

Versa HD, Mosaiq and Monaco:
VMAT SBRT, Symmetry and a Bunch of Other Stuff
(That's a lot to cover!)

AAMD-Region VI
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Disclosures

- ▶ No conflicts of interest to disclose
- ▶ KMC does have plenty of Elekta equipment and software and we have worked with them for decades. We are an Elekta Stereotactic Center of Excellence.
- ▶ We treat on Elekta linear accelerators using Mosaicq OIS, and plan SBRT and IMRT solely on Monaco. Much of the theory can be utilized with ANY vendor's hardware or software, but some of the practical application of this presentation is simply not possible without Elekta equipment and software.
- ▶ Therefore, some of this talk would be deemed "*Elekta-centric*".

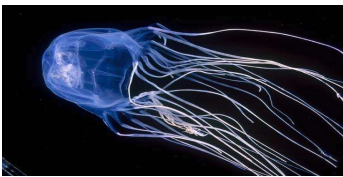
Thanks

- ▶ **Many thanks to the team at Kettering Medical Center**
- ▶ Our physicians Drs. Hale, Kudithipudi, Paravati and Knecht
- ▶ Our other 2 physicists Pat Heffron–Cartwright and Thomas Holtschneider
- ▶ Our dosimetrists Danyale Krieger, Kim Whaley, and Leshia Rudolph
- ▶ Our Information Systems team

What are we going to talk about?

- Treating SBRT using Monaco, Mosaic and Versa HD
 - VMAT, Symmetry and other items
- My Opinions
- Final thoughts
- Q and A

Dangerous and Deadly - AUS



Box Jellyfish



Coastal Taipan



Inland Taipan-
MORE Deadly



Irukandji Jellyfish



Funnelweb Spider



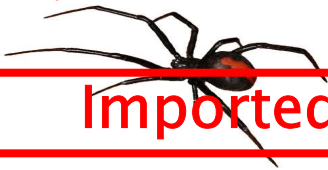
Saltwater Croc

Dangerous and Deadly - NZ



Katipo Spider

Dangerous and Deadly - NZ



Redback Spider



Whitetailed Spider

Imported from AUS

Dangerous and Deadly - USA



Tiger Rattler
May kill a human



Grizzly Bear



Whitetail Deer

Dangerous and Deadly - USA

Imported and Dangerous



Mel Gibson

Dangerous and Deadly - USA

Imported and Dangerous



Justin Bieber

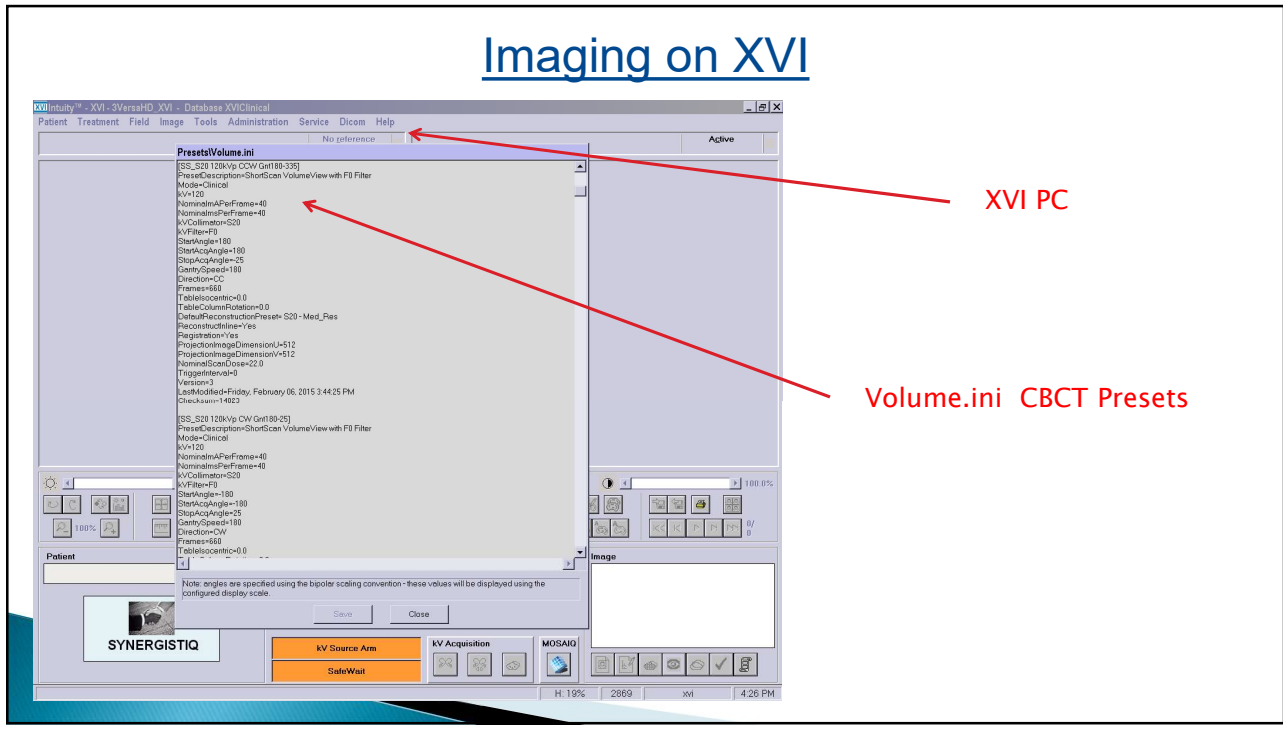
Imaging on XVI

Let's *not* start our clinical talk with Monaco or treatments.

Instead, let's start with the XVI image acquisition system (and Mosaic) to do some preliminary work there.

This XVI stuff looks hard but in reality is quite easy.
(There is a lot of copy/paste.)
And THAT is the point!

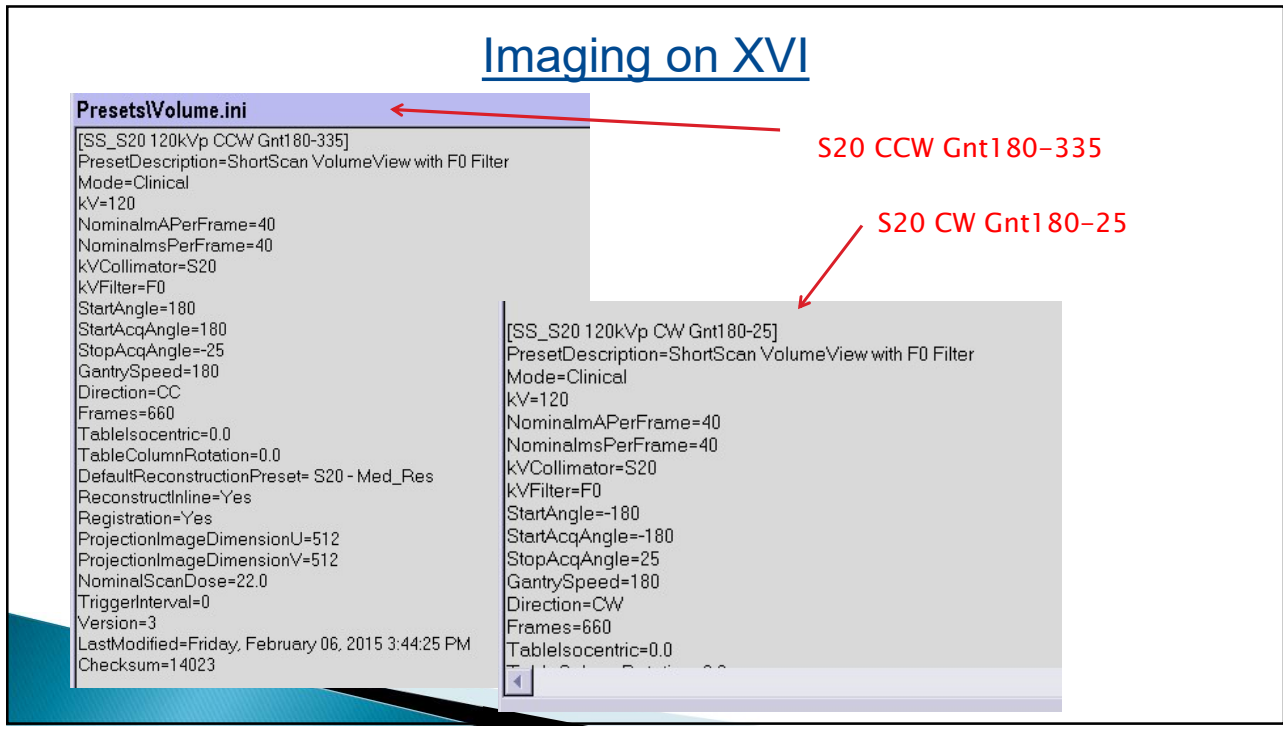
Imaging on XVI



XVI PC

Volume.ini CBCT Presets

Imaging on XVI



S20 CCW Gnt180-335

S20 CW Gnt180-25

Imaging on XVI

VolumeView - Preset Selection

Acquisition: SS_Pelvis S20 Fast
 SS_S20 120kVp CW Gnt335-180
 SS_S20 120kVp CCW Gnt180-335
 SS_S20 120kVp CW Gnt180-25
 SS_S20 120kVp CCW Gnt25-180
 SS_S20 120kVp CW Gnt270-180
 SS_S20 120kVp CCW Gnt180-270
 SS_S20 120kVp CW Gnt180-90
 SS_S20 120kVp CCW Gnt90-180

Reconstruction: Head and Neck S10
 Fast Head and Neck S20
 Fast Head and Neck S20 CCW
 Short Chest S20
 Chest M20
 Chest M20 CCW
 Chest M20 Fast
 Chest M20 Fast CCW
 SIM Chest M20
 SIM SS_S20 120kVp CW Gnt180-50

Online Registration: Pelvis M15
 Pelvis M20
 Pelvis M20 CCW
 Pelvis M20 Fast
 Pelvis M20 Fast CCW
 Pelvis L20
 Pelvis L20 Fast
 Fast Prostate Seed S10
 Prostate M10
 Prostate M15
 Symmetry
 Symmetry CW Gnt180-20
 Symmetry CCW Gnt20-180
 Symmetry CCW Gnt180-340
 Symmetry CW Gnt340-180
 SS_S20 120kVp CW Gnt250-95

SET
 [] deg
 [] deg
 [] deg/min
 [] kV
 [] mAs
 [] mGy

Warnings

Buttons: Unconfirm Settings, Confirm Settings, View Inhibits, Cancel

XVI Preset Selection (points to the preset list)

Our XVI Protocols (points to the 'SET' section)

Imaging on XVI

SS_Pelvis S20 Fast
SS_S20 120kVp CW Gnt335-180
 SS_S20 120kVp CCW Gnt180-335
 SS_S20 120kVp CW Gnt180-25
 SS_S20 120kVp CCW Gnt25-180
 SS_S20 120kVp CW Gnt270-180
 SS_S20 120kVp CCW Gnt180-270
 SS_S20 120kVp CW Gnt180-90
 SS_S20 120kVp CCW Gnt90-180
 Head and Neck S10
 Fast Head and Neck S20
 Fast Head and Neck S20 CCW
 Short Chest S20
 Chest M20
 Chest M20 CCW
 Chest M20 Fast
 Chest M20 Fast CCW
 SIM Chest M20
 SIM SS_S20 120kVp CW Gnt180-50

SIM SS_S20 120kVp CW Gnt180-50
 Pelvis M15
 Pelvis M20
 Pelvis M20 CCW
 Pelvis M20 Fast
 Pelvis M20 Fast CCW
 Pelvis L20
 Pelvis L20 Fast
 Fast Prostate Seed S10
 Prostate M10
 Prostate M15
 Symmetry
 Symmetry CW Gnt180-20
 Symmetry CCW Gnt20-180
 Symmetry CCW Gnt180-340
 Symmetry CW Gnt340-180
 SS_S20 120kVp CW Gnt250-95

Short Scans for "Offset Lung" (points to SS_S20 120kVp CW Gnt335-180)

H&N and Standard Chest (points to Fast Head and Neck S20)

Pelvis and Symmetry (points to Pelvis M15)

Imaging on XVI

The point is that this stuff looks hard
but in reality is quite easy.

It is actually very important.
In many ways it could be even easier,
and customers certainly need a more robust set of
initial presets.

Either put them through the FDA,
Or the lawyers need to figure out how to let you do it!

Site Setup in Mosaiq

Site Setup is a wonderful tool that all your users need to
get extremely familiar and comfortable with.

It's where we write our setup information and table
parameters for the site we are treating.

But *most importantly*, Site Setup holds the site's 3-D
image information and isocenter.

Site Setup in D&I

The screenshot shows the MDSAQ (2.64.068) - KMC Radiation Oncology software. The main window displays a list of radiation therapy plans. The 'Site Setup' plan is selected and highlighted in blue. The right-hand panel shows the 'Plan Information' for the selected plan, including patient details (Head First Supine, 3380 Z), grid information (0.30, Medium, 3643545), and prescription information (Prescribe To: Rx Dose: 2500.9, Fractional Dose: 500.0, Number of Fractions: 5). The bottom status bar shows the current plan is 'A 9/22/2016 KAW'.

Site Setup

This close-up view of the 'Diagnoses and Interventions' window shows a list of plans. A red arrow points from the text 'D&I Screen' to the top right corner of the window. Another red arrow points from the text 'Site Setup for current plan' to the 'Site Setup' plan entry in the list, which is highlighted in blue. The list shows various plans with their start dates and statuses, such as 'A 5/14/2015 DBE' and 'A 9/22/2016 KAW'.

Site Setup

The screenshot shows a hierarchical tree view of radiotherapy plans and fields. The top level is 'Radiotherapy Fractionation', which contains 'Radiation Oncology Course: 2'. Under this, there are two 'Rad Rx' entries: 'Neck, Left - IMRT with IGRT - 06MVphoton Dose: 6,200 cGy @ 200 cGy x 31' and 'Lung, Left - SBRT - 6MV FFF Dose: 2,500 cGy @ 500 cGy x 5'. Each 'Rad Rx' has a 'Plans' sub-entry containing three plan names: 'OVERLAP&EQD2', 'NECKLEFT62GY', and 'ANECKLEFT62GY' for the neck plan; and 'CUMLLUNGSBRT79GY', 'LLUNGSBRT25GY', and 'ALLUNGSBRT25GY' for the lung plan. Below each 'Plans' entry is a 'Site Setup' entry, which contains a 'Treatment Fields' sub-entry. The neck 'Site Setup' has fields: 'XVI2 - Neck, Left - CT', '3V - LT NECK CCW - 6 X VMAT 79 Control Points', '4V - LT NECK CW - 6 X VMAT 81 Control Points', 'PF3 - AP SETUP - 6 X MLC', and 'PF4 - LT LAT SETUP - 6 X MLC'. The lung 'Site Setup' has fields: 'XVI3 - Lung, Left - CT', '5V - L LUNG CCW - 6 X FFF VMAT 90 Control Points', '6V - L LUNG CW - 6 X FFF VMAT 19 Control Points', 'PF5 - AP SETUP - 6 X MLC', and 'PF6 - LT LAT SETUP - 6 X MLC'. The 'Site Setup' entry for the lung plan is highlighted in blue.

Plan Naming Convention

XVI Field Naming Convention

Site Setup

The screenshot shows a 3D anatomical model of a patient's chest and lungs. The model is displayed in a 3D view, with the lungs highlighted in green. The interface includes a toolbar at the top with various icons for navigation and manipulation. On the right side, there is a 'Structures and Markers List' panel showing a list of structures and markers, including 'GTV_LungL 16', 'PTV_LungL 16', 'SPINAL CANAL', 'TRACHEA', 'BRACHIAL PLEXUS', 'ADU_PTV', 'Isocenters', and 'Reference'. A 'Reference Structure Set/Isocenter' dialog box is open at the bottom left, showing the coordinates for the structure set: X: 4.97, Y: -19.30, Z: -46.40. The dialog box also has a 'Set Isocenter (cm)' button and an 'Update' button. The status bar at the bottom indicates 'Site Setup Definition Will Be Changed'.

Site Setup

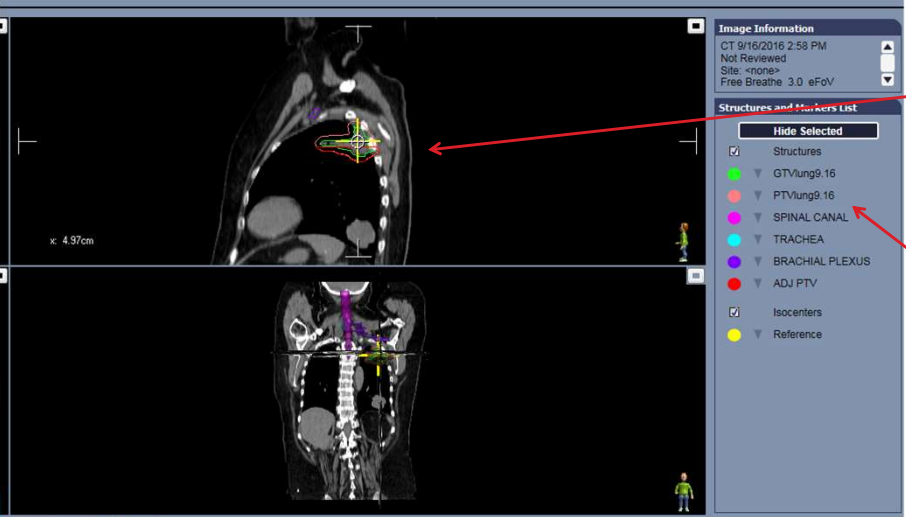
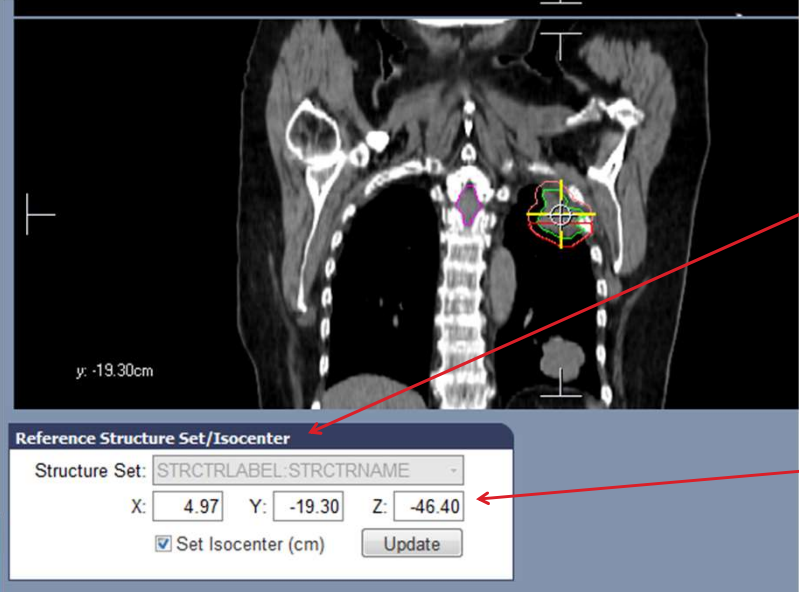


Image Information with full image control (W/L etc.)

(Needs to Match Plan)

Structure Interaction (We send only those that are important)

Site Setup



Structure Set and Iso Information

This info is attached to the DICOM structure set, NOT the plan!

There is no need to type coordinates here! (Not EVER!)

Site Setup

Prescription Information: [A]

Rx Site	Prescribe To:	Rx Dose (cGy)	Fractional Dose	Number of Fractions
L LUNG	Plan Isocenter	2500.0	500.0	5

Actual Dose(cGy): 718.4
 Rescale: No user normalization applied
 Algorithm: Monte Carlo Photon
 Statistical Uncertainty (%) per Calculation: 1.00
 Delivery Mode: VMAT

Beam Information

Scan Reference Coordinates (cm): X = 0.13 Y = -55.10 Z = 28.17

Seq.	Description	Treatment Unit	Modality	Energy	Gantry (deg)	Coll. (deg)	Couch (deg)	Isocenter X(cm) Y(cm) Z(cm)	# of Segs	MU/Fx
1	L LUNG CCW	3VersaHD	Photon	6.0 FFF	180.0/200.0	0.0	0.0	4.97 -46.40 19.30	89	1556.45
2	L LUNG CW	3VersaHD	Photon	6.0 FFF	180.0/40.0	0.0	0.0	4.97 -46.40 19.30	18	743.52
3	AP SETUP	3VersaHD	Photon	6.0 MV	0.0	0.0	0.0	4.97 -46.40 19.30	0	0.00
4	LT LAT SETUP	3VersaHD	Photon	6.0 MV	90.0	0.0	0.0	4.97 -46.40 19.30	0	0.00
Total:									107	2299.97

Plan and isocenter info in Tx Planning documents

A great place to double check what iso came into Site Setup.

Site Setup

Beam Information

Scan Reference Coordinates (cm): X = 0.13 Y = -55.10 Z = 28.17

Seq.	Description	Treatment Unit	Modality	Energy	Gantry (deg)	Coll. (deg)	Couch (deg)	Isocenter X(cm) Y(cm) Z(cm)	# of Segs	MU/Fx
1	L LUNG CCW	3VersaHD	Photon	6.0 FFF	180.0/200.0	0.0	0.0	4.97 -46.40 19.30	89	1556.45
2	L LUNG CW	3VersaHD	Photon	6.0 FFF	180.0/40.0	0.0	0.0	4.97 -46.40 19.30	18	743.52
3	AP SETUP	3VersaHD	Photon	6.0 MV	0.0	0.0	0.0	4.97 -46.40 19.30	0	0.00
4	LT LAT SETUP	3VersaHD	Photon	6.0 MV	90.0	0.0	0.0	4.97 -46.40 19.30	0	0.00
Total:									107	2299.97

Reference Structure Set/Isocenter

Structure Set: STRCTRLABEL:STRCTRNAME

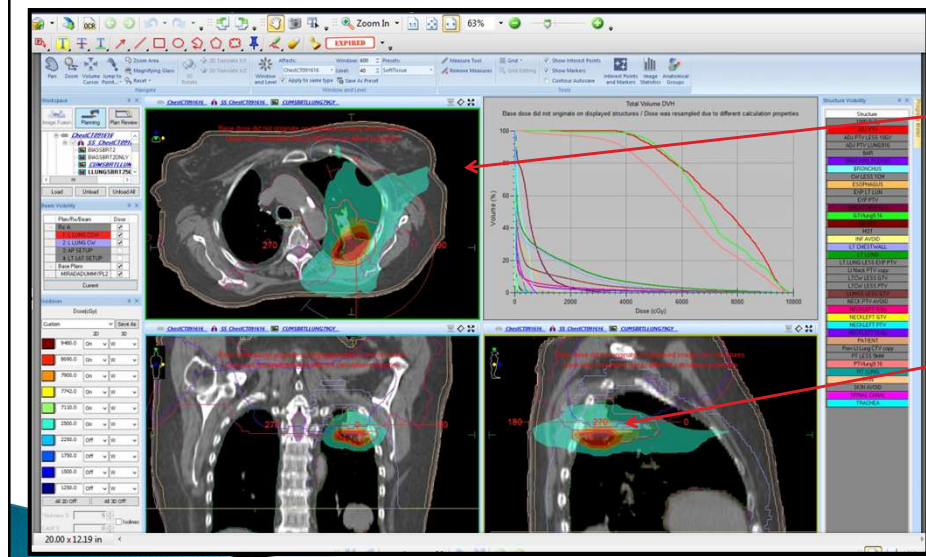
X: 4.97 Y: -19.30 Z: -46.40

Set Isocenter (cm)

This isocenter's coordinates do not exactly match the one in Site Setup because they are not listed in DICOM format.

There is no need to type coordinates here! (Not EVER!)

Site Setup



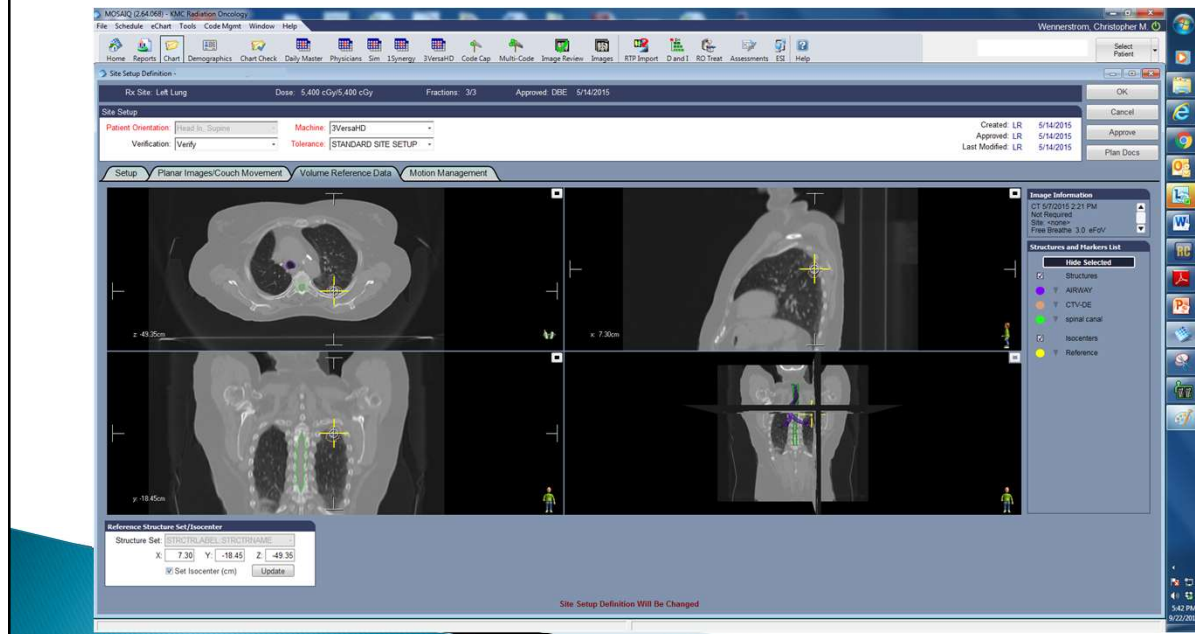
Cumulative 3-View

Remember the previous IMRT and SBRT?

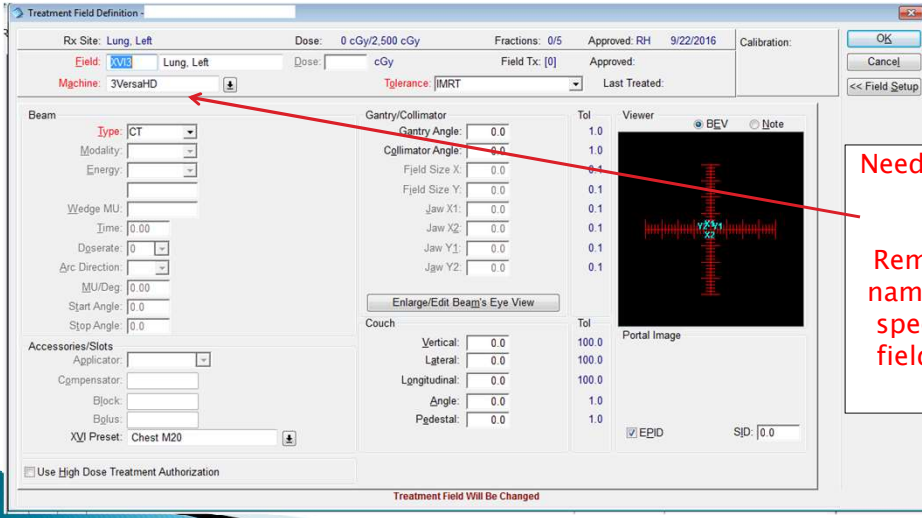
The previous isocenter is *very* close to our current isocenter.

Imaging on the wrong one would lead to *VERY* bad things!

Site Setup



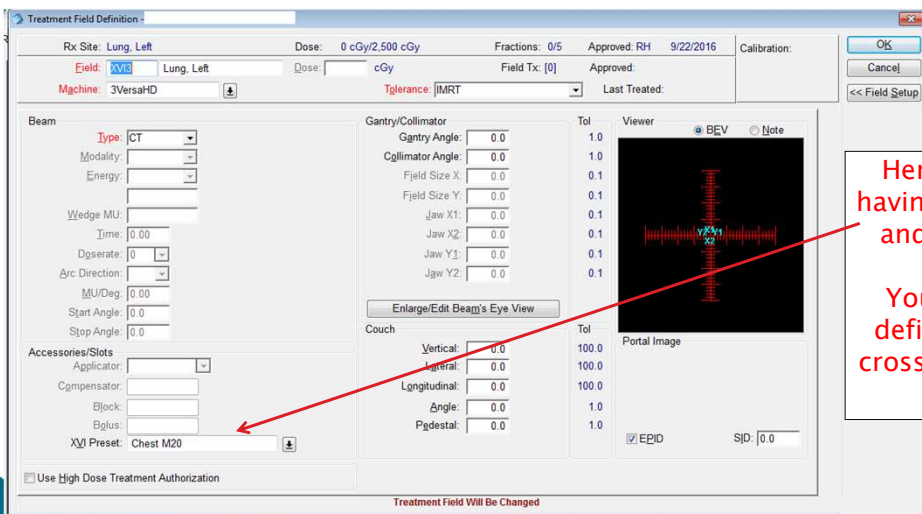
XVI Field Definition



Need to make a CBCT field for MQ to "Port"

Remember that we use a naming convention which specifies an incremental field ID and a name that matches the Rx.

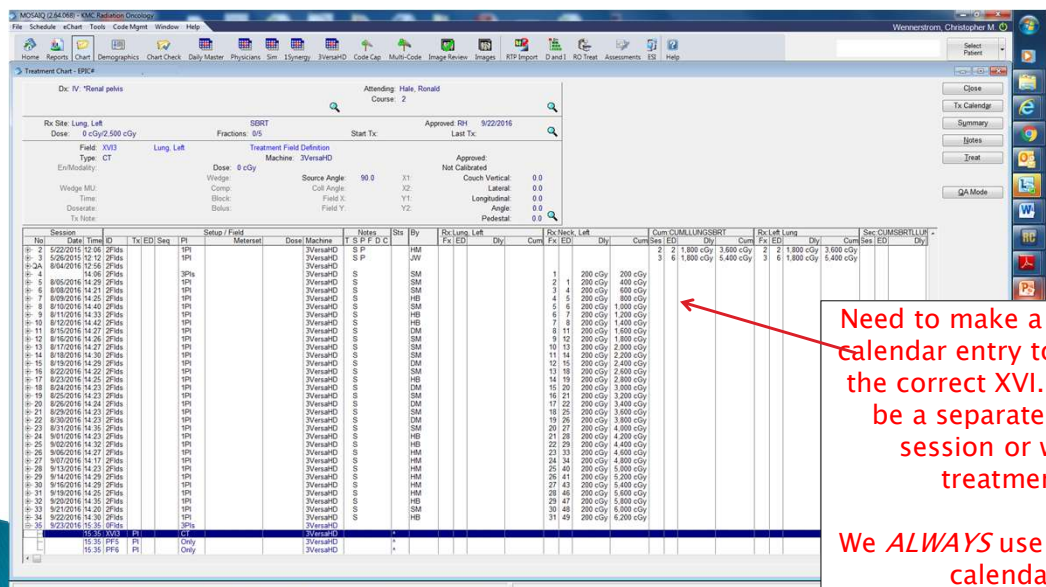
XVI Field Definition



Here's a huge bonus of having well defined presets and using Synergistiq...

Your XVI preset can be defined in MQ and it will cross over automatically to XVI.

Treatment Calendar Definition



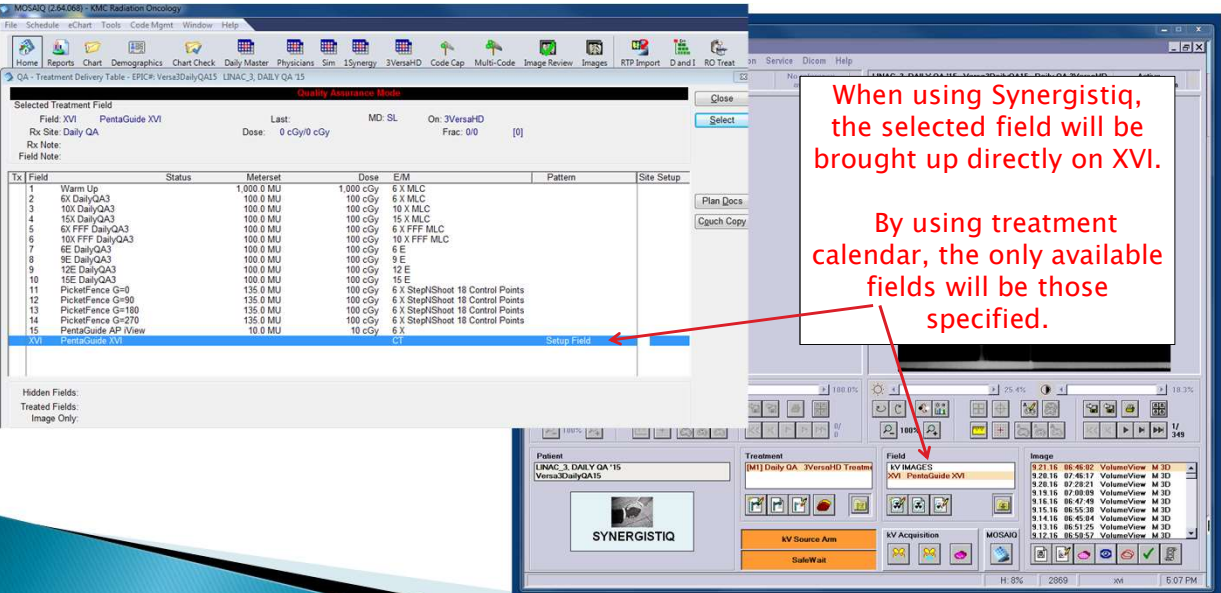
The screenshot shows the MOSAIQ software interface for defining a treatment calendar. A table lists treatment sessions with columns for Date, Time, Tx, Yr, Seq, Status, Meter, Dose, Machine, Site, and By. A red arrow points to a specific entry in the table.

No.	Date	Time	Tx	Yr	Seq	Status	Meter	Dose	Machine	Site	By
1	5/22/2016	12:56	PRs						3VersaHD	S P	JW
2	5/22/2016	12:56	PRs						3VersaHD	S	JW
3	5/22/2016	12:56	PRs						3VersaHD	S	JW
4	5/22/2016	12:56	PRs						3VersaHD	S	JW
5	5/22/2016	12:56	PRs						3VersaHD	S	JW
6	5/22/2016	12:56	PRs						3VersaHD	S	JW
7	5/22/2016	12:56	PRs						3VersaHD	S	JW
8	5/22/2016	12:56	PRs						3VersaHD	S	JW
9	5/22/2016	12:56	PRs						3VersaHD	S	JW
10	5/22/2016	12:56	PRs						3VersaHD	S	JW
11	5/22/2016	12:56	PRs						3VersaHD	S	JW
12	5/22/2016	12:56	PRs						3VersaHD	S	JW
13	5/22/2016	12:56	PRs						3VersaHD	S	JW
14	5/22/2016	12:56	PRs						3VersaHD	S	JW
15	5/22/2016	12:56	PRs						3VersaHD	S	JW
16	5/22/2016	12:56	PRs						3VersaHD	S	JW
17	5/22/2016	12:56	PRs						3VersaHD	S	JW
18	5/22/2016	12:56	PRs						3VersaHD	S	JW
19	5/22/2016	12:56	PRs						3VersaHD	S	JW
20	5/22/2016	12:56	PRs						3VersaHD	S	JW
21	5/22/2016	12:56	PRs						3VersaHD	S	JW
22	5/22/2016	12:56	PRs						3VersaHD	S	JW
23	5/22/2016	12:56	PRs						3VersaHD	S	JW
24	5/22/2016	12:56	PRs						3VersaHD	S	JW
25	5/22/2016	12:56	PRs						3VersaHD	S	JW
26	5/22/2016	12:56	PRs						3VersaHD	S	JW
27	5/22/2016	12:56	PRs						3VersaHD	S	JW
28	5/22/2016	12:56	PRs						3VersaHD	S	JW
29	5/22/2016	12:56	PRs						3VersaHD	S	JW
30	5/22/2016	12:56	PRs						3VersaHD	S	JW
31	5/22/2016	12:56	PRs						3VersaHD	S	JW
32	5/22/2016	12:56	PRs						3VersaHD	S	JW
33	5/22/2016	12:56	PRs						3VersaHD	S	JW
34	5/22/2016	12:56	PRs						3VersaHD	S	JW
35	5/22/2016	12:56	PRs						3VersaHD	S	JW
36	5/22/2016	12:56	PRs						3VersaHD	S	JW
37	5/22/2016	12:56	PRs						3VersaHD	S	JW
38	5/22/2016	12:56	PRs						3VersaHD	S	JW
39	5/22/2016	12:56	PRs						3VersaHD	S	JW
40	5/22/2016	12:56	PRs						3VersaHD	S	JW

Need to make a treatment calendar entry to schedule the correct XVI. This can be a separate filming session or with a treatment.

We ALWAYS use treatment calendar.

Image the XVI field



The screenshot shows the MOSAIQ software interface for imaging the XVI field. A table lists treatment fields with columns for Tx, Field, Status, Meter, Dose, E/M, Pattern, and Site Setup. A red arrow points to the 'PentaGuide AP View' field.

Tx	Field	Status	Meter	Dose	E/M	Pattern	Site Setup
1	Warm Up		1,000.0 MU	1,000 cGy	6 X MLC		
2	6X DailyQA3		100.0 MU	100 cGy	6 X MLC		
3	10X DailyQA3		100.0 MU	100 cGy	10 X MLC		
4	15X DailyQA3		100.0 MU	100 cGy	15 X MLC		
5	10X FFF DailyQA3		100.0 MU	100 cGy	6 X FFF MLC		
6	10X FFF DailyQA3		100.0 MU	100 cGy	10 X FFF MLC		
7	6E DailyQA3		100.0 MU	100 cGy	6 E		
8	9E DailyQA3		100.0 MU	100 cGy	9 E		
9	12E DailyQA3		100.0 MU	100 cGy	12 E		
10	15E DailyQA3		100.0 MU	100 cGy	15 E		
11	PicketFence G=9		135.0 MU	100 cGy	6 X StepShoot 18 Control Points		
12	PicketFence G=90		135.0 MU	100 cGy	6 X StepShoot 18 Control Points		
13	PicketFence G=180		135.0 MU	100 cGy	6 X StepShoot 18 Control Points		
14	PicketFence G=270		135.0 MU	100 cGy	6 X StepShoot 18 Control Points		
15	PentaGuide AP View		10.0 MU	10 cGy	6 X		

When using Synergistiq, the selected field will be brought up directly on XVI.

By using treatment calendar, the only available fields will be those specified.

Image the XVI field

Correct Site Setup...

Plus the correct XVI field defined in that RX...

Plus the correct calendar entry....

=Always Correct Isocenter

Tx	Field	Status	Meterset	Dose	E/M	Pattern	Site Setup
1	Warm Up		1,000.0 MU	1,000.0 cGy	6 X MLC		
2	6X DailyQA3		100.0 MU	100.0 cGy	6 X MLC		
3	10X DailyQA3		100.0 MU	100.0 cGy	10 X MLC		
4	15X DailyQA3		100.0 MU	100.0 cGy	15 X MLC		
5	6X FFF DailyQA3		100.0 MU	100.0 cGy	6 X FFF MLC		
6	10X FFF DailyQA3		100.0 MU	100.0 cGy	10 X FFF MLC		
7	6E DailyQA3		100.0 MU	100.0 cGy	6 E		
8	9E DailyQA3		100.0 MU	100.0 cGy	9 E		
9	12E DailyQA3		100.0 MU	100.0 cGy	12 E		
10	15E DailyQA3		100.0 MU	100.0 cGy	15 E		
11	PicketFence G=0		135.0 MU	100.0 cGy	6 X StepHSShoot 18 Control Points		
12	PicketFence G=90		135.0 MU	100.0 cGy	6 X StepHSShoot 18 Control Points		
13	PicketFence G=180		135.0 MU	100.0 cGy	6 X StepHSShoot 18 Control Points		
14	PicketFence G=270		135.0 MU	100.0 cGy	6 X StepHSShoot 18 Control Points		
15	PentaGuide AP View		10.0 MU	10.0 cGy	6 X		
	XVI PentaGuide XVI				6 X		Setup Field

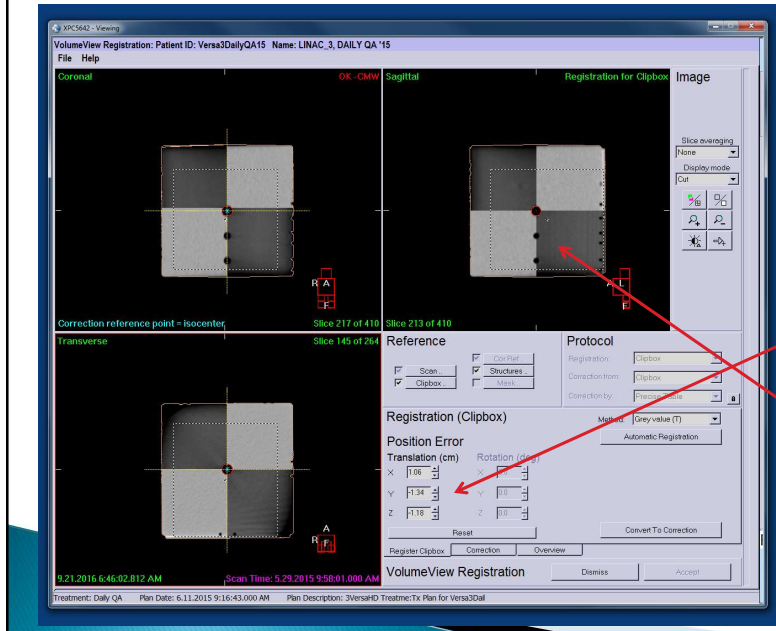
Site Setup

Again, Site Setup is a wonderful tool that you need to get extremely familiar and comfortable with.

Again, *most importantly*, Site Setup holds the site's 3-D image information and isocenter.

Used correctly, Site Setup makes treatment definition easy and safe, even for multiple plans.

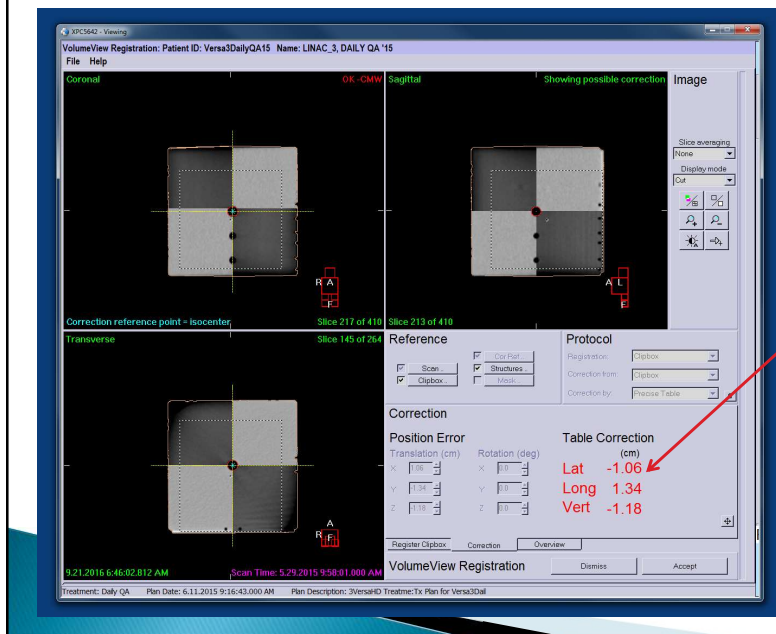
Couch Move Assist (CMA)



Use manual and/or automatic methods to register the XVI with the reference image.

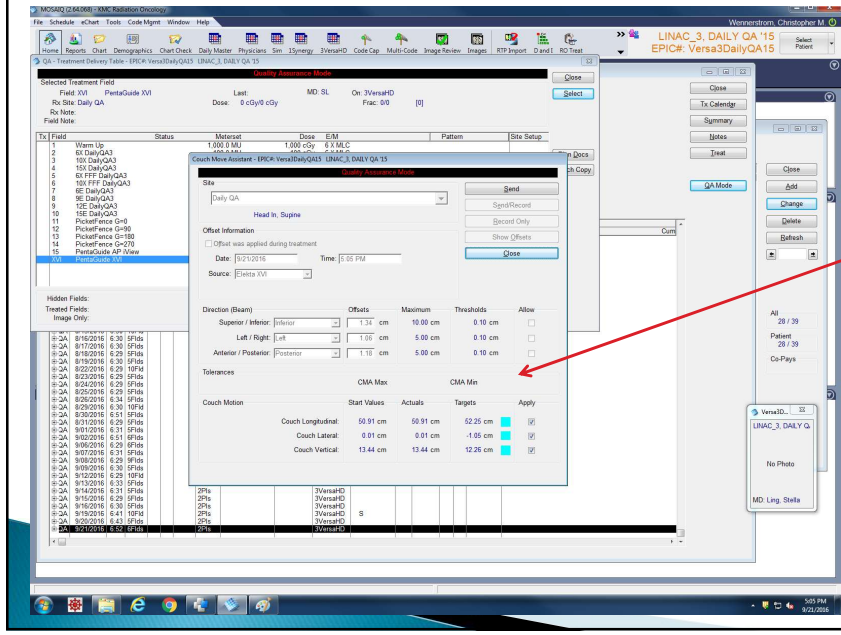
BTW, MIMI is *Soooooo* much better than Pentaguide!
 So, thanks for that!

Couch Move Assist (CMA)



Convert to correction and accept your results.

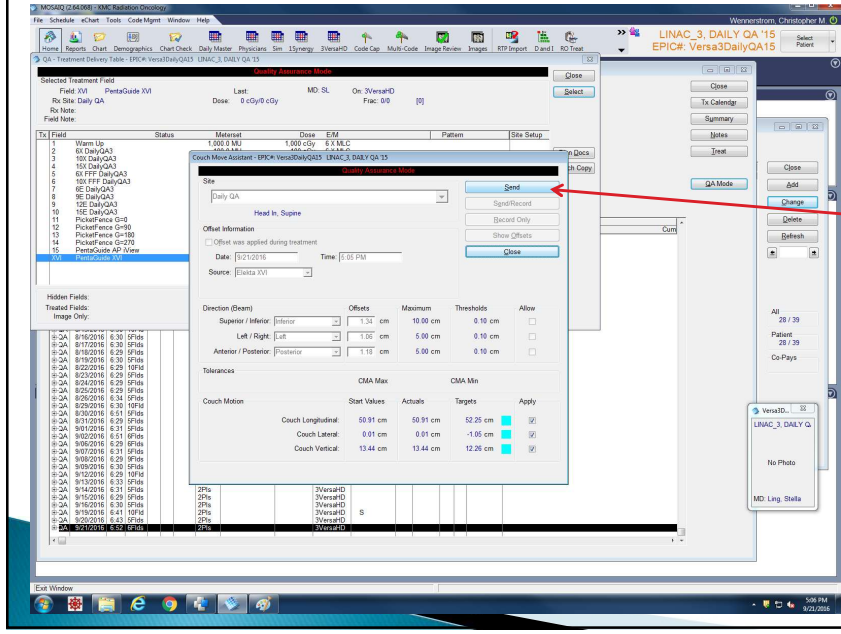
Couch Move Assist (CMA)



Couch Move Assist window pops up on the MQ window.

We always allow all shifts, no matter how small.

Couch Move Assist (CMA)



Press "Send"

Enable the table movements and move the table.

Couch Move Assist (CMA)

The screenshot shows the MOSAIQ software interface with the Couch Move Assist (CMA) window open. The window displays a table of CMA data with columns for Start Values, Actuals, Targets, and Apply. A red arrow points to the 'Apply' column, and a text box states 'CMA shows you the target values for the table were achieved.'

Couch Motion	Start Values	Actuals	Targets	Apply
Couch Longitudinal	50.91 cm	52.24 cm	52.25 cm	<input checked="" type="checkbox"/>
Couch Lateral	0.01 cm	-1.00 cm	-1.05 cm	<input checked="" type="checkbox"/>
Couch Vertical	13.44 cm	12.29 cm	12.26 cm	<input checked="" type="checkbox"/>

Distributed Review / Distributed Imaging

Allows images in Mosaik to be accessed for review at any MOSAIQ station.

Uses Spatial Registration Objects (SRO) imported and associated to the patient, allowing review in the new Image review workspace. Includes all original data from XVI (pre- convert to correction) and correction with and without rotations

Easily transfer patients across machines, as DR/DI keeps the XVI reference data and MQ reference data in sync.

Distributed Review

The screenshot shows the 'Localization Trend Review (Beam) - EPIC# VersaDailyQA15 LINAC_3_DAILY QA 15' window. The main table lists localization data for various sites and dates. A red arrow points from a callout box to a specific row in the table.

Site / Image List	Description	Date	Time	Superior	Lateral	Anterior	Coronal	Sagittal	Transverse	Mag						
3D Site		9/09/2016	6:45 AM	Inf	1.3	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/12/2016	6:50 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/13/2016	6:51 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/14/2016	6:45 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/15/2016	6:55 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/16/2016	6:47 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/20/2016	7:28 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/20/2016	7:46 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	6/19/2015	6:45 AM	Inf	1.4	Lft	0.9	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	6/22/2015	6:37 AM	Inf	1.3	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/24/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/25/2015	6:30 AM	Inf	1.4	Lft	1.0	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/26/2015	6:34 AM	Inf	1.4	Lft	1.0	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/29/2015	6:31 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/30/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	7/02/2015	6:28 AM	Inf	1.5	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	7/05/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.1

Localization Offset (Beam) section shows fields for Superior/Inferior, Right/Left, and Anterior/Posterior offsets, with 'Current (cm)' and 'Additional (cm)' values.

Callout box: Localization Trend Review.

Distributed Review

The screenshot shows the 'Localization Trend Review (Beam) - EPIC# VersaDailyQA15 LINAC_3_DAILY QA 15' window. The main table lists localization data for various sites and dates. A red arrow points from a callout box to a specific row in the table.

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3D Site		9/12/2016	6:50 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/13/2016	6:51 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/14/2016	6:45 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/15/2016	6:55 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/16/2016	6:47 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/20/2016	7:28 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D Site		9/20/2016	7:46 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	6/19/2015	6:45 AM	Inf	1.4	Lft	0.9	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	6/22/2015	6:37 AM	Inf	1.3	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/24/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/25/2015	6:30 AM	Inf	1.4	Lft	1.0	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/26/2015	6:34 AM	Inf	1.4	Lft	1.0	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/29/2015	6:31 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	6/30/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.0
H	Third Party: Elekta XVI	7/02/2015	6:28 AM	Inf	1.5	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	7/05/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1	CW	0.0	CW	0.0	CW	0.0	2.1

Localization Offset (Beam) section shows fields for Superior/Inferior, Right/Left, and Anterior/Posterior offsets, with 'Current (cm)' and 'Additional (cm)' values.

Callout box: Distributed Review allows much more information to pass across to MQ.

Distributed Review

Localization Trend Review (Beam) - EPIC#: Versa3DailyQA15 LINAC_3, DAILY QA '15

Course: 1 Status: Active
 Site Name: Daily QA Source: 3VersaHD_XVI
 Patient Orientation: Head In, Supine

Site / Image List

Sts	Description	Date	Time	Superior S/I	Lateral L/R	Anterior A/P	Coronal Dir	Sagittal Dir	Transverse Dir	Mag						
3D	Site	9/09/2016	6:45 AM	Inf	1.3	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/12/2016	6:50 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/13/2016	6:51 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/14/2016	6:45 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/15/2016	6:55 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/16/2016	6:47 AM	Inf	1.4	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/20/2016	7:28 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/20/2016	7:46 AM	Inf	1.4	Lft	1.0	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
3D	Site	9/21/2016	6:46 AM	Inf	1.3	Lft	1.1	Pos	1.2	CW	0.0	CW	0.0	CW	0.0	2.1
H	Third Party: Elekta XVI	6/19/2015	6:45 AM	Inf	1.4	Lft	0.9	Pos	1.2							2.1
H	Third Party: Elekta XVI	6/22/2015	6:37 AM	Inf	1.3	Lft	1.0	Pos	1.2							2.0
H	Third Party: Elekta XVI	6/23/2015	6:33 AM	Inf	1.4	Lft	0.9	Pos	1.2							2.0
H	Third Party: Elekta XVI	6/24/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1							2.0
H	Third Party: Elekta XVI	6/25/2015	6:30 AM	Inf	1.4	Lft	1.0	Pos	1.1							2.0
H	Third Party: Elekta XVI	6/26/2015	6:34 AM	Inf	1.4	Lft	1.0	Pos	1.1							2.0
H	Third Party: Elekta XVI	6/29/2015	6:31 AM	Inf	1.4	Lft	0.9	Pos	1.1							2.0
H	Third Party: Elekta XVI	6/30/2015	6:32 AM	Inf	1.4	Lft	0.9	Pos	1.1							2.0
H	Third Party: Elekta XVI	7/01/2015	6:45 AM	Inf	1.4	Lft	0.9	Pos	1.1							2.0
H	Third Party: Elekta XVI	7/02/2015	6:28 AM	Inf	1.5	Lft	0.9	Pos	1.1							2.1

Localization Offset (Beam)

Derive Localization Offset

	Current (cm)	Additional (cm)	New (cm)
Superior/Inferior:	0.0	Superior 0.0	Superior 0.0
Right/Left:	0.0	Left 0.0	Left 0.0
Anterior/Posterior:	0.0	Anterior 0.0	Anterior 0.0

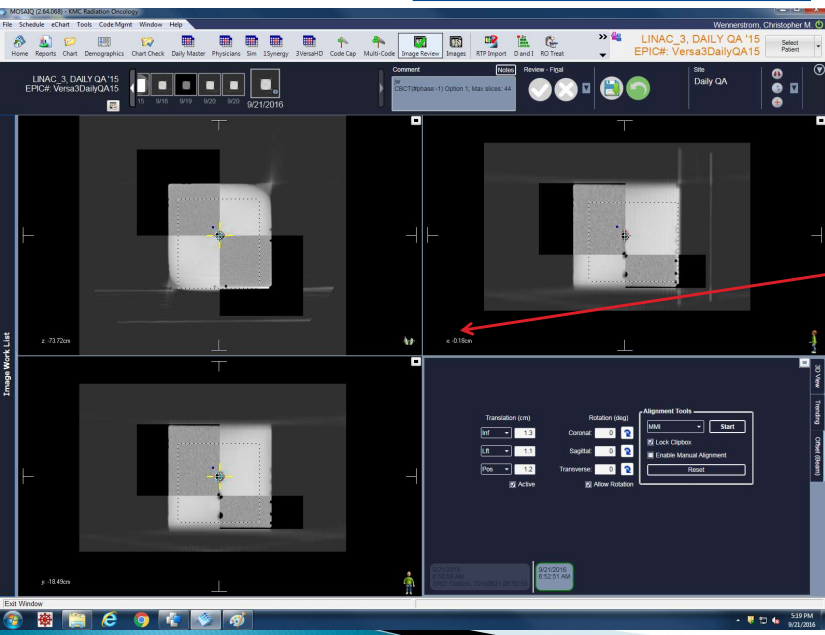
Distributed Review allows all 6 DOF information to pass across and be recorded in MQ.

This is essential for Hexapod.

Distributed Review also allows the site information to pass across to MQ, thereby automatically associating the XVI with the correct site.

Not only is this more efficient, it is much more **SAFE!**

Distributed Review



What you end up with in Mosaiq's new 3D Image Review workspace.

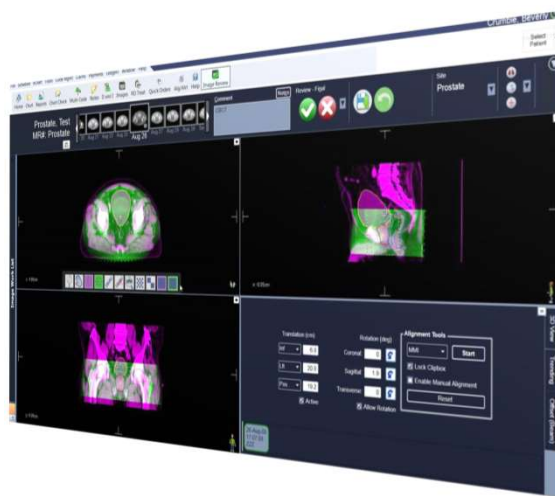
CMA / Distributed Review / Distributed Imaging

Why do you care?

Because with these tools, all non-Hexapod shifts are controlled by Mosaicq, and ALL shifts reside in Mosaicq.

Ease-of-use, safety, using the current version...
All Better.

MOSAIQ 2.6 Image review workspace



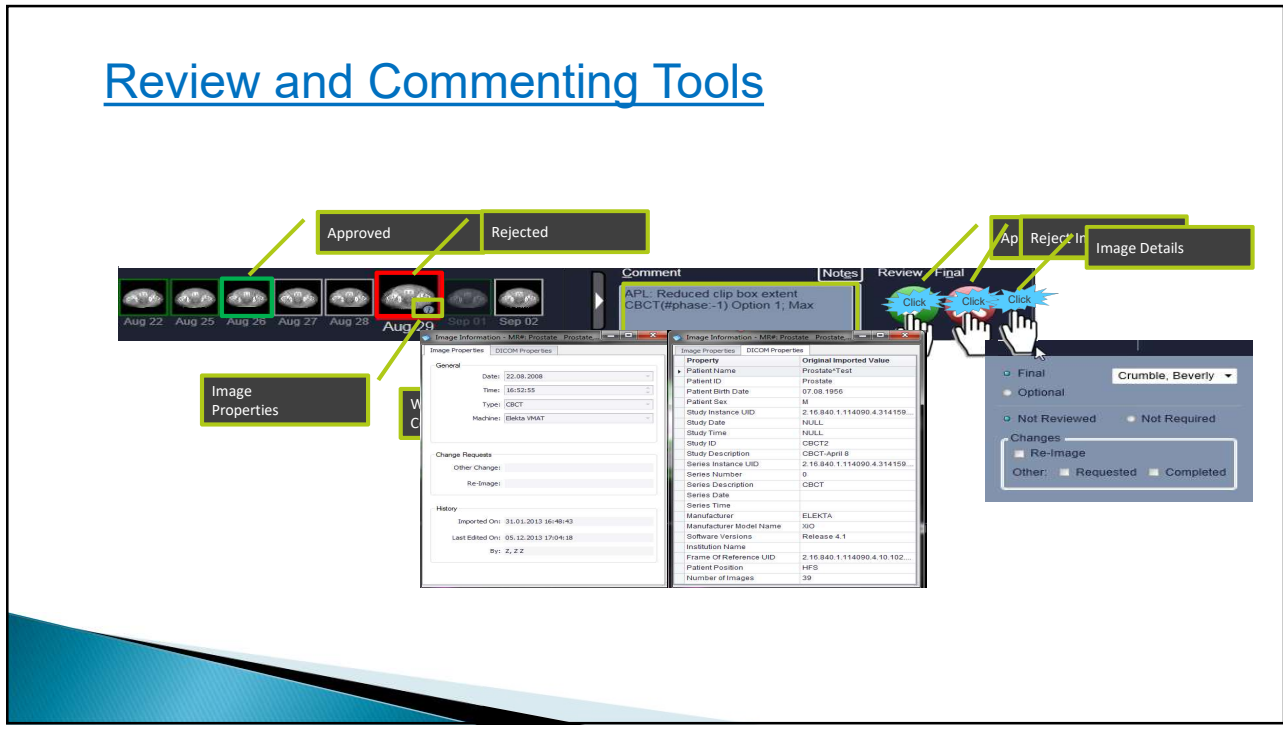
Efficient User Interface



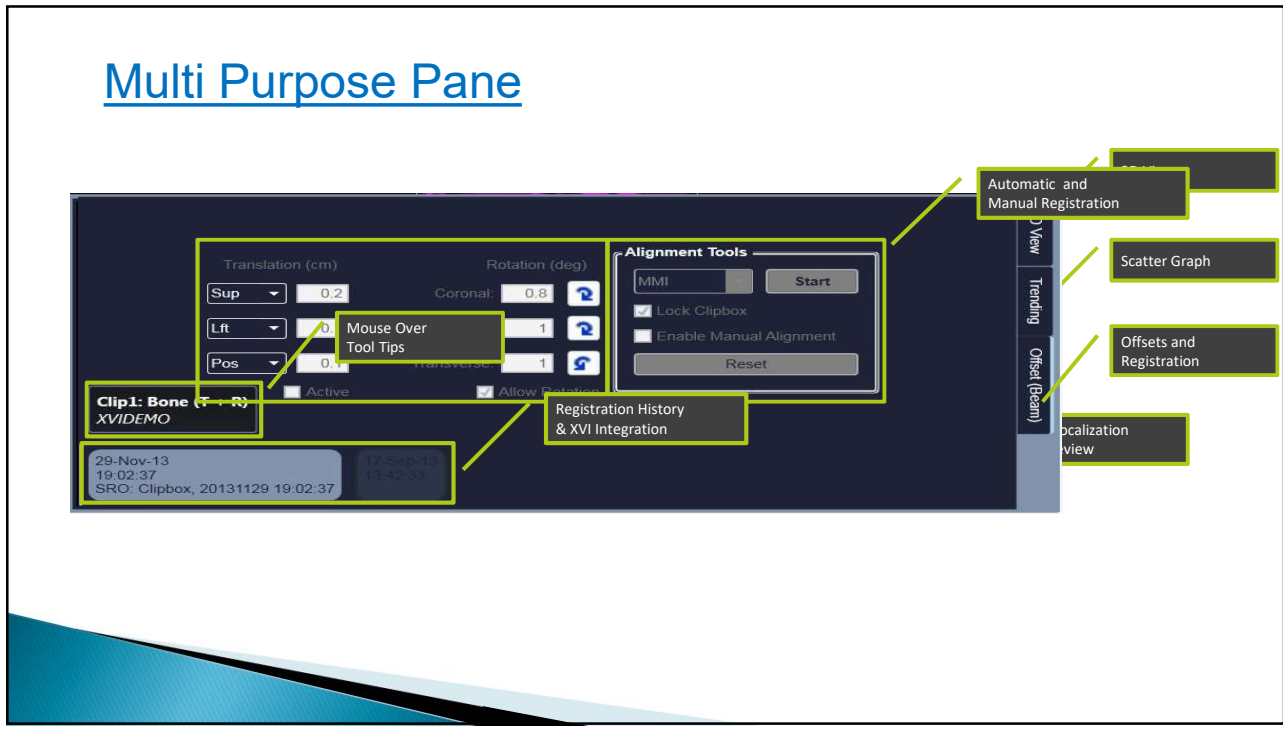
Image Carousel and Image Work List



Review and Commenting Tools

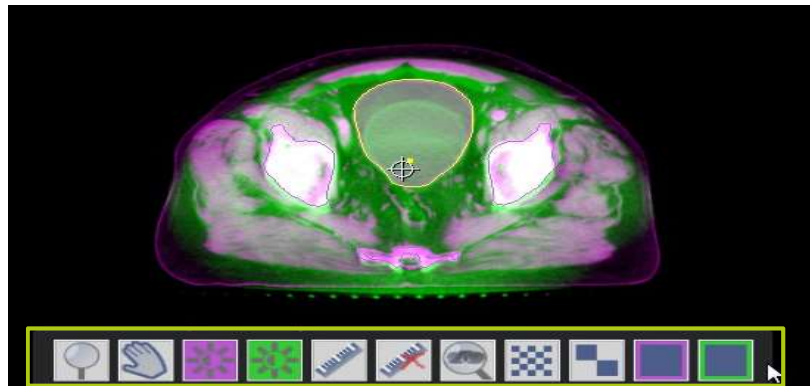


Multi Purpose Pane



In View Tools and Buttons

- Zoom
- Pan
- Window/Level
- Measure
- Spy Glass
- Checkerboard
- Toggle Images



Mosaiq Hardware Setup

Mosaiq Servers at Kettering Health Network

SAN Setup

Workstations

Kettering's Mosaiq Server Specs

KHWPAPP203	MosaiQ Application Server
Hardware	VMWare Server
OS	Windows Server 2012 R2 Standard
Processors	2 – Intel Xeon CPU E5-2667 v3 @ 2.90GHz
Memory	16 GB

KHWPSQL037	MosaiQ DB Server
Hardware	HP Proliant BL460c G9
OS	Windows Server 2012 R2 Standard
SQL	SQL Server 2012
Processors	2 – Intel Xeon CPU E5-2630 v3 @ 2.40GHz
Memory	32 GB

Kettering's Mosaiq/Monaco SAN Specs

KHWPAPP052	File Server for Monaco
Hardware	Proliant DL380 G8
OS	Windows Server 2008 Standard R2 SP1
Processors	2 – Intel Xeon CPU E5-2640 v3 @ 2.50GHz
Memory	32 GB
SAN	3Par v400
SAN Connection	Fiber – 8 GB
SAN Switch	Brocade DCX-8510-4
SAN Drives	The volume is a RADI 5 Set Size 6, with 15K (FC) 600GB Drives

Kettering's Workstation Specs

Standard Workstation

Model: HP EliteDesk 800 G1 USDT (Also, the EliteDesk 800 G2)

Intel Core i5 @ 3GHz or faster

- 6 MB cache, 4 cores, 4 threads
- Intel HD Graphics 4600 (Integrated, Shared RAM)
- 8 GB RAM

Notes: Some have a Quadro 400 or Quadro 600 graphics card
This WS meets our EPIC specs

Kettering's Workstation Specs

Image review

Model: HP Z240 WorkstationTower
Intel Core i7 @ 3GHz or faster

- 6 MB cache, 4 cores, 8 threads
- Solid State Drive

- Quadro K600 graphics card or better
- 8 GB RAM

Notes: This is a new configuration. Older, slower are still working
Standard dosimetrist PC (Multiple Monaco's, MQ, iSite, etc)

Kettering's Workstation Specs

Physician

Model: HP Z440 Workstation Tower
Intel Xeon @ 3GHz or faster

- 15 MB cache, 6 cores, 12 threads
- Solid State Drive
- Quadro K2200 graphics card or better
- 16 GB RAM

Notes: This is a new configuration. Older, slower are still working
Constant image review, Monaco Sim contouring, etc

Kettering's Workstation Specs

Monitors

MD/Physics/Dosimetry: Dual 24" WS *on Digital Connections*
HP Z-Series or similar
Need good-to-excellent vertical viewing angle

Everyone Else: Single or Dual 23" WS *on Digital Connections*
HP Elite Display or similar
Vertical viewing angle not as critical

Notes: MQ works better in WS. You need the horizontal real estate.
Mosaiq Sequencers should be WS *on Digital Connections*
Users look at these all day, every day, and need to buy like it!

MOSAIQ 2.6 Image review workspace

If your clinic has not already done so, *PLEASE* try to get them to upgrade Mosaiq to the latest version. The new 3-D image review workspace *alone* is worth it.

Upgrade your servers and workstations to meet current specs. Your hospital EMR may have already mandated this.

Give everyone *real* monitors to work on!

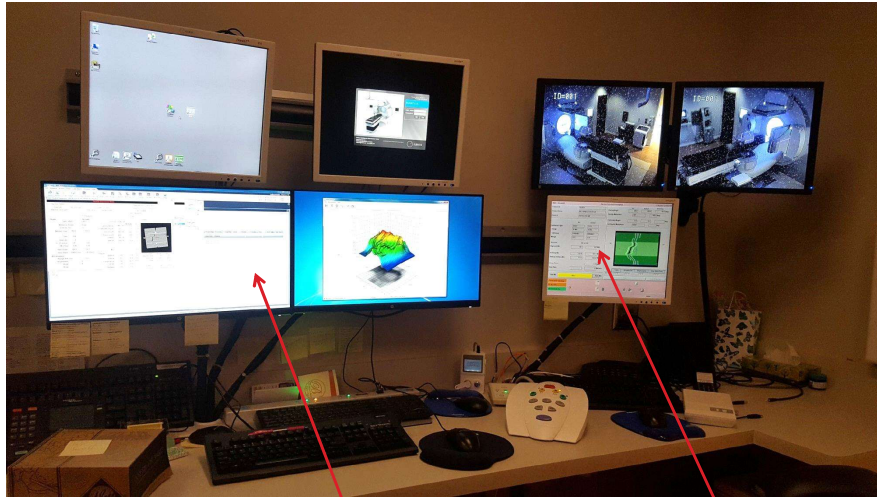
MOSAIQ 2.6 Image review workspace

Why do you care?

Ease-of-use, safety, using the current version...
All Better.

Because with the correct PC and Server configuration
the Radiation Oncologists love it,
and dosimetry and physics do, too!

Versa HD monitor setup



KMC Widescreen Monitors on DVI

Elekta's square monitors on VGA

VersaHD SBRT Setup - Breathing

Limiting breathing motion is, in our opinion, the most critical part of motion management.

Deep inspiration breath-hold is an option, but should be entered into with great care in SBRT.

4-D CT is an *imaging* technique.
It is NOT motion management.

A Few Words About Equipment...

This Abdominal Compression Belt from Aktina is *NOT* expensive, is comfortable and does amazing things to limit breathing excursion.



VersaHD SBRT Setup - Breathing



We use plastic wrap on the belt for infection control.
Use 24-36 inch wide restaurant-grade rolls.
(Only on occasion will we use the paddle.)

VersaHD SBRT Setup – Immobilization



We use the Civco Head & Neck type-S extension board.
Carbon fiber, very lite and versatile.

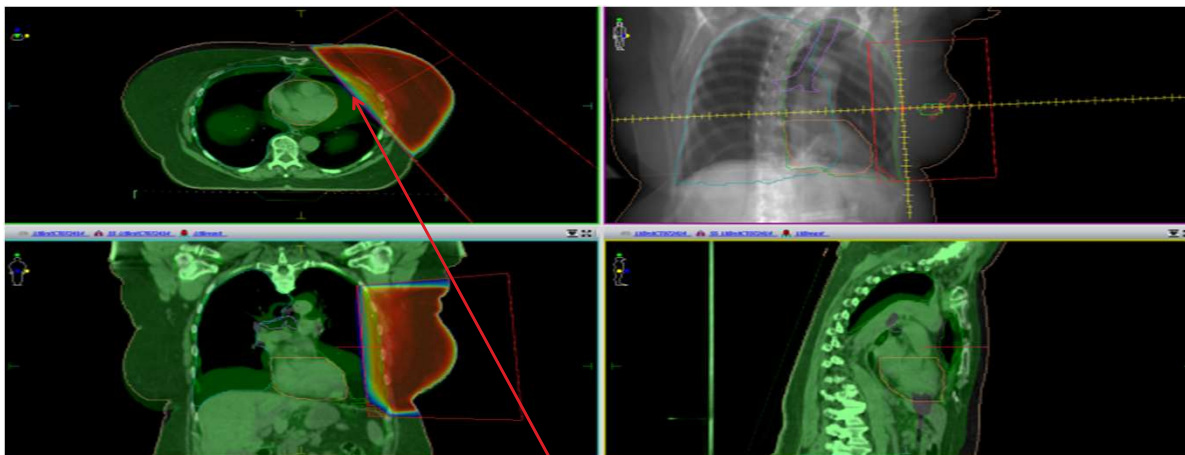
VersaHD and the ABC system

We use ABC on *every* left breast, except those very few patients that cannot do it.

Most women have no problems whatsoever, and they often tell us they can hold their breath longer as they get farther into treatment.

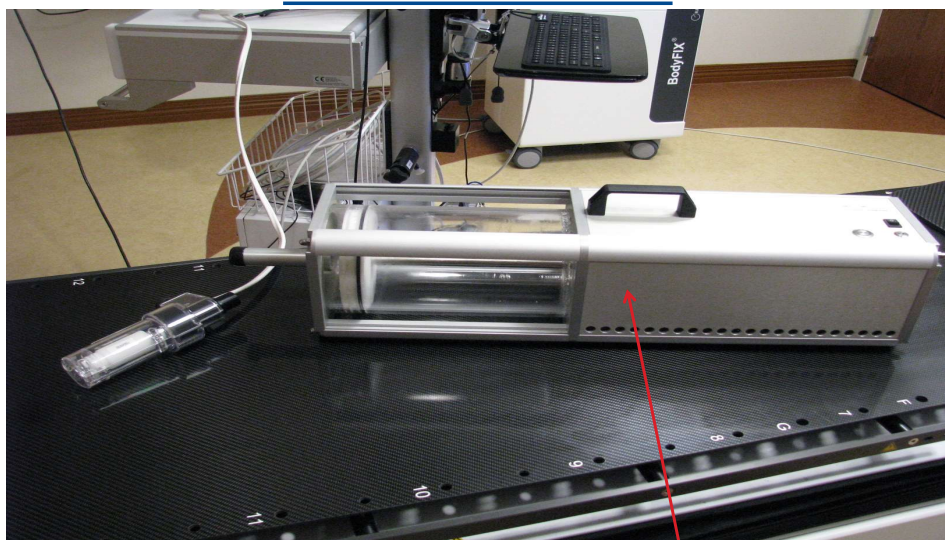
Our women using ABC express a sense of *empowerment*, since they are an active participant in their care.

VersaHD ABC Lt Breast Plan



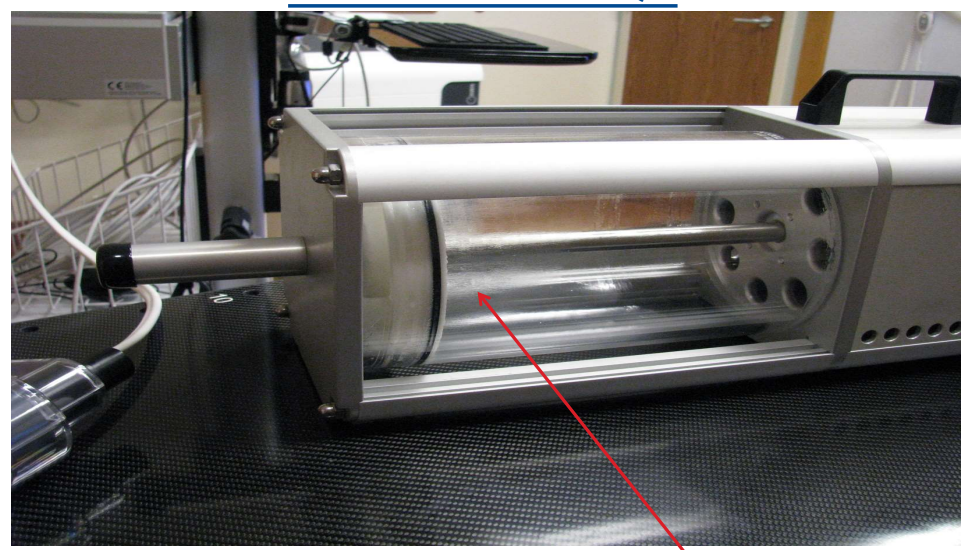
Heart is moved posterior and right.
Breast and Chestwall are moved anterior and left.

VersaHD ABC QA



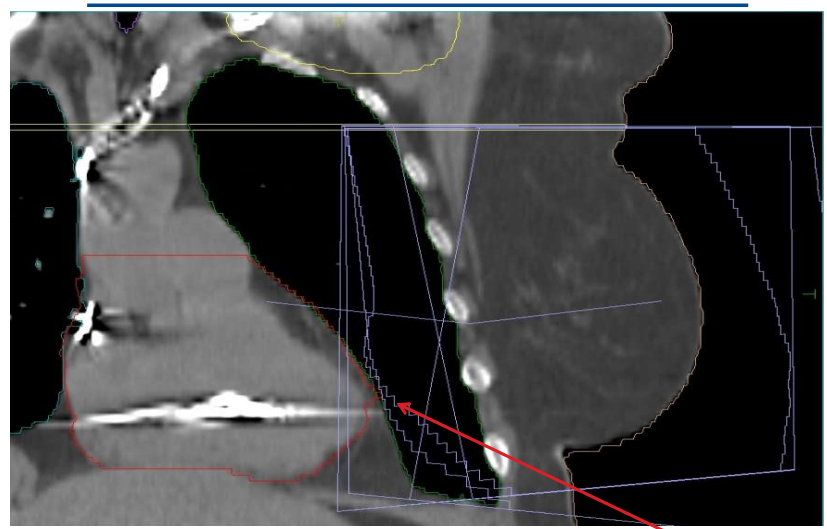
ABC QA device. A critical piece of equipment.
Tests single and multiple unit consistency.

VersaHD ABC QA



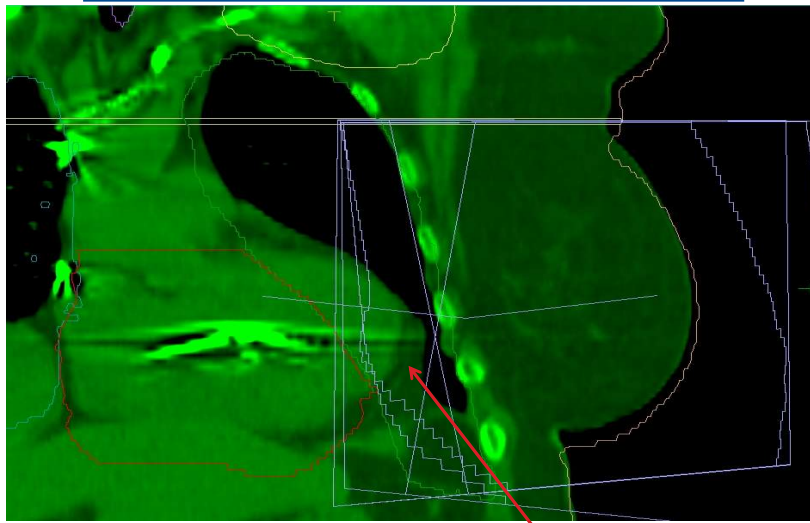
Calibration certificate accuracy to less than 1ml.
Far, *Far* better than original bellows QA.

VersaHD ABC Lt Breast Plan 2



Coronal cardiac profile.
Patient scan and fields as treated.

VersaHD ABC Lt Breast Plan 2



Additional cardiac tissue in FB scan.

Fields needed to treat patient with no ABC.

What is VMAT?

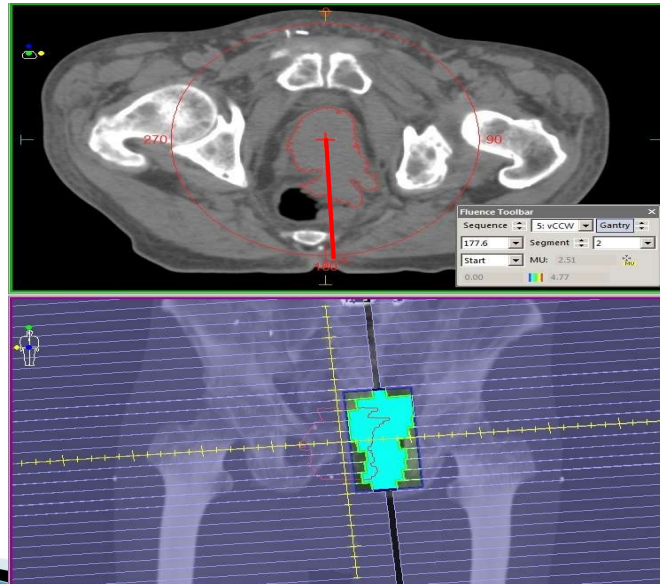
- VMAT stands for Volumetric Modulated Arc Therapy.
- VMAT allows full or partial arcs and creates the desired radiation field by modulating gantry speed, MLC speed and direction, and dose rate.
- A VMAT beam is broken up into arc segments that are specified at time of planning.
- All initial arc segments will contain the full number of degrees while the *last* arc segment will use up the remainder. (100 degrees/30 = 3 full segments of 30 degrees + 1 partial segment which moves 10 degrees.)

What is VMAT?

- The MLC's primarily move in one direction for the entire time the gantry is rotating through an arc segment.
- The MLC's move *with* the gantry on the first arc segment and move *against* the gantry on the second (etc.)
- The MLC's are therefore mostly on one side at the beginning of an arc segment, move to a more open shape, then close toward the other side near the end.

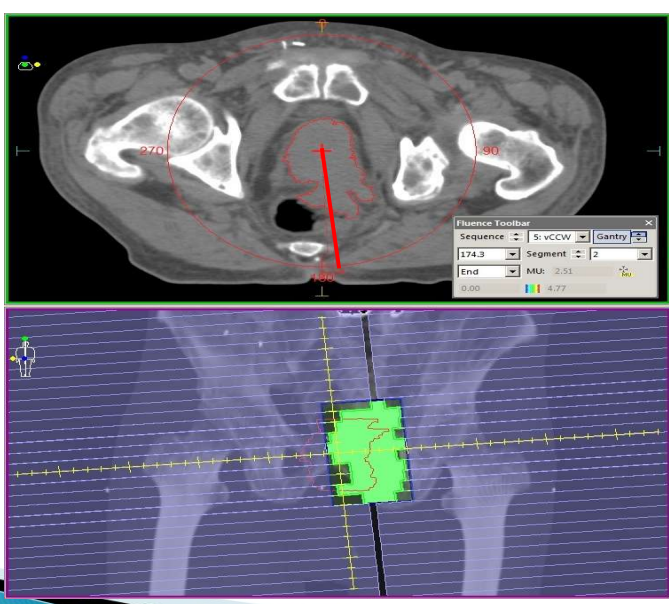
VMAT MLC Movement

CCW Movement
Gantry=178°



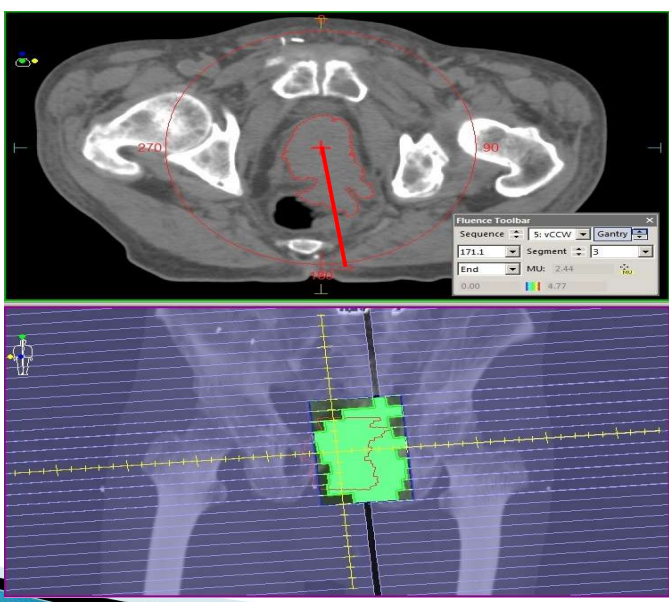
VMAT MLC Movement

CCW Movement
Gantry=174°



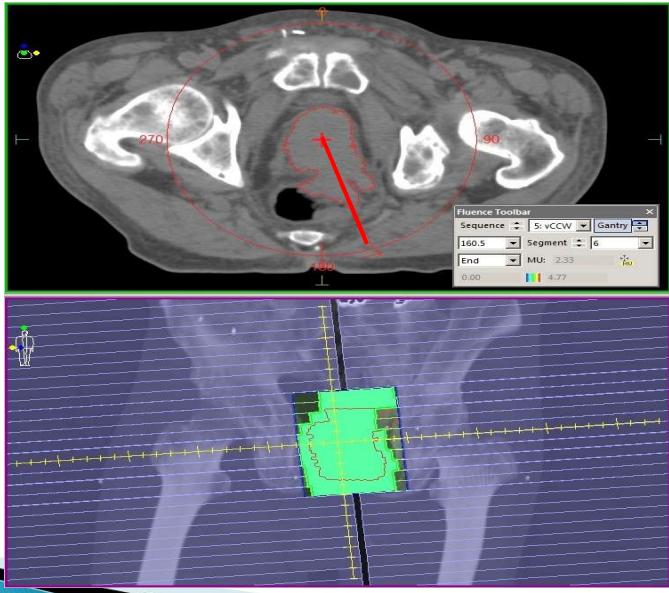
VMAT MLC Movement

CCW Movement
Gantry=171°



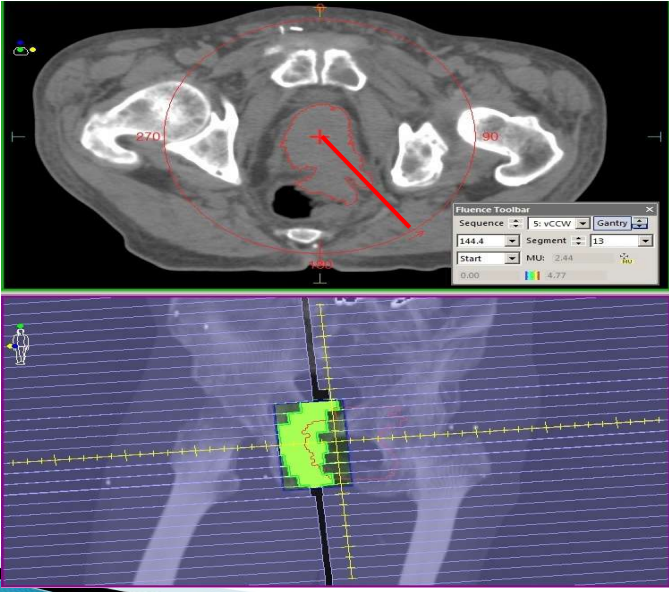
VMAT MLC Movement

CCW Movement
Gantry=160°



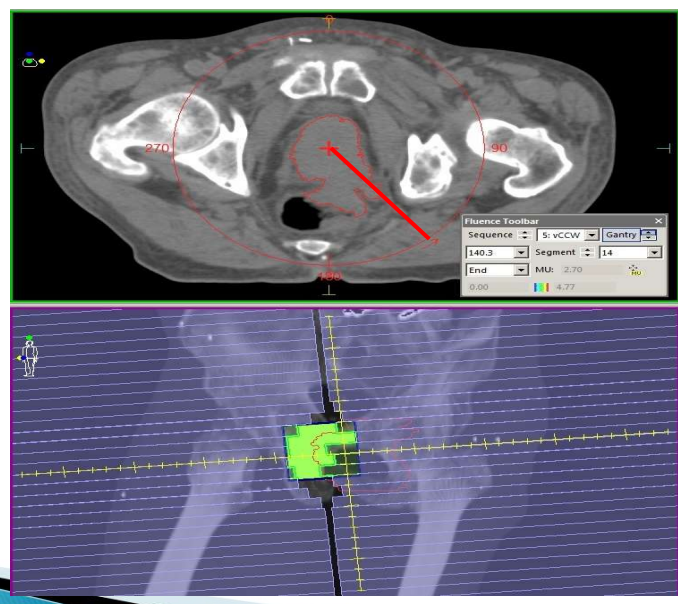
VMAT MLC Movement

CCW Movement
Gantry=145°



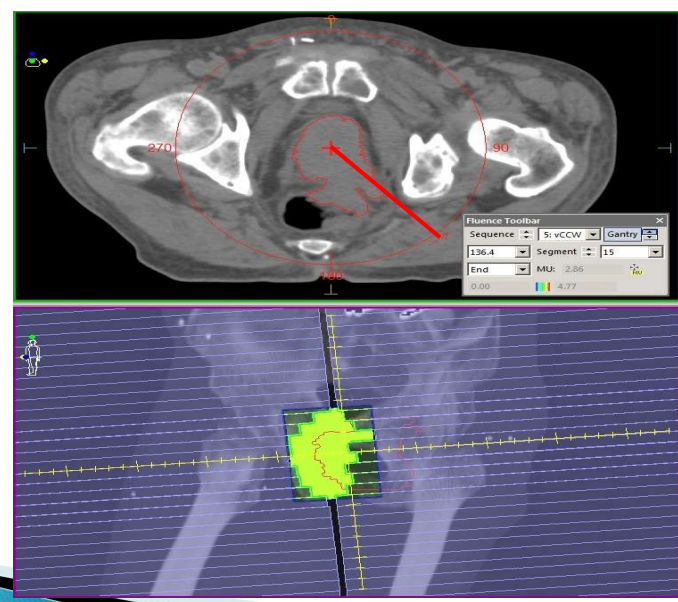
VMAT MLC Movement

CCW Movement
Gantry=140°



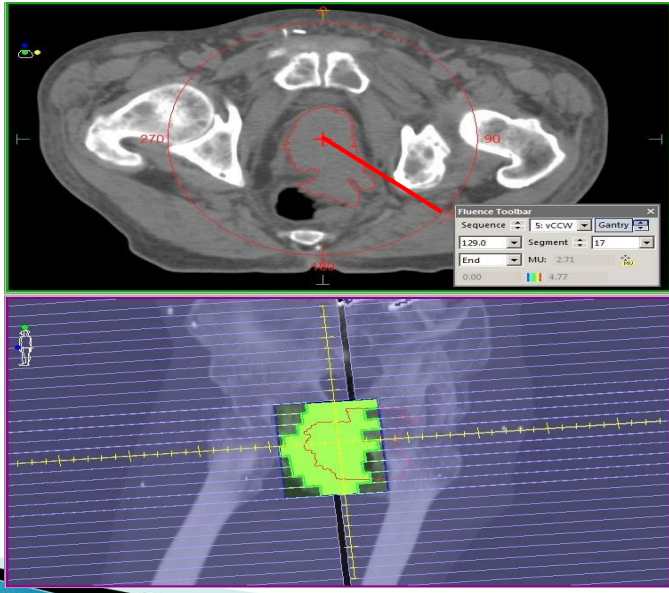
VMAT MLC Movement

CCW Movement
Gantry=136°



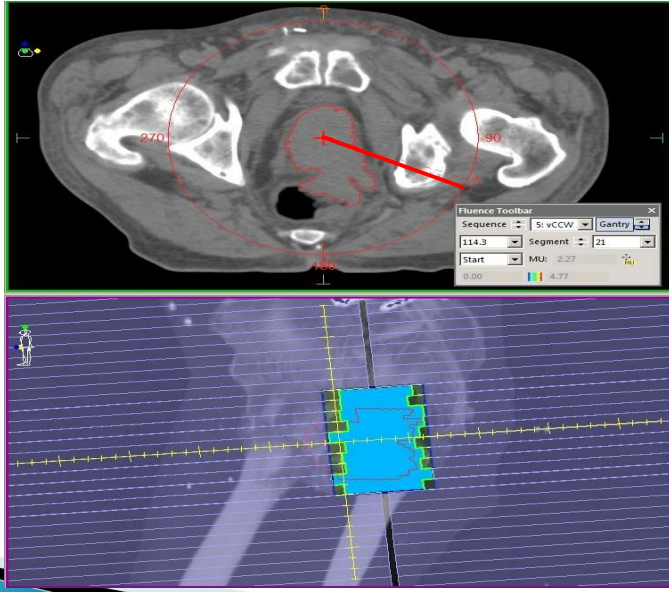
VMAT MLC Movement

CCW Movement
Gantry=129°



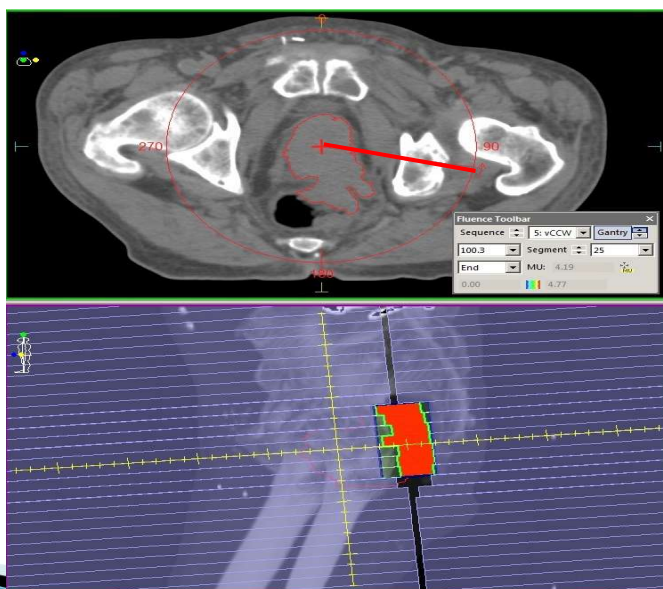
VMAT MLC Movement

CCW Movement
Gantry=114°



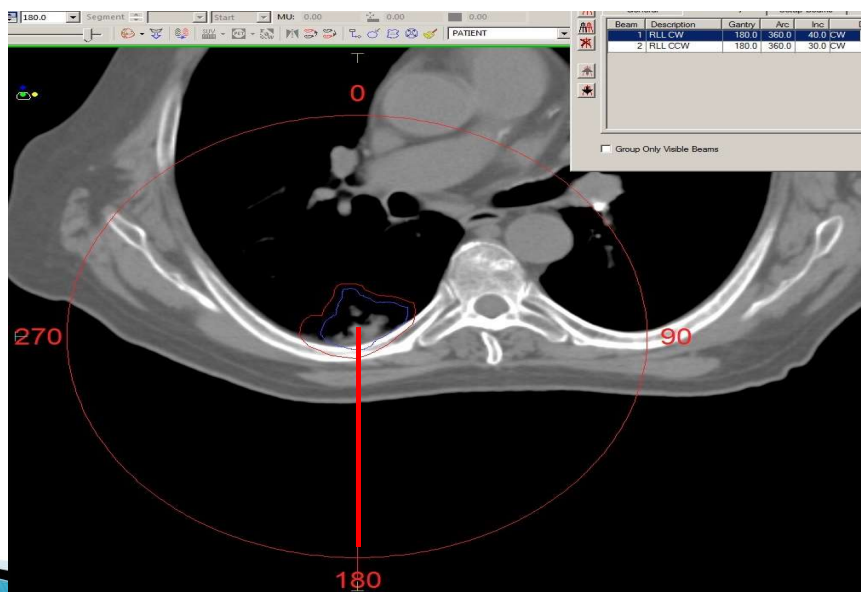
VMAT MLC Movement

CCW Movement
Gantry=100°



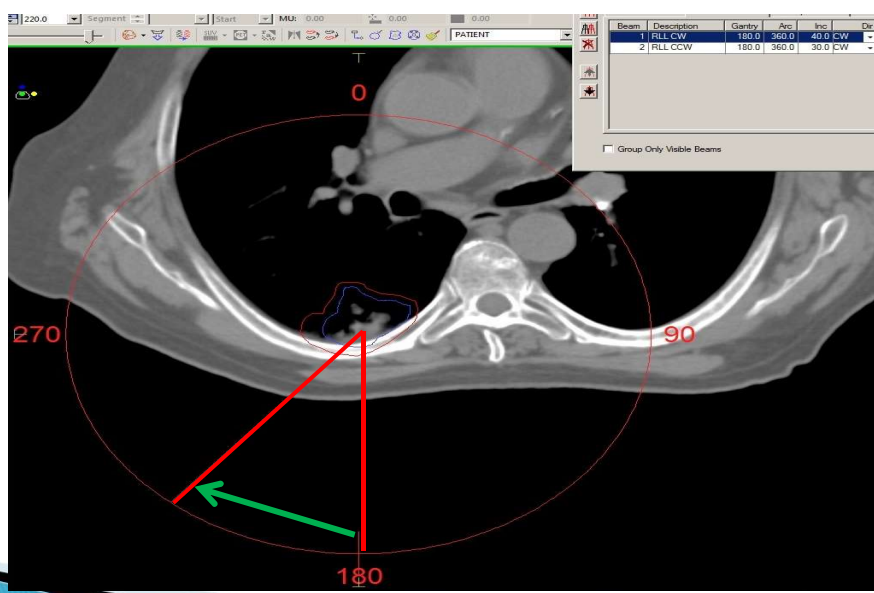
VMAT MLC Movement

40° CW
Increment
Gantry=180°



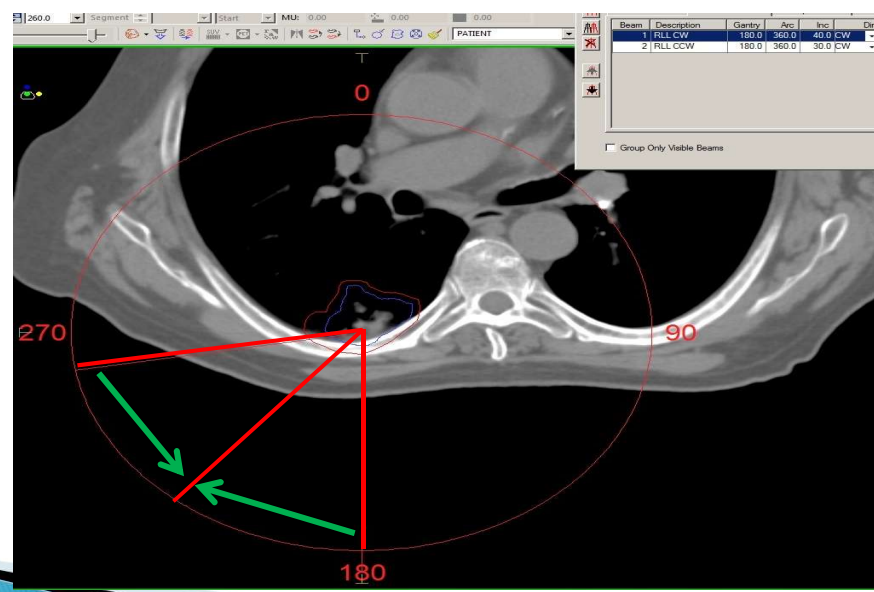
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=220°



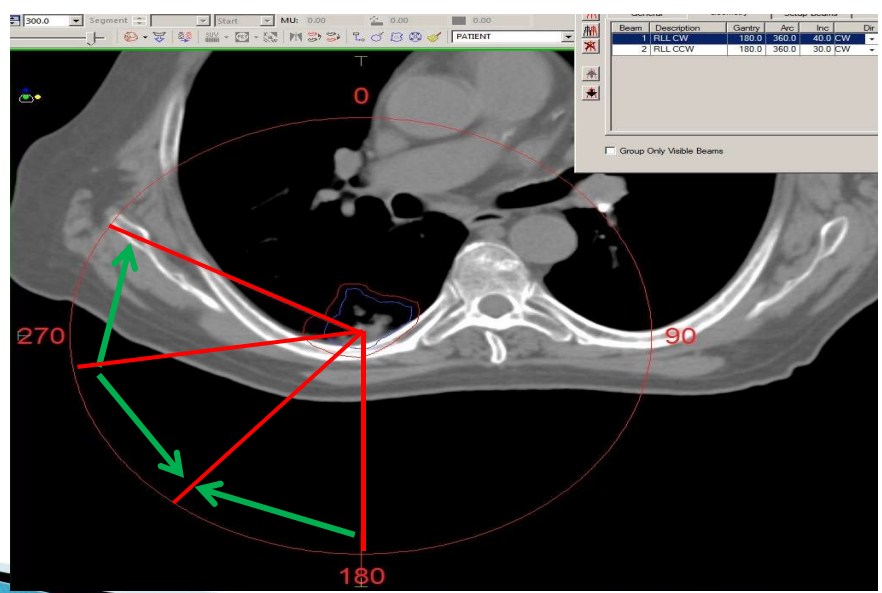
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=260°



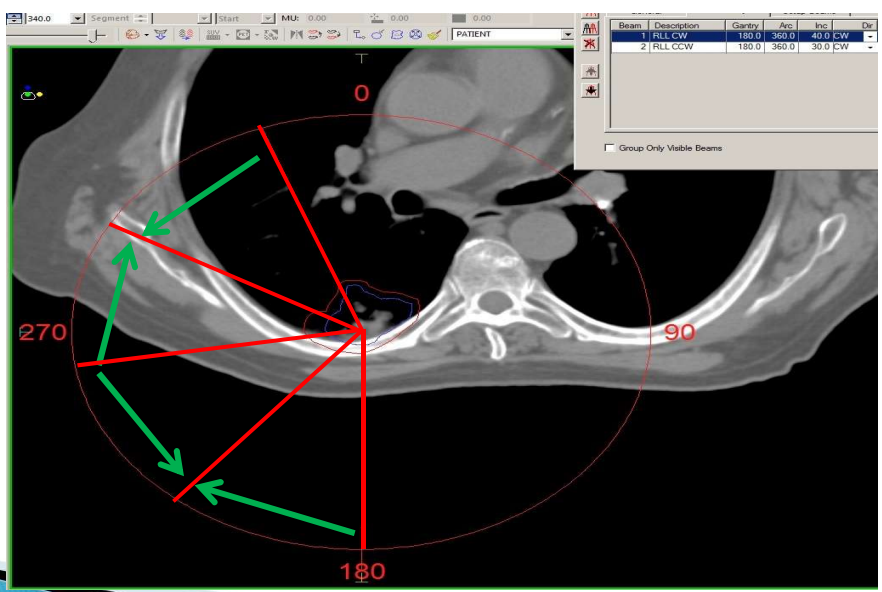
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=300°



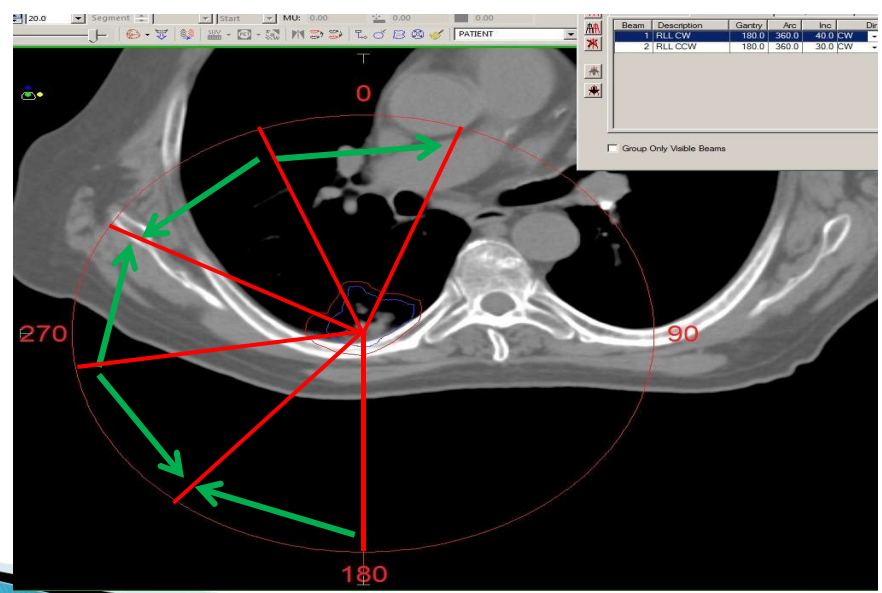
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=340°



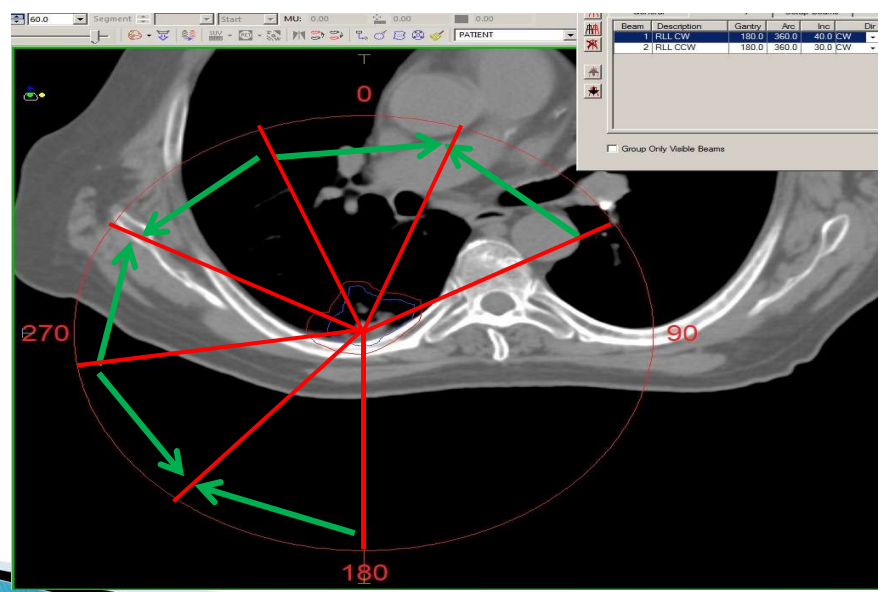
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=20°



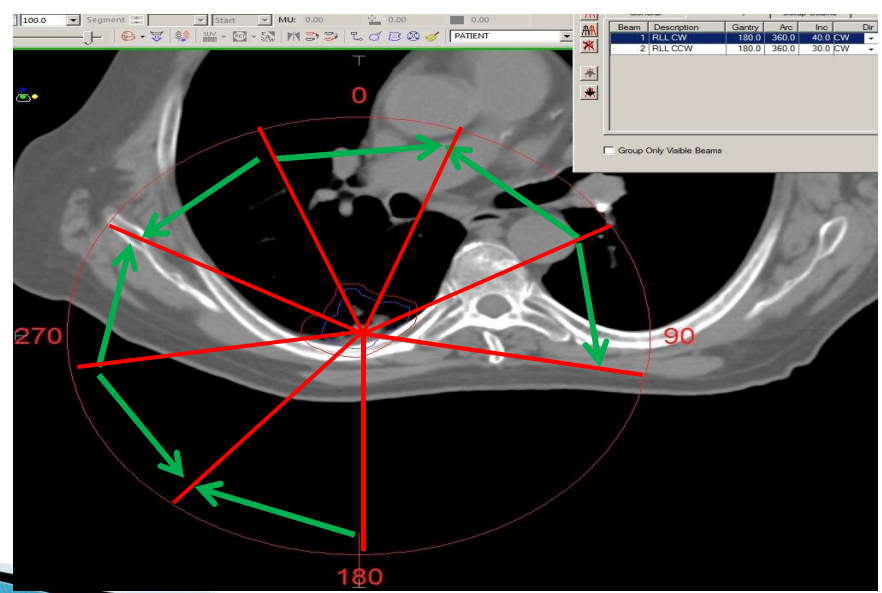
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=60°



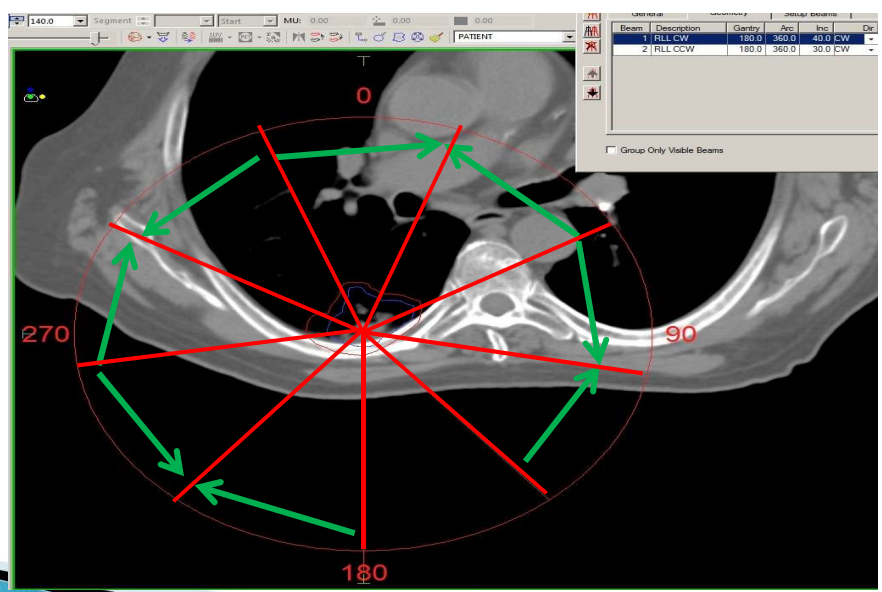
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=100°



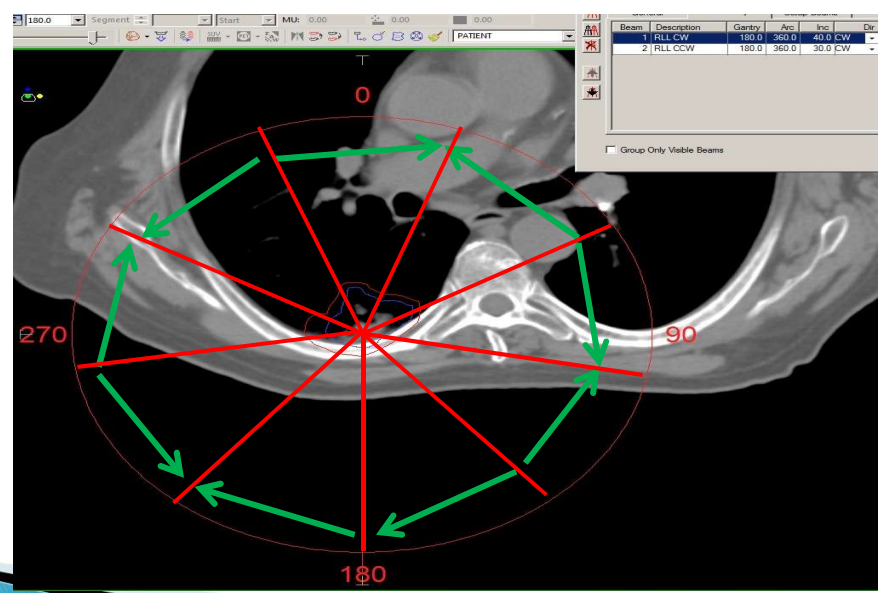
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=140°



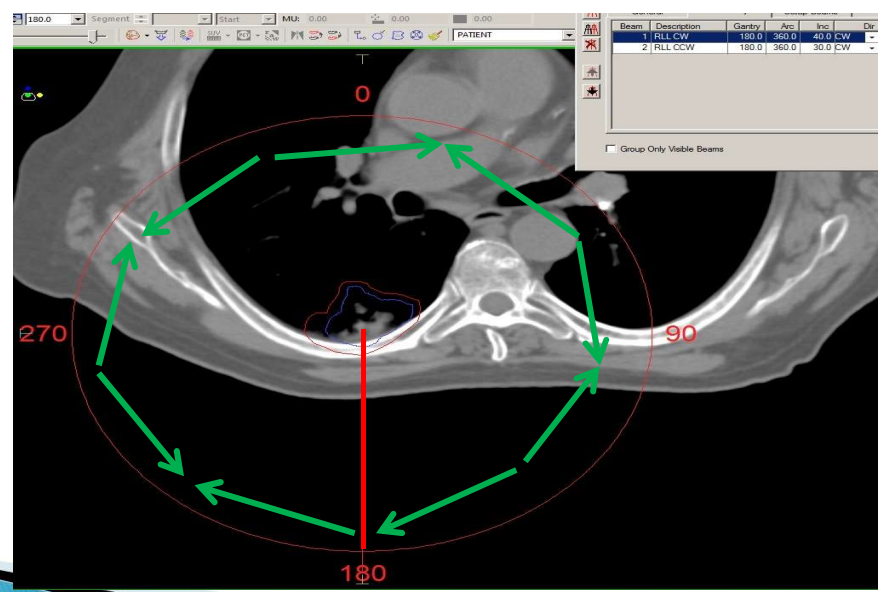
VMAT Gantry/MLC Movement

40° CW
Increment
Gantry=180°



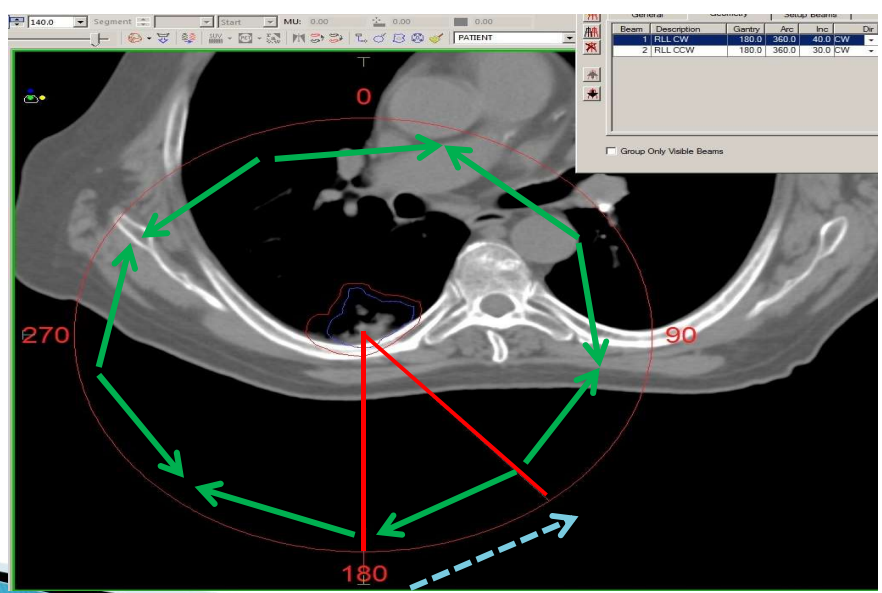
VMAT Gantry/MLC Movement

Next Arc
40° CCW
Increment
Gantry=180°



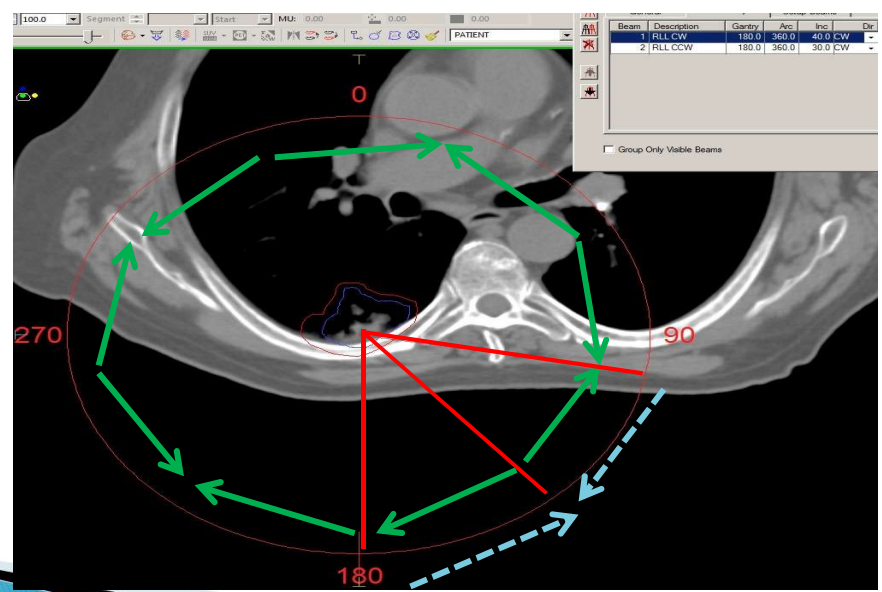
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=140°



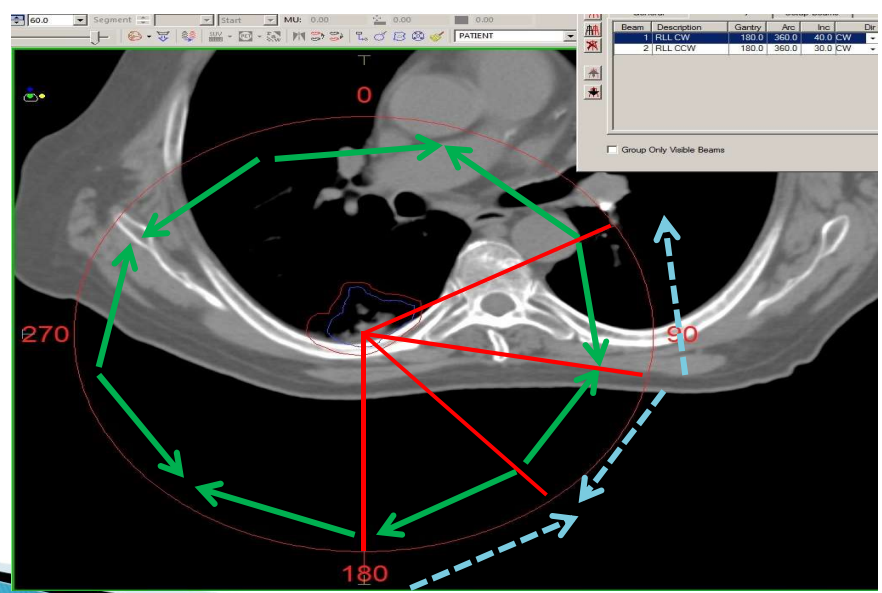
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=100°



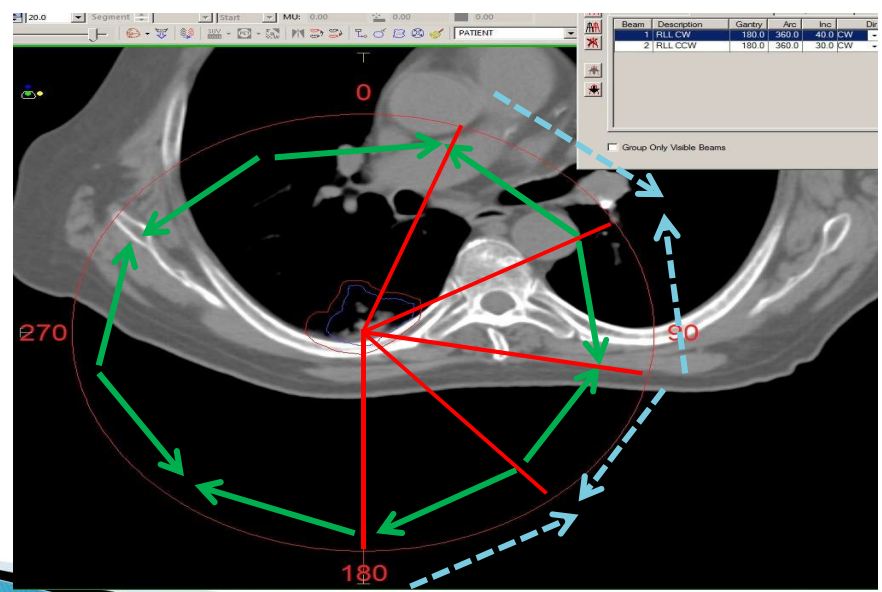
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=60°



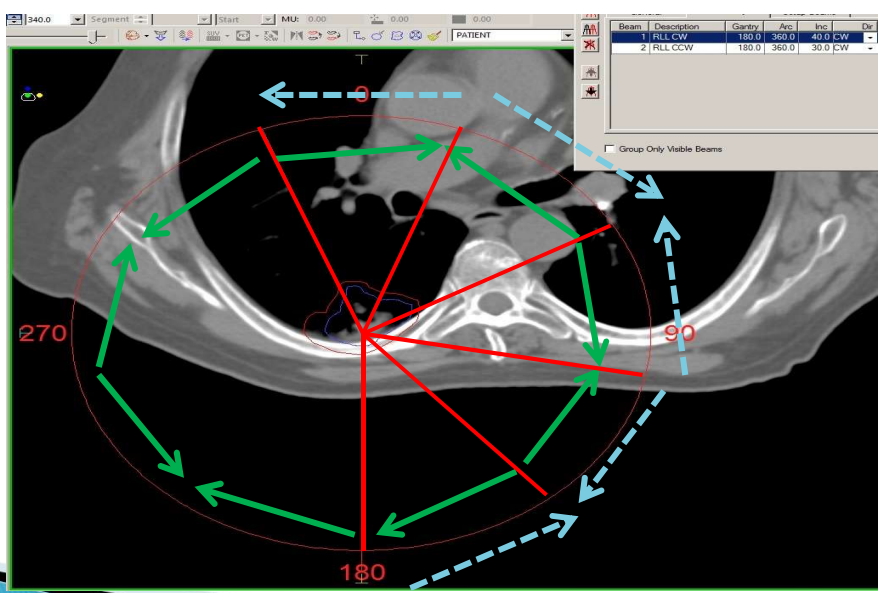
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=20°



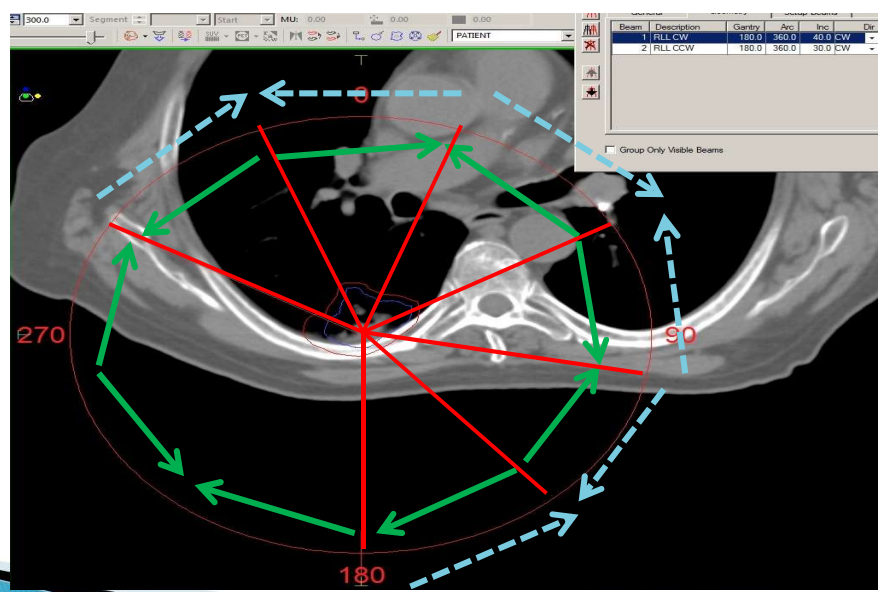
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=340°



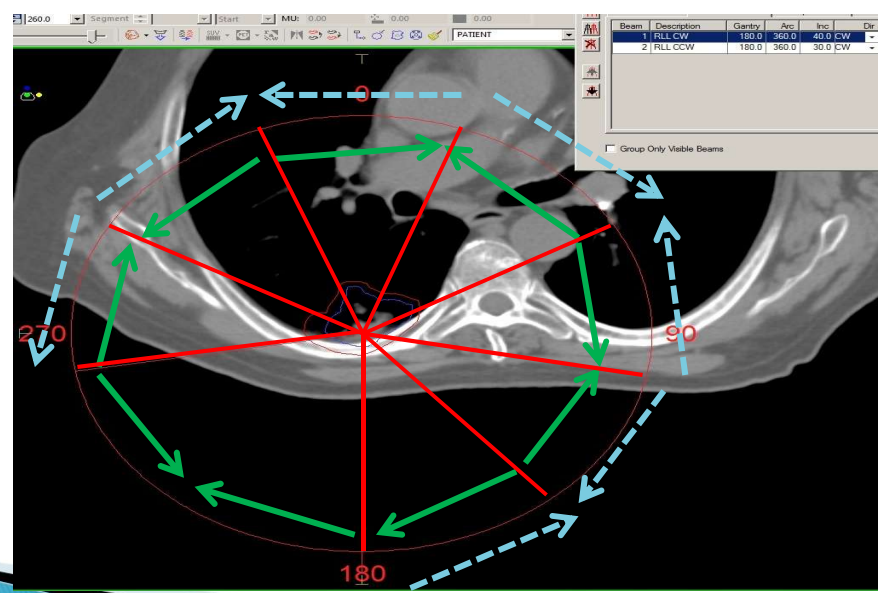
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=300°



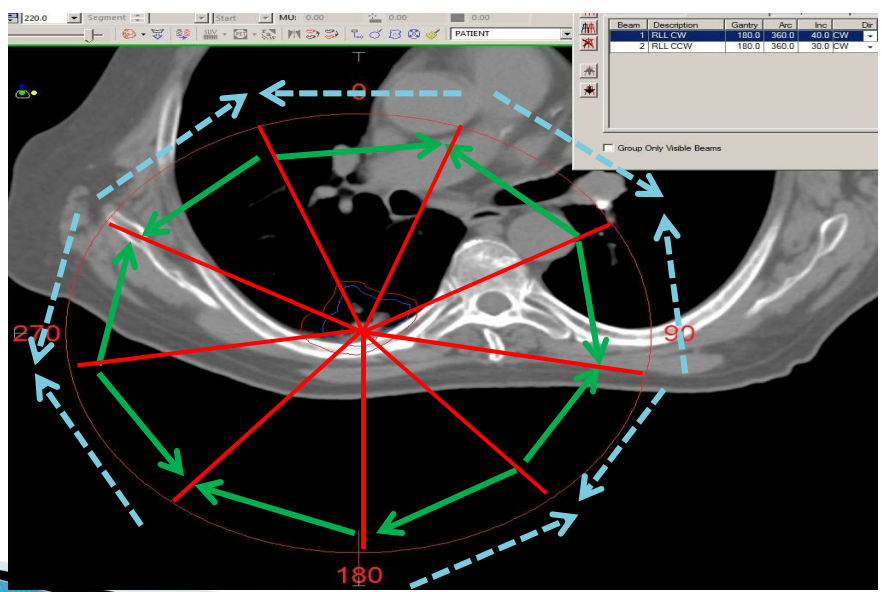
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=260°



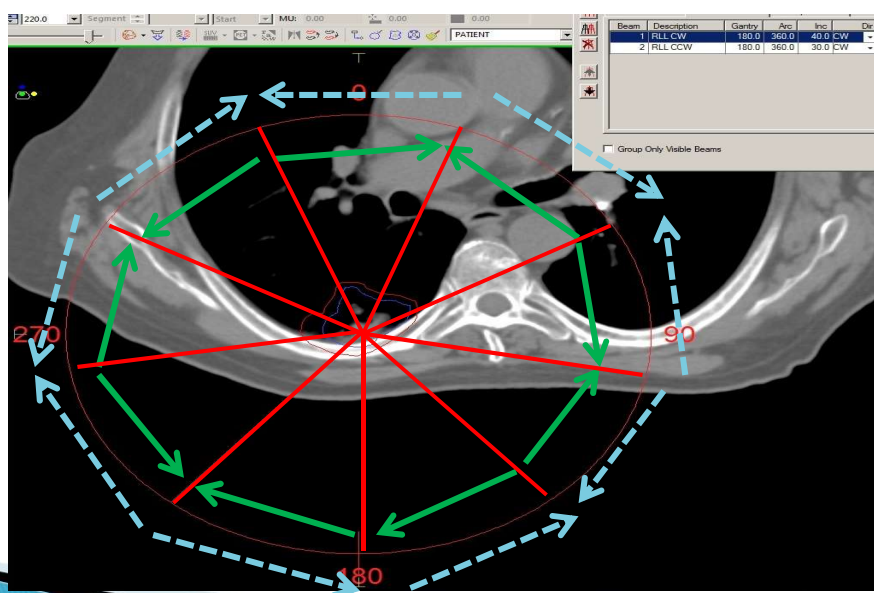
VMAT Gantry/MLC Movement

40° CCW
Increment
Gantry=220°



VMAT Gantry/MLC Movement

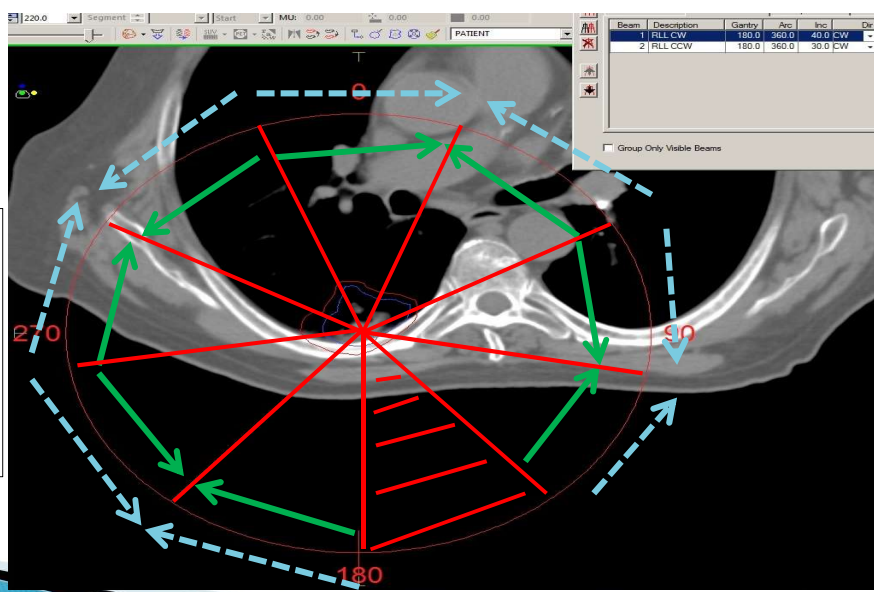
40° CCW
 Increment
 Gantry=180°



VMAT Beam Definition Tricks

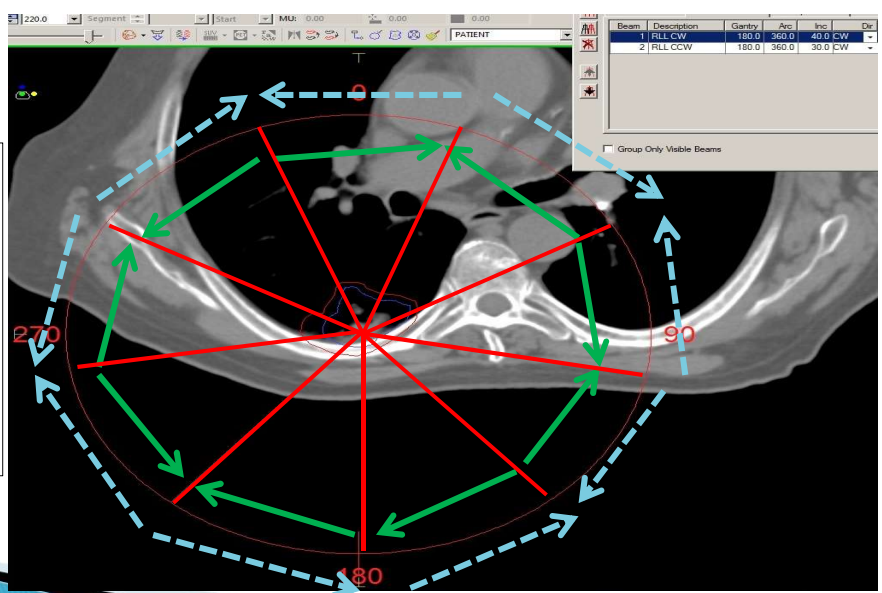
320° Arcs
 40° CCW
 Increment

For 2 Similar
 Beams
 an EVEN
 number
 of Arc
 Segs
 Is
Worse
 than an ODD
 number!



VMAT Beam Definition Tricks

An ODD number of Arc Segs Is **BETTER** because the MLCs move against each other on opposing-travel beams.



VMAT Beam Definition Tricks

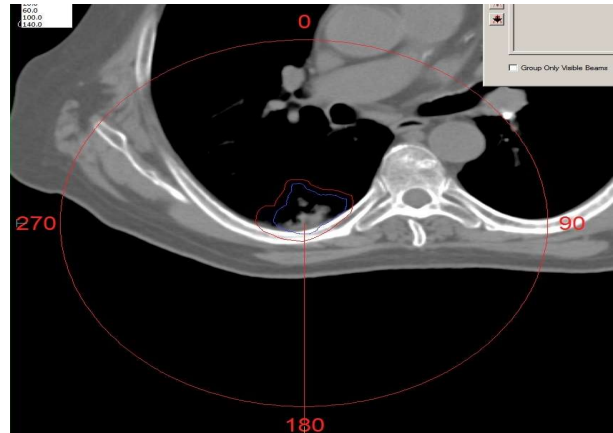
Beam Spreadsheet

General		Geometry		Setup Beams		Collimator	Couch	Field
Beam	Description	Gantry	Arc	Inc	Dir			
1	RLL CW	180.0	360.0	40.0	CW	355.0	0.0	[Auto]
2	RLL CCW	180.0	360.0	40.0	CCW	5.0	0.0	[Auto]

<click to add a new beam>

360° CW Arc
 40° Increment

- 180.0
- 180.0
- 220.0
- 260.0
- 300.0
- 340.0
- 20.0
- 60.0
- 100.0
- 140.0



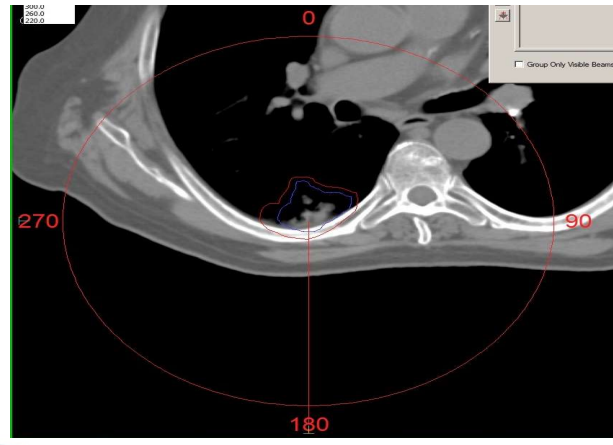
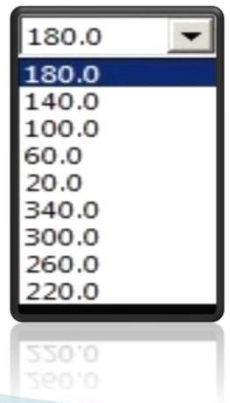
VMAT Beam Definition Tricks

Beam Spreadsheet

General		Geometry			Setup Beams				
Beam	Description	Gantry	Arc	Inc	Dir	Collimator	Couch	Field	
1	RLL CW	180.0	360.0	40.0	CW	-	355.0	0.0 [Auto]	
2	RLL CCW	180.0	360.0	40.0	CCW	-	5.0	0.0 [Auto]	

<click to add a new be

360° CCW Arc
 40°
 Increment
 The SAME end-
 points!



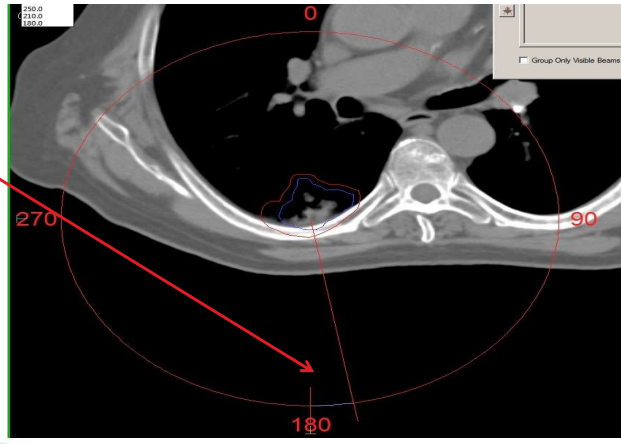
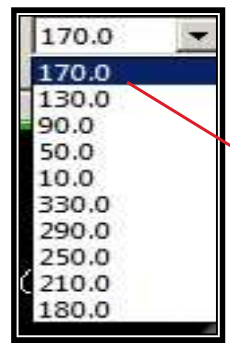
VMAT Beam Definition Tricks

Beam Spreadsheet

General		Geometry			Setup Beams				
Beam	Description	Gantry	Arc	Inc	Dir	Collimator	Couch	Field	
1	RLL CW	180.0	360.0	40.0	CW	-	355.0	0.0 [Auto]	
2	RLL CCW	180.0	350.0	40.0	CCW	-	5.0	0.0 [Auto]	

<click to add a new be

350° CCW Arc
 Start @ 170°
 40° Increment



VMAT Beam Definition Tricks

Beam Spreadsheet:

General		Geometry		Setup Beams				
Beam	Description	Gantry	Arc	Inc	Dir	Collimator	Couch	Field
1	RLL CW	180.0	360.0	40.0	CW	355.0	0.0	[Auto]
2	RLL CCW	180.0	350.0	40.0	CCW	5.0	0.0	[Auto]

<click to add a new be

360° CW Arc
 Start @ 180°
 40° Increment

350° CCW Arc
 Start @ 170°
 40° Increment

Note that the Arc
 Segments NEVER end
 at the same angle
 between beams.

180.0
180.0
220.0
260.0
300.0
340.0
20.0
60.0
100.0
140.0

170.0
170.0
130.0
90.0
50.0
10.0
330.0
290.0
250.0
210.0
180.0

VMAT Beam Definition Tricks

360° CW Arc
 Start @ 180°
 40° Increment

350° CCW Arc
 Start @ 170°
 40° Increment

Beam Spreadsheet:

General		Geometry		Setup Beams				
Beam	Description	Gantry	Arc	Inc	Dir	Collimator	Couch	Field
1	RLL CW	180.0	360.0	40.0	CW	355.0	0.0	[Auto]
2	RLL CCW	180.0	350.0	40.0	CCW	5.0	0.0	[Auto]

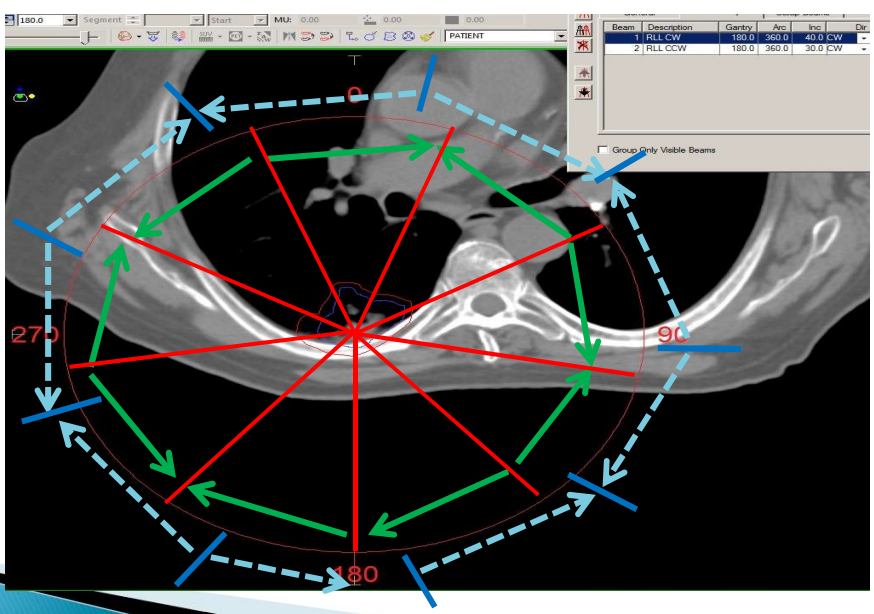
<click to add a new be

VMAT Beam Definition Tricks

360° CW Arc
Start @ 180°
40° Increment

350° CCW Arc
Start @ 170°
40° Increment

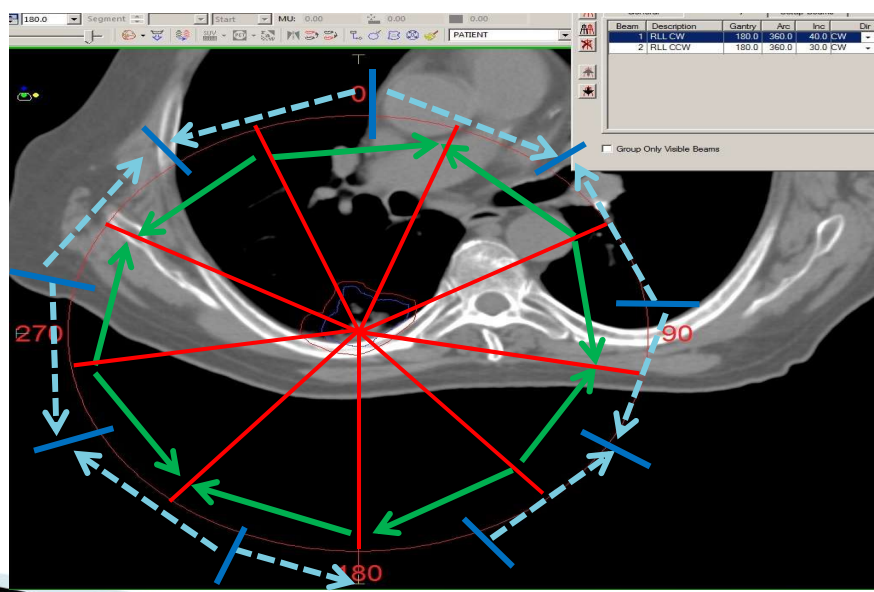
HOWEVER...
Monaco currently
has an issue with
this second beam.



VMAT Beam Definition Tricks

Therefore, for the
second beam, use a
start angle of 160°
and a 340° arc.

This beam layout has
all the benefits of
opposing MLC travel
COMBINED
with offsetting areas
of MLC narrowing.



Why VMAT?

- VMAT is *fast*.
- VMAT can cover more targets with fewer MU's. (See above)
- VMAT uses fewer beams and almost always plans and QA's better, especially when using Monaco. (See above!)
- Everyone who owns a license needs to be using it!

VersaHD Beam Delivery

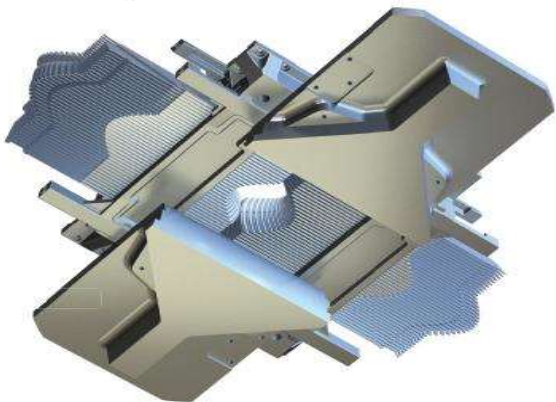
How do you get all that dose in?

For our clinic, IMRT means VMAT
and SBRT means FFF VMAT.

Fast modulation is the key here.

VersaHD gives you FFF,
But it comes standard with...

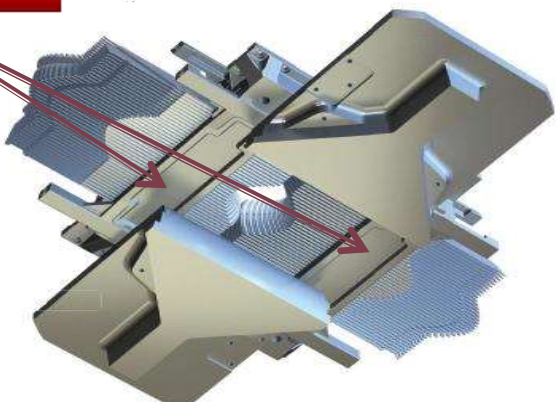
Elekta
Agility



Speed

Dynamic Leaf Guides

Elekta
Agility



+ Bonuses

3cm/s Leaf
Speed

+

3.5cm/s DLG
Speed

=

6.5cm/s
(0.145401 mph)

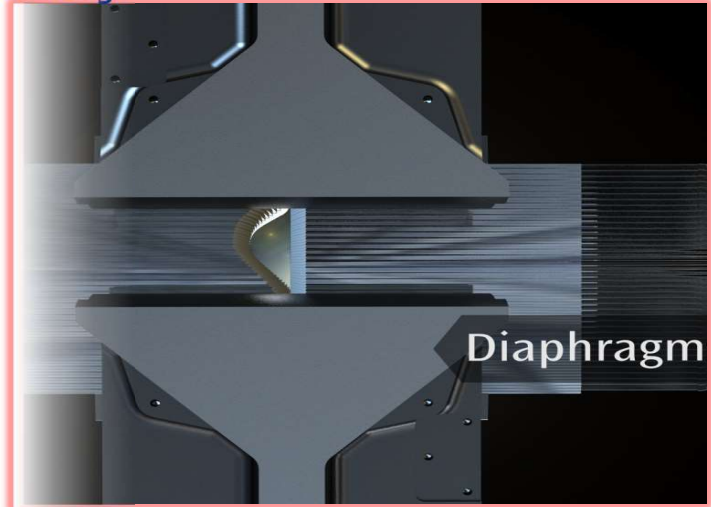
Low Transmission

Intelligent leaf positioning and design

Leaf speed 6.5 cm/s

Very Low Transmission
Less than 0.5%

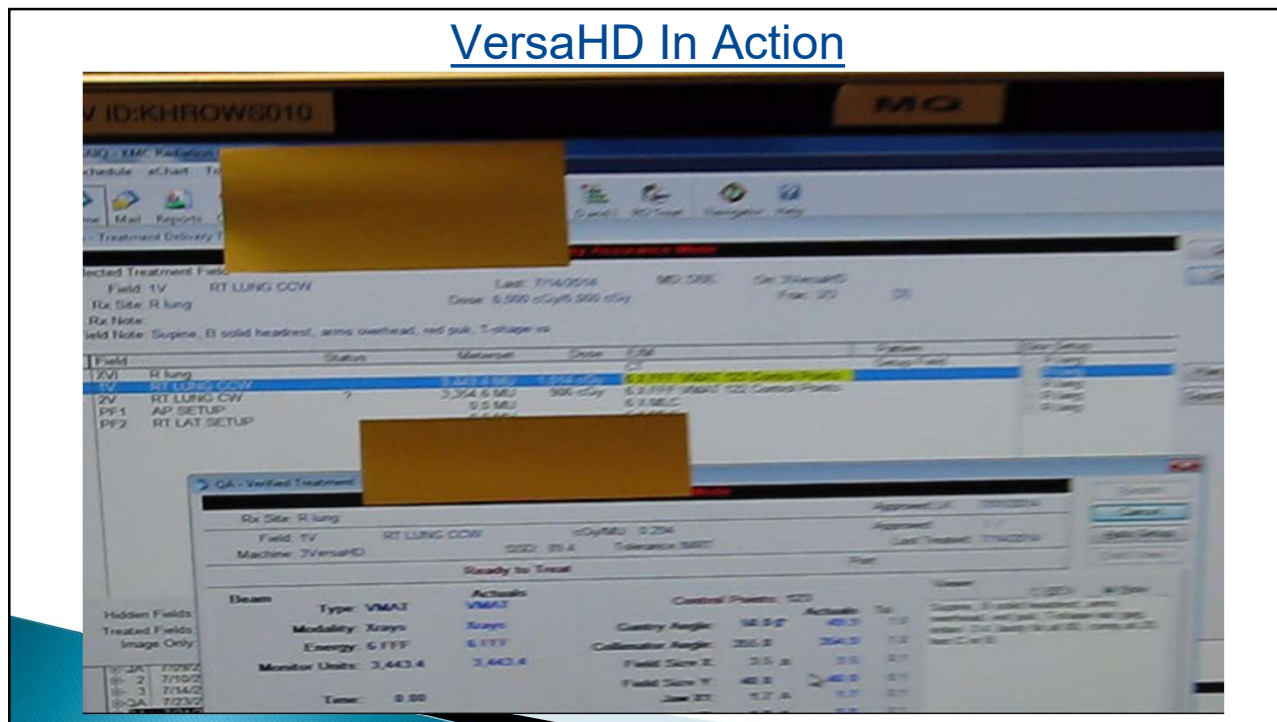
Sculpted Diaphragms
9cm/s



VersaHD In Action

So...Do you want to see what you are playing for?

VersaHD In Action



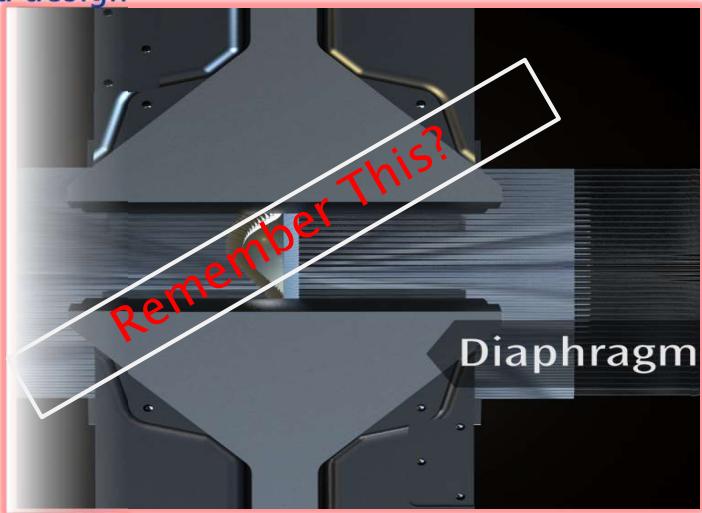
Low Transmission

Intelligent leaf positioning and design

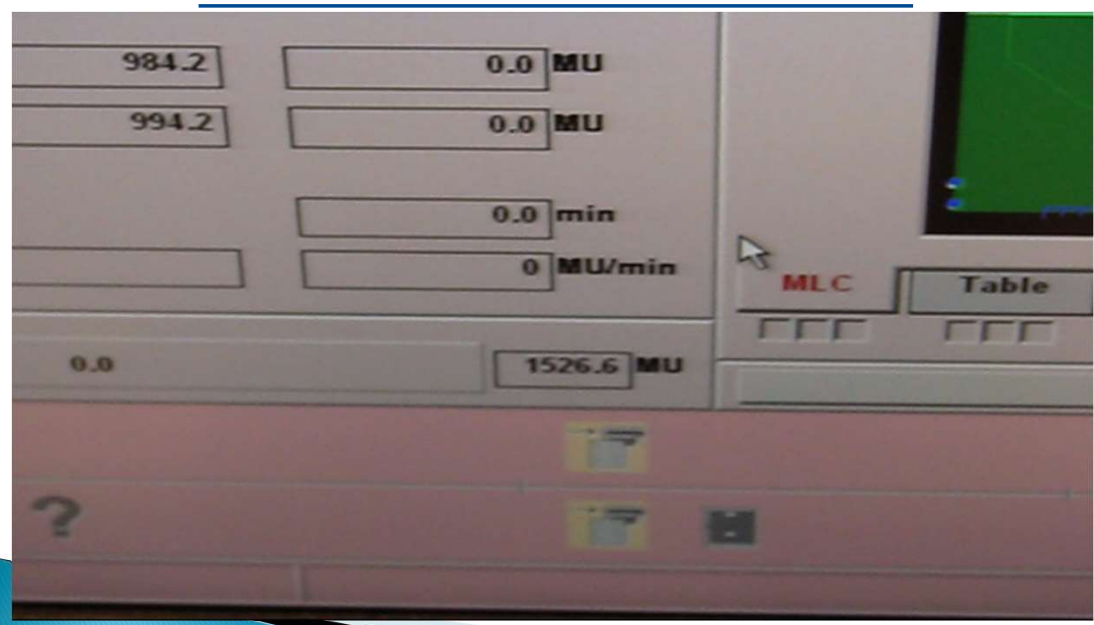
Leaf speed 6.5 cm/s

Very Low Transmission
Less than 0.5%

Sculpted Diaphragms
9cm/s



VersaHD FFF VMAT - More Info

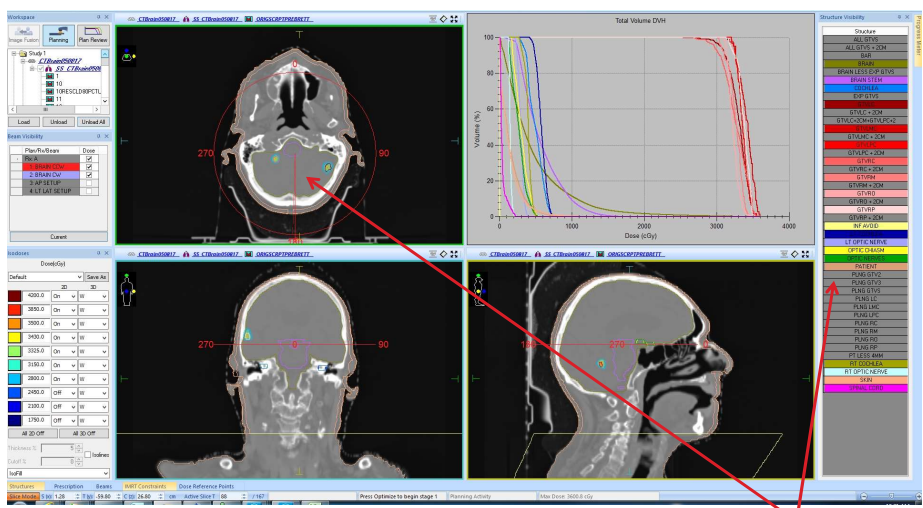


VersaHD In Action

The first 1000 MU's were delivered in about 31 seconds.

This is what you can do with it...

VersaHD SRT Brain

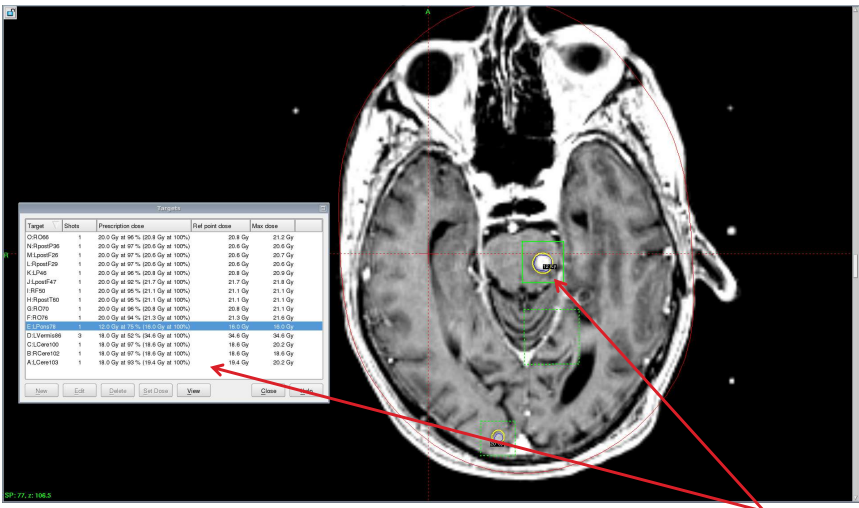


7 Lesion SRT Brain, 1 Isocenter, 2 VMAT arcs, 6FFF
3500cGy in 5Fxs of 700cGy

VersaHD SRT Brain

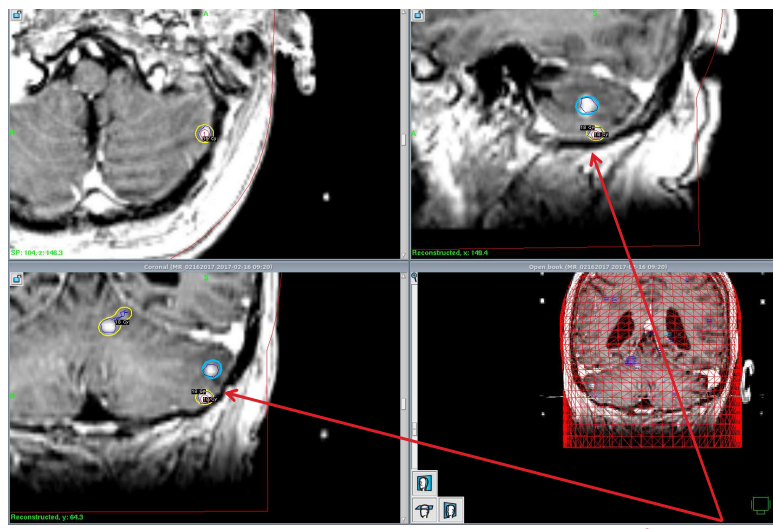


VersaHD SRT Brain



Previous GK in February 2017
 15 lesions treated

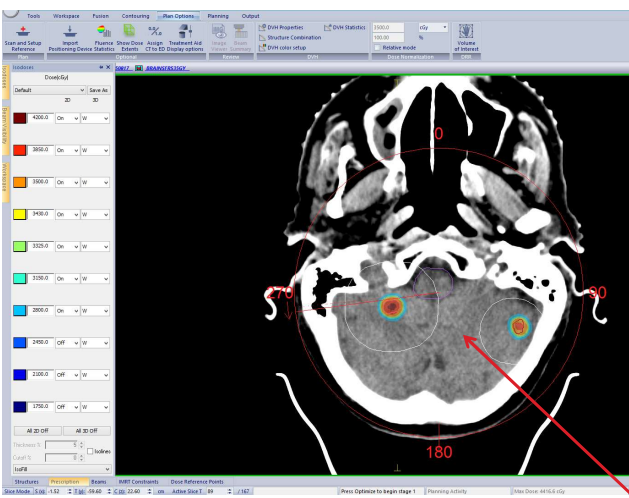
VersaHD SRT Brain



1st GK in October 2016

Many lesions close to the current ones

VersaHD SRT Brain



Patient disgruntled with surgeon, did not want GK
 Monaco VMAT FFF used

VersaHD SRT Brain

Structure	Cost Function	Enabled	Status	Manual	Weight	Reference Dose (cGy)	Multicriterial	Isoconstraint	Isoeffect	Relative Impact
GTVL	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVR	Maximum Dose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	78.43			3500.0	0.0	
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	68.85	1475.0	<input type="checkbox"/>		45.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	334.36	1475.0	<input type="checkbox"/>		45.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	3.71	1475.0	<input type="checkbox"/>		50.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.40	1475.0	<input type="checkbox"/>		45.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	17.44	1475.0	<input type="checkbox"/>		45.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	13.73	1475.0	<input type="checkbox"/>		45.0	0.0
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	0.01			3500.0	0.0	
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>						
	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>						

Target Penalty

Required Parameters

Prescription (cGy):

Minimum Volume (%):

Optional Physical Parameters

Surface Margin:

Optimize over all voxels in volume:

OK Cancel

1 Target Penalty per lesion
 Set to cover at better than the 80% Isoline

VersaHD SRT Brain

Structure	Cost Function	Enabled	Status	Manual	Weight	Reference Dose (cGy)	Multibriterial	Isoconstraint	Isoeffect	Relative Impact
GTVLC	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVLPC	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVRC	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVRM	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVRP	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVLMC	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVRO	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
PLNG GTV3	Target Penalty	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.00			2850.0	0.0	
GTVLC+2CM+GTVLPC+2	Maximum Dose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	78.43	1475.0	<input type="checkbox"/>	3500.0	0.0	
GTVLMC + 2CM	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	334.36	1475.0	<input type="checkbox"/>	45.0	0.0	
GTVRC + 2CM	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	3.71	1475.0	<input type="checkbox"/>	50.0	0.0	
GTVRM + 2CM	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	1.40	1475.0	<input type="checkbox"/>	45.0	0.0	
GTVRO + 2CM	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	17.44	1475.0	<input type="checkbox"/>	45.0	0.0	
GTVRP + 2CM	Quadratic Overdose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	13.73	1475.0	<input type="checkbox"/>	45.0	0.0	
PATIENT	Maximum Dose	<input checked="" type="checkbox"/>	On	<input type="checkbox"/>	0.01			3500.0	0.0	

Quadratic Overdose

Required Parameters

Maximum Dose (cGy):

RMS Dose Excess (cGy):

Optional Physical Parameters

Shrink Margin (cm):

Optimize over all voxels in volume:

Multibriterial:

OK Cancel

1 Quadratic Overdose per 2cm margin
 Set to a 2.5mm shrink margin (No Dose Rings!)

VersaHD SRT Brain

Beam: 4: LT LAT SETUP
 Gantry: 90.0
 Segment: 1
 Calculation: Static
 Fluence: 0.00
 MU: 0.00

Grid Type: CF Occupa
 Volume Cursor: Structure 12 GTVRC
 Units: 1.00
 Grid Volume: 100.00

Cost Function Occupancy
 Use CFO to see why your plan might be failing.

VersaHD SRT Brain

The screenshot shows the 'Prescription' window in the VersaHD SRT Brain software. It includes fields for Rx ID, Rx Site, Plan Isocenter, and coordinates (X, Y, Z). The Rx Dose is set to 3500.0 cGy, and the Number of Fractions is 5. The Fractional Dose is 700.0 cGy. The Actual Dose is 413.6 cGy. The Rescale section shows a dose of 3500.0 cGy to relative isoline, with a percentage of 80% and a note that the dose is rescaled by a ratio of 1.250. The Weight beams by section has 'Dose' selected. The table below shows two beams:

Beam	Description	Field ID	%	Lock	MU / Fx
1	BRAIN CCW	1V	64.38	<input type="checkbox"/>	1698.50
2	BRAIN CW	2V	35.62	<input type="checkbox"/>	1587.15

Total MU / Fx: 3285.65

Treated 3500cGy to the 80% Isoline
<3300 MU's !!!

VersaHD SRT Brain

Gamma Knife is the best tool on the planet for brain.
However, if a Gamma Knife is not available, a good treatment
planning and delivery system such as Monaco and Versa HD
can do amazing things.

<3,300 MU's for 7 lesions x 700cGy

We only needed 2 arcs for 7 lesions,
and each of those arcs was delivered in under 2 minutes!

VersaHD SRT Brain

This plan came together because I “phoned a friend”.

I told Brett Sloman from Elekta what we were trying to do. He immediately had a solution and we generated a template that took 27 constraints that were failing and condensed them to 15 simple ones that worked.

FFF, VMAT and SBRT...

We all go home to someone...

Patients want to go home to be with their families.

But we do, too!
Radiation Oncology is often a long, mentally
challenging day.

FFF, VMAT and SBRT...

This is who I go home to...



FFF, VMAT and SBRT...

New technology helps us all...

Better, quicker treatment helps the patients most of all.

But don't forget that better, quicker treatment helps all of us in the clinic get home, too.

VersaHD Symmetry 4-D XVI

So what about imaging on the linac? Is there something *New* or *Different* or *Better* to use that might help us do some of the things we always say we want to do...

Things like being able to draw a smaller PTV.

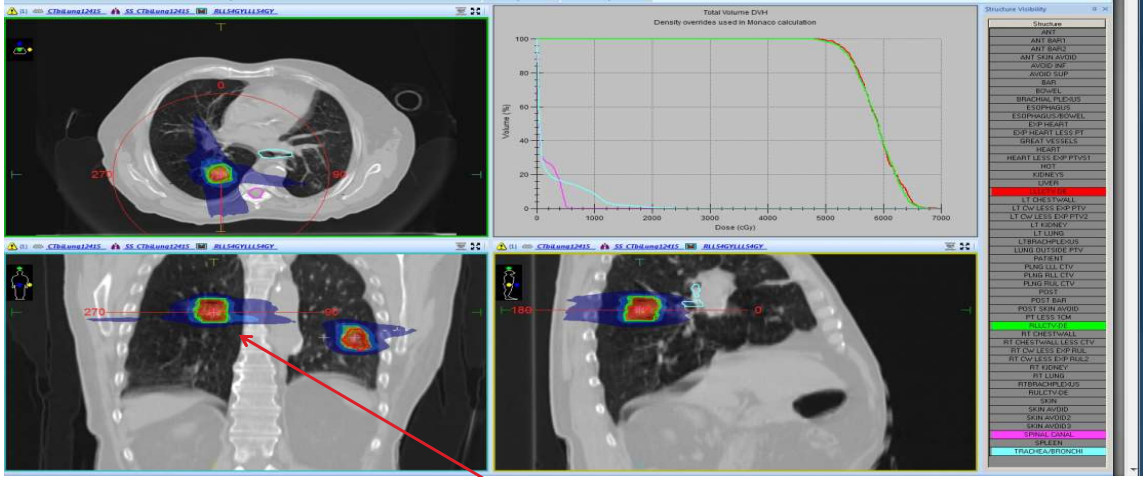
(NOT just because a smaller PTV makes our constraints easier to achieve!).

VersaHD Symmetry 4-D XVI

Elekta users have the ability to perform 4-D conebeam CT on the linac.

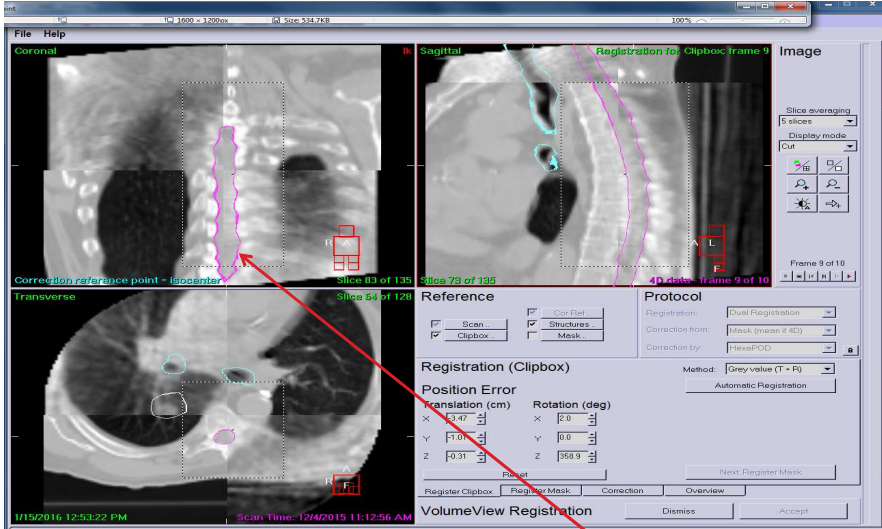
The 4-D scan on XVI is known as Symmetry and we think it is absolutely game-changing.

VersaHD Symmetry 4-D XVI



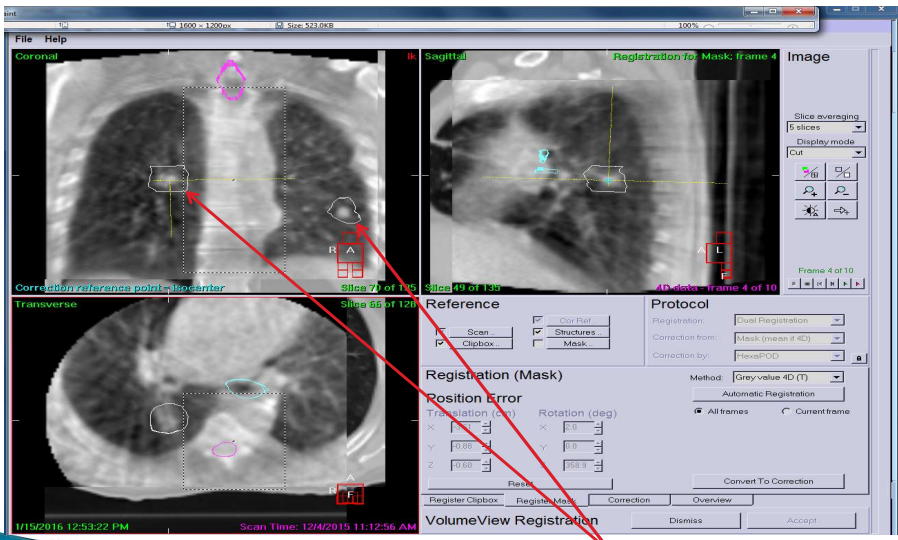
2 Area Bilateral Lung SBRT
1 isocenter, placed in Rt Target

VersaHD Symmetry 4-D XVI



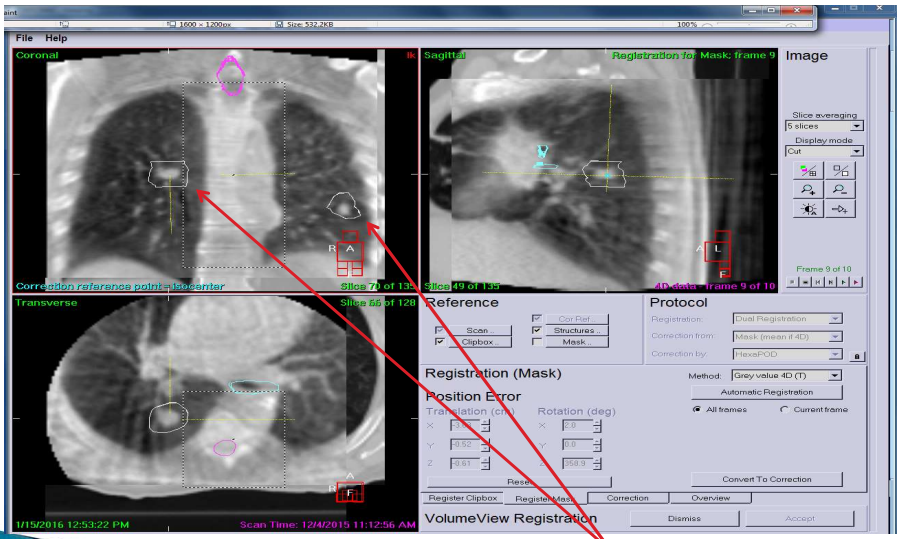
Step 1: Align Clip Box (T+R)

VersaHD Symmetry 4-D XVI



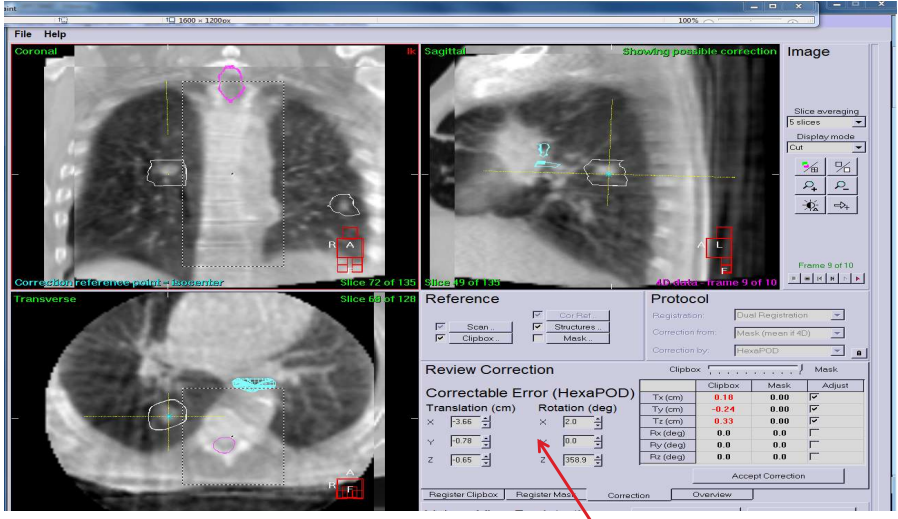
Step 2: Align Targets automatically in all 10 Phases (T)

VersaHD Symmetry 4-D XVI



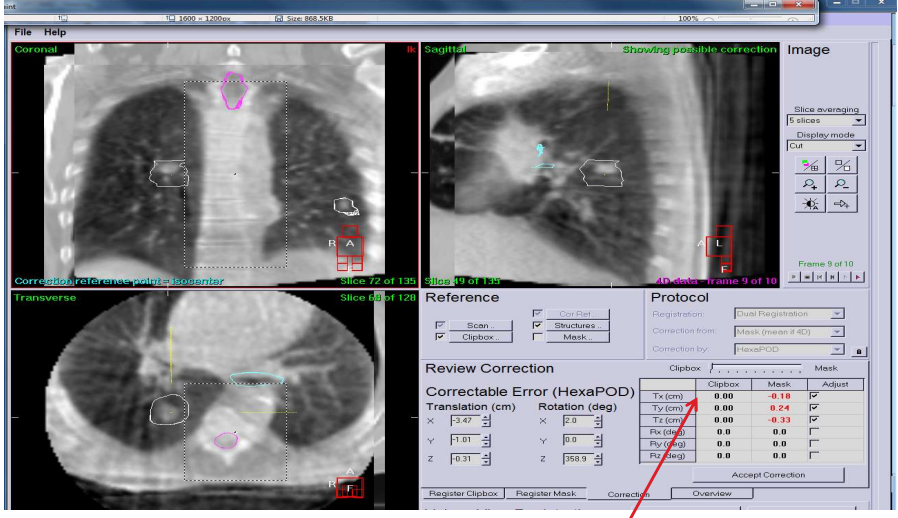
Step 2: A different breathing phase.

VersaHD Symmetry 4-D XVI



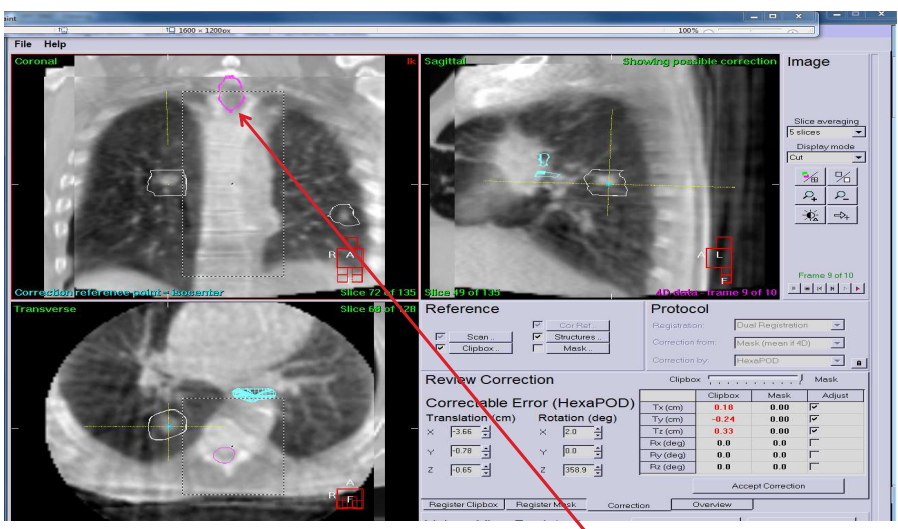
Step 3: Verify Corrections.

VersaHD Symmetry 4-D XVI



Step 3: Can adjust to Critical Structures.

VersaHD Symmetry 4-D XVI



Step 3 Again: Correction 100% for Targets.

VersaHD Symmetry 4-D XVI

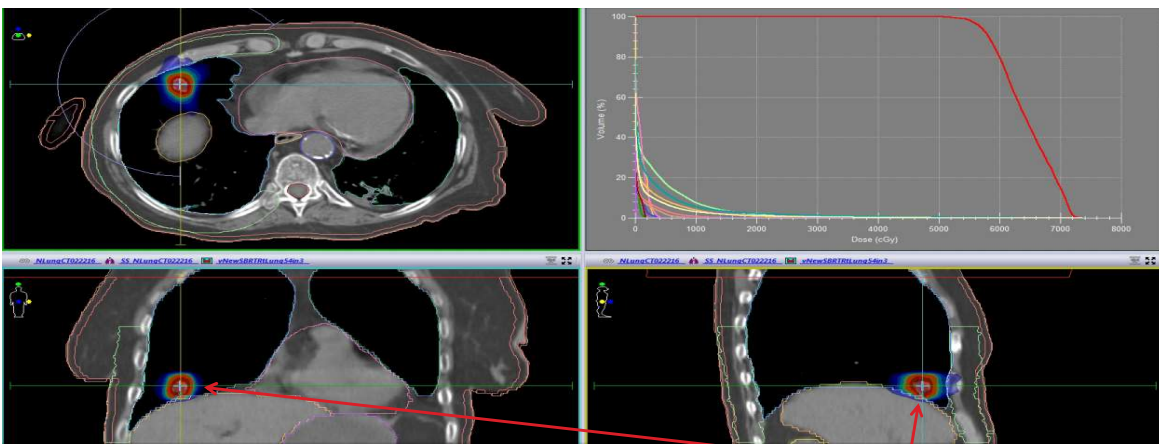


VersaHD Symmetry 4-D XVI



Superior Targets Can Still Use Symmetry

VersaHD Symmetry 4-D XVI



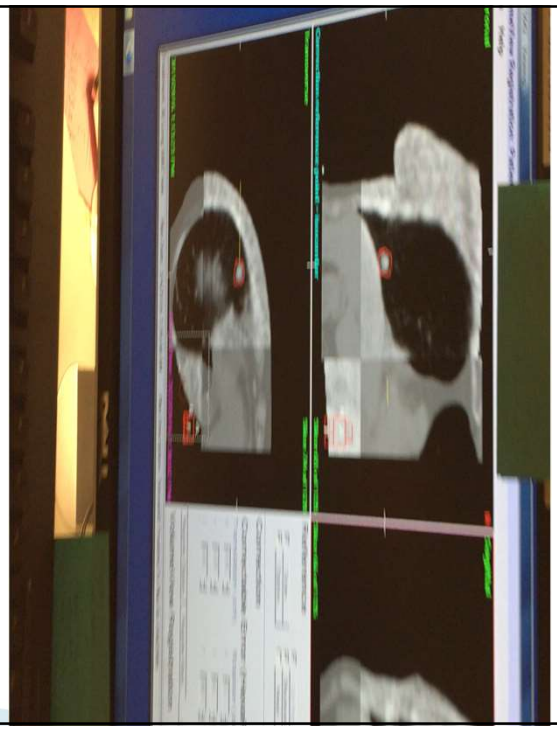
SBRT Lung Near the Diaphragm

5400cGy in 3Fxs of 1800cGy

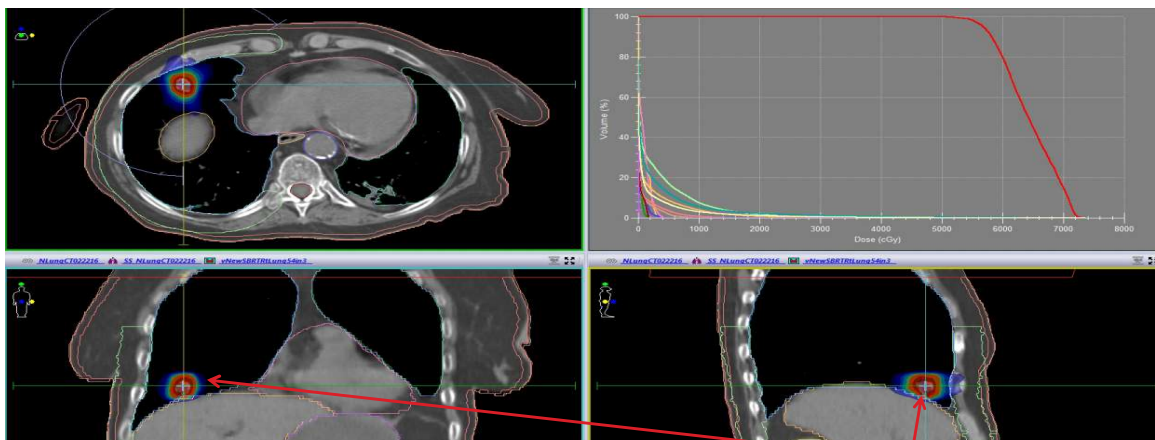
Symmetry
In Action



Symmetry
In Action



VersaHD Symmetry 4-D XVI



Symmetry allows clinicians to confidently draw and treat their moving targets.

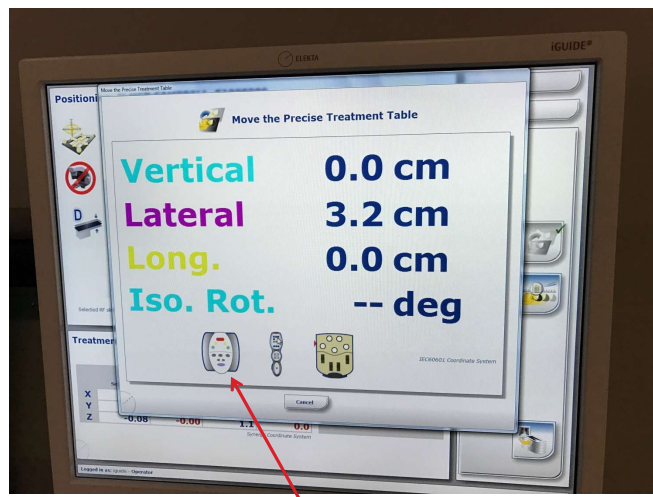
VersaHD Symmetry 4-D XVI

Except for spine, we use Symmetry on every SBRT (and some initial IMRT scans) between the bottom of the neck and the top of the pelvis.

With –or even without– an initial 4-D simulation, Symmetry allows the Oncologist to truly have the confidence that a smaller PTV is justified.

A 6-DOF table like Hexapod (and XVI 5.0) only makes it better.

New iGuide for Hexapod



New iGuide is Wonderful!

The RTTs love being able to move the table from outside the room.

Why So Much SBRT?

Your clinic, doctor and administration
will be *Happy*

- **Let's consider some SEER data...**
 - SEER: Surveillance, Epidemiology and End Results
 - SEER.Cancer.gov

- This is real "Back of the envelope" type stuff

Why So Much SBRT?

- **From SEER data...**
 - Estimated 224,210 New cases of **LUNG** cancer, 2015
 - “Localized” (Stage 1) are 15% of cases
- **Quick math = 33,631.5 (33,632 ☺)**
 - ALL are potentially *SBRT-able*
 - Yes...Surgery gets some of those. (Boooo ☹)
- **Those 33,632 cases are *New Cases***
Just for Lung
Just for Stage 1
Just for 2015

Why So Much SBRT?

- **In addition...**
- **Add in all the other *SBRT-able* lesions**
 - Lung mets
 - Liver, Pelvis, Pancreas, H&N.....
- **Then, after SBRT, patients live longer**
(and better, too)
 - They may develop brain mets
 - The brain mets can be treated (Longer, better lives with Gamma Knife)
 - More SBRT and the cycle continues.....

Some Opinions That I Have...

PLEASE consider having you, the Dosimetry staff,
plan your SBRT's.

Why would someone take their highest dose,
largest "constraint-delta" plans out of the hands
of their best planners?

Plus, it will make you *better*.

Don't just consider it. *DO IT*.
Dosimetrists do this for a living!

Some Opinions That I Have...

Clinicians are a hard bunch to please.

Just selling to us isn't the end of the process,
and I believe there are many times that we not only want
but *NEED* to speak with a "Clinical Equal".

We are trying to do what is best for our patients and
our clinics. To do that, we need information,
and the interaction we have with peers is critical.

Some Opinions That I Have...

I suppose that interaction with others is the key to almost everything we do, and what we do is sometimes *hard*.

I've spent almost 22 years at Kettering and more time before that in school, and I still wake up every morning with so much to learn!

I can't possibly expect that every person, sales or otherwise, I come in contact with would know everything I need to know.

Some Opinions That I Have...

But *someone* knows at least one answer.
And someone else knows another...

I am very lucky.
My cell phone address book is full of Elekta people.
I count so many of them not just as acquaintances
but as friends.

Find someone to help you!

Some Opinions That I Have...

So you see the problem...
Out in the clinic, we are supposed to know *EVERYTHING*.

Switching to something new or trying a better,
more advanced way to treat patients means we may not
know all the answers.

There is always resistance to change.
The availability of training and peer-to-peer answers
to questions makes it easier.

Some Opinions That I Have...

So what's to be done?

Since everyone out there needs someone to call to ask
important questions of,
have someone available to answer them.

There is so much resistance to change.
The availability of training and peer-to-peer answers
to questions makes it easier.

Some Opinions That I Have...

Some of you may be newer to Dosimetry.
Some of you may be newer to SBRT.

Ask questions of your technical people.
Elekta, Varian and every other RT company out there
has some amazing scientists...Use them!

By all means, please don't hesitate to ask me
(and my peers) questions.
Being a part of medicine means we help others.

Some Opinions That I Have...

I *enjoy* working with Elekta.
It's easy.
It's collegial.

I believe it is about the culture of your company.
You seem to want to work *with* people and really help us
treat patients.

Some Opinions That I Have...

My colleagues around the country have told me it is
different when buying from Varian.
I believe them.

I once heard
“ You buy a Varian, but you *join* Elekta”.

I personally think that’s really an important distinction.

A Final Word...

In order to perform high-quality radiotherapy, which is
the *ONLY* type anyone should do,
one needs the right tools and training.

I’ve shown you what we do, and how we use Monaco’s
planning tools, as well as Mosaic and Versa HD’s imaging and
treatment tools. (It’s all we have!)

However, planning and treating high-end radiotherapy
is not necessarily about the vendor chosen.
You have to *fully* utilize your systems.

A Final Word...

Sometimes, all the tools seem expensive
and difficult to learn.

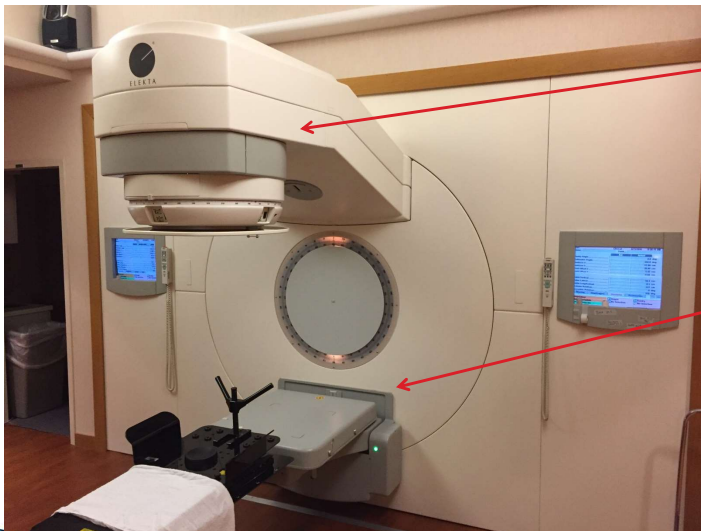
I would like to tell you they are not.

In the truly expensive world of health care that we all
live in, the cost is really quite small, an amazing value
and critical to the best care!

Get the tools and the training.

When the time is right (NOW), *Do It!*
Everyone in the clinic will benefit.

A Final Word...

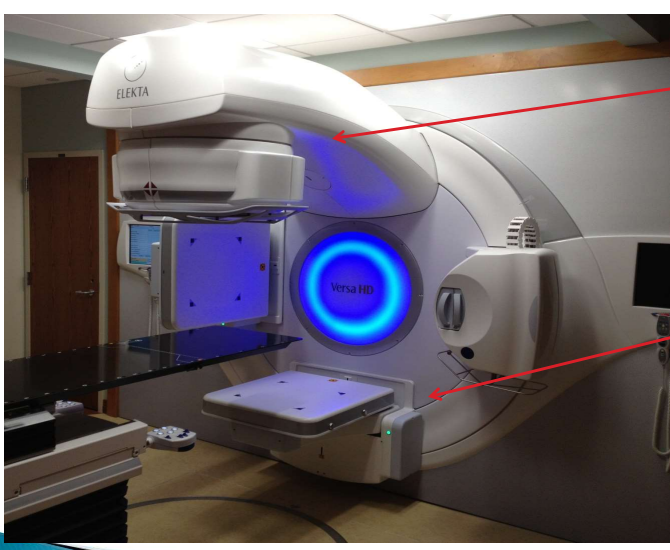


Our 23-year-old SL25
Serial number 5195 !!!

Has had many
upgrades since it was
installed.

“Treats Cancer”

A Final Word...



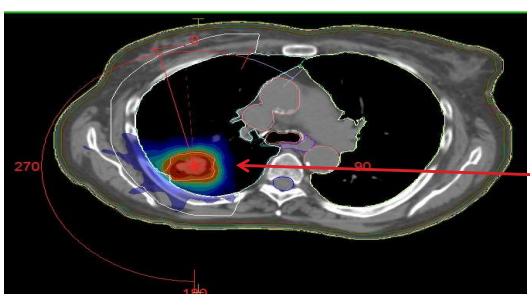
Our first VersaHD
The first in North America!

Has every imaging and treatment tool available.

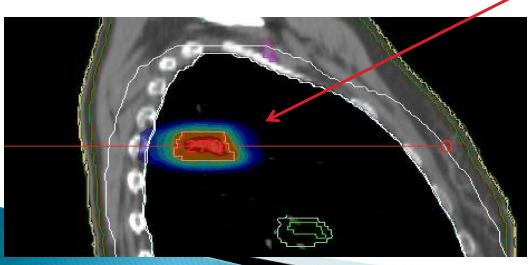
"Treats Cancer"

Which one do you want?

A Final Word...

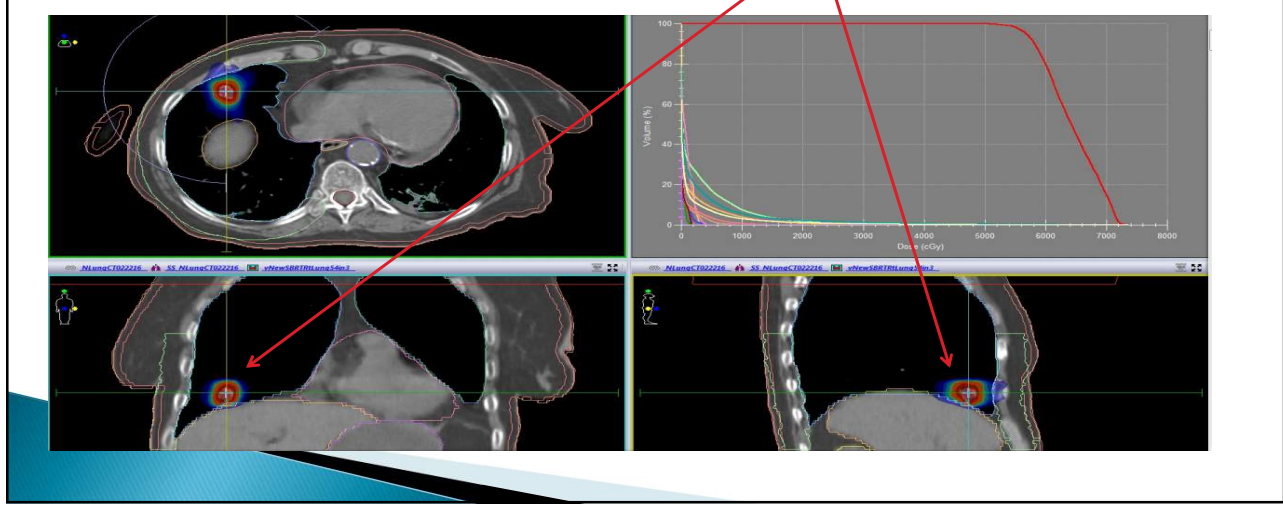


If you want to treat this...



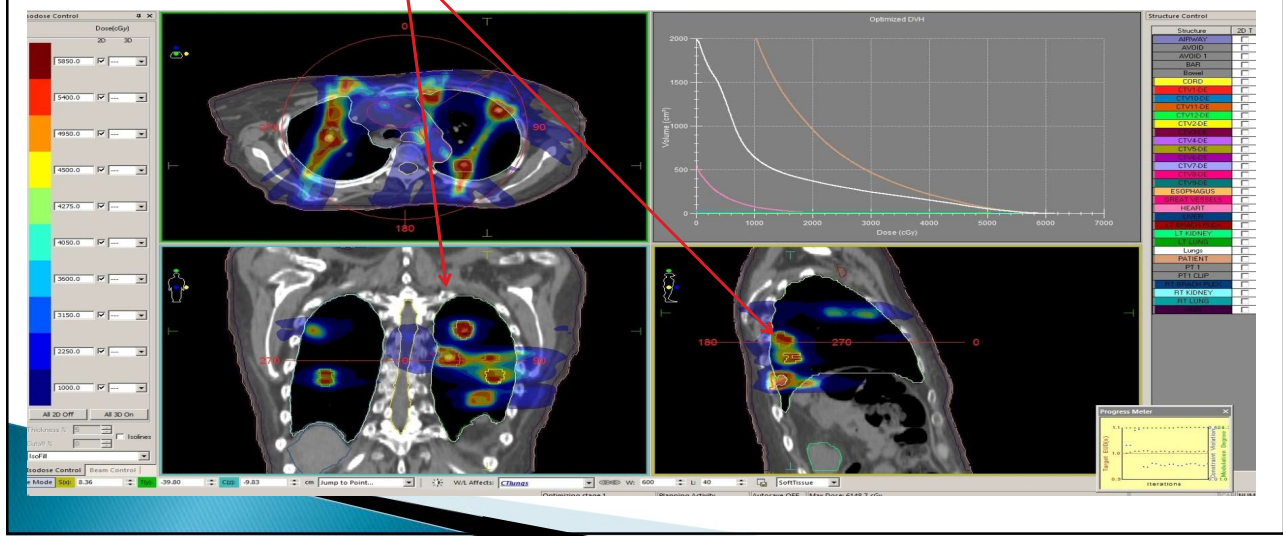
A Final Word...

Or do 4-D CBCT on this...

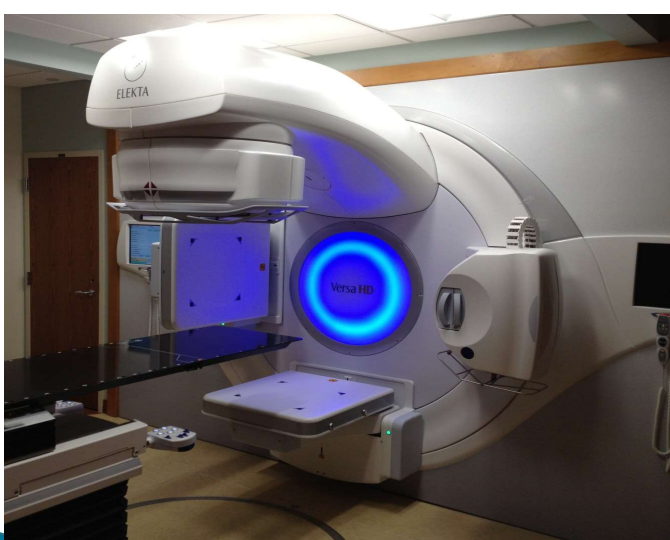


A Final Word...

Or treat all of these in one isocenter with FFF VMAT SBRT...



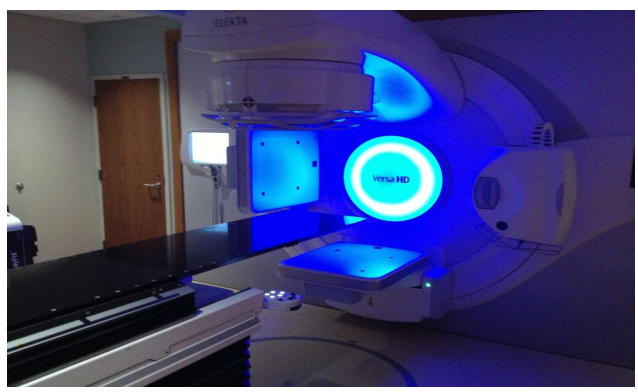
A Final Word...



**You need the
right tools to
do it!
Including
Treatment
And
Planning**

**Now go out
and use them!**

New VersaHD Vault at KCC



The End!



Questions,
Comments or
Complaints?

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