yr local relapse rate of 6.2% w/ APBI (3 wks) vs. 6.7% in conventional 50 Gy (5-6 wks).

Breast Tangents RT Techniques

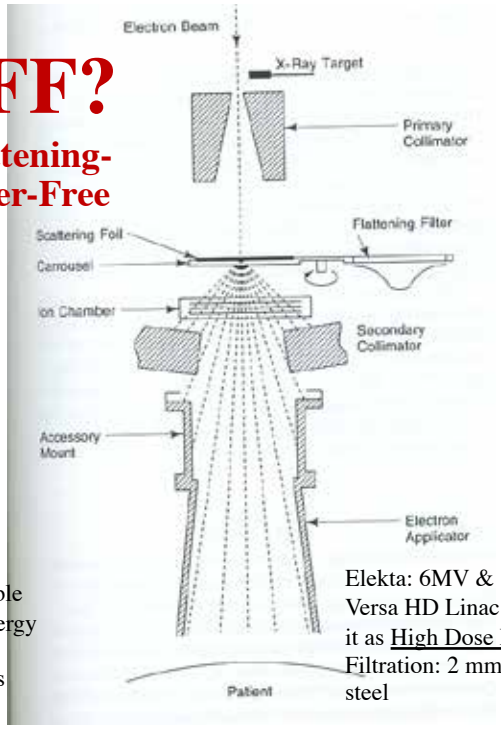
Abbreviation	Term	Radiation Planning Technique Code
H-IMRT	Hybrid IMRT	**Code to 05: IMRT**
T-IMRT	Tangential IMRT	
T-VMAT	Tangential VMAT	
M-IMRT	Multifield IMRT	
HT	Helical Tomotherapy	
FiF	Field-in-Field, Forward IMRT planning, Static IMRT	**Code to 04: 3D-Conformal**



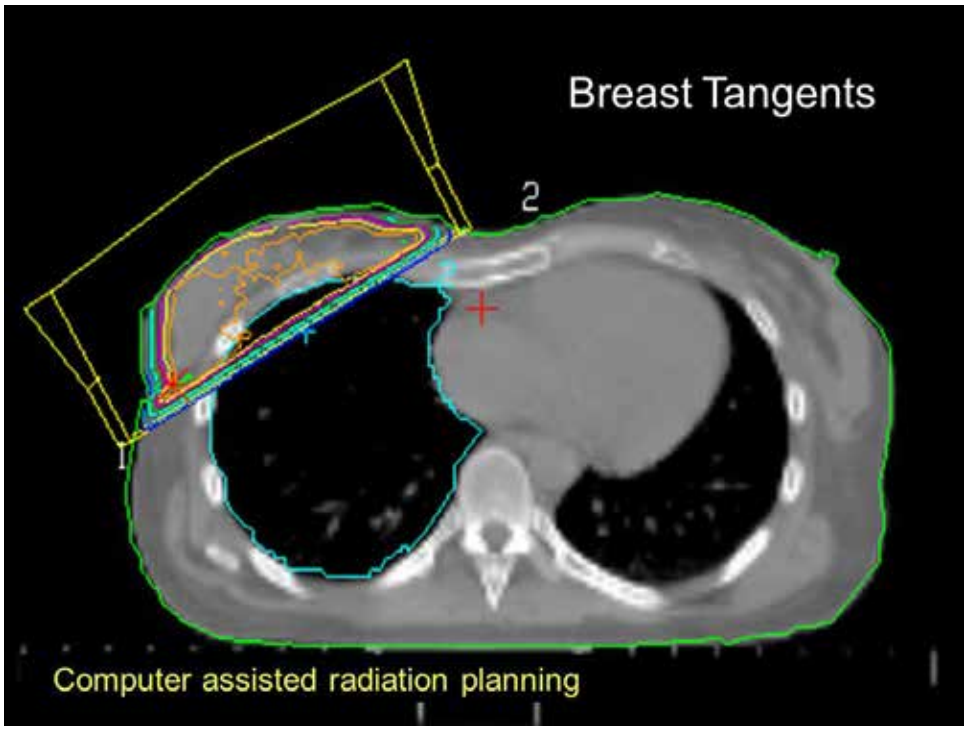
FFF?

Flattening-Filter-Free

Varian calls it High Intensity Mode. Available with 6MV & 10MV energy on TrueBeam Linacs. Filtration: 0.8 mm brass

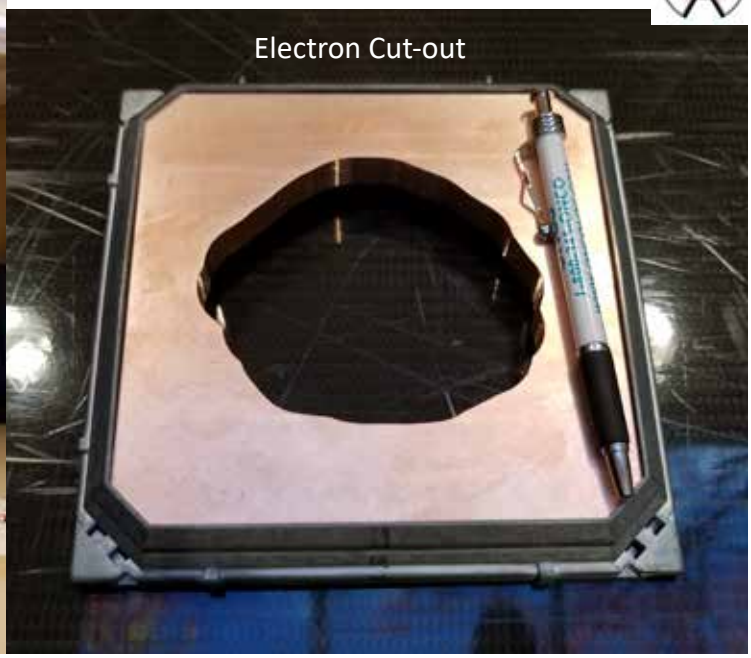


Elekta: 6MV & 10MV on Versa HD Linac. Referst to it as High Dose Rate Mode. Filtration: 2 mm stainless steel

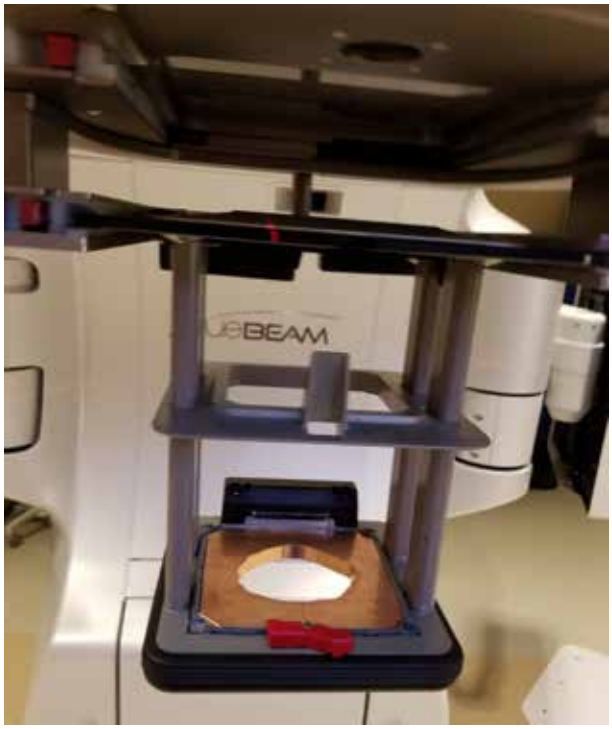


Breast Board with Vacuum loc

Electron Cut-out

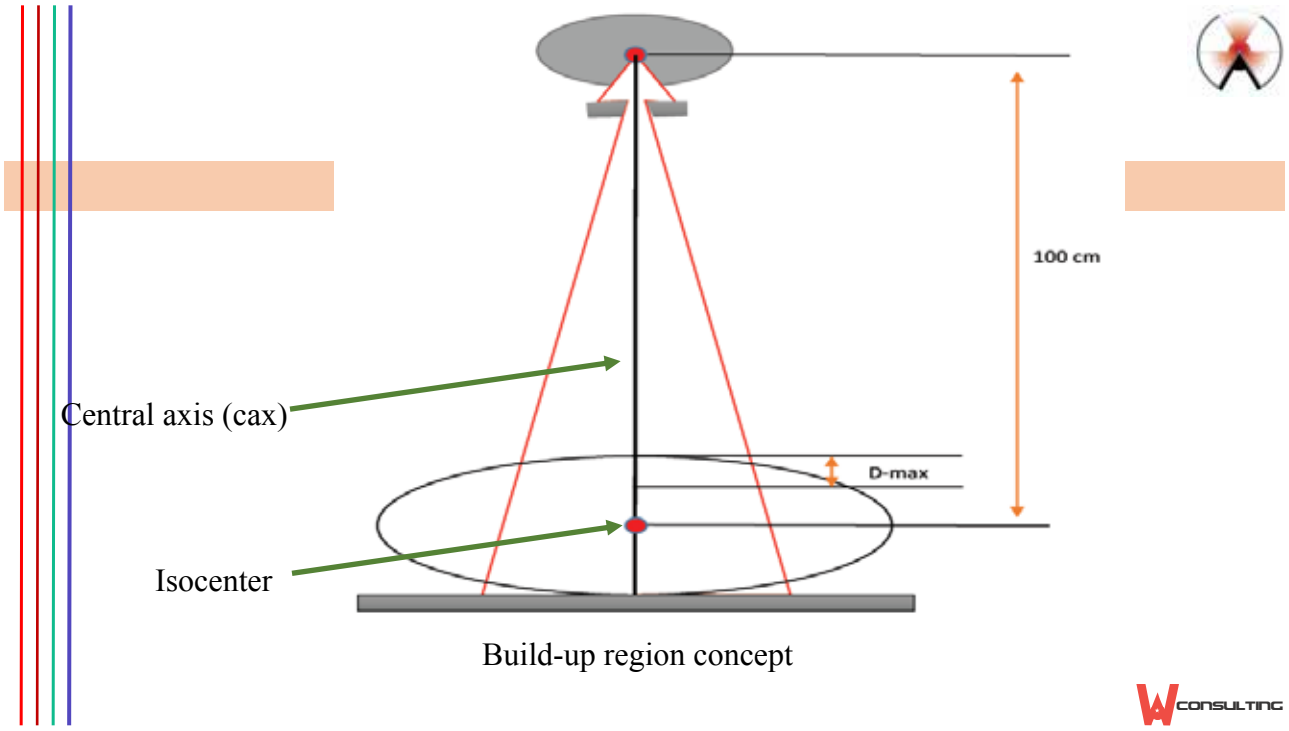


Attachment below collimators to hold Electron Cones for electron therapy



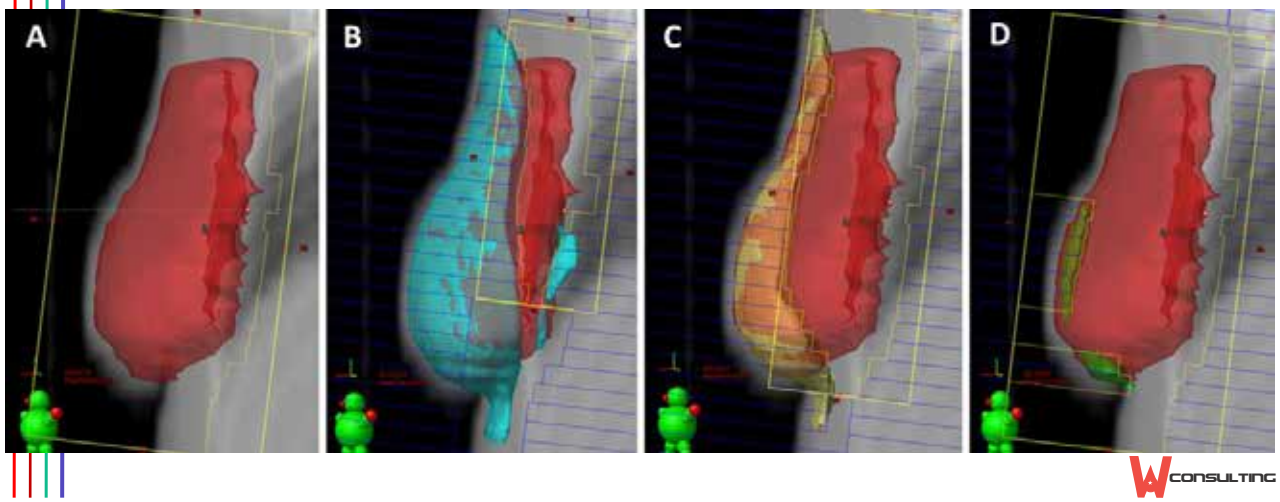
Electron Cone with Electron Cut-out (Copper)

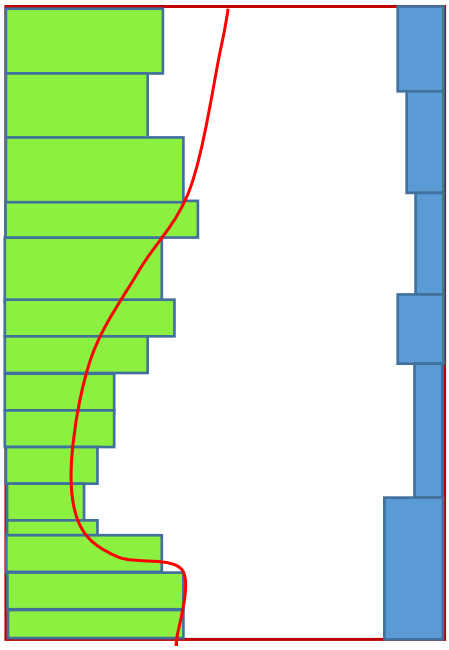
En-face technique: place the electron cut-out as close to patient's skin as possible.



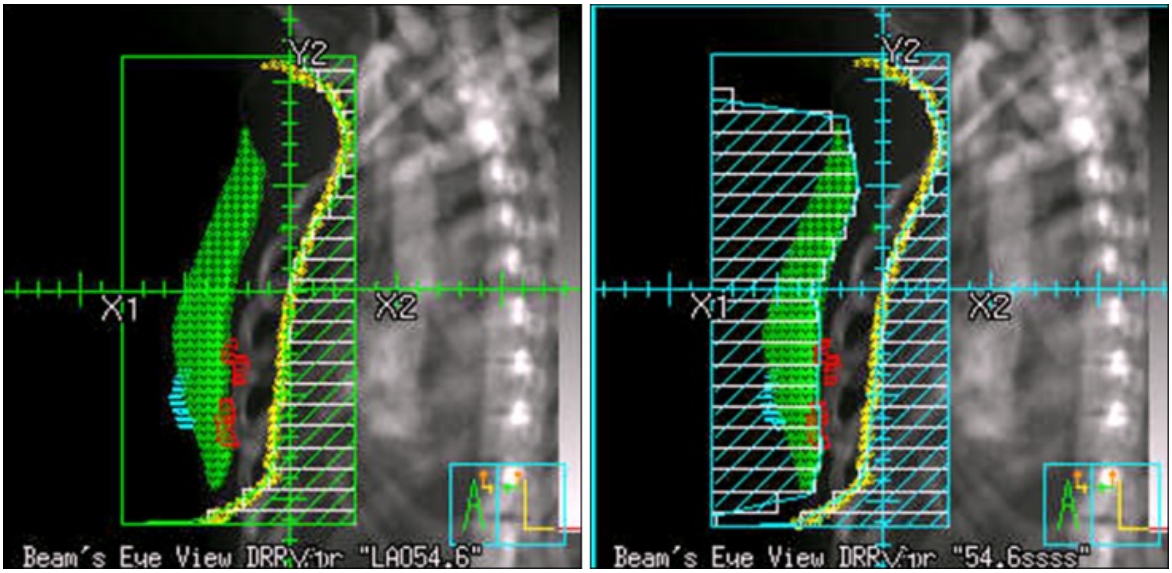
Build-up region concept

Field-in-Field Forward Planning





- In Field-in-Field Technique, the treatment field starts out as a basic tangential field with collimators used to reduce dose to lung and/or heart (blue).
- The beam is turned on initially with only the blue blocks in the irradiated field.
- After a set number of monitor units (MU) have been delivered, the beam is briefly turned off to give time for the collimator leaves (in green) to move into position to reduce dose to specific areas within the PTV.
- Once the collimator leaves (green) are in position, the beam will automatically turn on until the prescribed dose/fraction is delivered.
- Keep in mind that once the beam is on, the collimator leaves do not move in and out of the irradiated field (3D-Conformal).



FiF: With initial open field (LT), we can determine areas of hot spots (doses in excess of 100% of prescribed dose). Adding collimator segments (RT) during treatment will reduce hot spots to produce a more homogeneous dose distribution.

Objectives

- Describe the various radiation therapy delivery systems for treating breast cancer,
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- Explore NCCN Guidelines for EBRT for breast cancer,
- Apply the 2018 STORE Manual RT coding rules to clinical scenarios.

NCCN Guidelines-Invasive Breast Cancer

v3.2018

- Whole Breast RT
  - 45-50.4 Gy in 25-28 fractions (fx), or
  - 40-402.5 Gy in 15-16 fx (hypofractionation preferred),
  - Treatments 5 days/wk,
  - Tumor bed boost recommended in patients with high risk features
- Chest Wall(CW) RT
  - 45-50.4 Gy in 25-28 fx to CW +/- scar boost @ 1.8-2 Gy/fx for total of about 60 Gy.
- Regional Nodal RT
  - 46-60 Gy, 23-25 fx, 5 days/wk

NCCN Guidelines-Invasive Breast Cancer

v3.2018

- Accelerated Partial Breast Irradiation (APBI)
  - 34 Gy in 10 fx, twice a day (BID), via brachytherapy, or
  - 38.5 Gy in 10 fx, BID, with EBRT
  - Tumor bed boost recommended in patients with high risk features
- APBI patient selection criteria:
  - 50 yrs or older, with invasive ductal ca,
  - T1 disease with negative margin width $\geq$ 2 mm, no LVI, ER+, BRCA-, or
  - Low/intermed nuclear grade, screening detected DCIS, $\leq$ 2.5 mm, negative margins $\geq$ 3 mm

Objectives

- Describe the various radiation therapy delivery systems for treating breast cancer,
- Distinguish between 3D-Conformal, IMRT,
- Explore NCCN Guidelines for EBRT for breast cancer,
- Apply the 2018 STORE Manual RT coding rules to clinical scenarios.

Clinical Case 1

- 63 yr old postmenopausal white female, G2P2, with h/o HTN, hyperlipidemia, GERD, who recently noted a lump in her right breast.
- RT breast partial mastectomy @ UOQ, with sentinel lymph node bx: 32 mm unifocal invasive duct carcinoma. LVI+. Tumor gr: 9/9. SLNs: 1+/2.
- ER/PR+. HER2: 2+, equivocal. HER2 FISH: Neg. Ratio: 1.2.
- Post-op ACT chemotherapy, followed by RT breast EBRT.

Clinical Case 1…

- Radiation Therapy Summary:

Plan	Beam Energy	Fractions	Dose/fx (cGy)	Total Dose (cGy)	First txt	Last txt
RT breast, axillary LNs	15X/6X	26	180	4680	5/1/18	6/5/18
RT S'clav	15X	26	180	4680	5/1/18	6/5/18
Lumpectomy tumor bed boost	15 MeV	7	200	1400	6/6/18	6/14/18

- Radiation therapy was administered to the breast and supraclavicular lymph nodes with a 3D- conformal plan. The boost to the lumpectomy cavity was delivered via an electron boost.

Phase I Radiation: Case 1	
Phase I Primary Treatment Volume (1504)	40: Breast-whole
Phase I to Draining Lymph Nodes (1505)	04: Breast/CW LN regions
Phase I Treatment Modality (1506)	02: External beam, photons
Phase I External Beam Planning Technique (1502)	04: 3D-Conformal
Phase I Dose Per Fraction (cGy) (1501)	00180
Phase I Number of Fractions (1503)	026
Phase I Total Dose (cGy) (1507)	004680
Phase II Radiation:	
Phase II Primary Treatment Volume (1514)	04: Breast/CW LN regions
Phase II to Draining Lymph Nodes (1515)	88: NA; Phase II RT is to lymph nodes (p. 303)
Phase II Treatment Modality (1516)	02: External beam, photons
Phase II External Beam Planning Technique (1512)	04: 3D-Conformal
Phase II Dose Per Fraction (cGy) (1511)	00180
Phase II Number of Fractions (1513)	026
Phase II Total Dose (cGy) (1517)	004680
Phase III Radiation:	
Phase III Primary Treatment Volume (1524)	41: Breast-partial
Phase III to Draining Lymph Nodes (1525)	00: No RT to draining lymph nodes.
Phase III Treatment Modality (1527)	04: External beam, electrons
Phase III External Beam Planning Technique (1522)	01: External beam, NOS
Phase III Dose Per Fraction (cGy) (1521)	00200
Phase III Number of Fractions (1523)	007
Phase III Total Dose (cGy) (1527)	001400

RTT, CTR

Take away point:

- *The total dose/phase should add up to the total prescribed dose (Total Dose in Radiation Course)!*
- *Must adhere to STORE rule on p. 336 (if RT delivered to multiple sites, code to 999998)*

Clinical Scenario 1

Course Summary-Case 1	
Total Dose in Radiation Course (cGy)	**999998** (*See STORE, p. 336)*
Date Radiation Started	05/01/18
Date Radiation Ended	06/05/18
Number of Phases	03
Radiation Treatment Discontinued Early?	01: RT Completed as prescribed
Radiation/Surgery Sequence	03: RT after surgery
Reason for No Radiation	0: RT was administered

Prepared by Wilson Apollo, MS, RTT, CTR

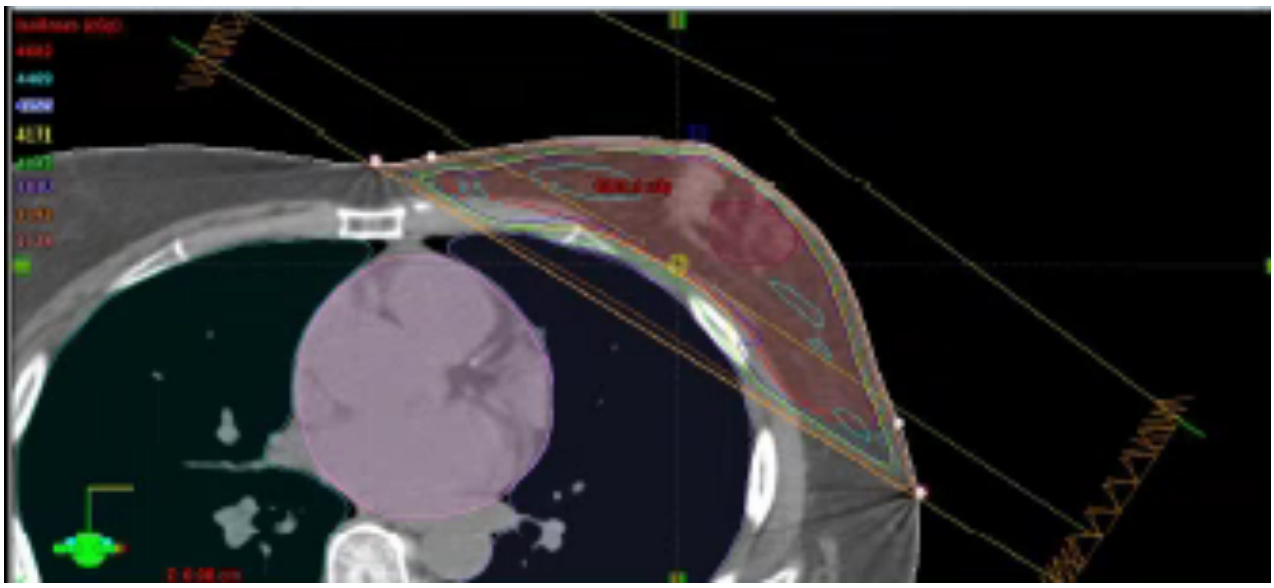
Clinical Case 2

- 71 year-old Asian female with h/o Hashimoto thyroiditis, chronic sinusitis, who recently underwent routine screening breast imaging with abnormal findings on left breast.
- Left partial mastectomy with sentinel lymph node bx: 9 mm DCIS, solid and cribriform types, low to intermediate nuclear grade. No invasive or micro-invasive component found. No necrosis. 0/1 sentinel lymph node negative. 0/1 non-sentinel lymph node negative. Margins negative. Closest margin >5 mm.

Clinical Case 2…

Radiation Therapy Summary:

Patient received a hypofractionated accelerated regimen. The left breast received a total dose of 4256 cGy, 266 cGy in 16 fractions using 3D Field-in-Field (FiF) technique with breast tangents @ 100 SAD, using 6MV photons. This was followed by a boost to the lumpectomy cavity, consisting of 250 cGy in four fractions, 6MV, 3D-conformal for a total dose of 5256 Gy. Patient tolerated the treatment well with no treatment interruptions.



Target Volume	Initial
	Left Breast
Treatment Planning	
Imaging	New CT Sim
Motion Mgmt	Breath Hold
Modality	Photon EBRT
Planning	3D
Fields	Tangents
Energy/Source	6 MV
Prescribed to	Isodose per plan
Fraction & Dosing	
Fraction Dose	2.66 Gy
Fraction Number	16
Fractions/week	1 fx daily
Total Dose	42.56 Gy
Cumulative EBRT Dose	42.56 Gy

Treatment Prescription Information.

Can be found in ARIA or Mosaiq.

Clinical Scenario 2

RT Prescription: Medial Tangent

Energy Mode	**6X**
Dose Rate	600 MU/min
Technique	Static IMRT
Source-Axis-Distance (SAD)	100.0 cm
Field size	9.0 cm x 17.0 cm (X1: 2.5, X2: 6.5, Y1: 7.0 cm, Y2: 10.0 cm)
Gantry Rtn	300.0 deg
Coll Rtn	10.0 deg
Couch Rtn	0.0 deg
MU	169
MLC Transmission factor	1.3 %

Clinical Case 2

RT Prescription: Lateral Tangent

Energy Mode	6X
Dose Rate	600 MU/min
Technique	Static IMRT
Source-Axis-Distance (SAD)	100.0 cm
Field size	8.5 cm x 17.0 cm (X1: 6.0, X2: 2.5, Y1: 7.0 cm, Y2: 10.0 cm)
Gantry Rtn	123.0 deg
Coll Rtn	350.0 deg
Couch Rtn	0.0 deg
MU	165
MLC Transmission factor	1.3%

Clinical Case 2

Phase I Radiation: Clinical Scenario 2	
Phase I Primary Treatment Volume (1504)	40: Breast-whole
Phase I to Draining Lymph Nodes (1505)	00: No RT to draining lymph nodes
Phase I Treatment Modality (1506)	02: External beam, photons
Phase I External Beam Planning Technique (1502)	04: 3D Conformal
Phase I Dose Per Fraction (cGy) (1501)	00266
Phase I Number of Fractions (1503)	016
Phase I Total Dose (cGy) (1507)	004256
Phase II Radiation	
Phase II Primary Treatment Volume (1514)	41: Breast-partial
Phase II to Draining Lymph Nodes (1515)	00: No RT to draining lymph nodes.
Phase II Treatment Modality (1516)	02: External beam, photons
Phase II External Beam Planning Technique (1512)	04: 3D conformal
Phase II Dose Per Fraction (cGy) (1511)	00250
Phase II Number of Fractions (1513)	004
Phase II Total Dose (cGy) (1517)	001000

Take away point:

- When the breast tangents technique is used, lymph nodes may be in the irradiated field (not planned).
- Unless stated otherwise, phase I to draining LNs should be coded to 00.

Clinical Scenario 2

Course Summary-Case 2	
Total Dose in Radiation Course (cGy)	**005256**
Date Radiation Started	
Date Radiation Ended	
Number of Phases	02
Radiation Treatment Discontinued Early?	01: RT Completed as prescribed
Radiation/Surgery Sequence	00: No RT and/or surgical procedures
Reason for No Radiation	0: RT was administered

Prepared by Wilson Apollo, MS, RTT, CTR

Clinical Scenario 3

- 59 year-old postmenopausal Hispanic female with history of left calf malignant melanoma in 2006, status post, Mohs' resection and immunotherapy, who underwent routine screening mammogram with suspicious findings on right breast.
- On exam, there are no palpable lesions on either breast. Patient denies any nipple discharge. No observable nipple retraction and no palpable axillary lymphadenopathy.
- Nonsmoker. Social drinker. +FHX: Mother and M-grandmother dx'd with breast cancer. Given patient's family h/o breast cancer, pt underwent genetic testing with BRCA 1/2 negative results.

Clinical Scenario 3

- Patient underwent IORT to right breast, using the Zeiss Intrabeam XRS 50 Kv unit. Prescribed dose to the surface was 20 Gy, with a 4.0 cm applicator. Dose rate = 0.712 Gy/minute @ the surface. Treatment time = 28 minutes, 45 seconds by ionization chamber second check measurements. Ultrasound simulations confirmed that the skin to applicator distances were: 1.12 cm sup, 0.98 cm lat, 1.1 cm inf, and 0.8 cm medially, all within acceptable distances. IORT was followed by EBRT(3D-conformal) as detailed below:

Plan	Beam Energy	Fractions	Dose/fx (cGy)	Total Dose (cGy)
RT breast	6 MV	25	180	4500

Target Volume	Initial
	RT 1:00 lumpectomy cavity
Treatment Planning	
Imaging	Ultrasound Sim
Motion Mgmt	
Modality	HDR Brachytx
Planning	2D
Fields	Applicator
Energy/Source	Electronic kV
Prescribed to	Depth 0 cm
Fraction & Dosing	
Fraction Dose	20 Gy
Fraction Number	1
Fractions/week	1 fx daily
Total Dose	20 Gy
Cumulative EBRT Dose	20 Gy

RT Prescription information found on ARIA

Phase I Radiation: Clinical Scenario 3	
Phase I Primary Treatment Volume (1504)	41: Breast-partial
Phase I to Draining Lymph Nodes (1505)	00: No RT to draining lymph nodes
Phase I Treatment Modality (1506)	02: External beam, photons
Phase I External Beam Planning Technique (1502)	12: Electronic brachytherapy
Phase I Dose Per Fraction (cGy) (1501)	002000
Phase I Number of Fractions (1503)	001
Phase I Total Dose (cGy) (1507)	002000
Phase II Radiation	
Phase II Primary Treatment Volume (1514)	40: Breast-whole
Phase II to Draining Lymph Nodes (1515)	00: No RT to draining lymph nodes.
Phase II Treatment Modality (1516)	02: External beam, photons
Phase II External Beam Planning Technique (1512)	04: 3D conformal
Phase II Dose Per Fraction (cGy) (1511)	00180
Phase II Number of Fractions (1513)	025
Phase II Total Dose (cGy) (1517)	004500

TR

Take away point:

- The Zeiss Intrabeam and XOFT Axxent systems deliver EBRT, which means you can code the dose/fx & total dose in cGy.

Clinical Scenario 3

Course Summary-Case 3	
Total Dose in Radiation Course (cGy)	**006500** (Zeiss Intrabeam RT, 20 Gy, + 3D-Conformal RT, 45 Gy). They are both EBRT!
Date Radiation Started	
Date Radiation Ended	
Number of Phases	02
Radiation Treatment Discontinued Early?	01: RT Completed as prescribed
Radiation/Surgery Sequence	03: RT after surgery
Reason for No Radiation	0: RT was administered

Clinical Scenario 4

- 55-year-old W/F, who on routine screening breast imaging had abnormal findings on LT breast.
- Left breast SAVI Scout localizer partial mastectomy with sentinel lymph node bx= 0.9 cm DCIS, solid & cribriform, low nuclear grade. No invasive component present. SLNs= 0/2 neg Margins negative. Closest margin @ 3 mm lat.

Radiation Therapy Summary

- Using a 6-1 mini SAVI catheter, the lumpectomy cavity received 34 Gy in 10 treatments, BID.

SAVI Scout localizer system

Phase I Radiation: Clinical Scenario 4	
Phase I Primary Treatment Volume (1504)	41: Breast-partial
Phase I to Draining Lymph Nodes (1505)	00: No RT to draining lymph nodes
Phase I Treatment Modality (1506)	09: Brachytherapy, intracavitary, HDR
Phase I External Beam Planning Technique (1502)	88: Treatment not by external beam
Phase I Dose Per Fraction (cGy) (1501)	99998 (p. 290, STORE manual)
Phase I Number of Fractions (1503)	010
Phase I Total Dose (cGy) (1507)	999998 (p. 294, STORE manual)
Phase II Radiation	
Phase II Primary Treatment Volume (1514)	
Phase II to Draining Lymph Nodes (1515)	
Phase II Treatment Modality (1516)	
Phase II External Beam Planning Technique (1512)	
Phase II Dose Per Fraction (cGy) (1511)	
Phase II Number of Fractions (1513)	
Phase II Total Dose (cGy) (1517)	

TR

Take away point:

- The SAVI catheter system involves use of Ir-192 seeds, inserted into the lumpectomy cavity.
- This makes the procedure HDR intracavitary brachytherapy.

Clinical Scenario 4

Course Summary-Case 4	
Total Dose in Radiation Course (cGy)	**999998**
Date Radiation Started	
Date Radiation Ended	
Number of Phases	01
Radiation Treatment Discontinued Early?	01: RT Completed as prescribed
Radiation/Surgery Sequence	03: RT after surgery
Reason for No Radiation	0: RT was administered

Recommended Journals

- Radiation Therapist,
- International Journal of Radiation Oncology, Biology, Physics (Red Journal),
- Journal of Registry Management
- Journal of Clinical Oncology
- Lancet Oncology
- Medical Dosimetry
- Journal of Radiation Oncology

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Questions

Questions

Questions

Questions

You can submit your RT coding questions to *apollow@mac.com*

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