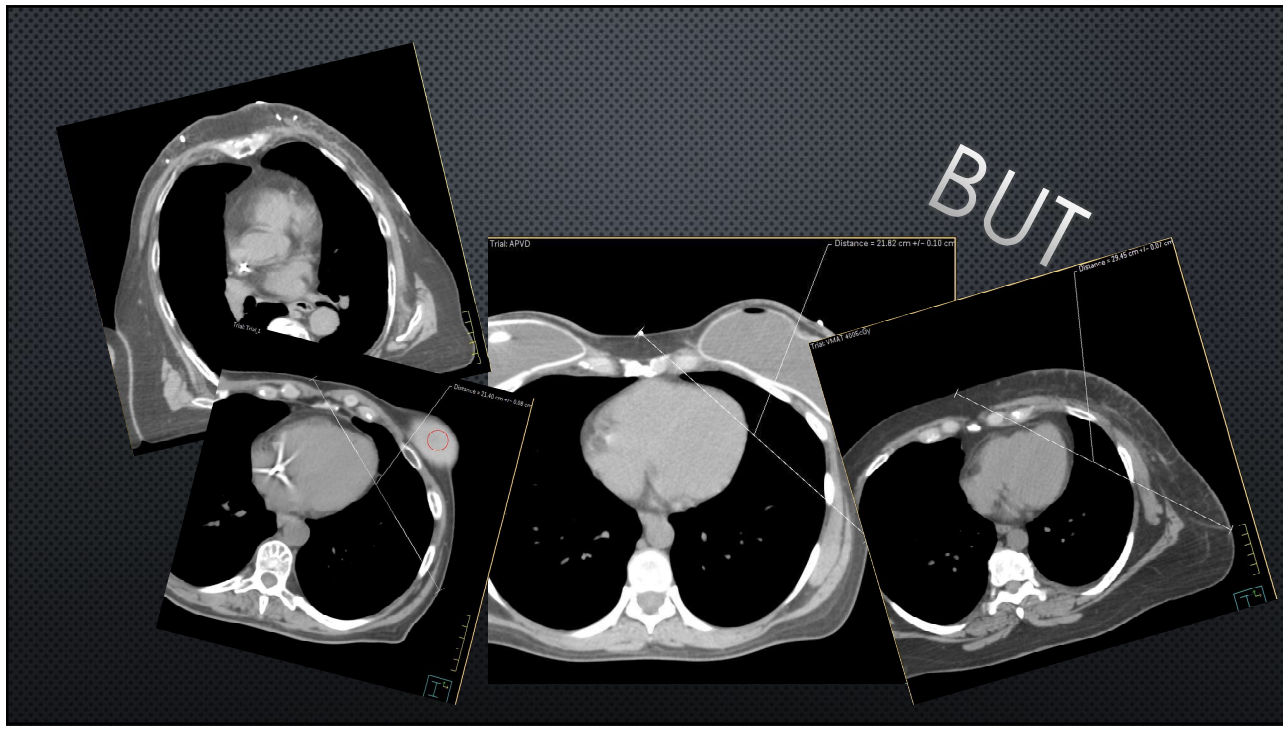
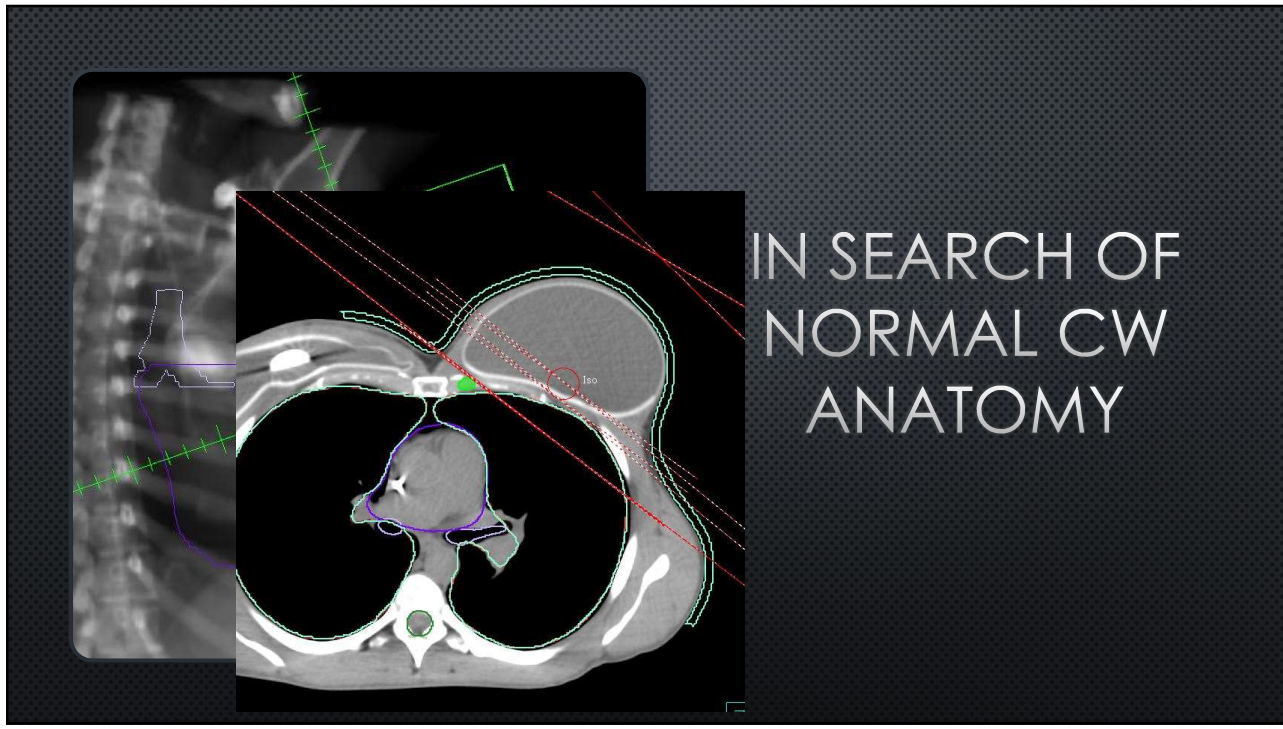


CASE STUDY: ROLE OF VOLUMETRIC
MODULATED ARC THERAPY IN LEFT SIDED
BREAST CANCER POST RADICAL
MASTECTOMY

LESLIE K POTEET, CMD,R.T.(R)(T)
PENROSE CANCER CENTER
COLORADO SPRINGS, CO



CASE # 1

RADIATION ONCOLOGY CONSULTATION

REASON FOR CONSULTATION: cT2N1M0; ypT0N0M0 invasive ductal carcinoma, left breast.

HISTORY OF PRESENT ILLNESS: [REDACTED] is a very pleasant 44-year-old premenopausal female who presented with a palpable mass in her left breast in February 2016. This would come and go with her periods. By March 2017, the mass persisted and she sought medical attention.

Diagnostic mammogram from 4/13/17 showed a 3 cm mass in the 1:00 position of the left breast. There was also a 2.6 cm enlarged left axillary lymph nodes suspicious for metastatic disease. I personally reviewed these images at the recent Multidisciplinary Breast Conference.

Ultrasound-guided needle biopsy demonstrated grade 3 invasive ductal carcinoma. ER/PR and HER-2/neu were all positive. Ki-67 was 38%.

She underwent fine-needle aspiration of the left axillary node confirming metastatic breast cancer.

PET/CT scan showed hypermetabolic activity within the left breast and left axilla but no metastatic disease. Breast MRI was notable for the same. There was an indeterminate 9 x 5 mm enhancing breast mass on the right side.

She elected to undergo TCHP chemotherapy and started this in June. Her last cycle was on 9/18/2017. Clinically she noticed a dramatic response and this was confirmed by both ultrasound and subsequent MRI. Both studies showed no definitive persistent disease.

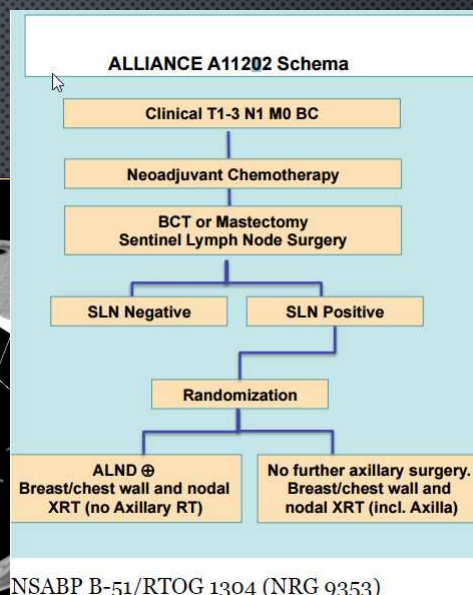
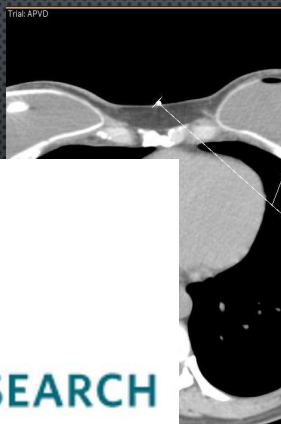
Genetic testing had shown her to be negative on a 28 gene panel but given her mother's breast cancer at an early age, she decided to pursue bilateral mastectomies. These occurred on 10/17/2017 with Dr. [REDACTED] and were notable for a complete pathologic response in both the primary site and in her axillary nodes (0 of 11 nodes).

She had tissue expanders placed but has not yet had her first expansion. She was discussed at our Multidisciplinary Breast Conference recently and a recommendation was made for her to hear about adjuvant radiation from our office.

She has persistent discomfort in her chest wall from her mastectomy which is moderate in intensity. She had diarrhea during chemotherapy but this is resolving.

CASE # 1

CT SIM DAY



CASE

Abstract: Conventional volumetric modulated arc therapy (C-VMAT) for breast cancer after radical mastectomy had its limitation that resulted in larger volumes of normal tissue receiving low doses. We explored whether there was a way to deal with this disadvantage and determined the potential benefit of flattening filter-free (FFF) beams.

Twenty patients with breast cancer after radical mastectomy were subjected to 3D conformal radiotherapy (3DCRT) and VMAT treatment planning. For VMAT plans, 3 different designs were employed with RapidArc form: conventional-VMAT plan (C-VMAT), modified-VMAT plan (M-VMAT), and modified-VMAT plan using FFF beams (M-VMAT-F). Plan quality and efficiency were assessed for all plans.

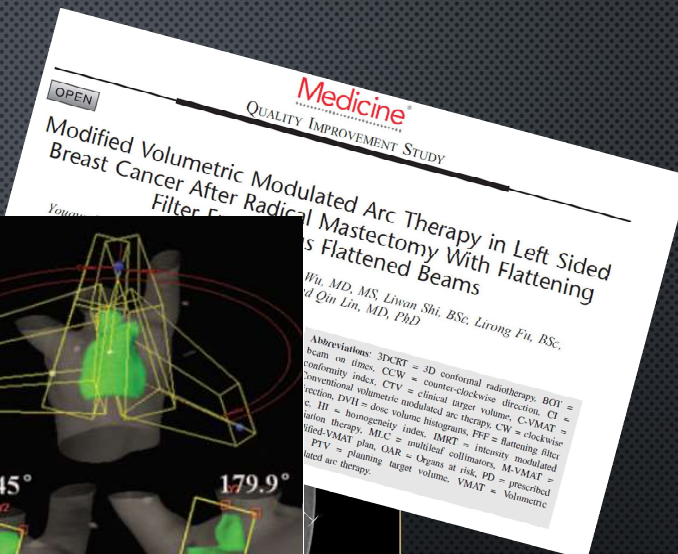
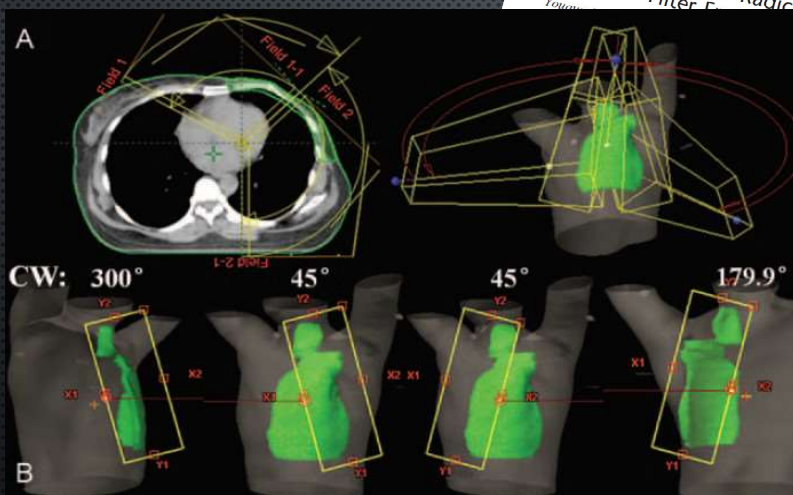
For each technique in homogeneity, there were no statistically significant differences. VMAT plans showed superiority compared with 3DCRT in conformity. C-VMAT plans were obviously not only superior to 3DCRT in the medium to high-dose regions (about 15–50 Gy) but also resulted in larger volumes in low-dose regions (about 0–10 Gy). M-VMAT plans were similar to M-VMAT-F. Both of them might significantly reduce the regions of low dose compared with C-VMAT ($V5_{lung} \sim 11.5\%$; $V5_{heart} \sim 23.8\%$, $P < 0.05$), even less than 3DCRT in heart irradiation ($V2.5_{heart}$, 9.4% , $P < 0.05$). For liver, contralateral breast, and lung irradiation, M-VMAT-F plans were slightly superior to M-VMAT with a reduction of ~ 0.08 , 0.2 , and 0.24 Gy in the respective mean doses ($P < 0.05$).

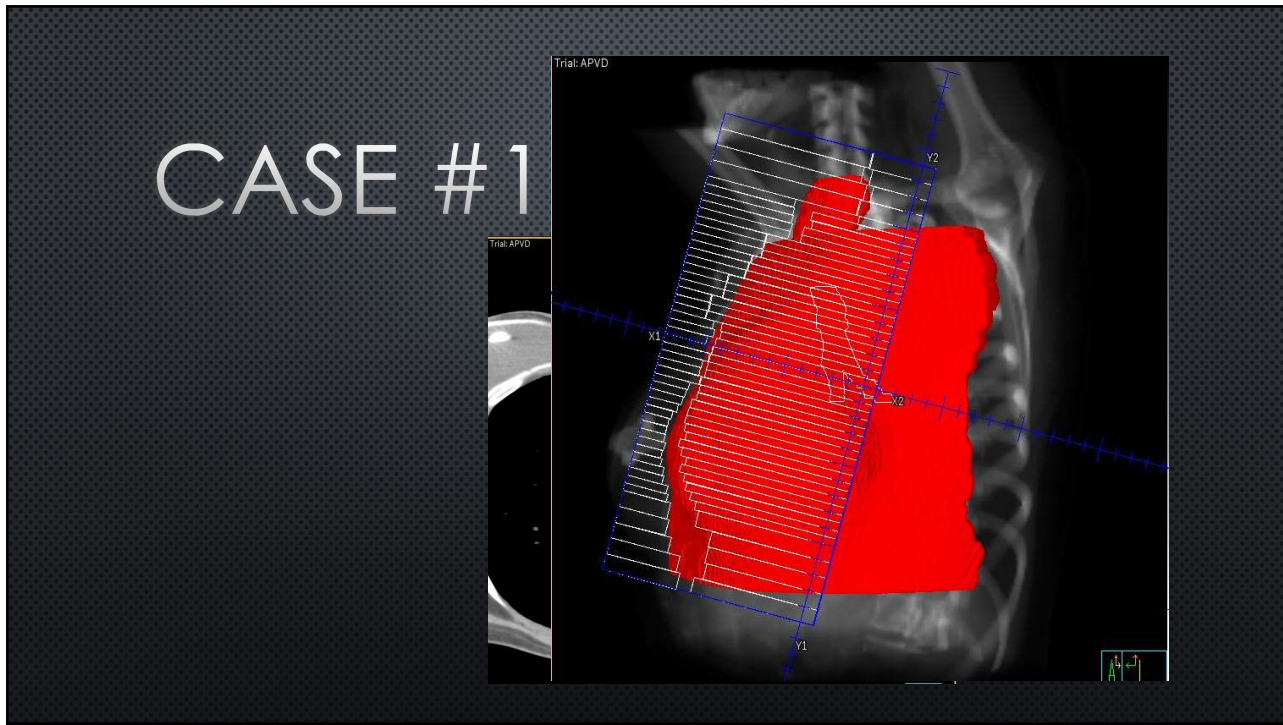
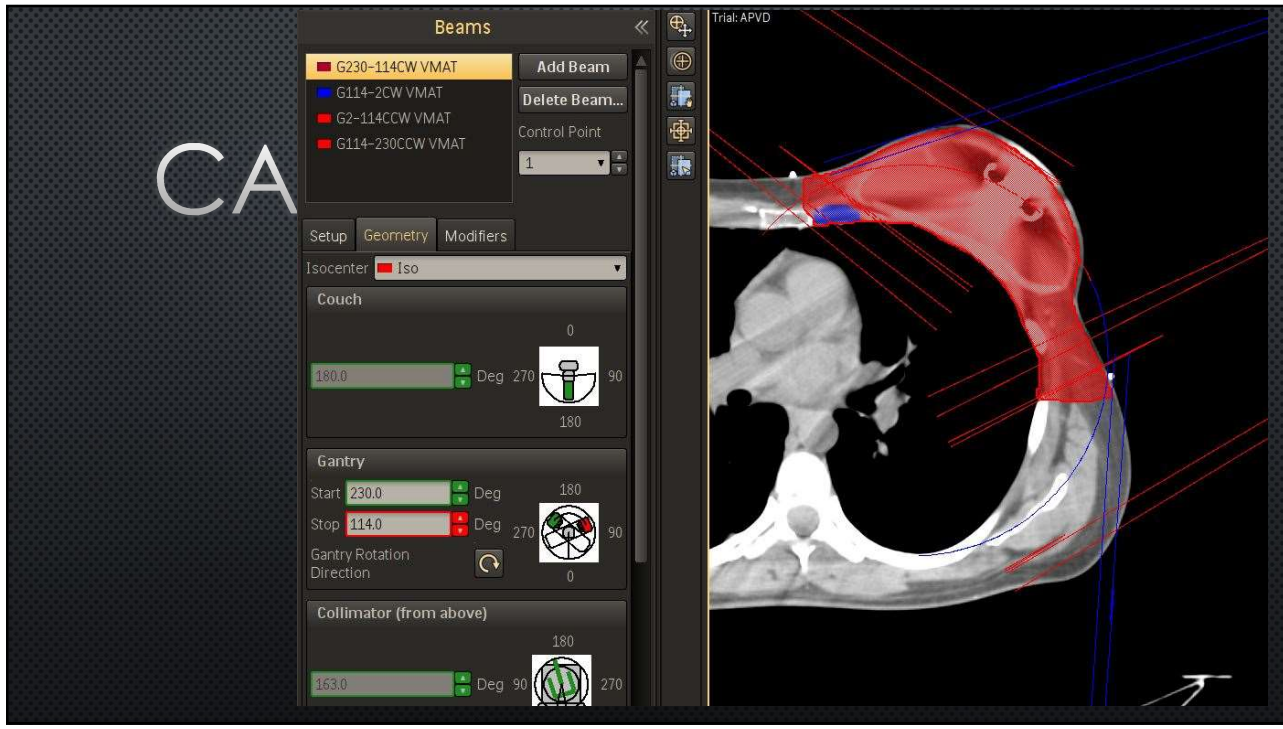
C-VMAT plans showed superiority compared with 3DCRT, while also resulted in larger volumes of normal tissue receiving low doses. M-VMAT and M-VMAT-F plans might not only reduce the region in the medium to high doses but also have lower volumes in low-dose regions. M-VMAT-F plans were slightly superior compared with M-VMAT due to further contralateral organs sparing.

(Medicine 95(14):e3295)



CASE #1







Scorecard

Name: APVD

Description: NSABP1304, LT CW, SCL, IMNs

ROI	Type	Primary Goal Dose cGy	Primary Goal Volume	Units	Secondary Goal Dose cGy	Secondary Goal Volume	Units	Dose cGy	Volume at Primary Goal Dose	Units	Result
PTV_CW_EVAL_L	Min DVH (%)	4750	95.000	%	4500	90.000	%	1858.3	Min 99.473	%	Met
PTVn_SCL_L	Min DVH (%)	4750	95.000	%	4500	90.000	%	4196.4	Min 69.435	%	OK
PTVn_Ax_L	Min DVH (%)	4750	95.000	%	4500	90.000	%	4858.5	Min 99.967	%	Met
PTVn_IMN_L	Min DVH (%)	4500	95.000	%	4000	90.000	%	4021.1	Min 99.243	%	Met
HEART	Max DVH (%)	2500	10.000	%	3000	10.000	%	4849.4	Max 1.589	%	Met
HEART	Mean Dose	400	0.000		500	0.000		405.4	Mean --		OK
LUNG_L	Max DVH (%)	2000	35.000	%	2000	40.000	%	5308.0	Max 33.612	%	Met
PTV_CW_EVAL	Max Dose	6000	0.000		0	0.000		5623.7	Max --		Met
PTVn_SCL_L	Max Dose	5750	0.000		0	0.000		5098.6	Max --		Met
PTVn_Ax_L	Max Dose	5750	0.000		0	0.000		5427.5	Max --		Met
PTVn_IMN_L	Max Dose	5750	0.000		0	0.000		5442.1	Max --		Met
LUNG_L	Max DVH (%)	1000	65.000	%	0	0.000	%	5308.0	Max 49.885	%	Met
LUNG_L	Max DVH (%)	500	75.000	%	0	0.000	%	5308.0	Max 65.087	%	Met
LUNG_R	Max DVH (%)	500	15.000	%	0	0.000	%	1259.6	Max 3.368	%	Met

CASE #1

TL Dosimetry Report

Patient: ██████████	Date: 23-Jan-18
Institution: Penrose Cancer Center	Date Irradiated: 23-Jan-18
Physician: Dr. Alan Monroe	
Physicist: Kieman McCullough, M.S.	
Tx Area: Lt Chest Wall	Fractions: 25

Dose/Fx (cGy)	Total Dose (cGy)
194.5	4861
177.4	4436
192.0	4799

Dose for comparison (cGy):	4750
	2.3%

CASE #1

CASE # 1

TL Dosimetry Report			
Patient:	[REDACTED]	Date:	23-Jan-18
Institution:	Penrose Cancer Center	Date Irradiated:	23-Jan-18
Physician:	Dr. Alan Monroe		
Physicist:	Kiernan McCullough, M.S.		
Tx Area:	LT Chest Wall	Fractions:	25
Energy:	6x		

TLD	Dose/Fx (cGy)	Total Dose (cGy)
1	194.5	4861
2	177.4	4436
3	192.0	4799

APVD	Iso	TLD#1	TLD#2	TLD#3
	(Lateral Ant-Post Sup-Inf) Local(6.23 -9.74 16.35)cm DICOM(62.30 97.38 -163.50)...	(Lateral Ant-Post Sup-Inf) Local(10.51 0.12 15.45)cm DICOM(105.10 -1.16 -154.50)...	(Lateral Ant-Post Sup-Inf) Local(5.13 2.23 20.25)cm DICOM(51.30 -22.28 -202.50)...	(Lateral Ant-Post Sup-Inf) Local(15.17 -2.34 23.25)cm DICOM(151.68 23.41 -232.50)...
	Abs (cGy) Pct	Abs (cGy) Pct	Abs (cGy) Pct	Abs (cGy) Pct
LT CW				
G230-114CW ...	196.1 18.5%	758.3 15.5%	74.9 1.7%	801.2 16.6%
G114-2CW V ...	529.8 50.0%	1845.6 37.7%	2281.7 51.0%	1401.3 29.0%
G2-114CCW V ...	248.2 23.4%	592.6 12.1%	2076.7 46.4%	1319.4 27.3%
G114-230CC ...	84.7 8.0%	1700.4 34.7%	44.9 1.0%	1308.9 27.1%
Total	1058.8 100.0%	4896.9 100.0%	4478.1 100.0%	4830.7 100.0%
TOTAL	1058.8 100.0%	4896.9 100.0%	4478.1 100.0%	4830.7 100.0%

CASE # 1

QUESTIONS BEFORE MOVING
 ON TO CASE #2???

CASE #2

RADIATION ONCOLOGY CONSULTATION

REASON FOR CONSULTATION: 1) T4bN1aM0 invasive ductal carcinoma of the left breast.
2) T1N0M0 invasive carcinoma of the right breast.

HISTORY OF PRESENT ILLNESS: [REDACTED] is a very pleasant 78-year-old female who presented with a palpable mass on her annual physical exam when she saw Dr. [REDACTED]. The patient did not notice the mass herself. It grew rapidly over the next few weeks as she was being worked up. The patient relays that it grew substantially even within just a few days after seeing Dr. [REDACTED].

She had imaging performed initially which I personally reviewed today. There were bilateral abnormalities with indeterminate microcalcifications in the 12:00 position of the right breast and 2 clusters of pleomorphic calcifications in the upper outer left breast.

Staging CT showed only nephrolithiasis with no metastatic disease. There is an indeterminate left adrenal mass that will require additional imaging.

Biopsy on the right side was grade 2 invasive ductal carcinoma, ER/PR positive, HER-2 positive by FISH with associated grade 2 DCIS. Biopsy on the left was grade 2 invasive ductal carcinoma, ER/PR negative, HER-2 positive by IHC.

She had bilateral mastectomies on 5/23/2017. Her left breast mass measured 10 cm in greatest dimension and was a grade 3 invasive ductal carcinoma with high-grade DCIS. Surgical margins are negative. A total of 3 positive nodes were detected out of 9, 2 of which were macro metastases and there was extranodal extension associated. Carcinoma invaded the dermis without ulceration of the skin.

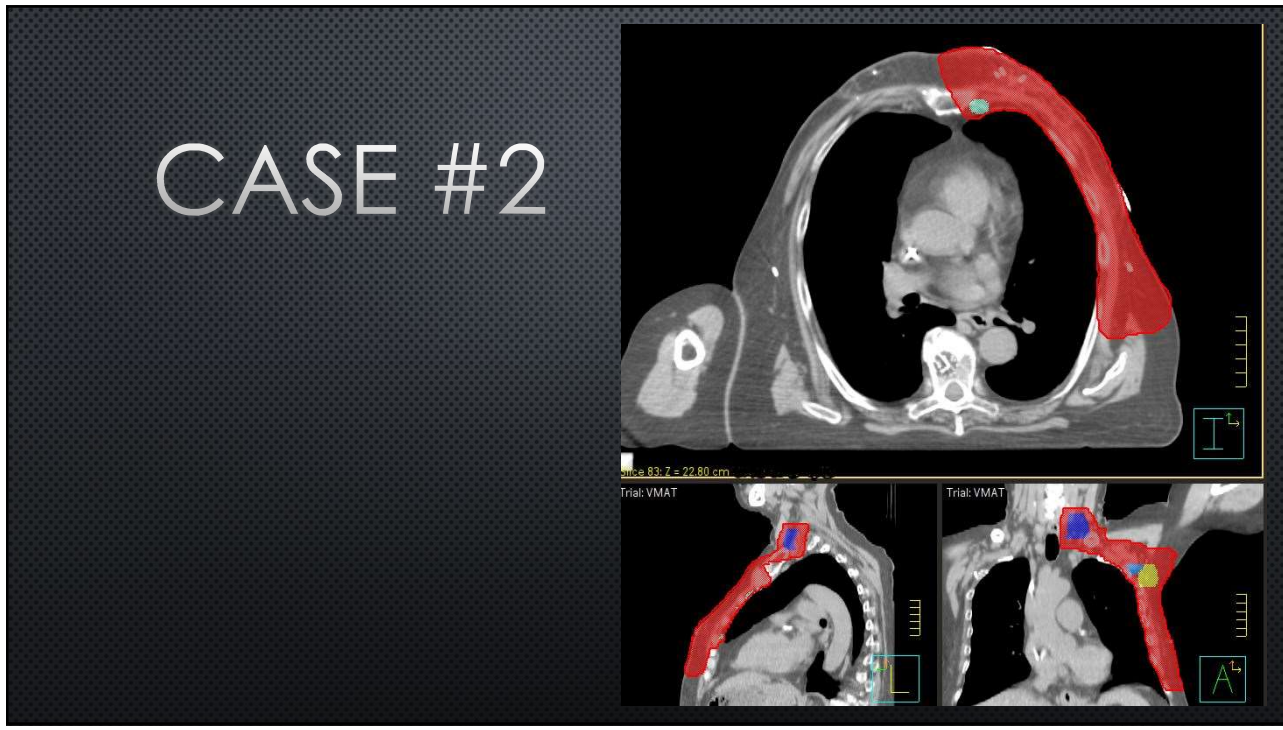
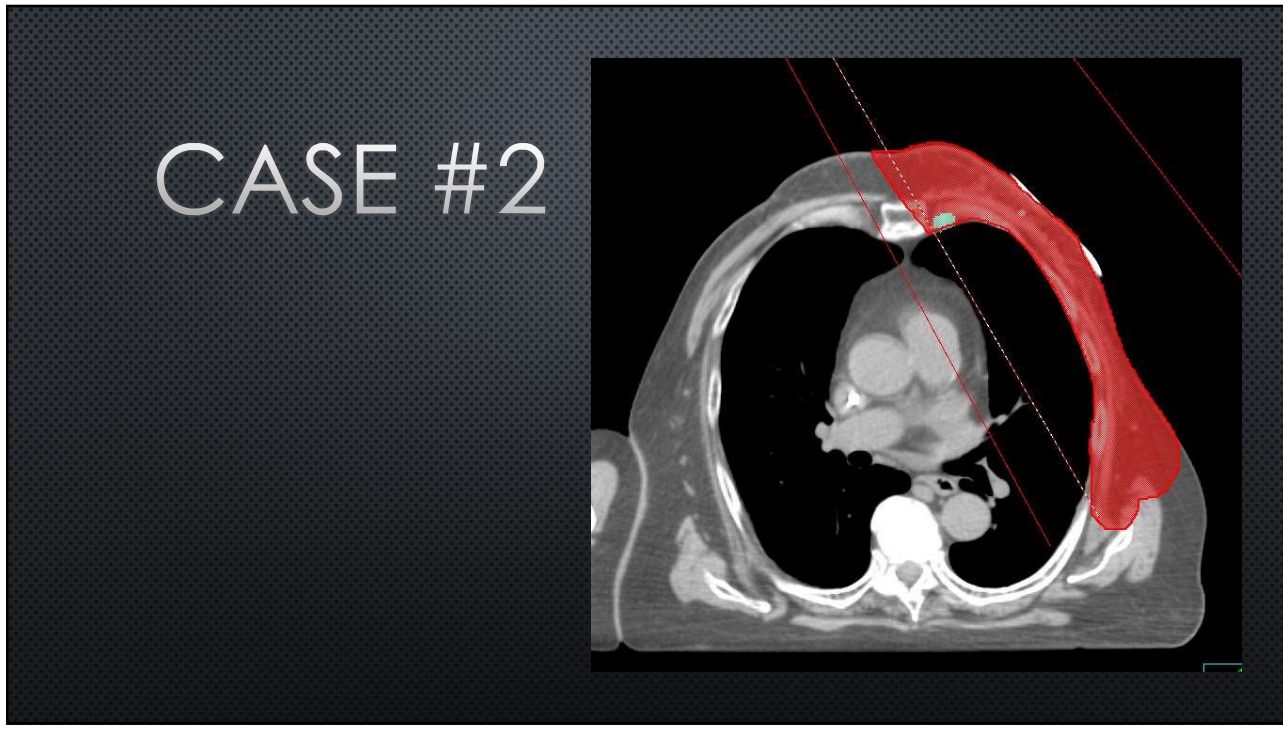
The right mastectomy was notable for a 9 mm invasive ductal carcinoma, grade 2. Surgical margins were negative and all 4 sentinel nodes were negative.

PET was negative for metastatic disease. The adrenal nodule was of low metabolic activity.

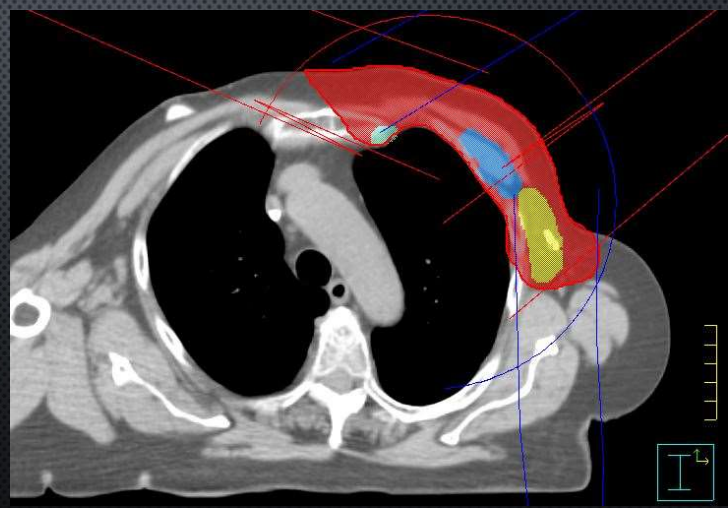
She has received TCH x4 and stopped due to side effects. She remains on Herceptin. She reports dyspnea with exertion and lower extremity edema. She feels poorly and would like to stop Herceptin.

CASE #2

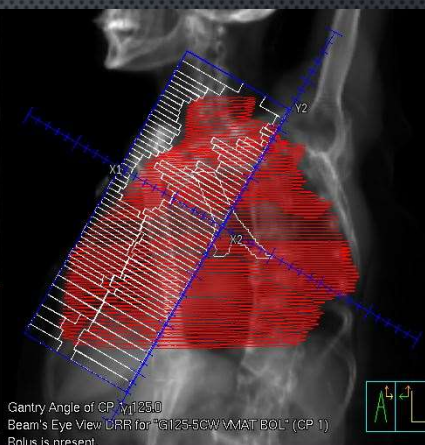
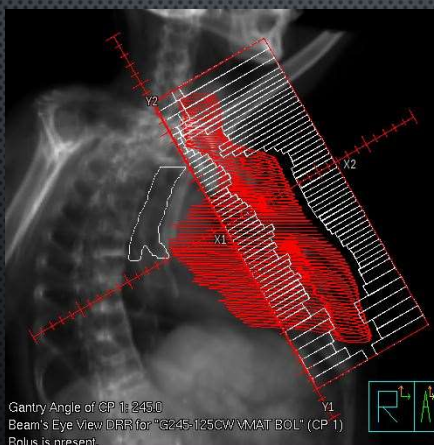


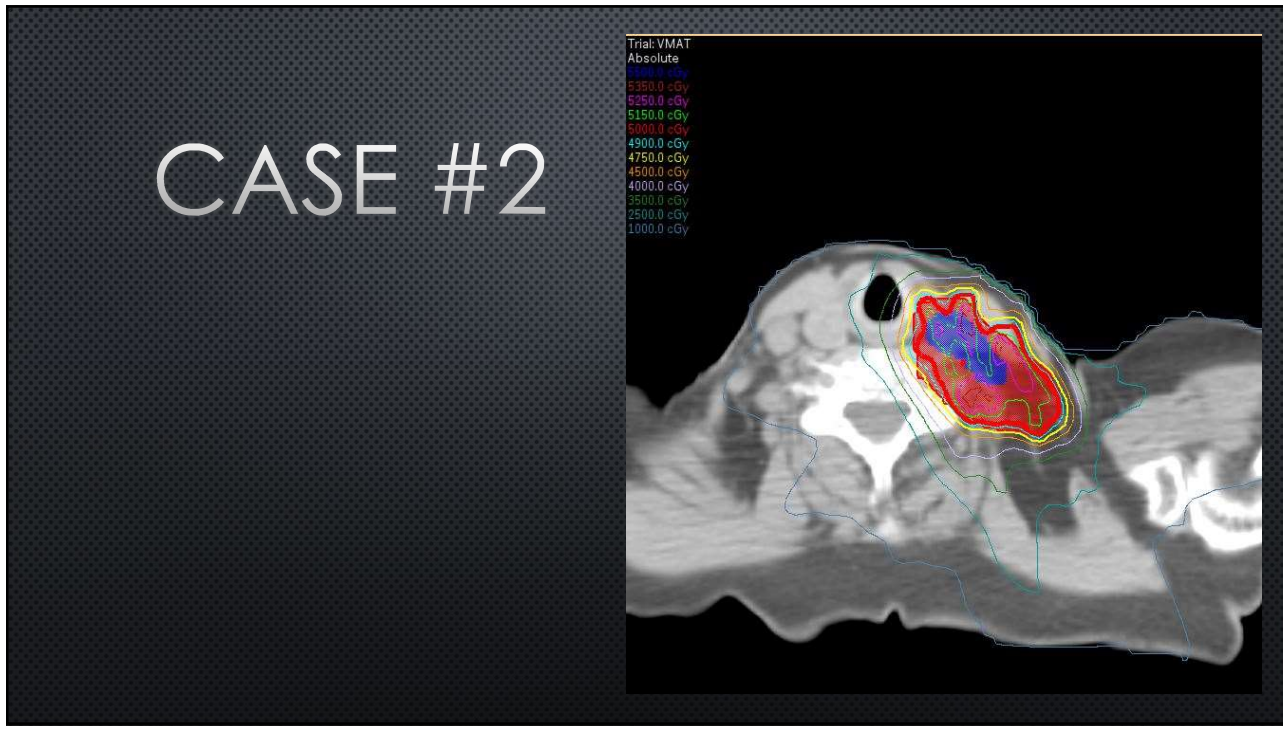
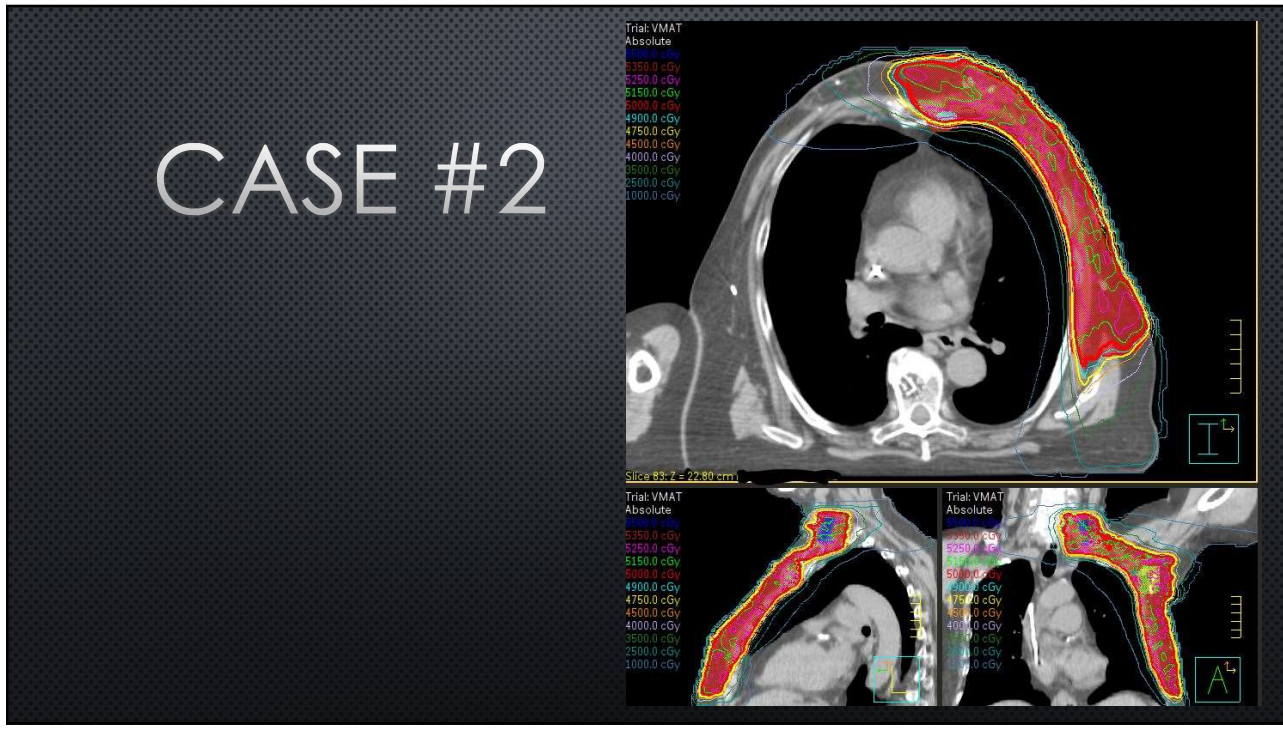


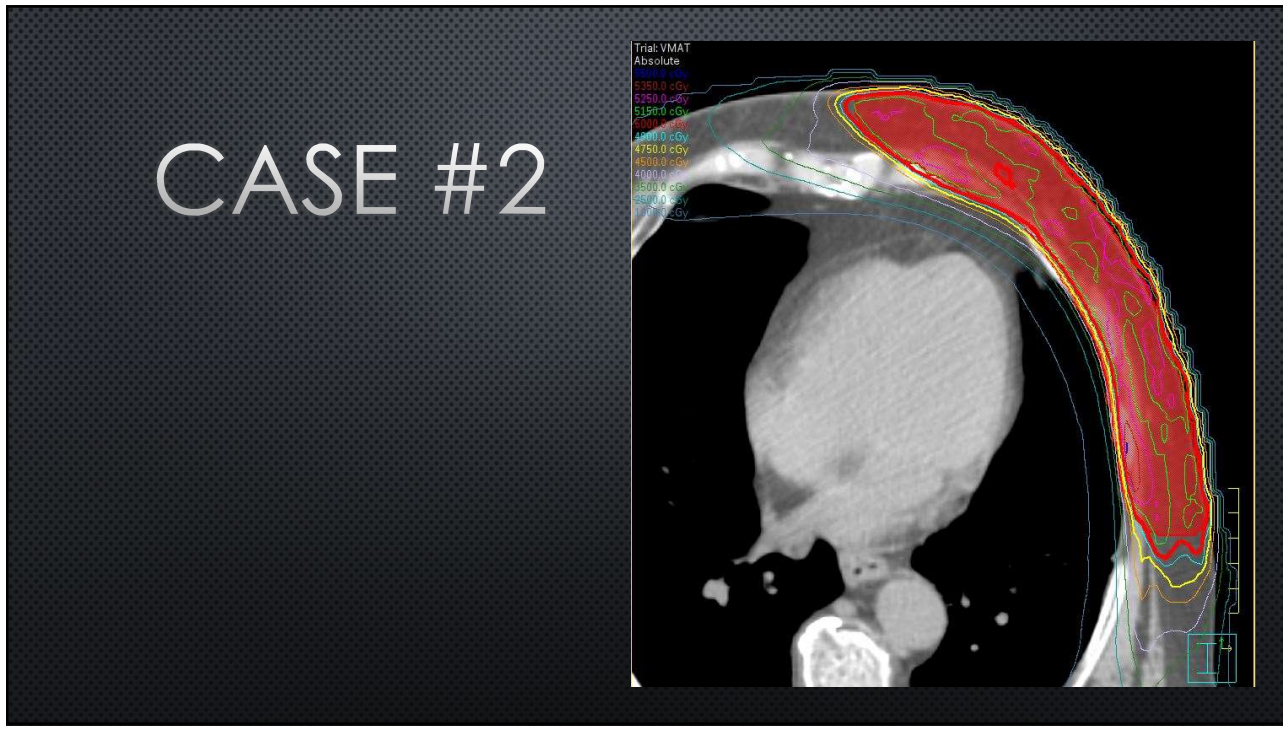
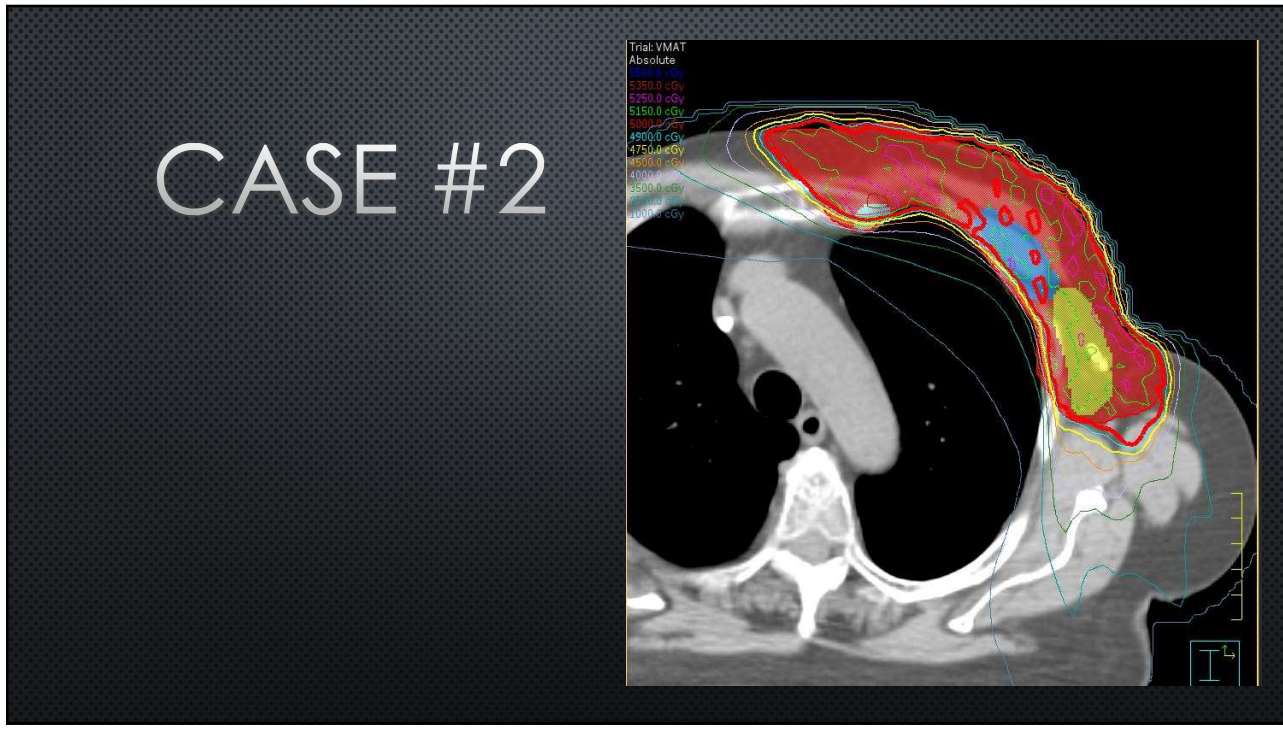
CASE #2

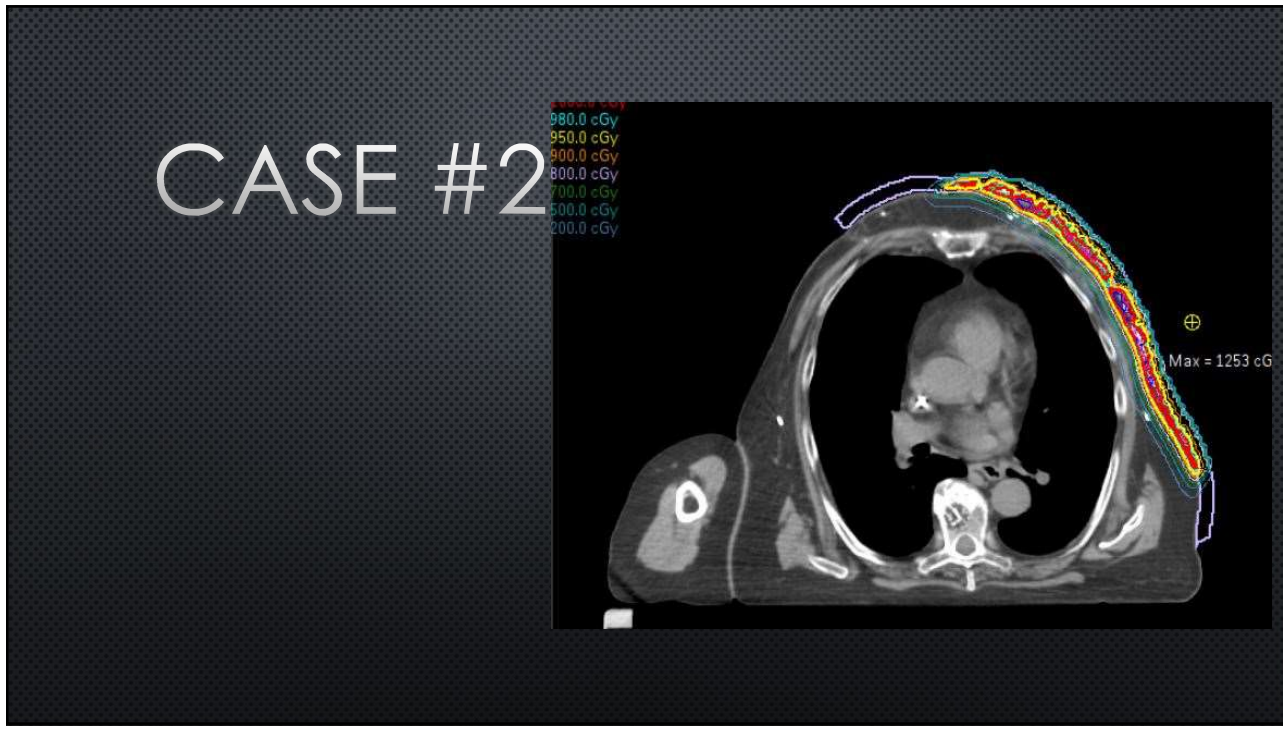
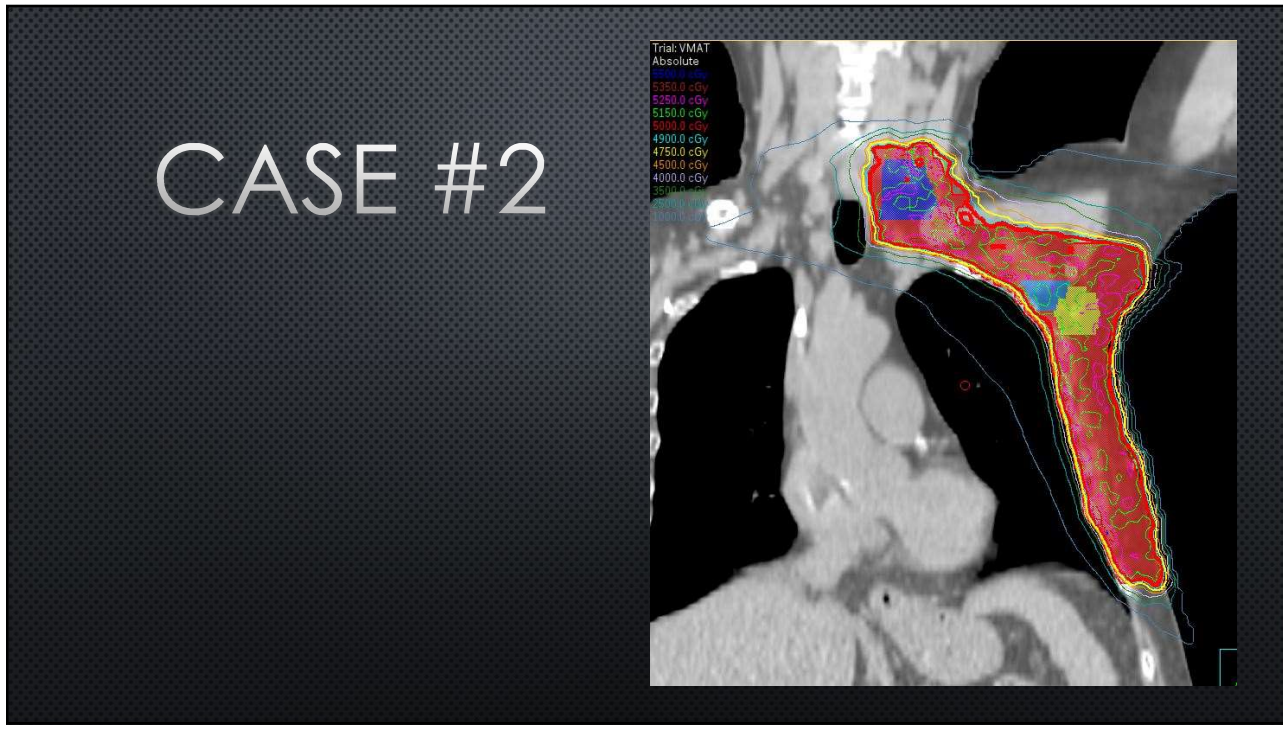


CASE #2









ROI	Type	Primary Goal Dose cGy	Primary Goal Volume	Units	Secondary Goal Dose cGy	Secondary Goal Volume	Units	Dose cGy	Volume at Primary Goal Dose	Units	Result
PTV	Min DVH (%)	4750	95.000	%	4500	90.000	%	2936.6	Min 98.416	%	Met
CTV Supraclav	Min DVH (%)	4750	95.000	%	4500	90.000	%	4879.2	Min 100.000	%	Met
CTV Ax Level 3	Min DVH (%)	4750	95.000	%	4500	90.000	%	4963.3	Min 100.000	%	Met
PTV IMN	Min DVH (%)	4500	95.000	%	4000	90.000	%	4022.3	Min 96.987	%	Met
Heart	Max DVH (%)	2500	10.000	%	3000	10.000	%	1851.9	Max 0.000	%	Met
Heart	Mean Dose	400	0.000		500	0.000		175.3	Mean --		Met
Heart	Mean Dose	200	0.000		250	0.000		175.3	Mean --		Met
Lung_L	Max DVH (%)	2000	35.000	%	2000	40.000	%	5386.5	Max 14.549	%	Met
PTV	Max Dose	6000	0.000		0	0.000		5520.7	Max --		Met
CTV Supraclav	Max Dose	5750	0.000		0	0.000		5497.7	Max --		Met
CTV Ax Level 3	Max Dose	5750	0.000		0	0.000		5307.6	Max --		Met
PTV IMN	Max Dose	5750	0.000		0	0.000		5437.6	Max --		Met
Lung_L	Max DVH (%)	1000	65.000	%	0	0.000	%	5386.5	Max 34.191	%	Met
Lung_L	Max DVH (%)	500	75.000	%	0	0.000	%	5386.5	Max 58.755	%	Met
Lung_R	Max DVH (%)	500	15.000	%	0	0.000	%	2190.9	Max 14.350	%	Met

CASE #3

RADIATION ONCOLOGY CONSULTATION

REASON FOR CONSULTATION: Recurrent breast cancer, (T4bN2M0 initially).

HISTORY OF PRESENT ILLNESS: Ms. [REDACTED] is a pleasant 68-year-old female who initially presented with locally advanced ER/PR positive, HER-2/neu negative breast cancer on the right in 2012. By my review of her records, she had T4N2 disease at that time but no evidence of metastatic disease. She was treated with neo-adjuvant Adriamycin and Cytoxan x4 followed by Taxol. She then decided not to proceed with the planned surgery or radiation and went to a healer instead. This is a decision that she has come to regret.

She recurred with a malignant pleural effusion in 2016. She had a 5 x 7 cm fungating right breast mass at that time. Imaging by PET demonstrated hypermetabolic activity in the medial aspect of the left breast as well.

She was started on Ibrance and Faslodex in early 2017. Clinically there was good response. CT imaging in June showed resolution of her large pleural effusion.

she underwent bilateral mastectomies in August confirming a 7 cm grade 2 invasive ductal carcinoma. Her posterior margin was positive, a 6 cm, grade 2 invasive ductal carcinoma. Her superior, medial, and lateral margins were positive. Her tumors remained ER/PR positive and HER-2/neu negative.

discusses the possibility of metastatic disease in the iliac bones. She is not sure about the hips. There is a questionable nodule in the left lower lobe which is being followed.

and new cutaneous nodules in her chest wall on the left. She claims that these are her mastectomies but the records that I have say they arose in 2012. This was confirmed clinically when she saw Dr. [REDACTED] on 11/30/2017. There are plans for a left chest wall excision x3 in mid-December.

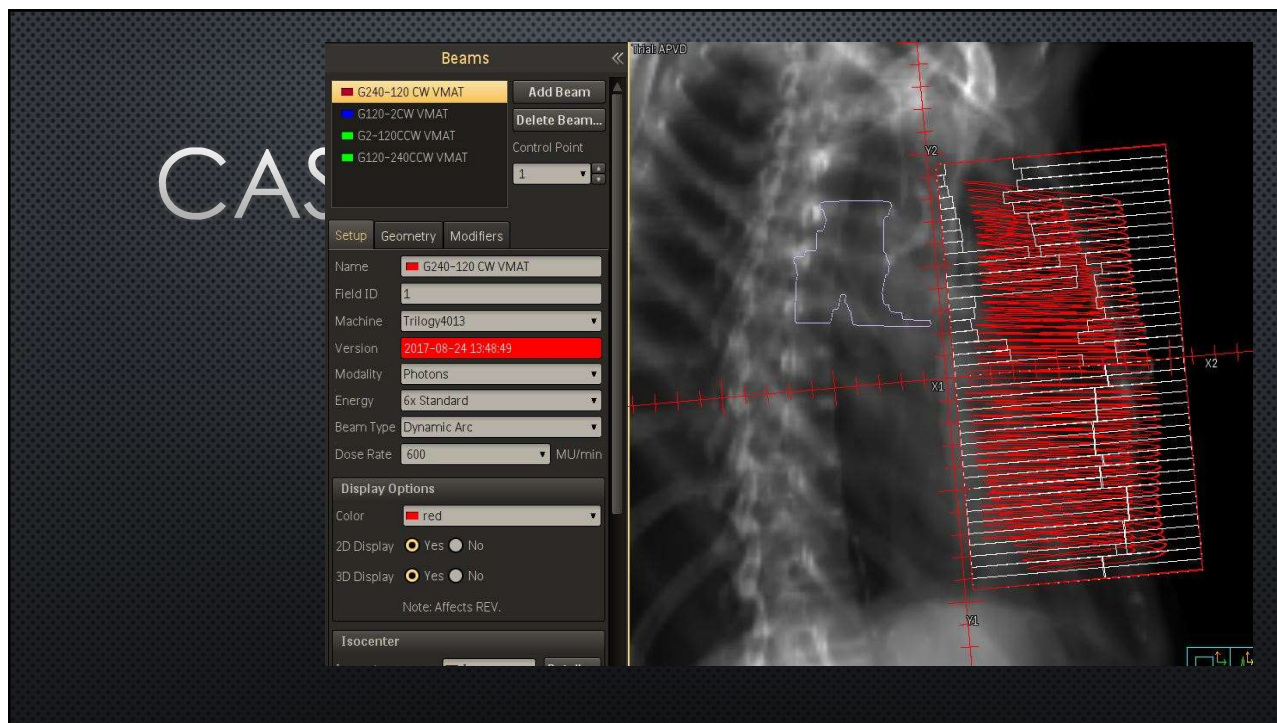
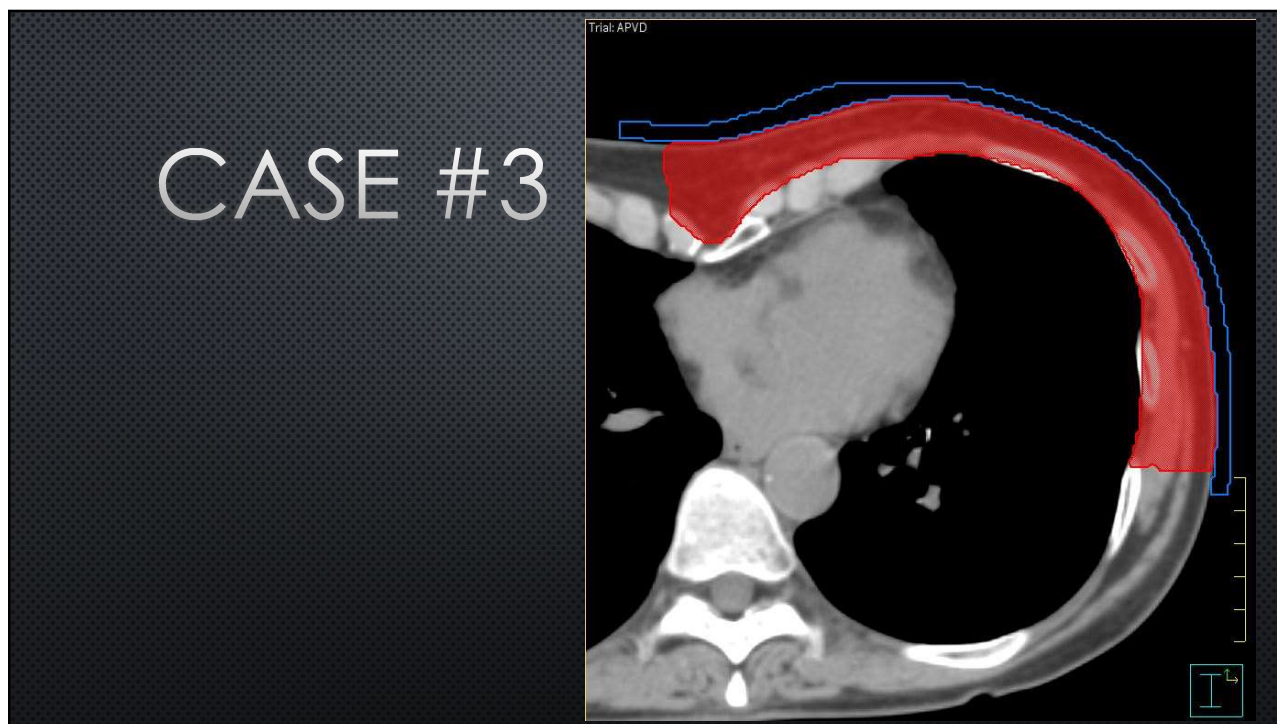
Dr. [REDACTED] has asked me to see her regarding the possibility of adjuvant radiation after the planned surgical resection. The patient has a bone scan scheduled on 12/29/2017 to follow up on the CT findings in her iliac bones.

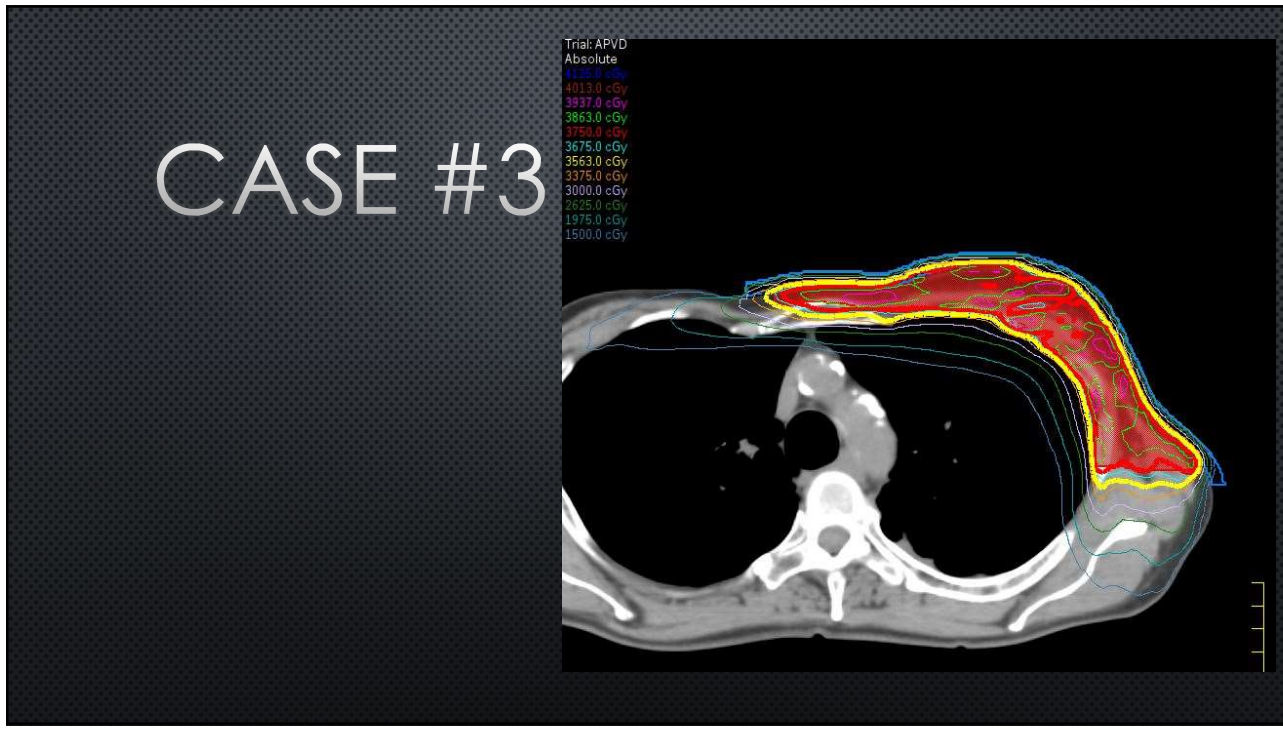
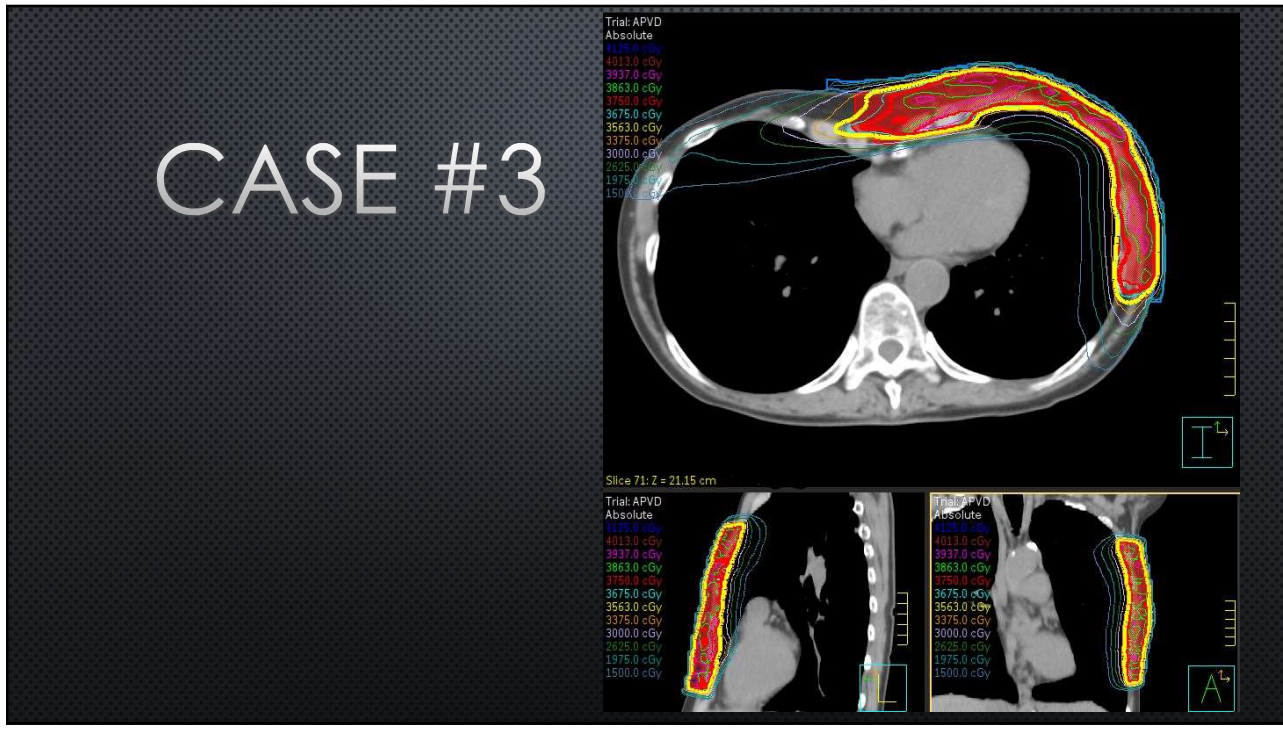
RADIATION ONCOLOGY RE-EVALUATION

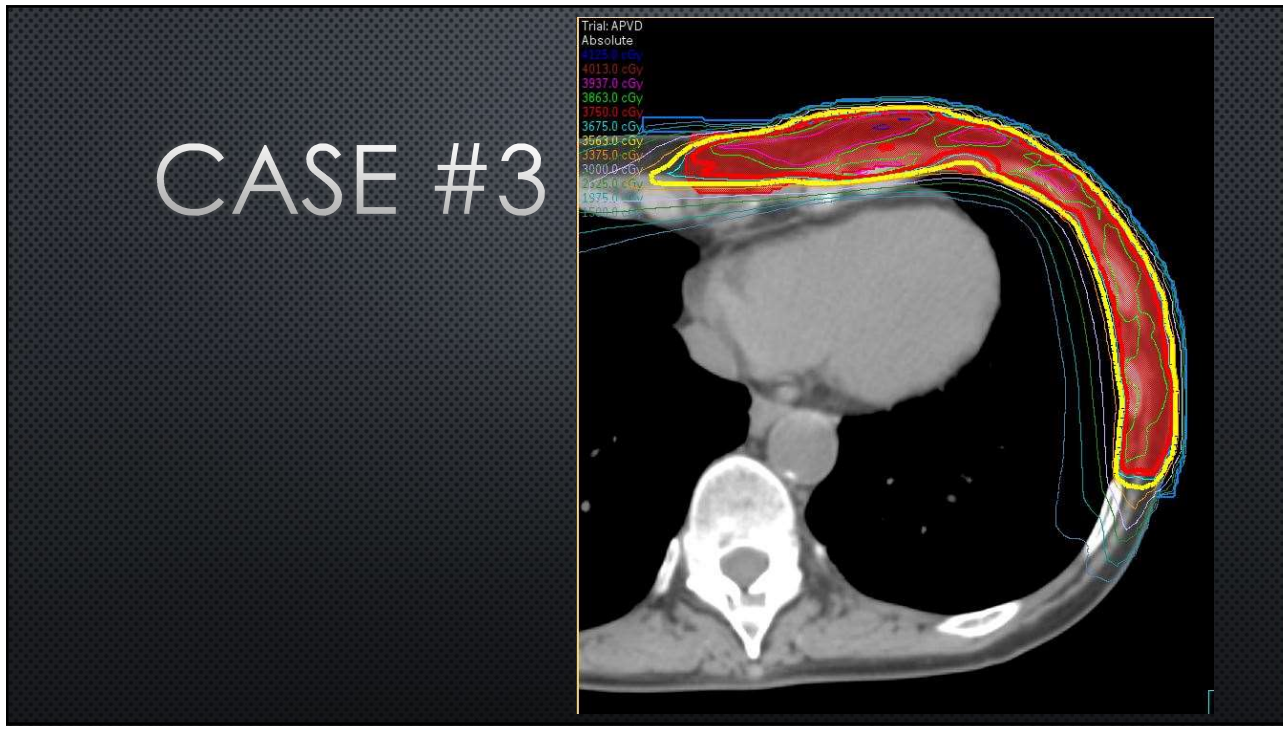
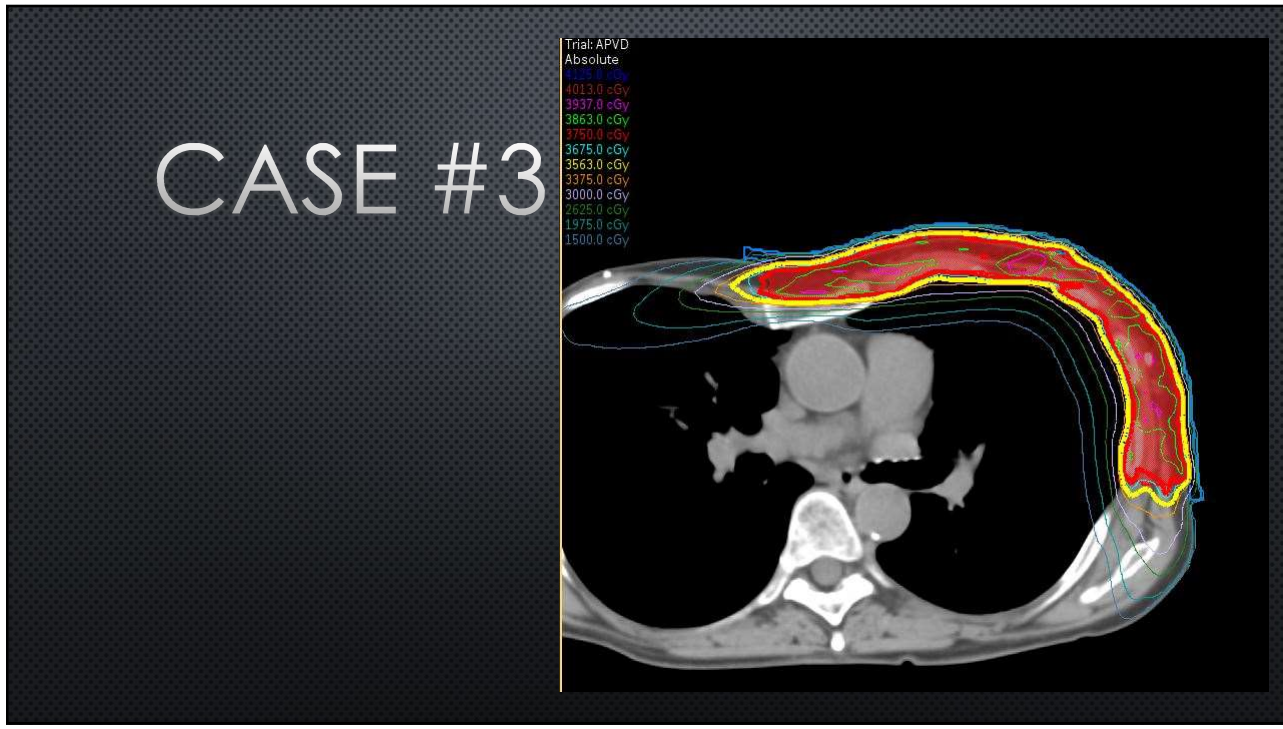
DIAGNOSIS: Recurrent breast cancer, (T4bN2M0 initially).

HISTORY OF PRESENT ILLNESS: Ms. [REDACTED] returns after her chest wall excision with Dr. [REDACTED]. Pathology from the procedure confirmed metastatic adenocarcinoma consistent with breast primary. Her tumor is HER-2/neu negative. Three separate lesions were removed and all are clinically controlled. She reports good healing of her incisions with no significant pain or discomfort.

Her case was presented at our Multidisciplinary Breast Conference this past week. It was recommended that she undergo radiation for local control given the rapid local recurrence.







Scorecard

Name: RTOG1304 APVD

Description: NSABP1304, LT CW, SCL, IMNs

ROI	Type	Primary Goal Dose cGy	Primary Goal Volume	Units	Secondary Goal Dose cGy	Secondary Goal Volume	Units	Dose cGy	Volume at Primary Goal Dose	Units	Result
CTV L CW	Min DVH (%)	3563	95.000	%	3375	90.000	%	2054.2	Min 98.342	%	Met
Heart	Max DVH (%)	2500	10.000	%	3000	10.000	%	3764.1	Max 0.643	%	Met
Heart	Mean Dose	400	0.000		500	0.000		284.6	Mean --		Met
Lung_L	Max DVH (%)	2000	35.000	%	2000	40.000	%	4034.7	Max 16.022	%	Met
CTV L CW	Max Dose	6000	0.000		0	0.000		4216.0	Max --		Met
Lung_L	Max DVH (%)	1000	65.000	%	0	0.000	%	4034.7	Max 34.520	%	Met
Lung_L	Max DVH (%)	500	75.000	%	0	0.000	%	4034.7	Max 58.076	%	Met
Lung_R	Max DVH (%)	500	15.000	%	0	0.000	%	3351.1	Max 26.352	%	Not Met

CTV L CW	APVD	2054.2	4216.0	3827.7	99.1	0.00 %	0.00 %	0
Lung_L	APVD	19.4	4034.7	973.4	956.7	0.00 %	0.00 %	0
Lung_R	APVD	17.1	3351.1	448.1	612.4	0.00 %	0.00 %	0
Lungs	APVD	4.8	4034.7	684.8	829.4	0.00 %	0.00 %	0
SpinalCord	APVD	9.3	202.2	44.4	30.3	0.00 %	0.00 %	0
Heart	APVD	83.1	3764.1	284.6	335.8	0.00 %	0.00 %	0

CASE

RADIATION ONCOLOGY CONSULTATION



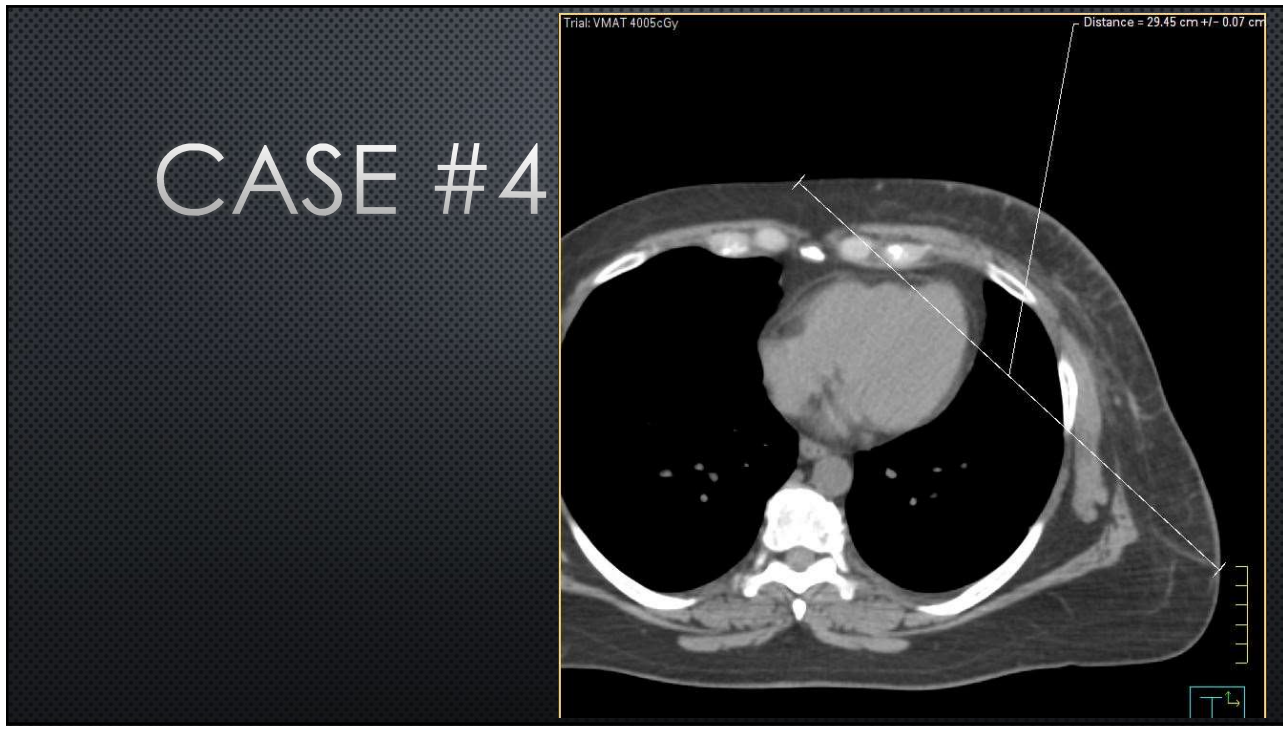
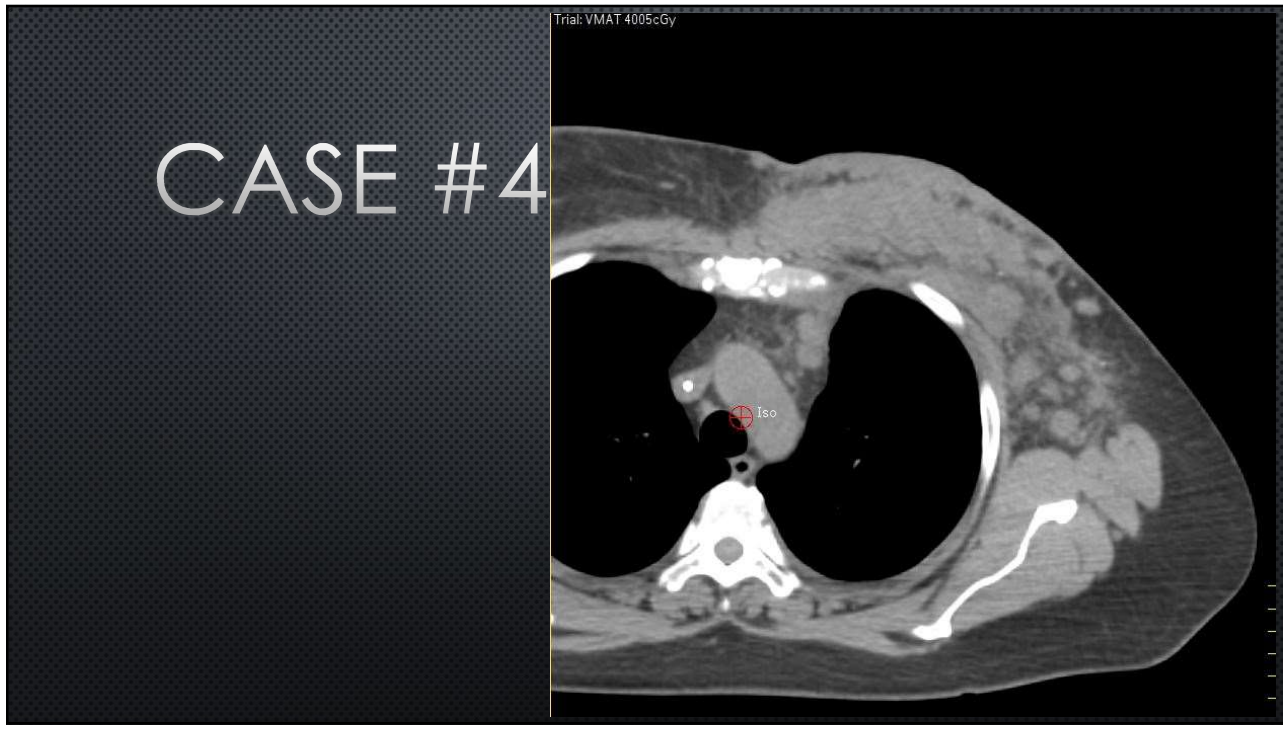
breast cancer, left.

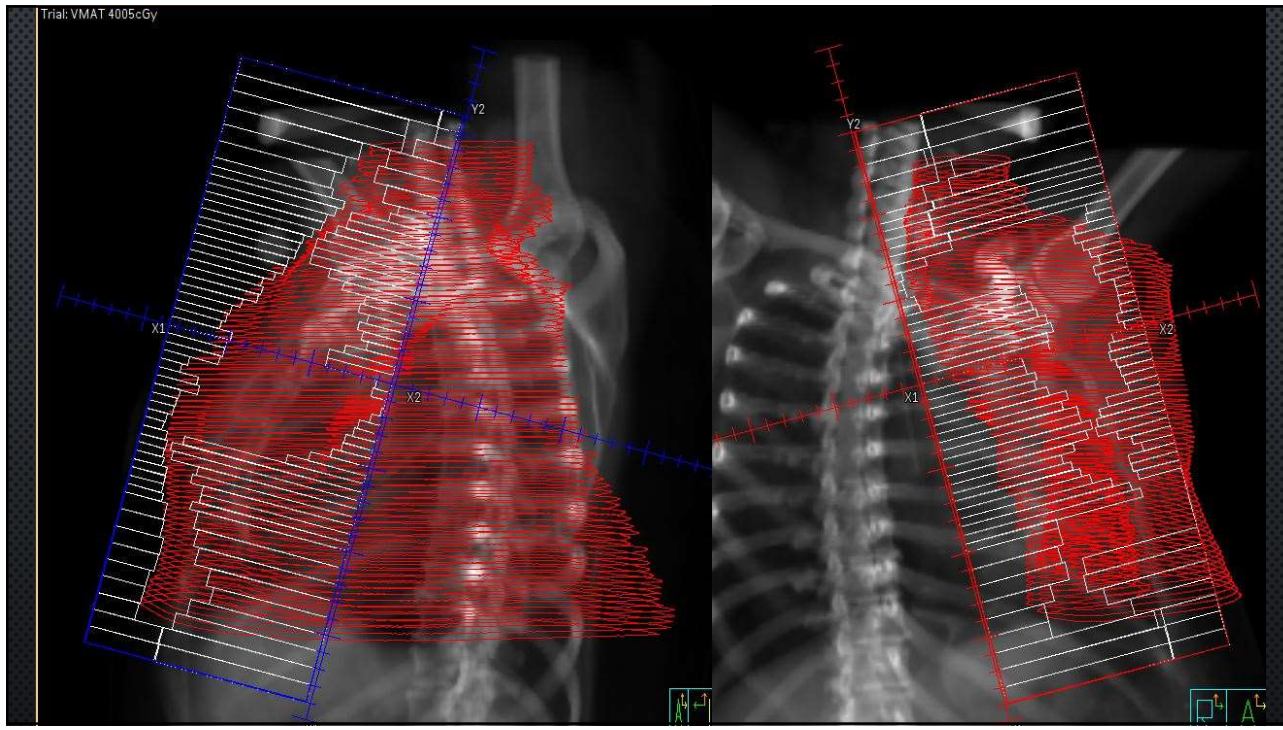
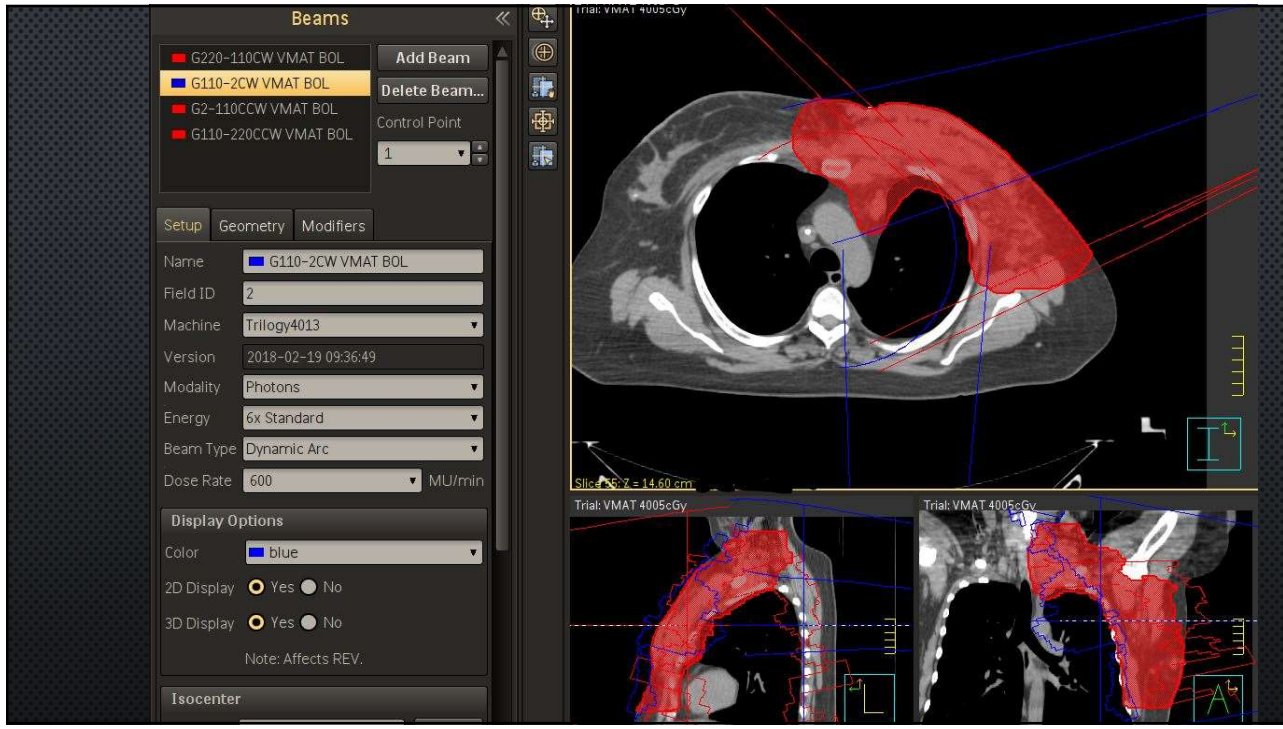
is a very pleasant 50-year-old with a history of a large breast cancer in October 2016. Her physical evaluation showed diffuse bone metastases and invasive ductal carcinoma. She was treated quickly and was then initiated on radiation therapy for a few months but then began to experience pain in her chest wall. Her treatment course was not successful.

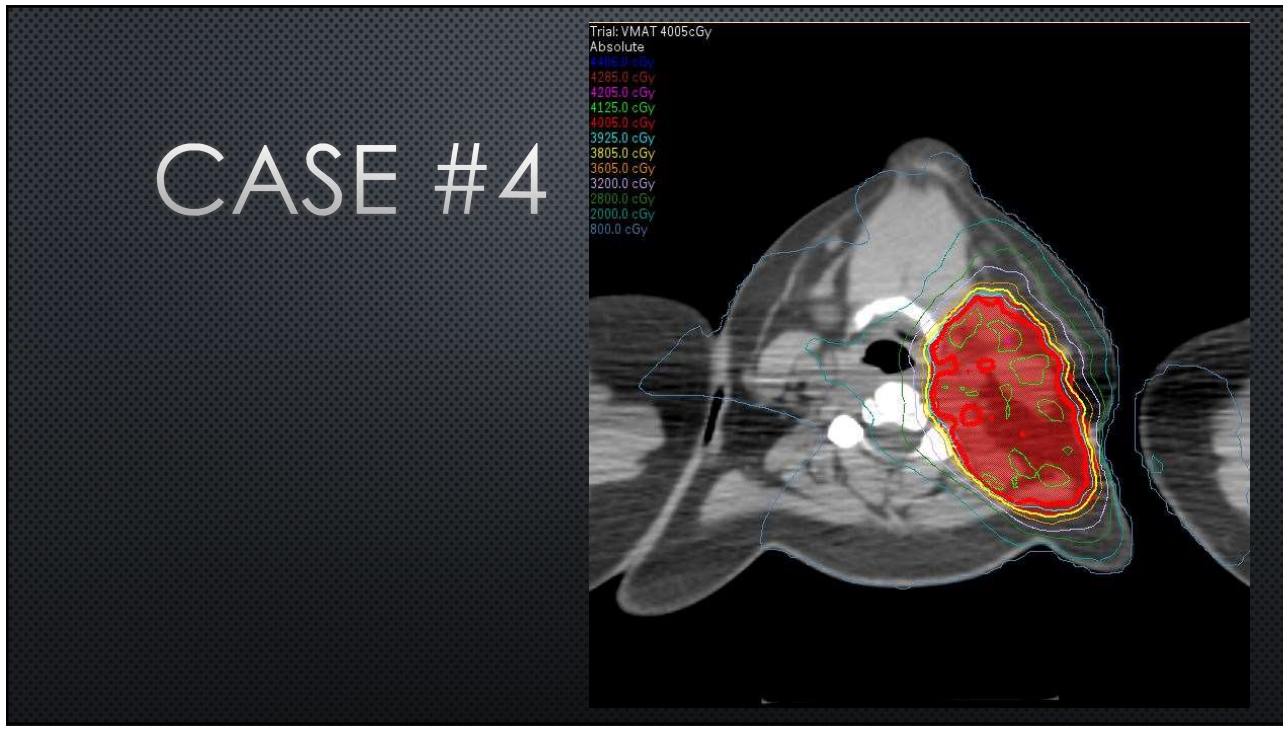
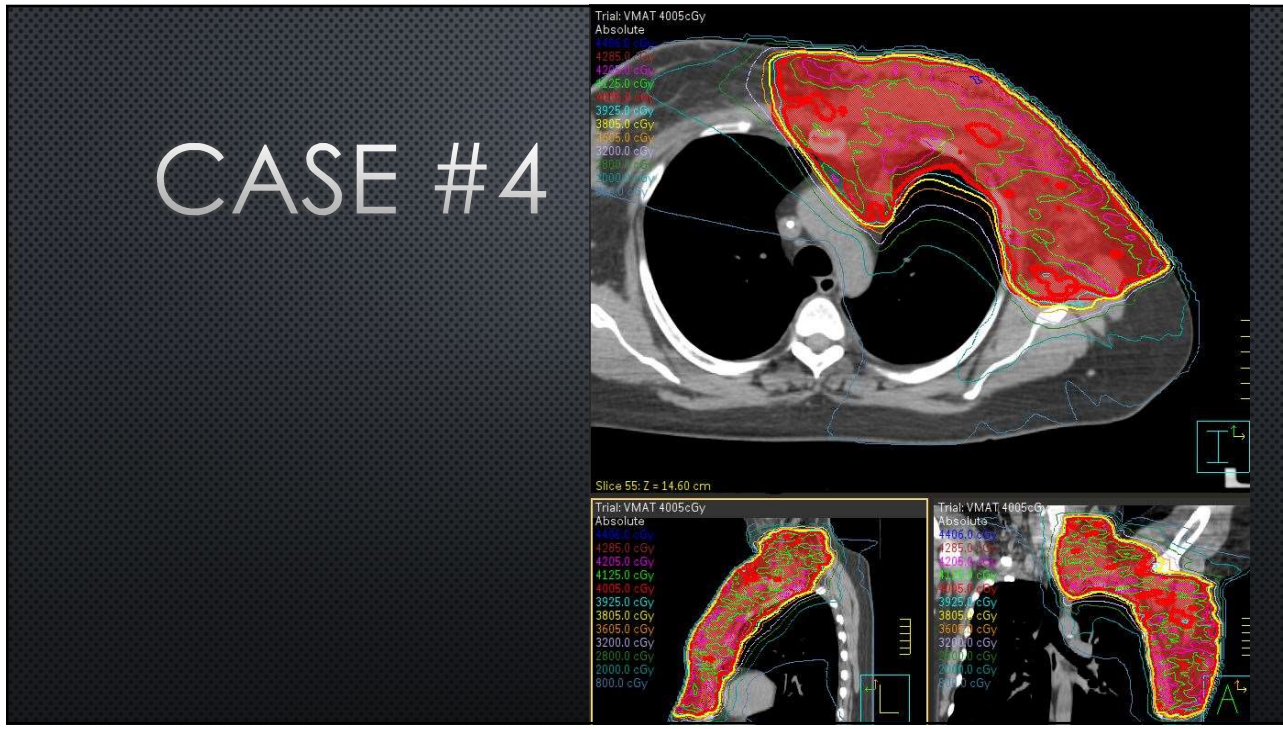
She had enough of a response that she was able to remain on a 12 cm primary tumor with a 12 cm chest wall. She has no concerns for her skin concerning for local recurrence and is tolerating the medication well. She stopped by and saw me for her chest wall and was thus referred for radiation therapy.

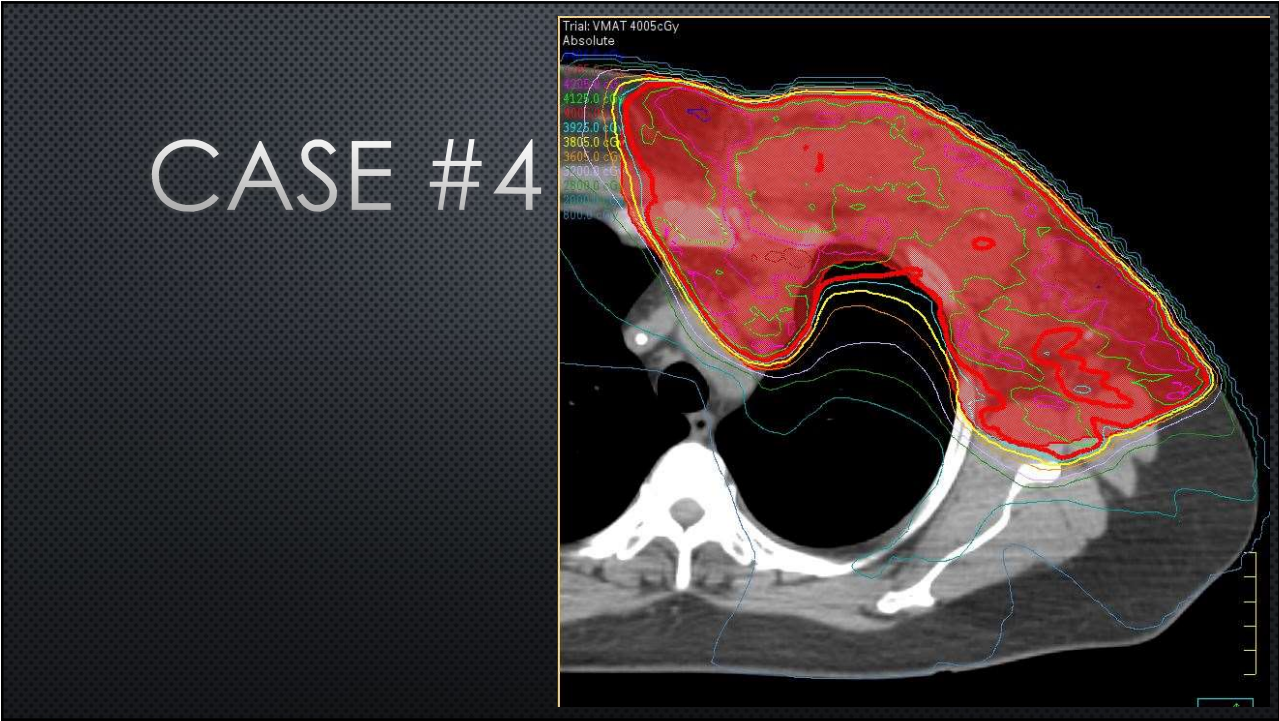
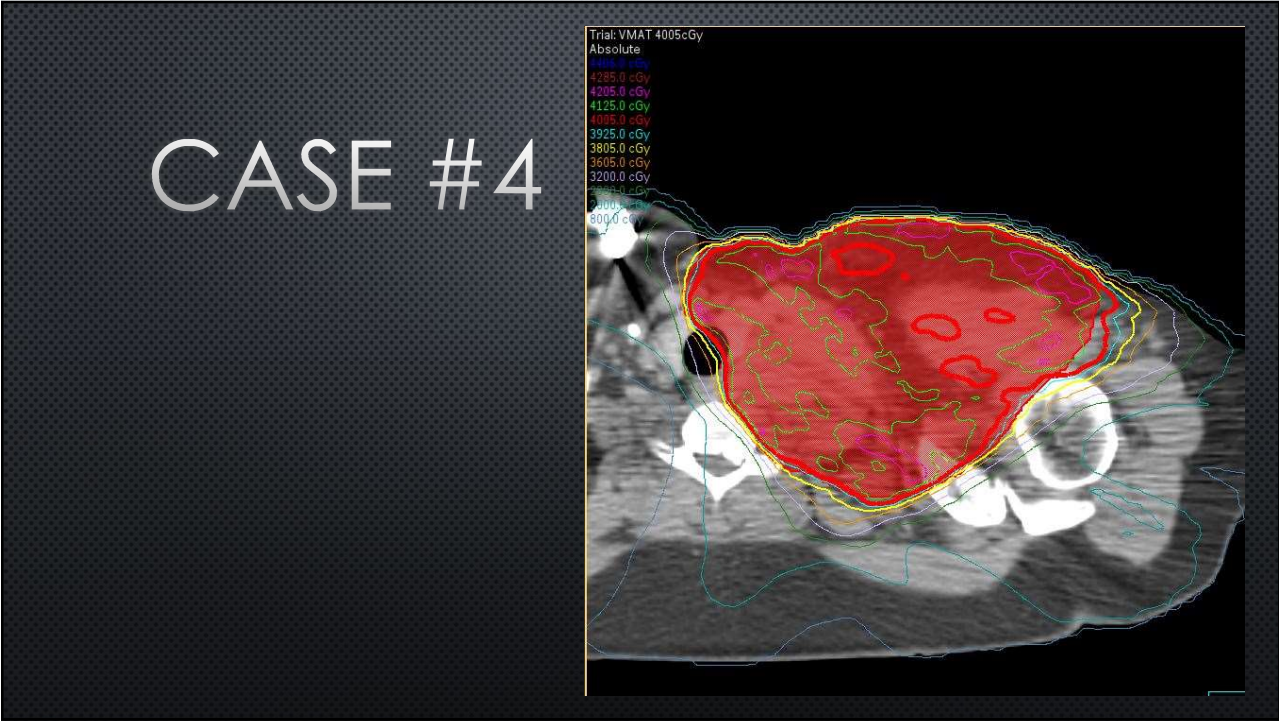
She has a metastasis in her lower thoracic spine. She has a metastasis in the T9 vertebral body. She has had a recent CT scan today. Her recent MRI scan felt to be benign but she did have a metastasis in her lower thoracic spine. She has had imaging 6 months ago but has an occasional more severe pain. She has no neurologic symptoms but no specific neurologic exam.

She will receive radiation.









CASE #4



Scorecard

File Name: RTOG1304 Description: NSABP1304, LT CW, SCL, IMNs

Dose Volume Histogram

DVH Calculation: Cumulative Differential

ROI	Type	Primary Goal Dose cGy	Primary Goal Volume	Units	Secondary Goal Dose cGy	Secondary Goal Volume	Units	Dose cGy	Volume at Primary Goal Dose	Units	Result
PTV_4005	Min DVH (%)	3805	95.000	%	3605	90.000	%	2417.4	Min 99.446	%	Met
CTV_nodes	Min DVH (%)	3805	95.000	%	3605	90.000	%	3879.2	Min 99.909	%	Met
HEART	Max DVH (%)	2500	10.000	%	3000	10.000	%	4357.2	Max 7.858	%	Met
HEART	Mean Dose	400	0.000		500	0.000		847.1	Mean --		Not Met
LUNG_L	Max DVH (%)	2000	35.000	%	2000	40.000	%	4357.7	Max 28.717	%	Met
PTV_4005	Max Dose	4806	0.000		0	0.000		4564.4	Max --		Met
CTV_nodes	Max Dose	4606	0.000		0	0.000		4374.9	Max --		Met
LUNG_L	Max DVH (%)	1000	65.000	%	0	0.000	%	4357.7	Max 57.800	%	Met
LUNG_L	Max DVH (%)	500	75.000	%	0	0.000	%	4357.7	Max 76.534	%	Not Met
LUNG_R	Max DVH (%)	500	15.000	%	0	0.000	%	4098.0	Max 25.125	%	Not Met
Esophagus					VMAT 400 111.6	3944.4		679.9	875.6	0.00%	0.00% 0

IS THERE A ROLE FOR M-VMAT TECHNIQUE IN LT
BREAST CANCERS WITHOUT A MASTECTOMY OR
ADVANCED DISEASE???

CASE #5

RADIATION ONCOLOGY CONSULTATION

REASON FOR CONSULTATION: pT2N1aM0 invasive ductal carcinoma of the left breast, upper outer quadrant.

HISTORY OF PRESENT ILLNESS: Ms. [REDACTED] is a very pleasant 74-year-old female with multiple medical comorbidities including oxygen dependence. She presented with an abnormal mammogram after some delay since her prior examinations. I reviewed her diagnostic mammograms today in the clinic and they are notable for a sizable area of architectural distortion in the upper outer quadrant of the left breast.

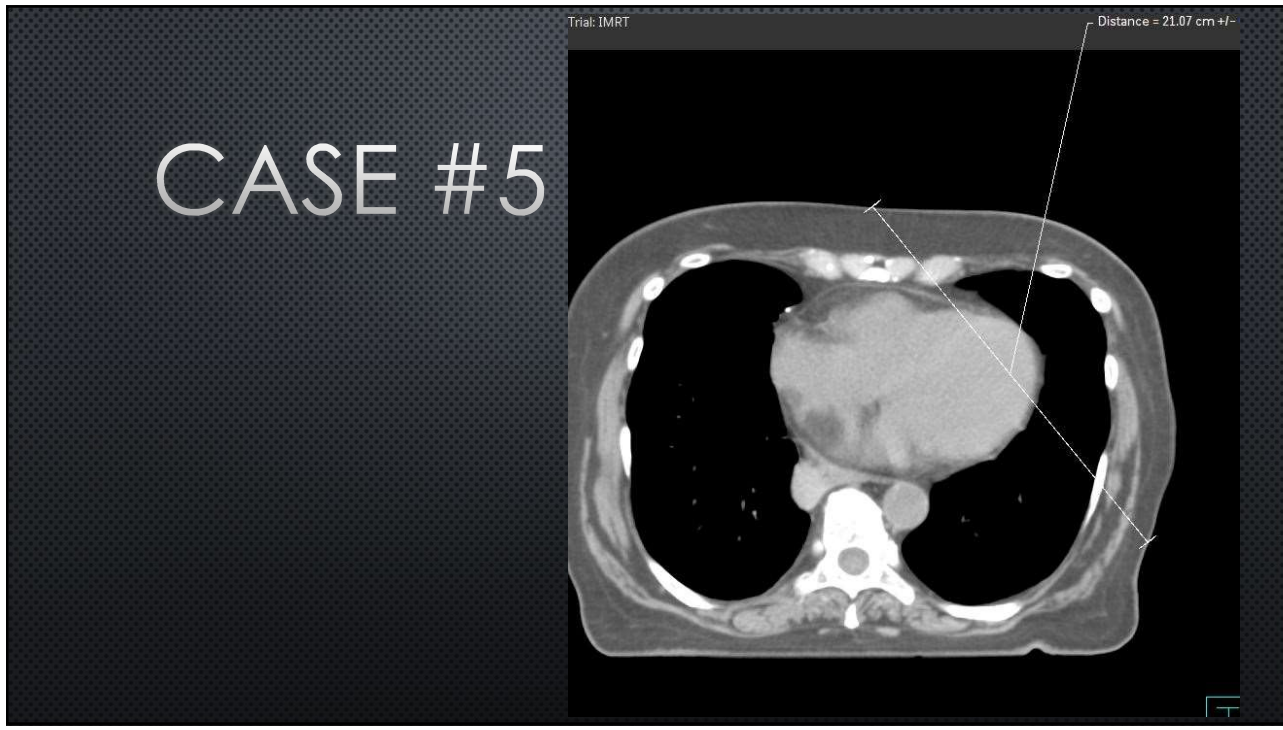
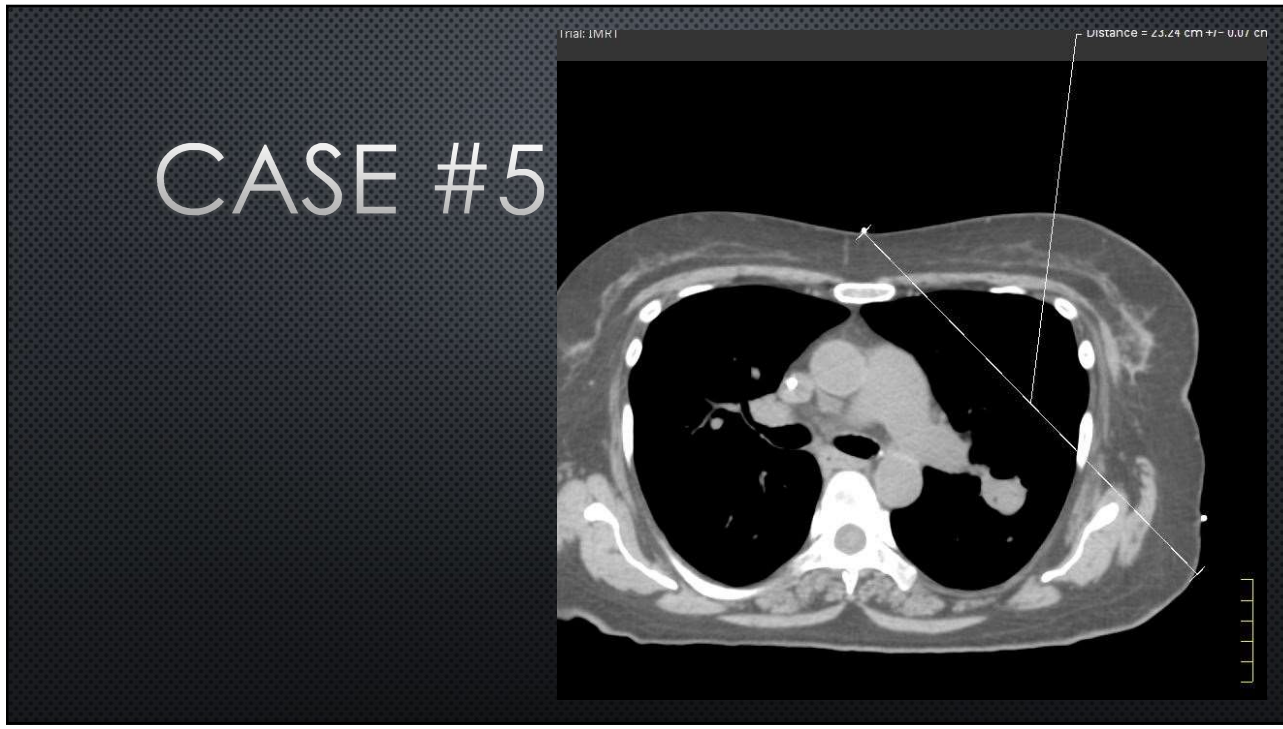
She had a biopsy confirming grade 2 invasive ductal carcinoma.

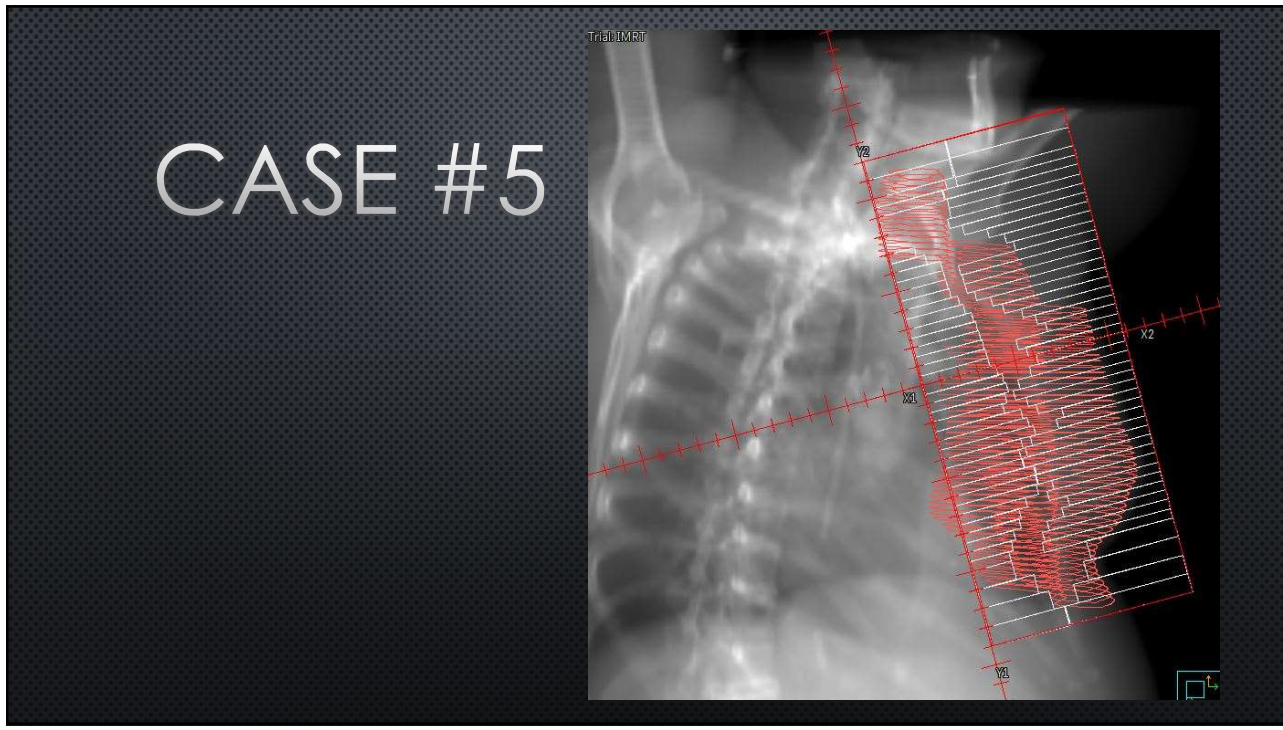
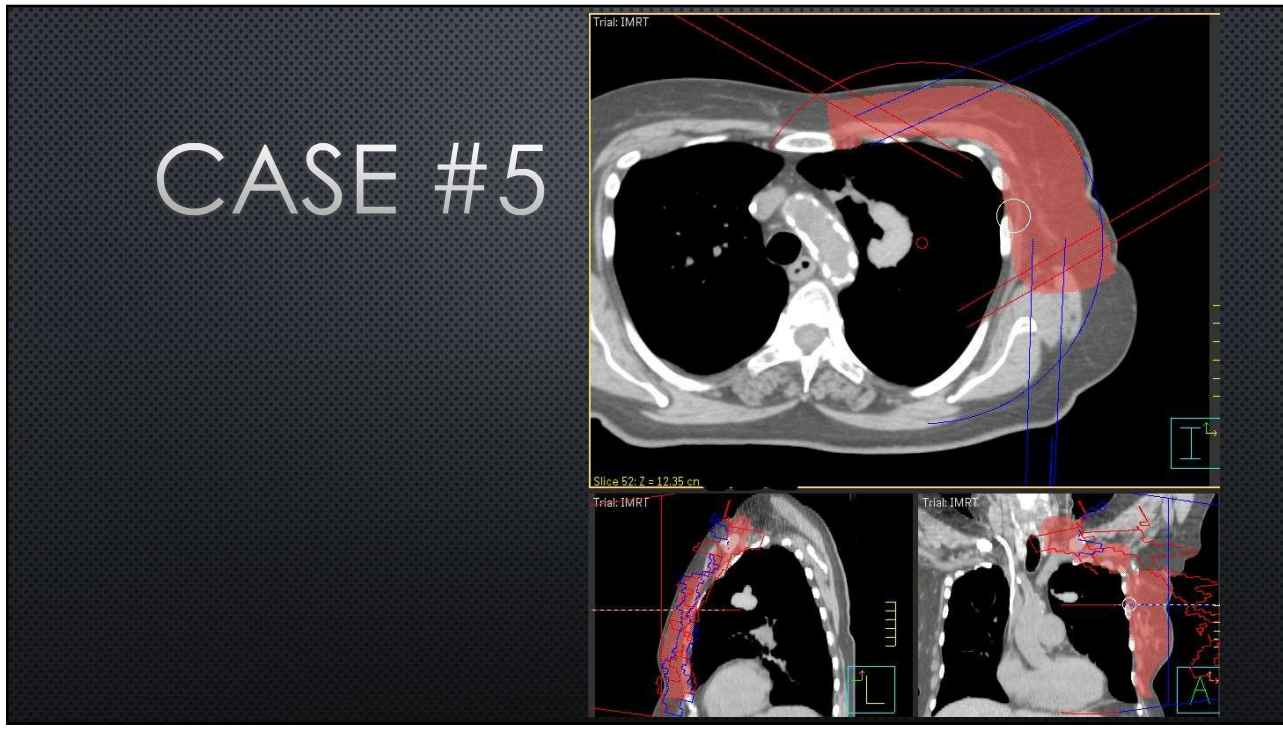
She underwent lumpectomy with Dr. [REDACTED]. Her tumor size is not listed by the pathologist though the area of associated DCIS covered 45 mm and she is positive for EIC. Based upon the imaging appearance, I would estimate her primary malignancy to be stage T2 (vs large T1c). Surgical margins were negative for both invasive and non-invasive disease. Her closest margin was 2 mm for DCIS inferiorly.

She had 2 positive lymph nodes out of 13 total dissected. The largest focus of nodal disease measured 8 mm and there was focal extracapsular extension present over 4 mm. Her tumor was ER/PR positive and HER-2/neu negative.

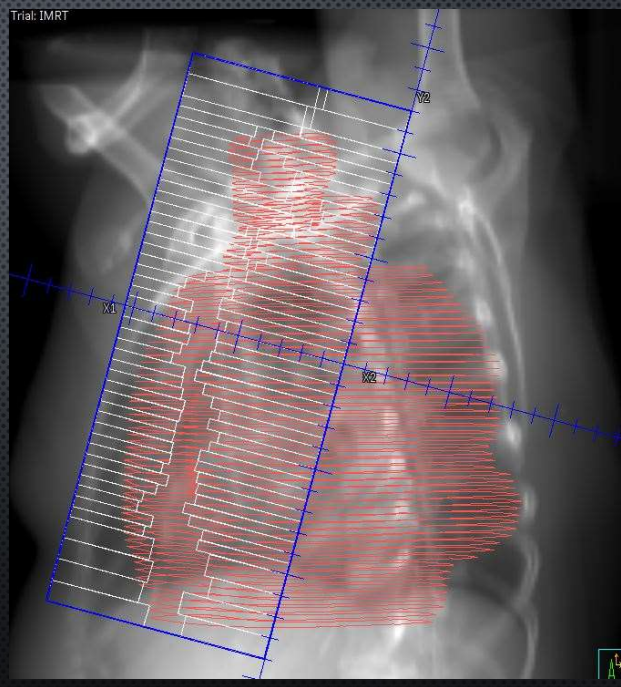
She has received adjuvant chemotherapy with Dr. [REDACTED]. She received 4 cycles of TC chemotherapy. This was rather difficult on her and she is glad to be finished.

PET/CT imaging showed no metastatic disease. She presents today to discuss adjuvant radiation therapy options.

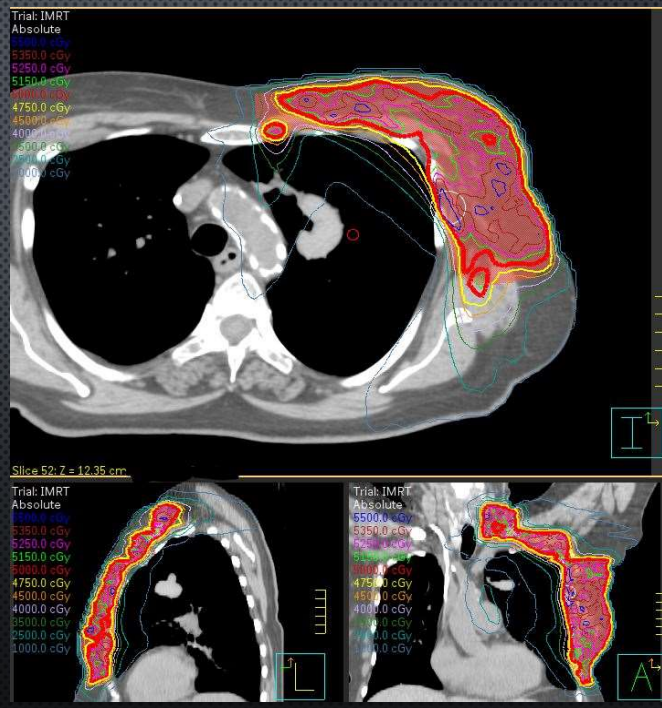


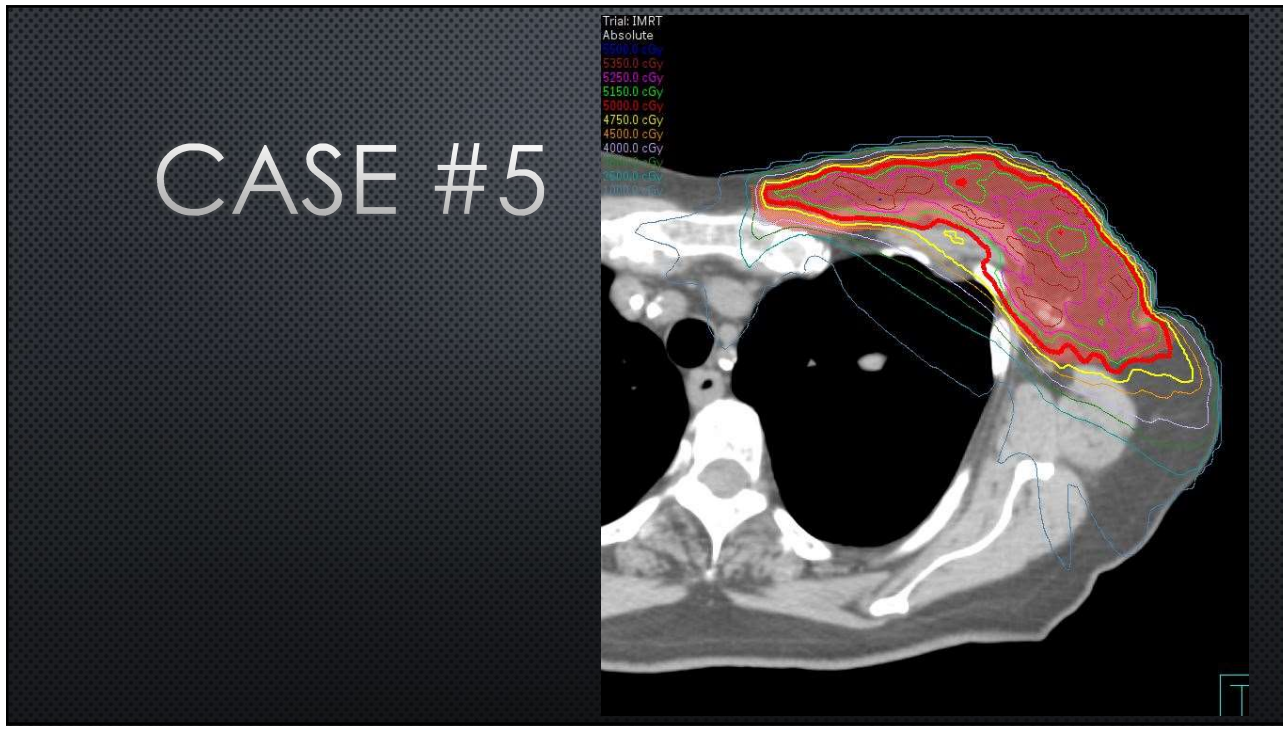
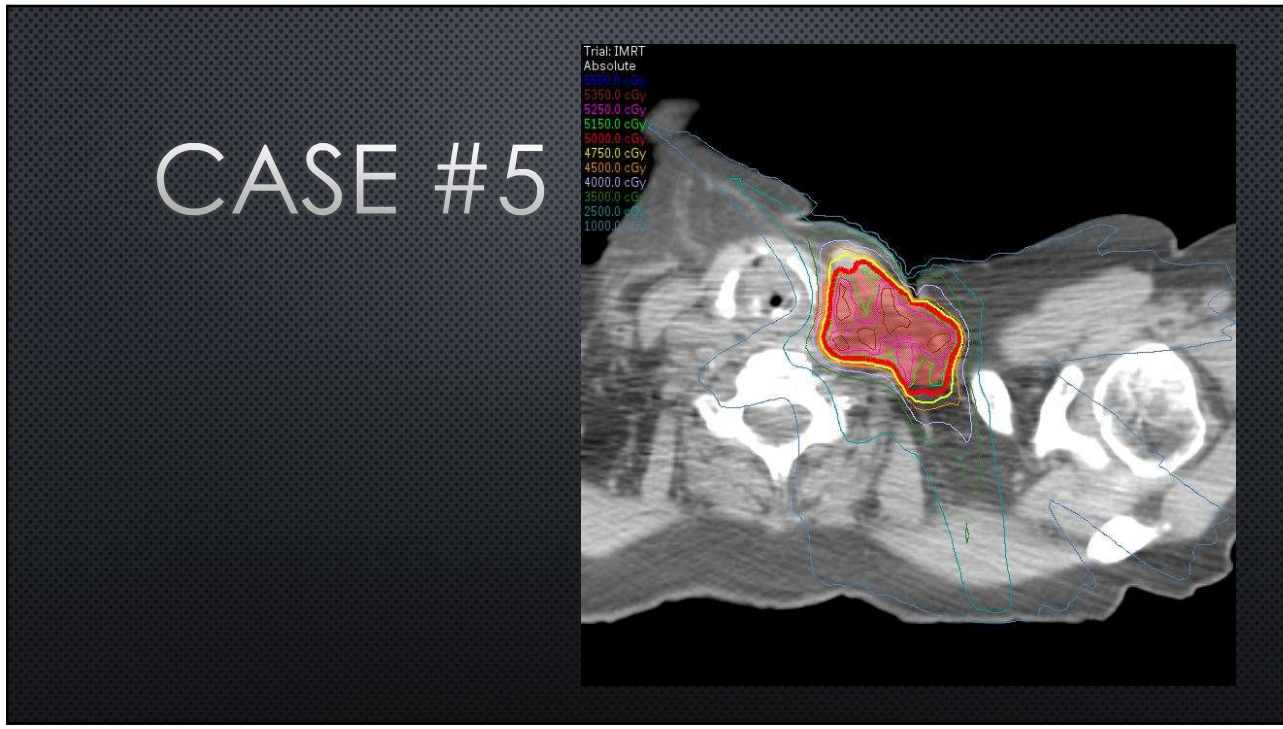


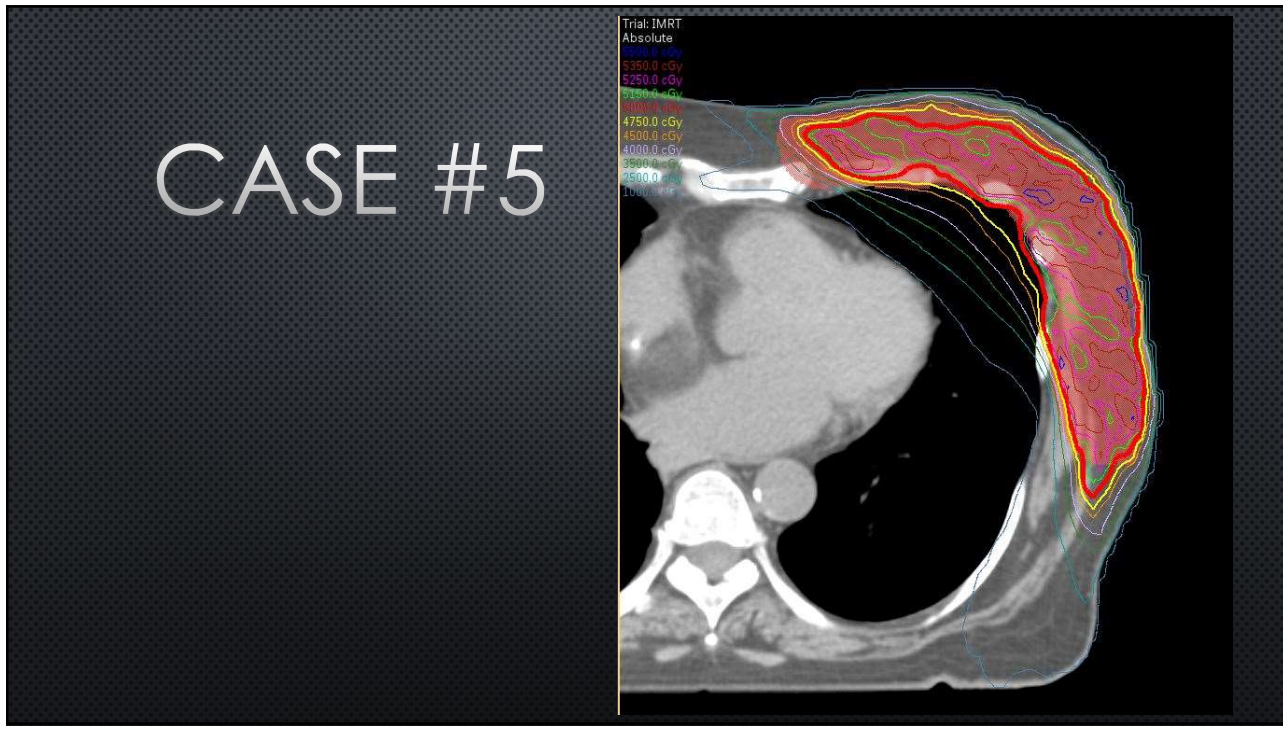
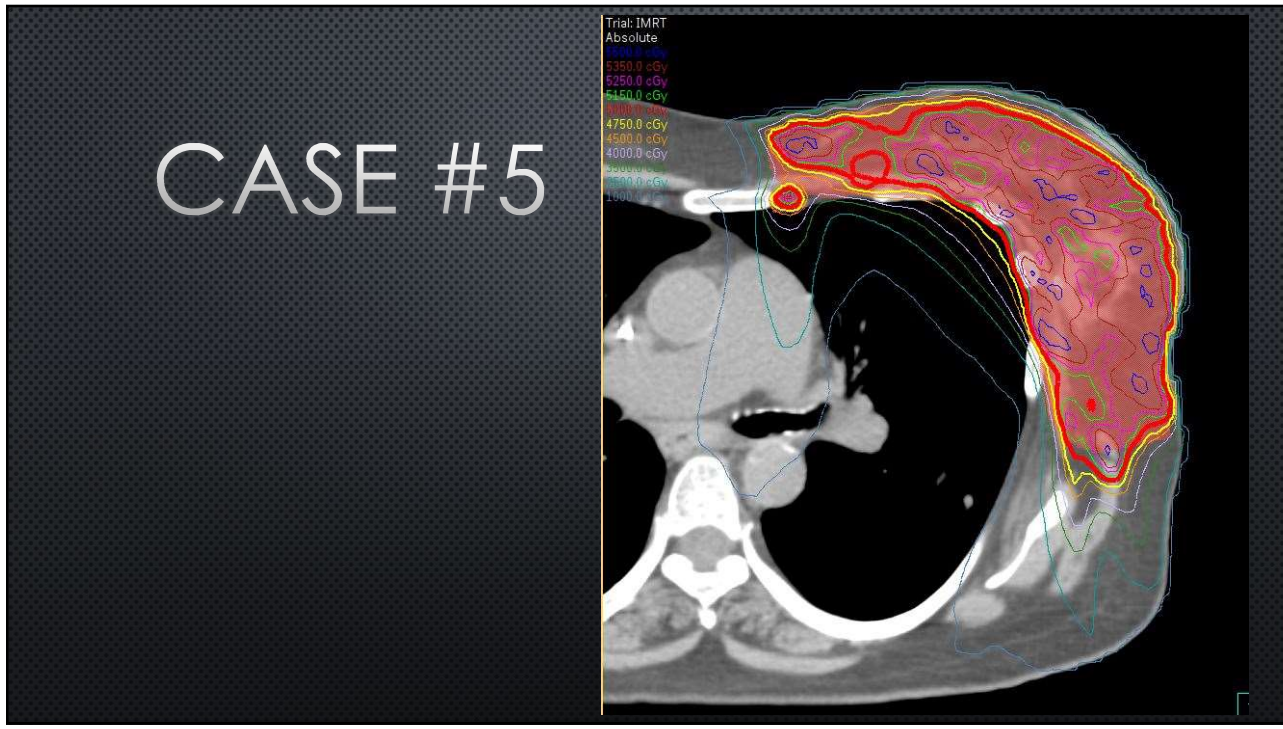
CASE #5

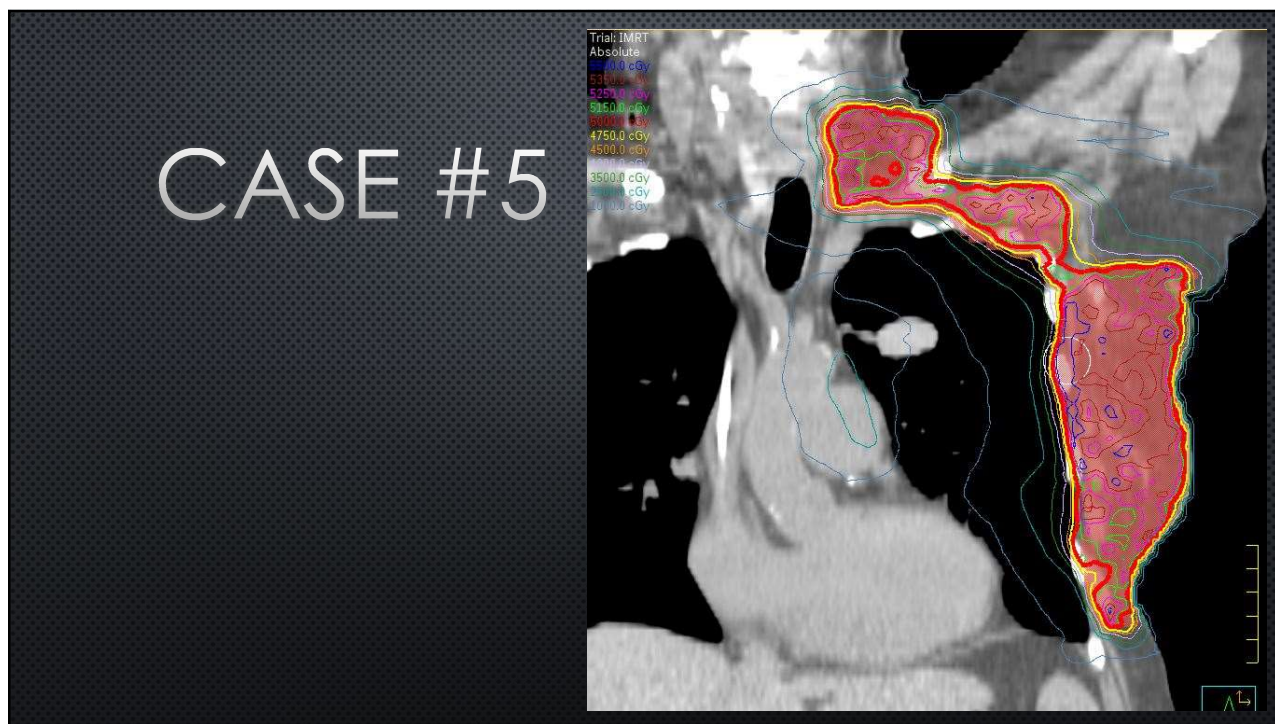


CASE #5









Scorecard

Name: **RTOG1304** IMRT

Description: **NSABP1304, LT CW, SCL, IMNs**

ROI	Type	Primary Goal Dose cGy	Primary Goal Volume	Units	Secondary Goal Dose cGy	Secondary Goal Volume	Units	Dose cGy	Volume at Primary Goal Dose	Units	Result
● PTV_5000_eval	Min DVH (%)	4750	95.000	%	4500	90.000	%	1504.6	Min 91.328	%	OK
● PTV_nodes	Min DVH (%)	4750	95.000	%	4500	90.000	%	87.0	Min 88.586	%	OK
● PTV_IMN	Min DVH (%)	4750	95.000	%	4500	90.000	%	3330.6	Min 78.172	%	OK
● CTV Supraclav	Min DVH (%)	4500	95.000	%	4000	90.000	%	4274.0	Min 99.807	%	Met
● Heart	Max DVH (%)	2500	10.000	%	3000	10.000	%	1894.3	Max 0.000	%	Met
● Heart	Mean Dose	400	0.000		500	0.000		304.7	Mean --		Met
● Lung_L	Max DVH (%)	2000	35.000	%	2000	40.000	%	5499.2	Max 18.918	%	Met
● Breast_R	Max DVH (%)	300	10.000	%	500	10.000	%	1191.9	Max 2.780	%	Met
● PTV_5000_eval	Max Dose	6000	0.000		0	0.000		5990.5	Max --		Met
● CTV Supraclav	Max Dose	5750	0.000		0	0.000		5664.2	Max --		Met
● PTV_nodes	Max Dose	5750	0.000		0	0.000		5685.1	Max --		Met
● PTV_IMN	Max Dose	5750	0.000		0	0.000		5630.5	Max --		Met
● Lung_L	Max DVH (%)	1000	65.000	%	0	0.000	%	5499.2	Max 34.297	%	Met
● Lung_R	Max DVH (%)	500	15.000	%	0	0.000	%	839.7	Max 6.063	%	Met

CONCLUSION...

- ROLE FOR VMAT DOES EXIST IN THE FORM OF M-VMAT VS C-VMAT
- 3 FLD LT CW IRRADIATION IN WHICH NODAL COVERAGE IS NECESSARY (IMN'S, AXILLA LEVELS 1,2, AND/OR 3, AND SCV)
- EXTREME CASES WITH LESS THAN ADEQUATE BODY HABITUS/ADVANCED DISEASE

Medicine
QUALITY IMPROVEMENT STUDY

OPEN

Modified Volumetric Modulated Arc Therapy in Left Sided Breast Cancer After Radical Mastectomy With Flattening Filter Free Versus Flattened Beams

Yousun Lai, MS, Yanyan Chen, BSc, Sangang Wu, MD, MS, Lixian Shi, BSc, Lirong Fu, BSc, Huiming Ha, BSc, and Qin Lin, MD, PhD

Abstract: Conventional volumetric modulated arc therapy (C-VMAT) for breast cancer after radical mastectomy had its limitation that resulted in larger volumes of normal tissue receiving low doses. We explored whether there was a way to deal with this disadvantage and determined the potential benefit of flattening filter-free (FFF) beams.

Twenty patients with breast cancer after radical mastectomy were subjected to 3D conformal radiotherapy (3DCRT) and VMAT treatment planning. For VMAT plans, 3 different designs were employed with RapidArc beam: conventional-VMAT plan (C-VMAT), modified-VMAT plan (M-VMAT), and modified-VMAT plan using FFF beams (M-VMAT-F). Plan quality and efficiency were assessed for all plans.

Abbreviations: 3DCRT = 3D conformal radiotherapy, BOT = beam on times, CCW = counter-clockwise direction, CI = conformity index, CTV = clinical target volume, C-VMAT = Conventional volumetric modulated arc therapy, CW = clockwise direction, DVH = dose volume histogram, FFF = flattening filter free, HI = homogeneity index, IMRT = intensity modulated radiation therapy, MLC = multileaf collimators, M-VMAT = modified-VMAT plan, OAR = Organ at risk, PD = prescribed dose, PTV = planning target volume, VMAT = Volumetric modulated arc therapy.