"RADIOTERAPIA HIGH TECH" Cosa c'è di nuovo?
Napoli 8-9 giugno 2009

IX Corso Partenopeo di Radioterapia
Associazione Italiana di Radioterapia Oncologica

L'elaborazione del treatment planning nella Tomoterapia

Imad Abu Rumeileh, MD

CRO AVIANO ISTITUTO NAZIONALE TUMORI

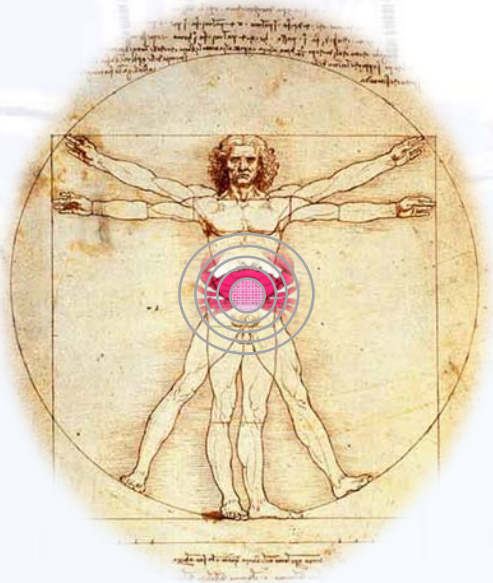
Annalisa Drigo, MPh

Don't miss the tumor ….

…. In general, most tumors are radioresistent if they are not included in the prescribed dose.

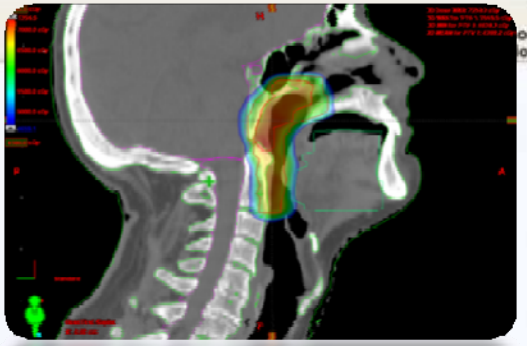
Yang: Fear of Missing the Target
Yin: Fear of causing toxicity

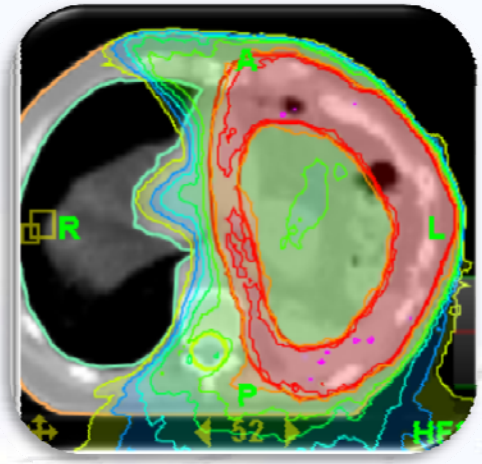
Be aware when things are out of balance

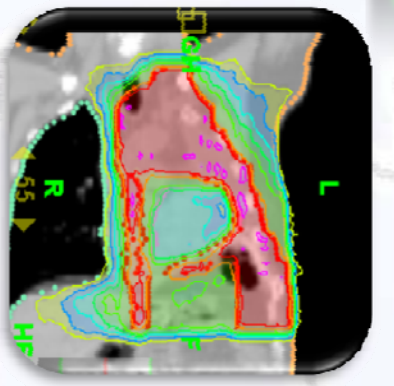


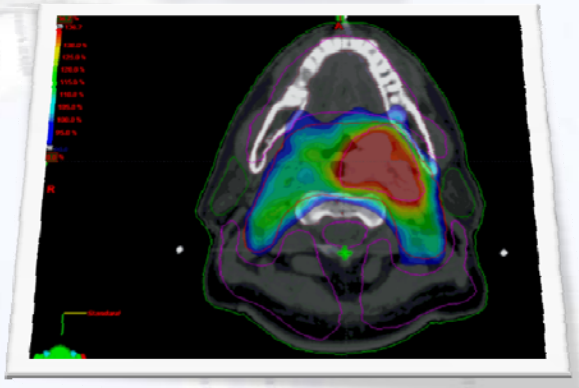
"Paint the dose"

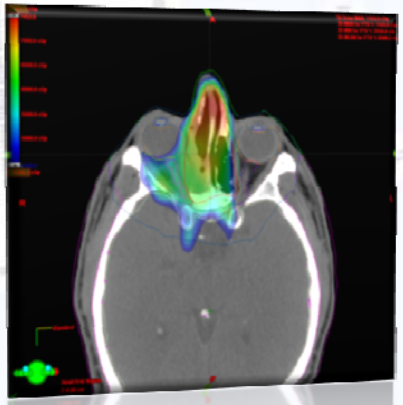
Intensity Modulated Radioherapy: IMRT

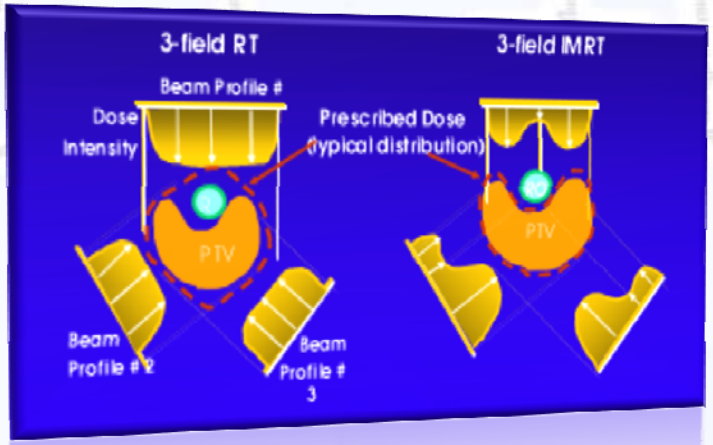


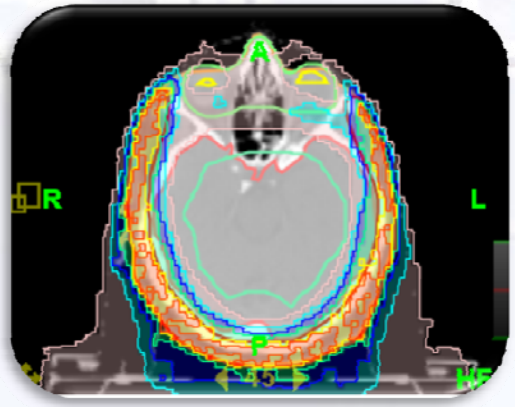








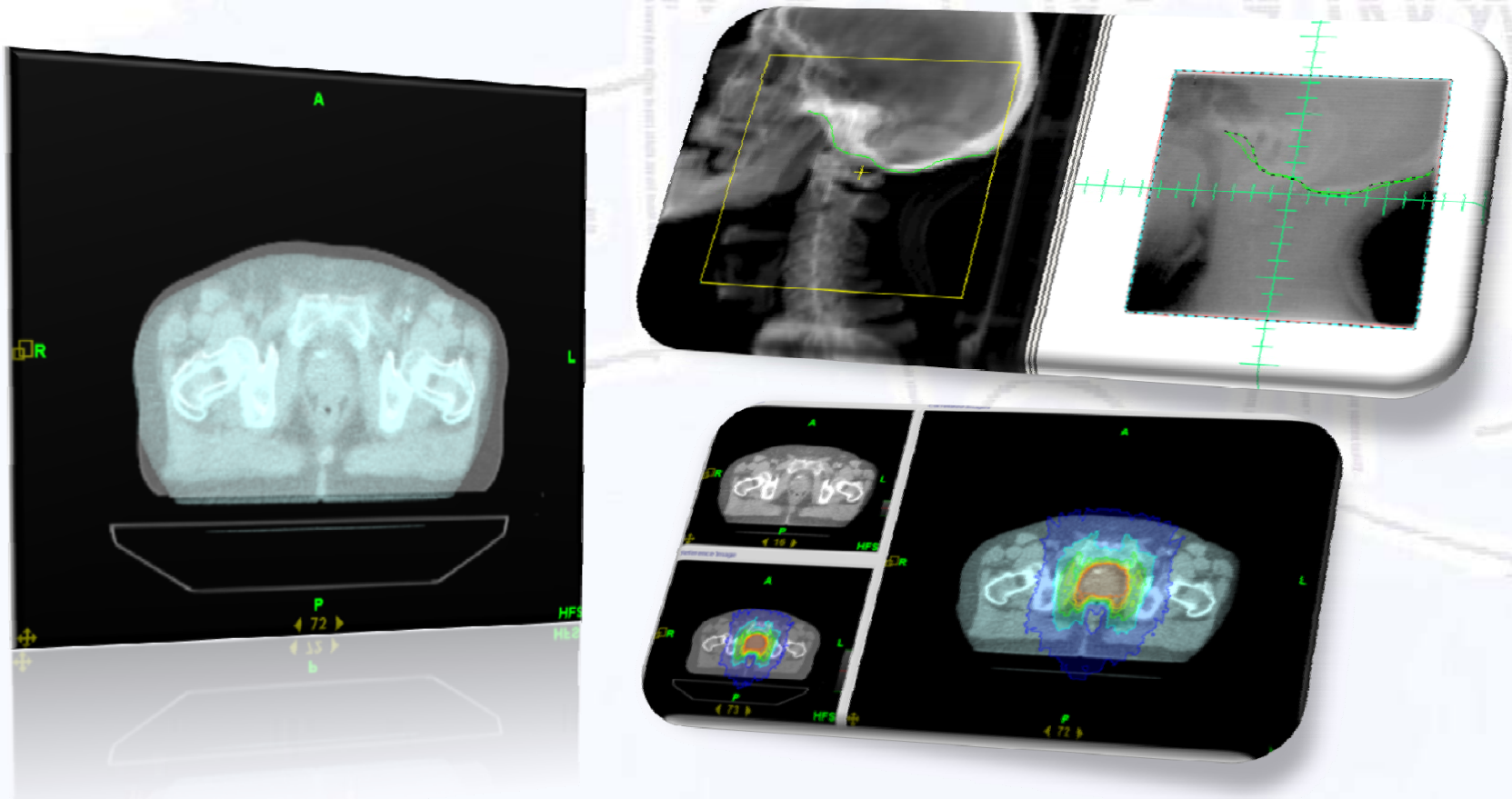




IMRT is mainly "dose control" on surrounded tissues

IGRT

In radiotherapy the overall treatment is only as good as the ability to know where the target is during the treatment



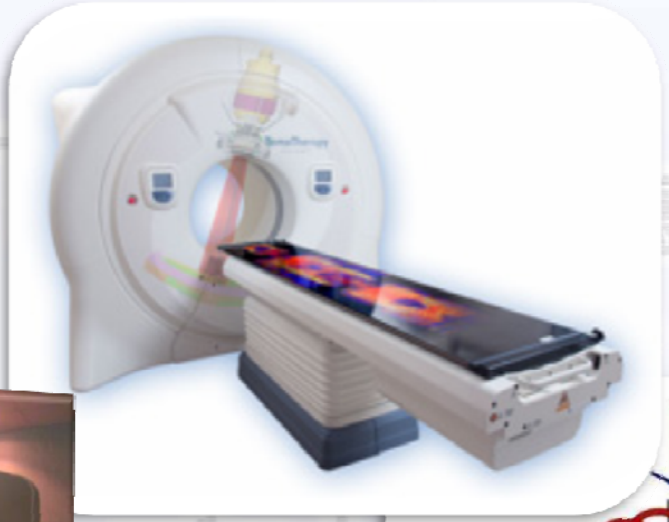
Designed for IGRT & IMRT: Integration!

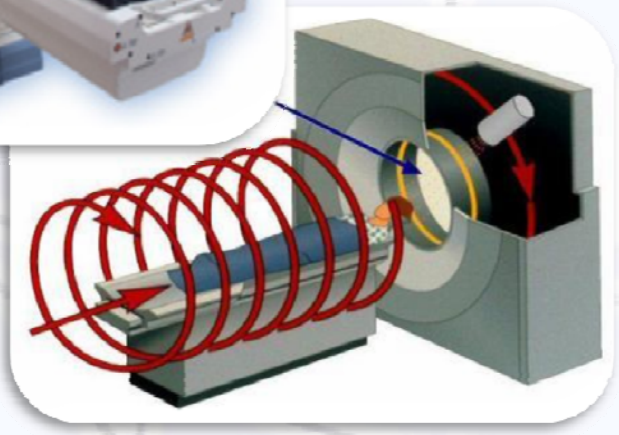
IGRT is not IMRT

IGRT = Net producer of information

IMRT = Net consumer of information

Jaffray: ASTRO IGRT 2007





IX Corso Partenopeo di Radioterapia
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Indications:

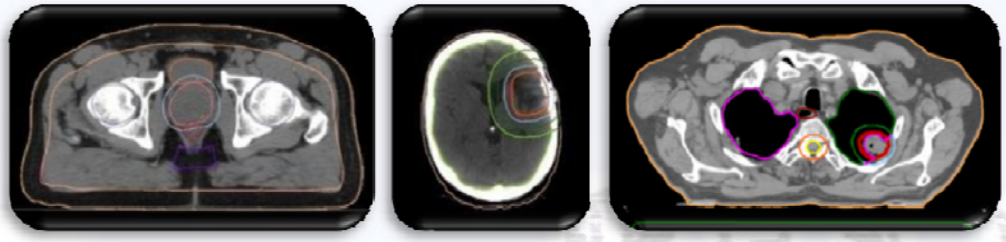
- Complex / Large Volumes
(Scalp Angiosarcoma, Mesothelioma, CSI)

- IGRT
(Lung, H&N, Prostate, ….)

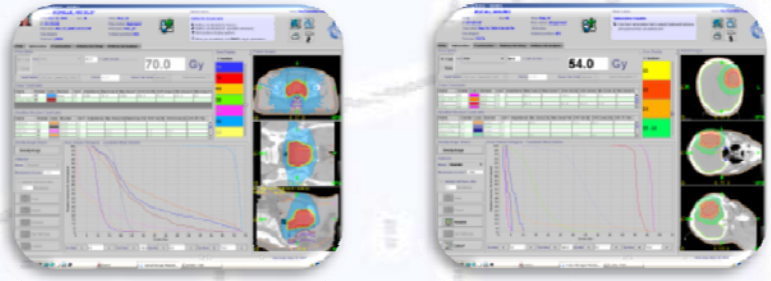
- Special Cases or Volume close to critical areas
(Para-vertebral Met, Multiple Mts, Pediatrics, ……)

WORKFLOW

PET / CT / MR Co-Registration

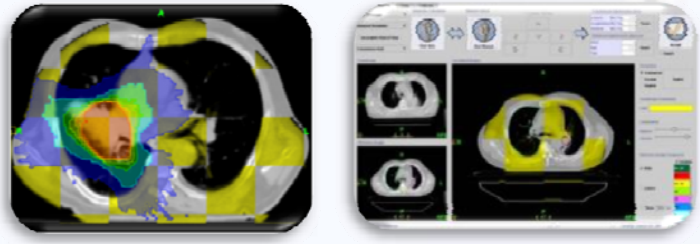


Contouring VOIs and OARs



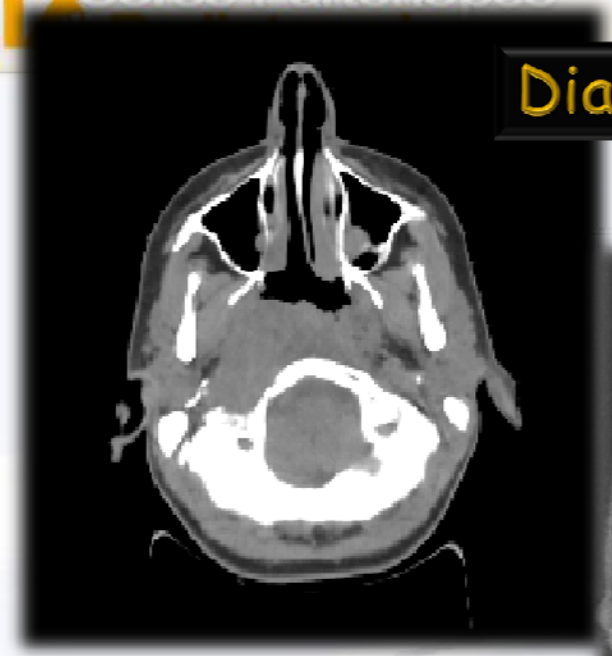
Planning

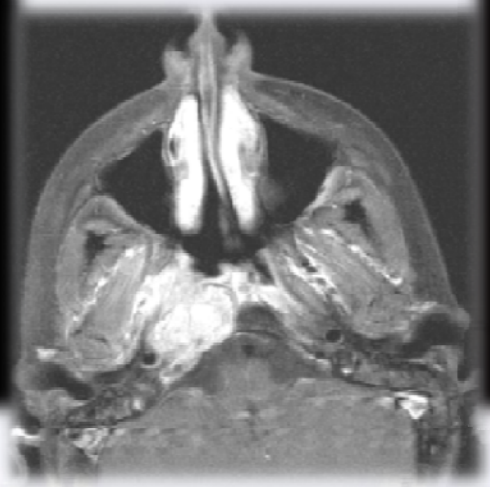
Dosimetry and QA Verification

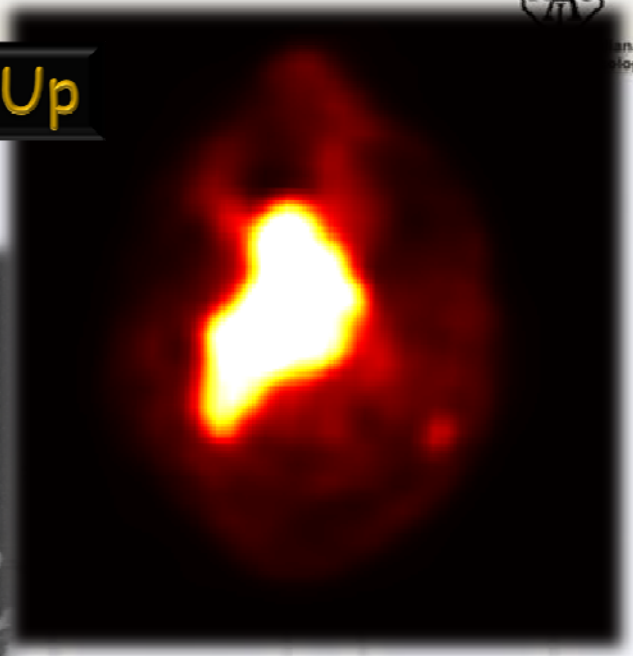


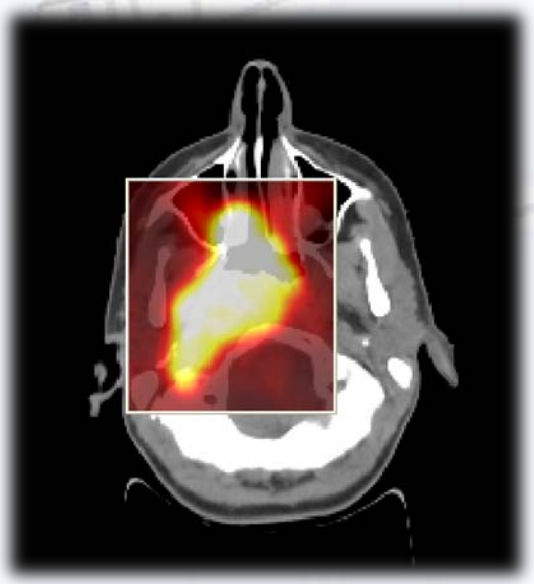
Daily MVCT and Treatment

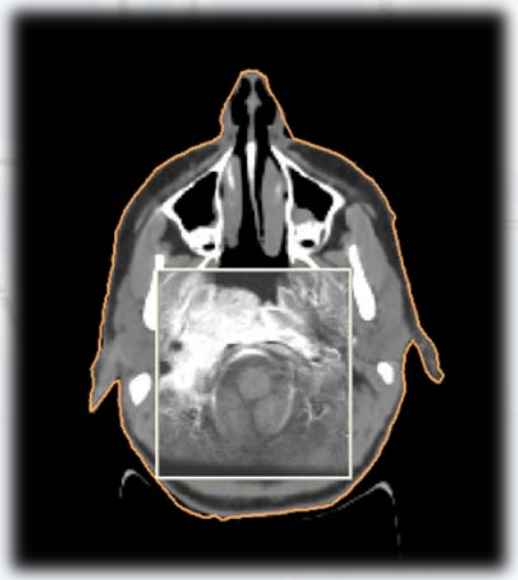
Diagnostic Work Up

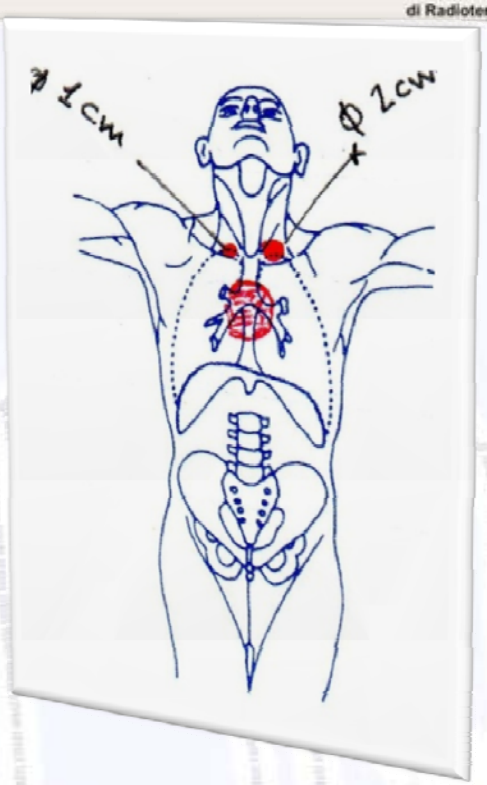




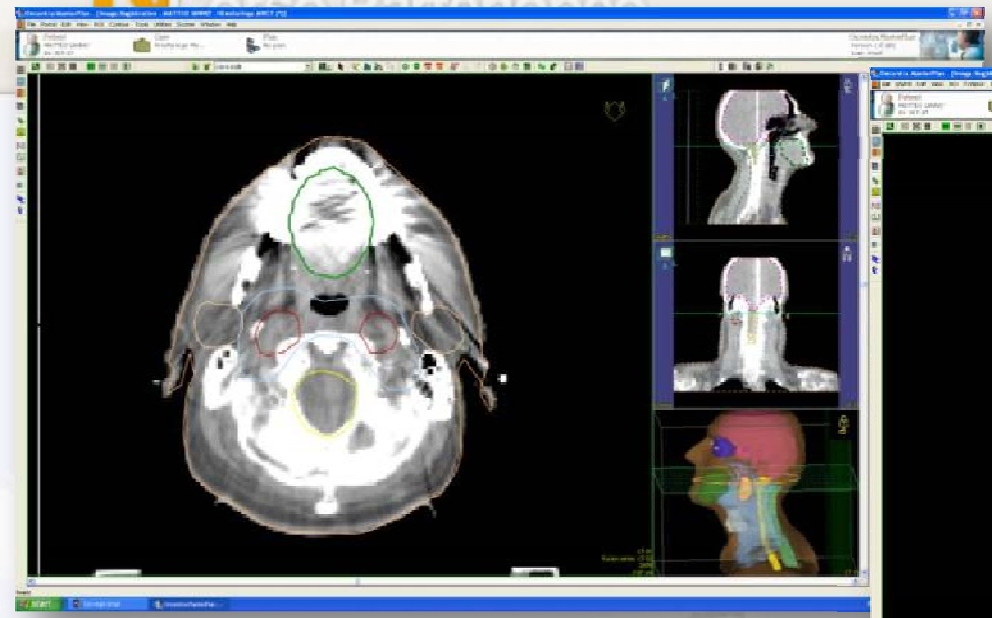


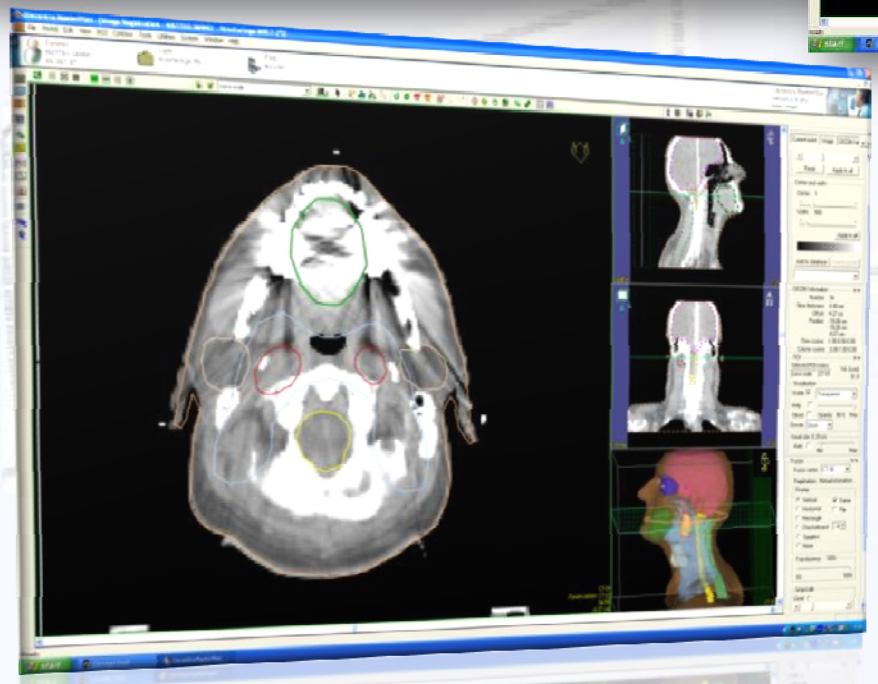


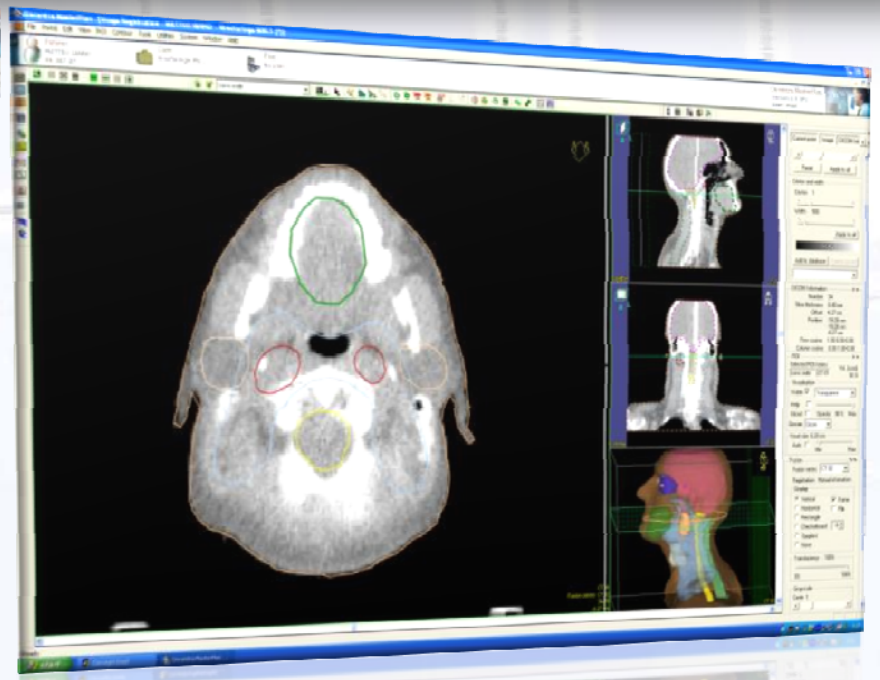


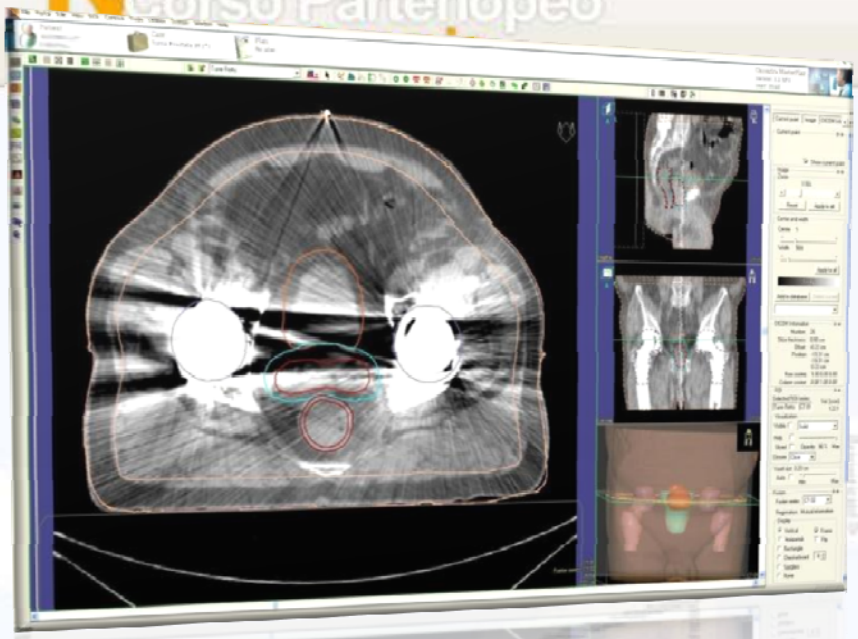


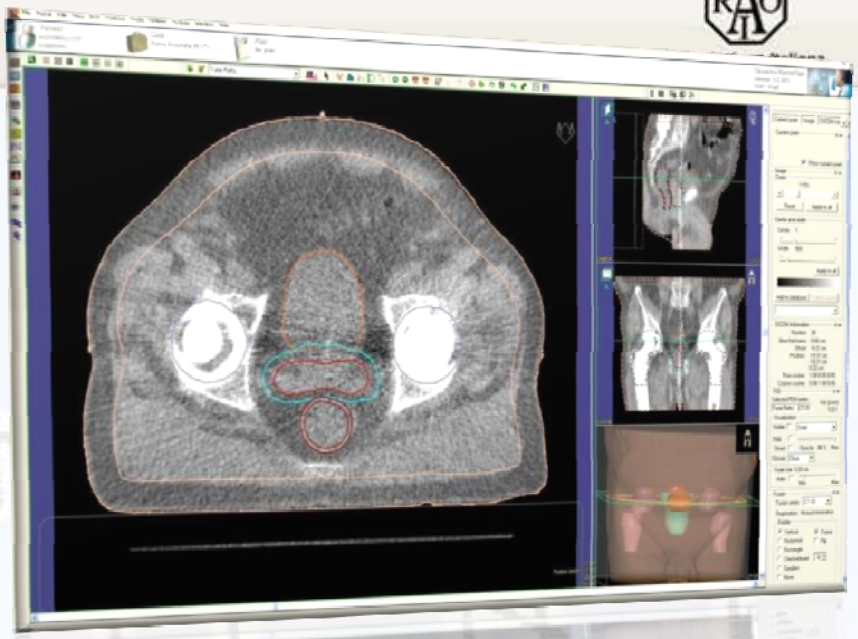
TC del torace:
Indagine eseguita dopo la somministrazione di mezzo di contrasto organo-iodato (Iomeprolo) per via endovenosa.
In mediastino presenza di voluminosa lesione solida polilobata di diametro assiale massimo complessivo di circa 12,5cm, con enhancement disomogeneo, in prima ipotesi di origine linfonodale, che disloca e comprime la trachea verso destra e comprime la vena cava superiore, l'arteria polmonare sinistra (esilissima) e, sempre a sinistra, il bronco principale, il bronco lobare superiore ed il bronco lobare inferiore. Alla base del lobo superiore di sinistra si evidenzia struttura, in prima ipotesi vascolare, piuttosto irregolare ed ectasica. Minimi ispessimenti pleurici marginali posteriori in sede biapicale.
A carico del lobo superiore di sinistra si riconosce piccolo nodulo di circa 4 mm di diametro massimo.
Stria opaca a sinistra, in corrispondenza della lingula.

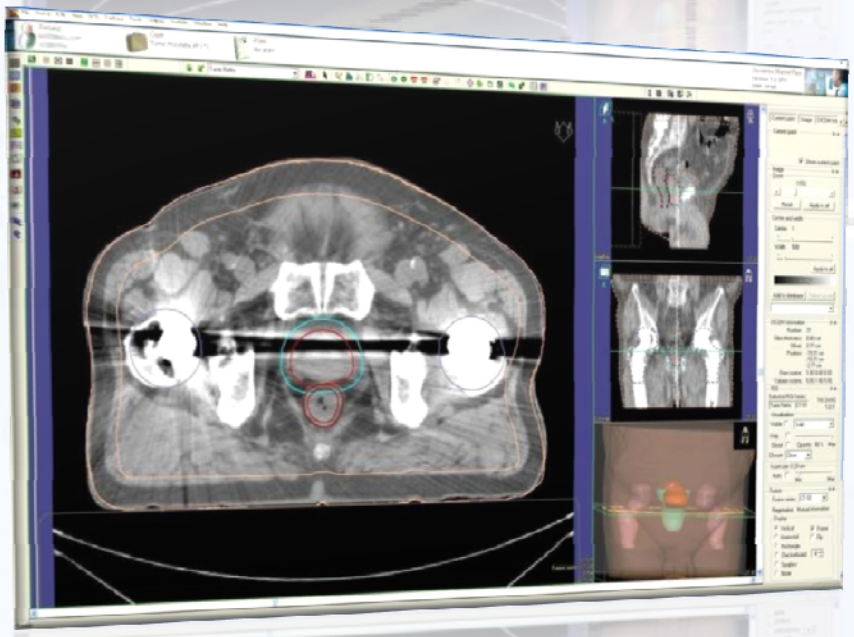


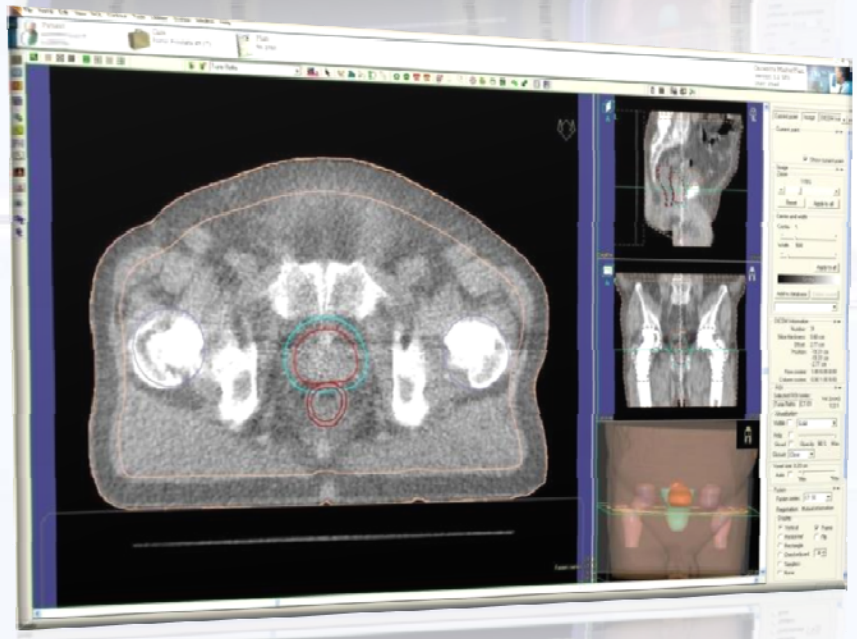












VOI/ROI & OAR Delineation

IGRT

IMRT

Target delineation

Theragnostic Imaging

ELSEVIER
doi:10.1016/j.meddos.2005.12.001
Medical Dosimetry, Vol. 31, No. 1, pp. 1-2, 2006

0958-3947/06/$–see front matter

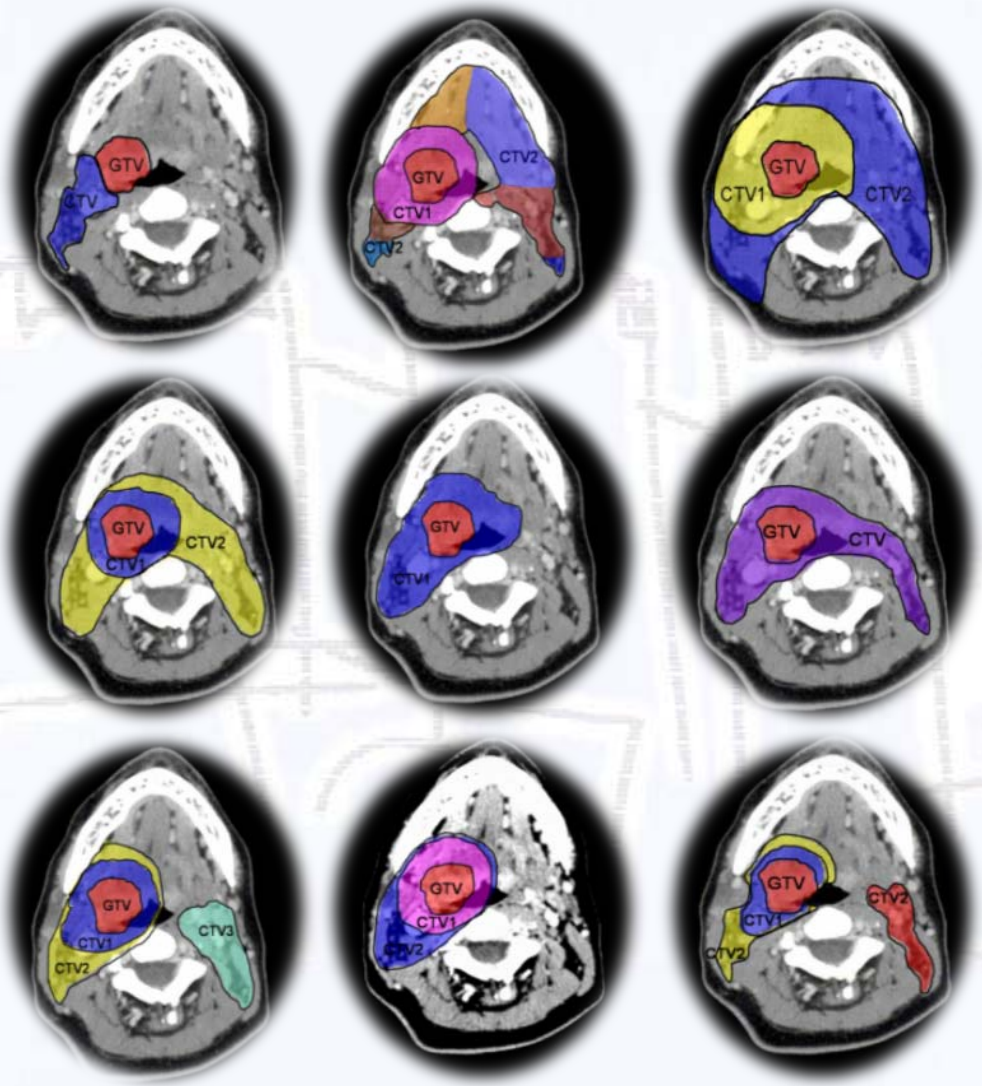
Reprint request to: Cheng B. Saw, Ph.D., Department of Radiation Oncology, University of Pittsburgh Cancer Institute, Pittsburgh, PA 15232.

Editorial

TARGET DELINEATION AND LOCALIZATION

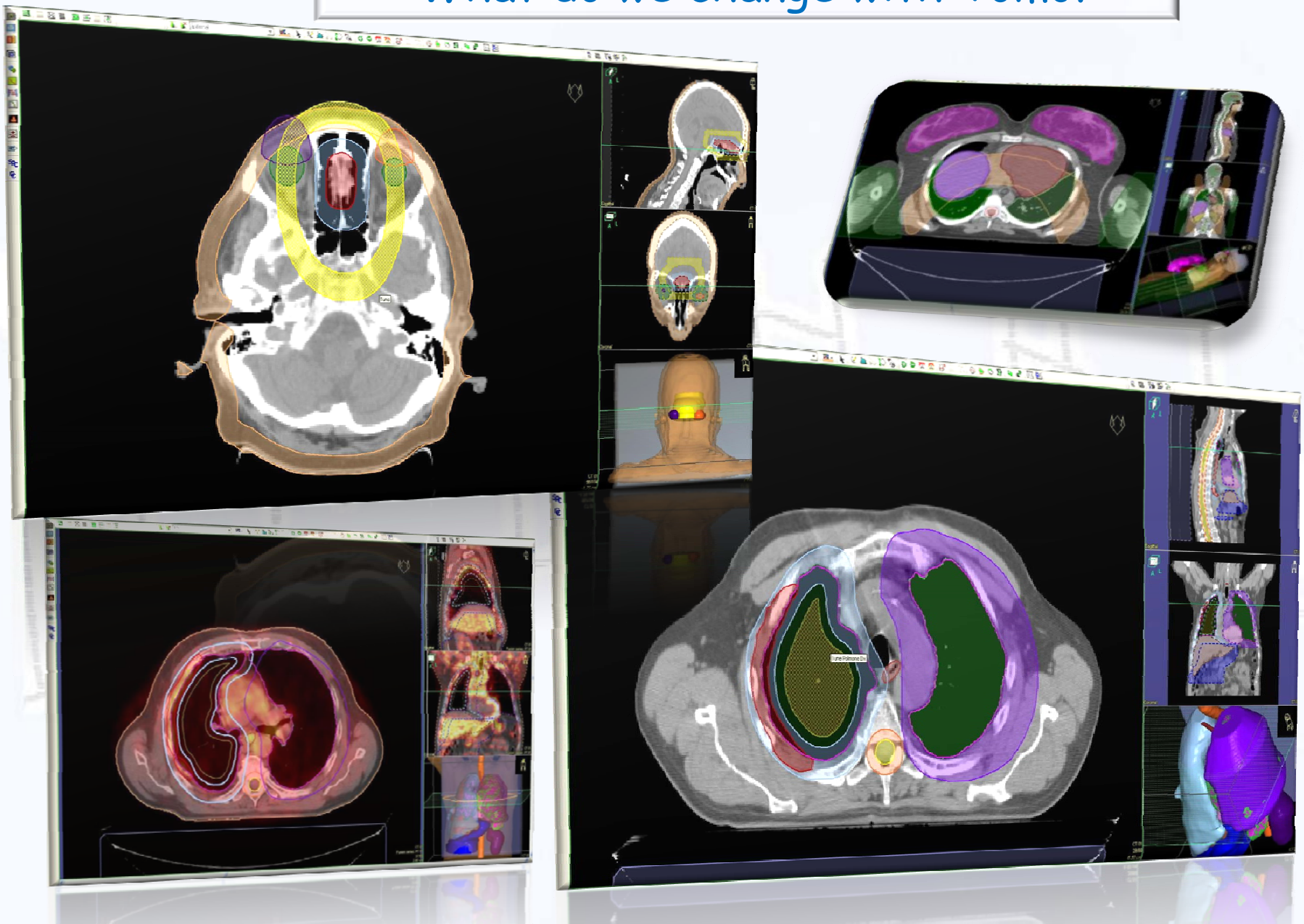
- Knowledge base to delineate in multiple disease sites is not part of training
- There is no consistency among physicians that delineate target
- The precise dose distributions produced by IMRT are less forgiving in terms of treatment uncertainties

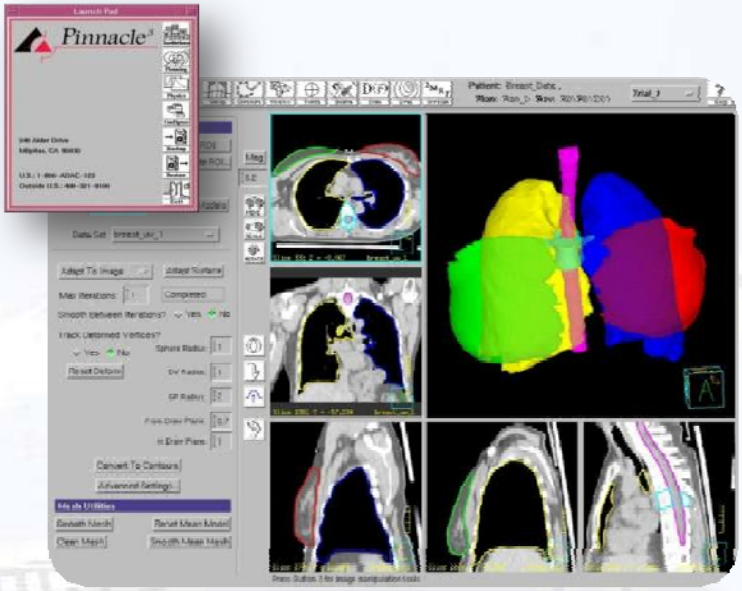
There is no consistency among physicians that delineate target



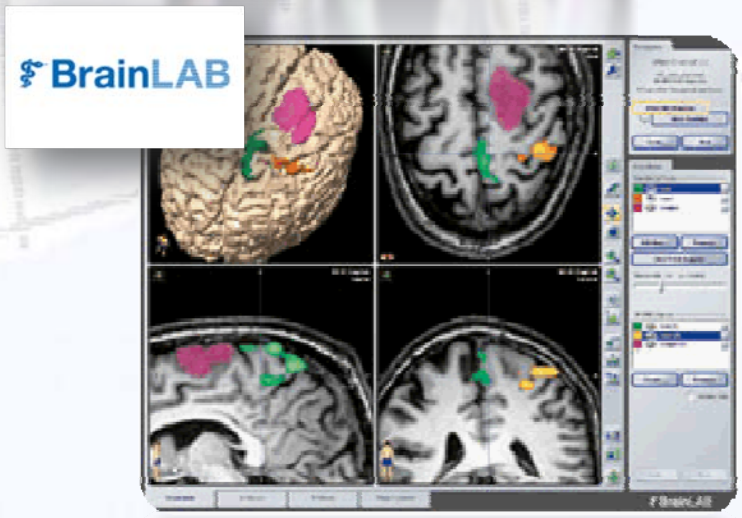
Harari et al., 2005

What do we change with Tomo?




Pinnacle³


MIMvista


BrainLAB

SCHEDA RINOFARINGE - Tomoterapia / IMRT

Cognome Nome _____ N. Cartella _____ N. Frazioni 30

Struttura	Dose Prescritta	Dose Max ($D_{0.5}$)	Dose Min	Dose Gy / Max % Volume	Note
PTV 66 (GTV + 5mm)	66 Gy	69 Gy	D98	66 Gy / 98%	
PTV 60	60 Gy	63 Gy	D95	60 Gy / 95%	
PTV 54	54 Gy	56.5 Gy	D95	54 Gy / 95%	
Midollo Allungato		50 Gy		60 Gy / 1%	
Midollo Spinale		40 Gy			
Midollo Esp (+3mm)					
Parotide Dx		60 Gy		Se Omolaterale 30 Gy / 50%	Mean Dose < 26 Gy
Parotide Sx		60 Gy		Se Controlaterale 20 Gy / 50%	Mean Dose < 26 Gy
Mucosa Cavo Oral				40 Gy / 50%	
Occhi		8 Gy		8 Gy / 1%	
NN. Ottici		50 Gy		50 Gy / 1%	
Laringe				36 Gy / 50%	
Coclea				56 Gy / 5%	
Chiasma / Ipofisi		60 Gy		50 Gy / 1%	
Muscoli Costrittori				50 Gy / 80%	
Tune Posteriore					
Tune Occhi					
Cute					
Lobi Temporali					

Data Consegna _____

Medico Referente _____ **Data Inizio** _____ **TAC Eseguita in** ☐RT ☐PET ☐TOMO ☐____

TOMOTERAPIA - SCHEDA POLMONE

Protocollo TAXO-TOMO

Cognome Nome _____ N. Cartella _____ N. Frazioni 25

Struttura	Dose Prescritta	Dose Max ($D_{0.5}$)	Dose Min	Dose / Max % Volume	
PTV (Celeste)	60 Gy ☐	60	60	60 Gy / 95%	
	57 Gy ☐	57	57	57 Gy / 95%	
GTV (Rosso)	60 Gy ☐	60	60	60 Gy / 100%	
	57 Gy ☐	57	57	57 Gy / 100%	
R. Lung (Verde Scuro)					
L. Lung (Verde Chiaro)					
Healthy Lung (Fuxia)					
Spinal Cord (Giallo)		46		20 Gy / 20%	Mean Dose < 14 Gy
Esofphagus (Marrone)		60 Gy		46 Gy / 1%	
L.V. – Heart (Rosa)		50 Gy		60 Gy / 1%	
Cont. L. Lung		45 Gy		50 Gy / 1%	20 Gy / 30%
Trachea (Blue)				45 Gy / 1%	15 Gy / 10%
Plexus Brachial					
Bronchus					
UST - Blocco					

Data Consegna _____

Medico Referente _____ **Data Inizio** _____ **TAC Eseguita in** ☐RT ☐PET ☐TOMO ☐____

60 Gy/25 ff >> *NTD 66Gy/33 ff*
57 Gy/25 ff >> *NTD 60Gy/30 ff*

TOMOTERAPIA - SCHEDA PROSTATA

Cognome Nome _____ N. Cartella _____ N. Frazioni 28

Struttura	Dose Prescritta	Dose Max (Dmx)	Dose Min	Dose Gy / Max % Volume	Andamento
PTV 72.5	72.5 Gy	76 Gy	Dm	72.5 / 95% Gy	
GTV	72.5 Gy		Dm		
Rectal Wall		72.5 Gy		36 Gy / 25%	15 Gy / 50%
Bladder		72.5 Gy		40 Gy / 50%	20 Gy / 50%
Skin		36 Gy		30 Gy / 1%	
Femoral Heads		35 Gy		15 Gy / 30%	
UST - Normal					
Small Bowel					
Seminal Vesicles					
Bulb					

Data Consegna _____

Medico Referente _____ **Data Inizio** _____ **TAC Eseguita in** ☐RT ☐PET ☐TOMO ☐____

DOB: Jul 23, 1990 Sex: F
ID: 03-380-07
Plan date: Jun 28, 2007 3:07:54 PM
Oncologist:
Disease: 19274

Plan: Plan_01
Plan status: Approved
DQA plan:
Patient position: HFS

Define Rx Constraints

- Define constraints for tumors.
- Define constraints for sensitive structures.
- Set isodose display options.

When you are satisfied, click **Start** to begin optimization.

ROIs | Optimization | Fractionation | Delivery QA Setup | Delivery QA Analysis

Prescription

% Vol / Stats — For GTV — 85.0 % will receive ..... 66.0 Gy

Field Width: 2.51 cm - Jaws(1.0,-1.0) Pitch: 0.215 Dose Calc Grid: Normal Batch beamlets

Tumor Constraints

Name	Display	Color	Blocked	Use?	Importance	Max Dose [G	Max Dose P	DVH Vol [%]	DVH Dose [	Min Dose [G	Min Dose Pe
GTV	✔		None	✔	1000	66.0	10000	85.0	63.0	60.0	100
PTV2	✔		None	✔	300	58.0	3000	95.0	54.0	54.0	1000
PTV1	✔		None	✔	300	62.0	3000	95.0	60.0	60.0	1000

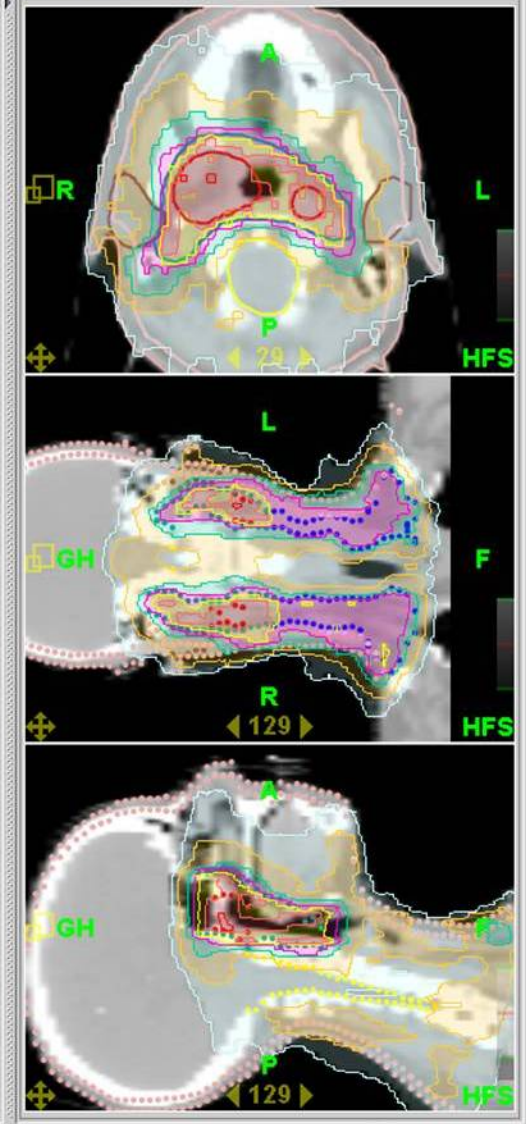
Sensitive Structure Constraints

Name	Display	Color	Blocked	Use?	Importance	Max Dose [Gy]	Max Dose Per	DVH Vol [%]	DVH Dose [Gy	DVH Pt. Pen.
Parotid right	✔		None	✔	10	60.0	1	10.0	35.0	100
Tune dental al	☐		None	✔	20	30.0	10	10.0	20.0	100
Optic nerve	☐		None	✔	3	40.0	1	10.0	30.0	10
Couch	☐		None	☐						

Dose Display

Isodose: 66, 63, 60, 54, 45, 30, 20

Patient Images



Density Image Viewer

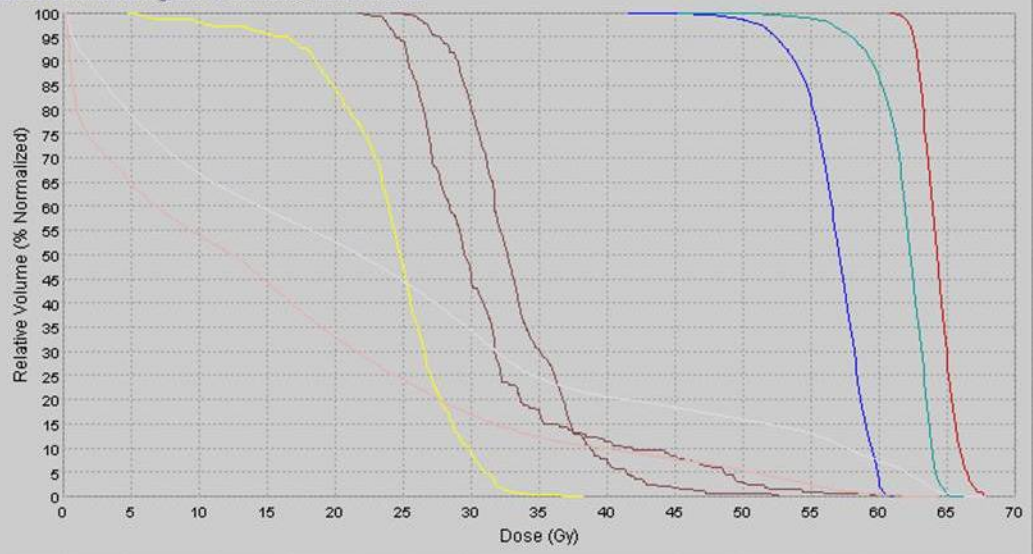
Density Image

Optimize

Mode: Beamlet
Modulation Factor: 3.000
Initiate Full Dose after 20 iterations.

Start | Pause | Resume | Get Full Dose | Cancel

Dose-Volume Histogram - Cumulative Mode Relative



Vol Min < 0.0 > | Vol Max < 100.0 | Gy Min < 0.0 > | Gy Max < 70.0 >

Wednesday, September 5, 2007 17:44:48

DOB: Jul 28, 1939 Sex: M
ID: 06-502-08
Plan date: Apr 6, 2009 5:31:13 PM
Oncologist:
Disease: 20925

Plan: Plan_01
Plan status: Approved
DQA plan:
Patient position: HFS

Define Rx Constraints

- Define constraints for tumors.
- Define constraints for sensitive structures.
- Set isodose display options.

When you are satisfied, click **Start** to begin optimization.

ROIs | Optimization | Fractionation | Delivery QA Setup | Delivery QA Analysis

Prescription

% Vol / Stats — For PTV — 90.0 % will receive ..... **40.0 Gy**

Field Width: 2.51 cm - Jaws(1.0,-1.0) Pitch: 0.287 Calc Grid: Normal Batch Beamlets

Tumor Constraints

Name	Display	Color	Blocked	Use?	Importa...	Max Dose [...	Max Dose ...	DVH Vol [...	DVH Dose ...	Min Dose [...	Min Dose P...
Midollo	☑		None	☐							
Polmone DX	☑		None	☐							
PTV	☑		None	☑	30	45.0	30	90.0	40.0	38.0	30
GTV	☑		None	☑	100	50.0	300	50.0	50.0	50.0	10

Sensitive Structure Constraints

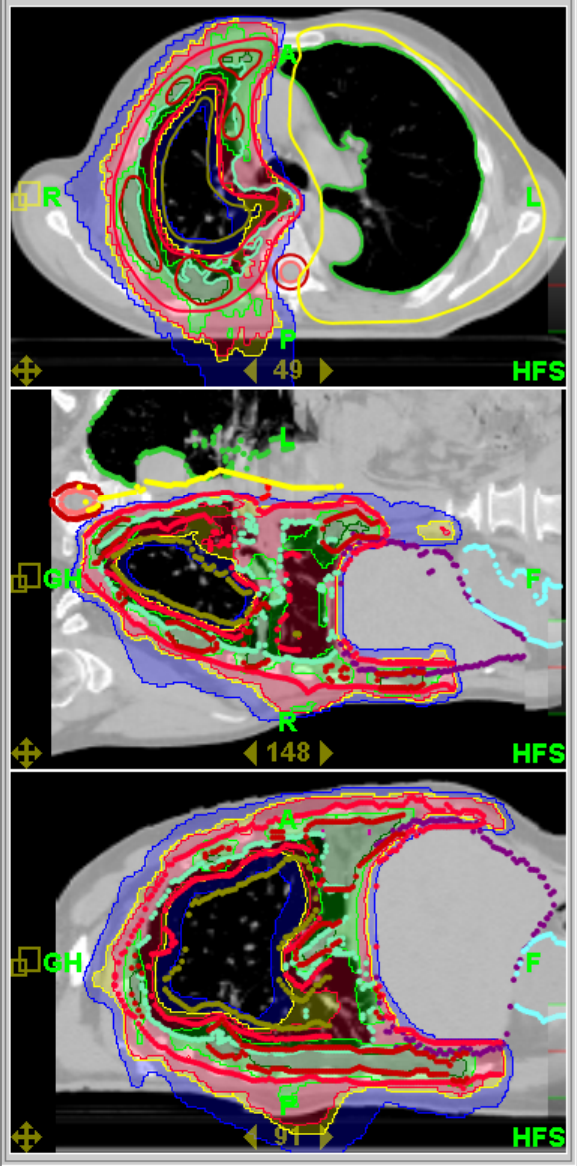
Name	Display	Color	Blocked	Use?	Importance	Max Dose [...	Max Dose P...	DVH Vol [%]	DVH Dose [...	DVH Pt. Pen.
External	☐		None	☐						
midollo espi	☑		None	☑	10	30.0	20	5.0	25.0	1
Polmone SX	☑		Direction	☑	30	10.0	30	5.0	5.0	100
Esofago	☐		None	☑	1	40.0	1	10.0	10.0	1

Dose Display

Isodose

53
50
45
40
38
30
20
10

Patient Images



Density Image Viewer

Density Image

Optimize

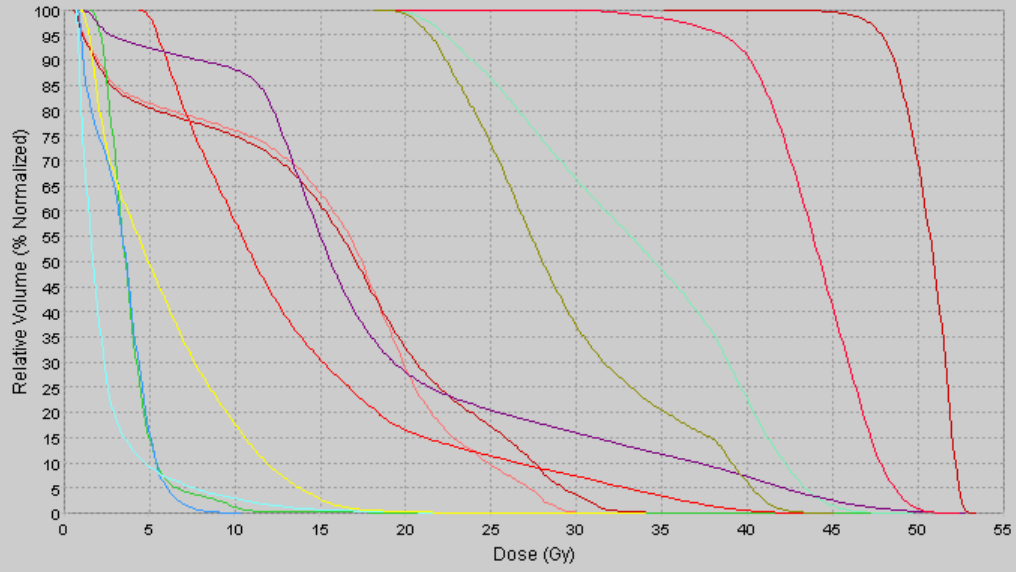
Mode: Beamlet

Modulation Factor: 3.000

Initiate Full Dose after 20 iterations.

Start
Pause
Resume
Get Full Dose
Cancel

Dose-Volume Histogram - Cumulative Mode Relative



Vol Min < 0.0 > Vol Max < Gy Min < 0.0 > Gy Max < 55.0 >

Wednesday, June 3, 2009 19:18:31

"RADIOTERAPIA HIGH TECH" Cosa c'è di nuovo?

To Conclude ……

"The true challenge …..
…… is to develop the wisdom to know
when to select which [treatment modality] in the clinic"

S. Webb

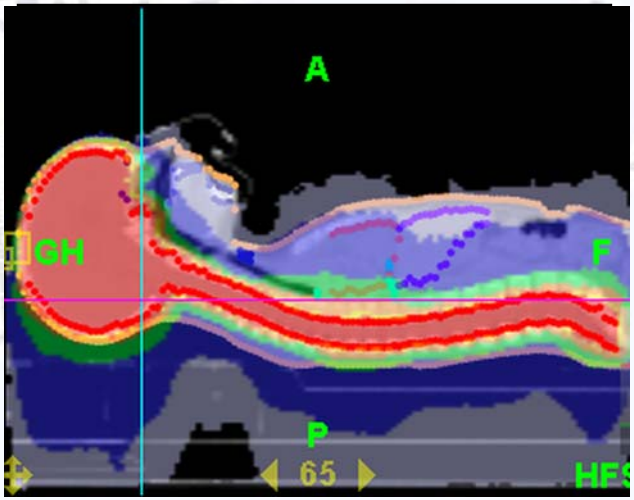
Tomotherapy High ART

irradiazione elicoidale (movimento combinato di gantry e lettino)

IGRT con MVCT a spirale incorporata

IMRT con MLC di tipo binario (campo di trattamento massimo 40x160 cm)

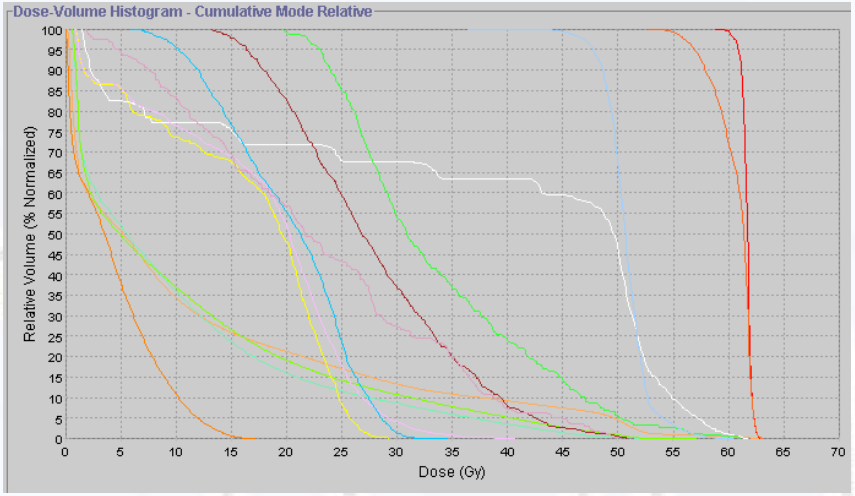
sistema integrato



Tomotherapy High ART

calcolo della distribuzione di dose con "Inverse Planning"

- Constrains
- Importance
- Penality
- DVH
- Disegno Target, OAR , TUNE

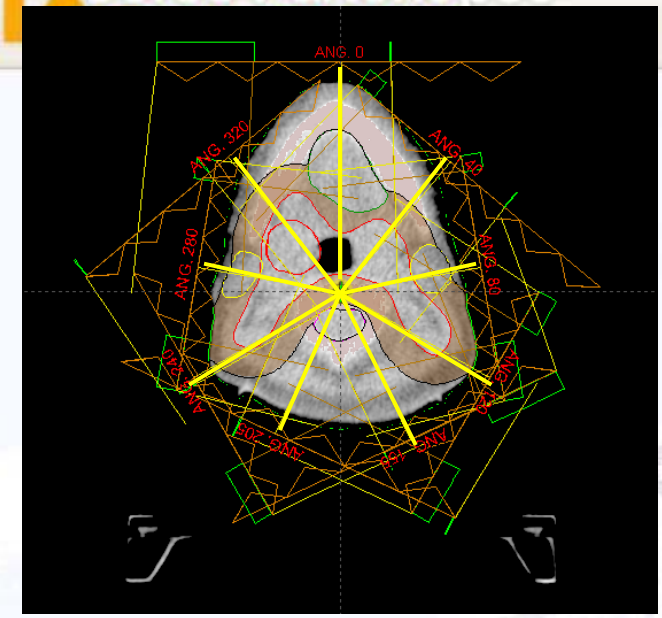


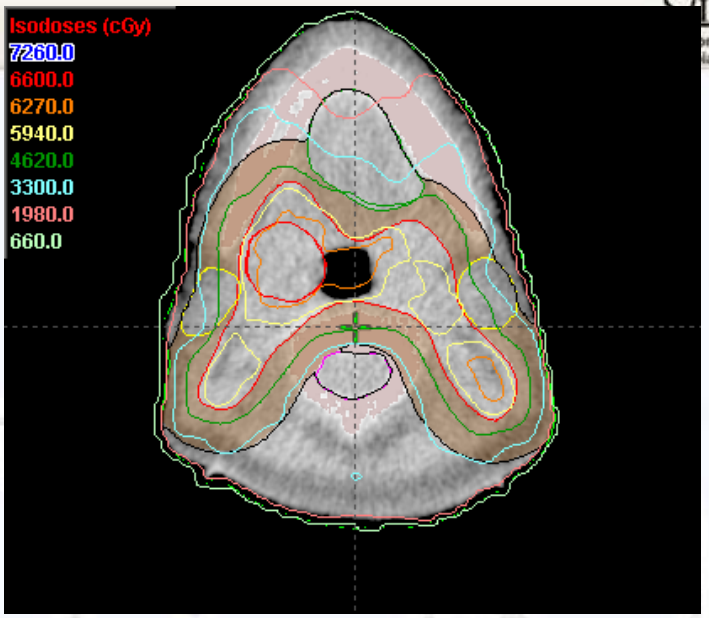
Tumor Constraints

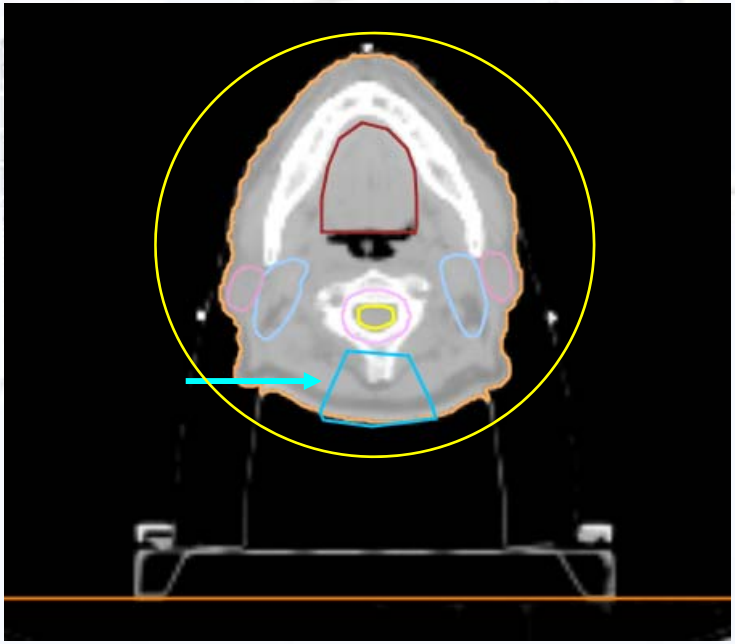
Name	Display	Color	Blocked	Use?	Importance	Max Dose [G	Max Dose P	DVH Vol [%]	DVH Dose [	Min Dose [G	Min Dose P
PTV50	✔		None	✔	30	52.0	1000	85.0	50.0	50.0	100
PTV60	✔		**None**	✔	**30**	**60.0**	**1000**	**75.0**	**60.0**	**60.0**	**300**
midollo	✔		None								

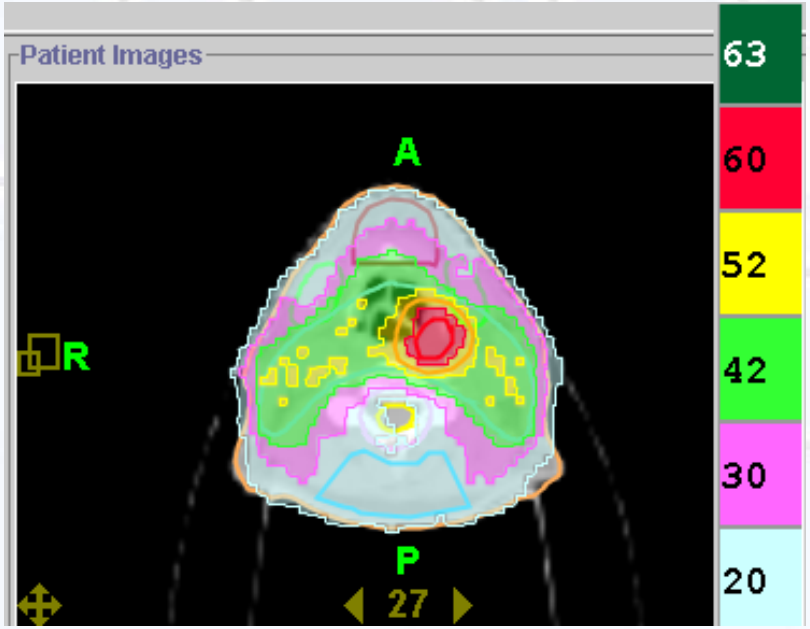
Sensitive Structure Constraints

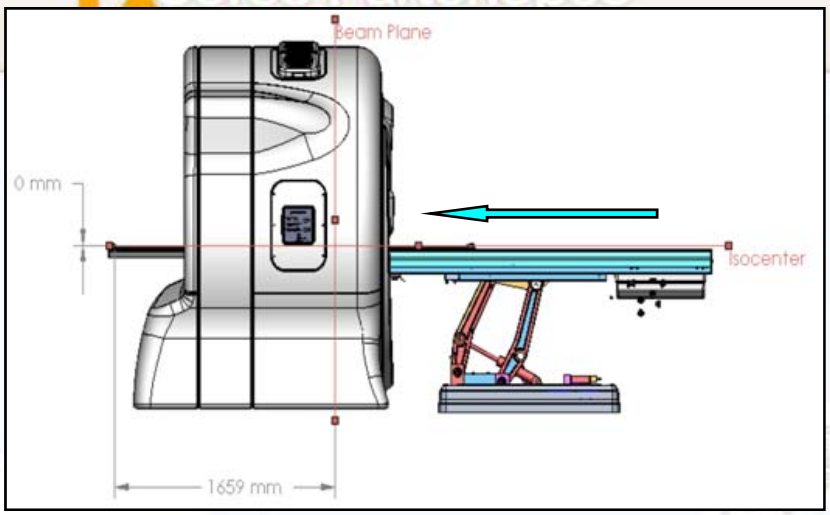
Name	Display	Color	Blocked	Use?	Importance	Max Dose [Gy]	Max Dose Per	DVH Vol [%]	DVH Dose [Gy	DVH Pt. Pen.
External	✔		None	✔	10	50.0	10	10.0	30.0	30
tune midollo	✔		None	✔	10	35.0	30	5.0	30.0	300
ghiandola sott	✔		None	✔	3	50.0	3	50.0	30.0	10
parotidi	✔		None	✔	3	50.0	3	30.0	28.0	10

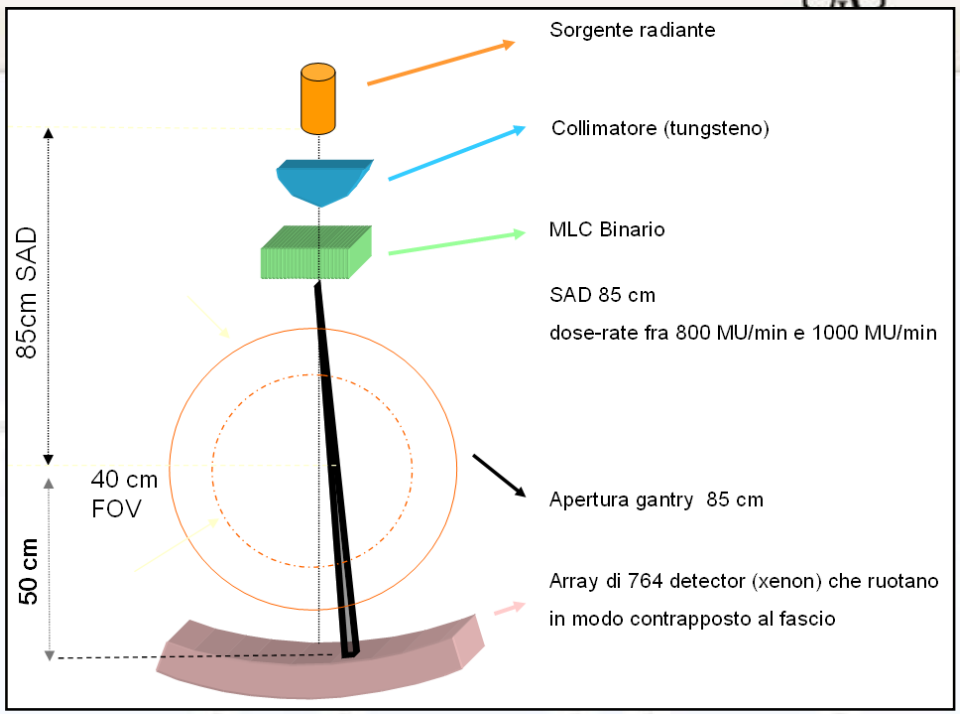

ANG. 0
ANG. 320
ANG. 40
ANG. 280
ANG. 80
ANG. 240
ANG. 120
ANG. 200
ANG. 160


Isodoses (cGy)
7260.0
6600.0
6270.0
5940.0
4620.0
3300.0
1980.0
660.0




Patient Images
A
R
P
27
63
60
52
42
30
20





Trattamento

Energia nominale: 6 MV

Energia media equivalente: 1,5 MeV

Dose-rate: 800-1000 MU/min

LARGHEZZA fascio all'isocentro (direzione longitudinale): 1 2.5 , 5 cm

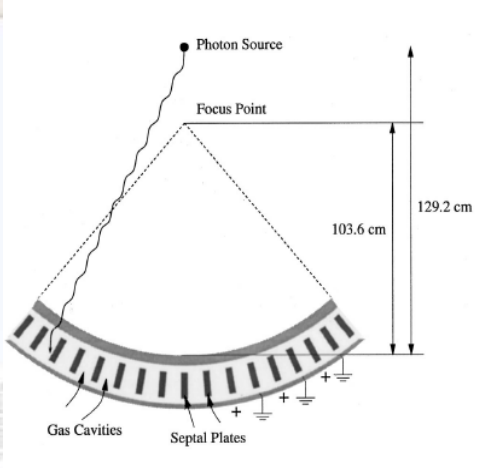
APERTURA fascio all'isocentro (direzione trasversale): 40 cm

Volume di trattamento : 40 cm diametro x 160 cm

Precisione traslazione longitudinale del lettino: 0,25 mm

Velocità di rotazione : 1 –10 rotazioni / minuto

Imaging (MVCT)



Energia nominale : 3,5 MV

Energia media equivalente : 1 MeV

Dose-rate : 2- 4 MU/min

764 camere di ionizzazione **(Xenon)**

Velocita' Rotazione max : 20 giri/minuto

Apertura collimatore primario: 4 mm.

Posizione delle lamelle del MLC: tutte "open"

Tempo di acquisizione per slice (ricostruzione e visualizzazione) : 2- 5 s

Apertura Gantry: 85 cm

FOV: 40 cm

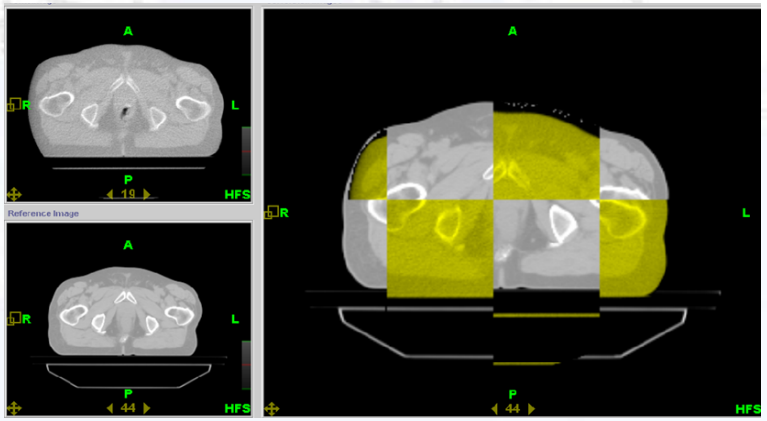
Verifica set up trattamento

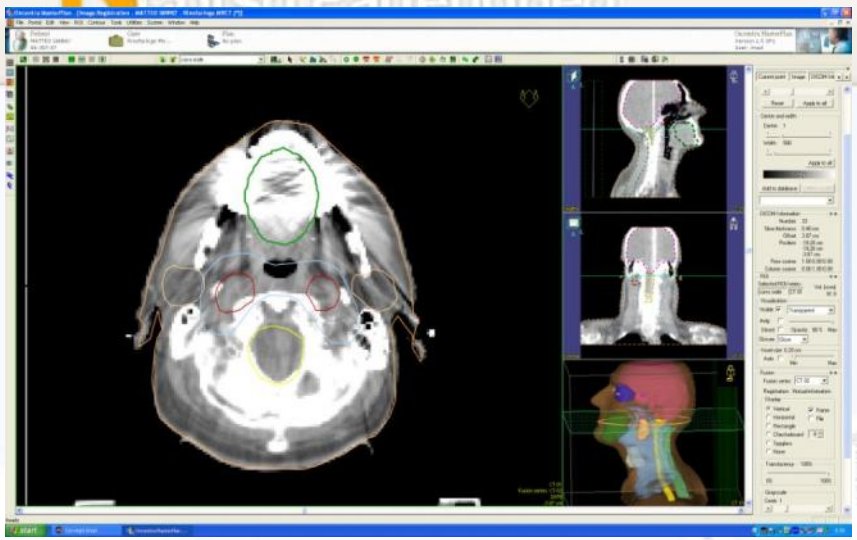
Controllo variazioni volumi anatomici

Riduzione artefatti

Pianificazione

Planning ADAPTIVE

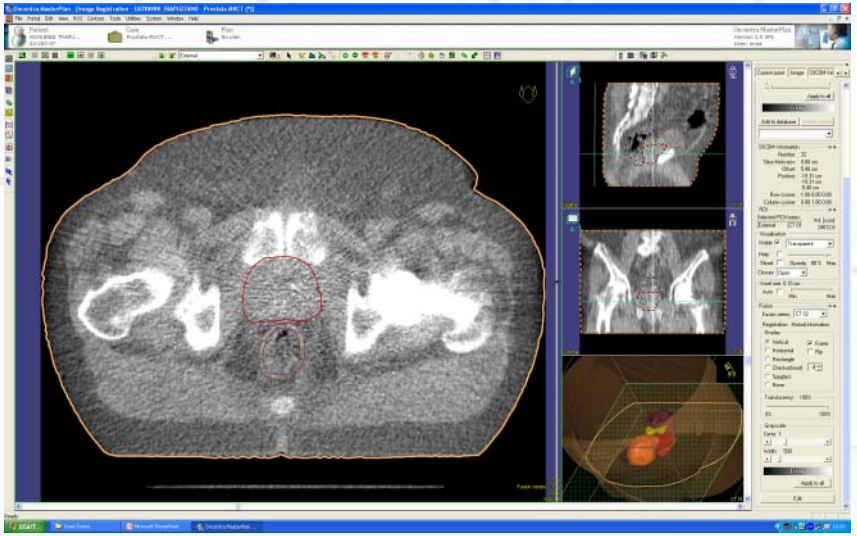




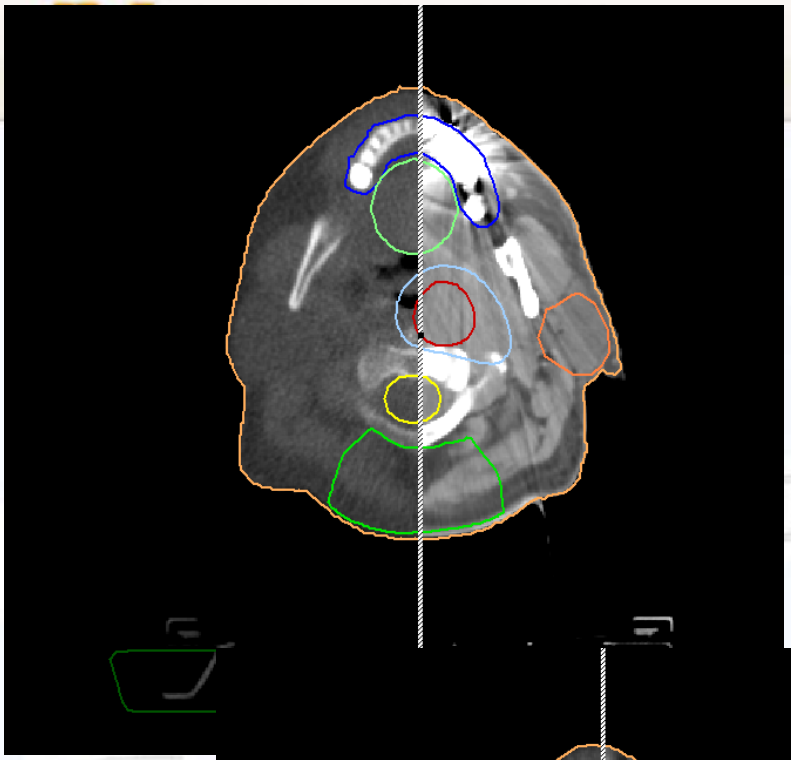
KVCT

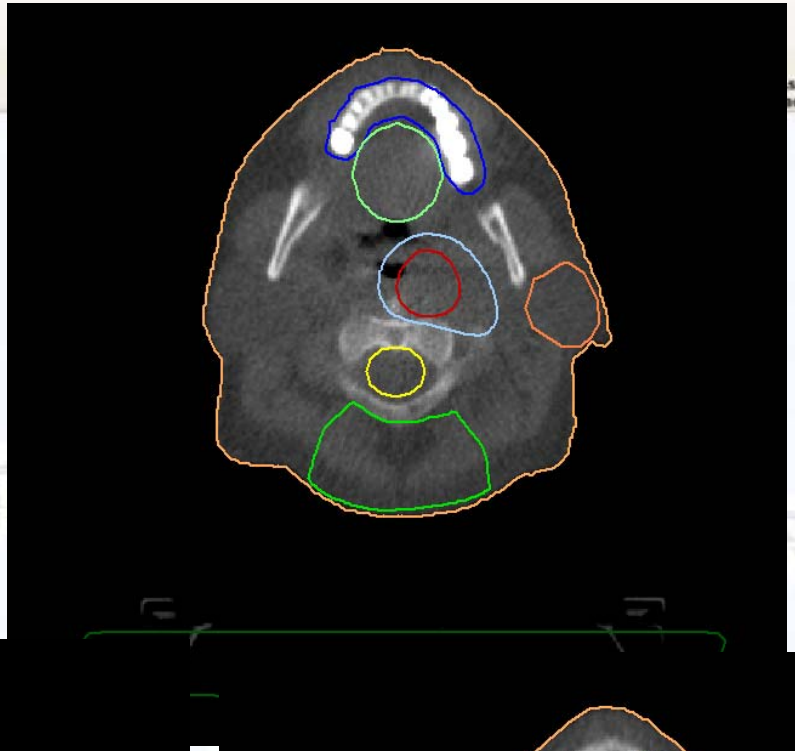
MVCT

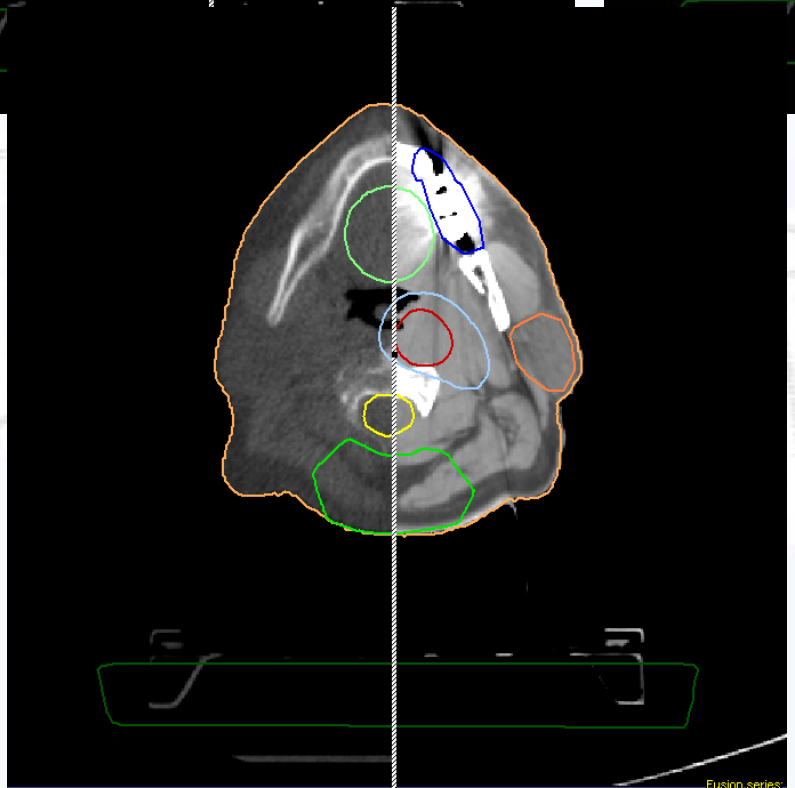
KVCT

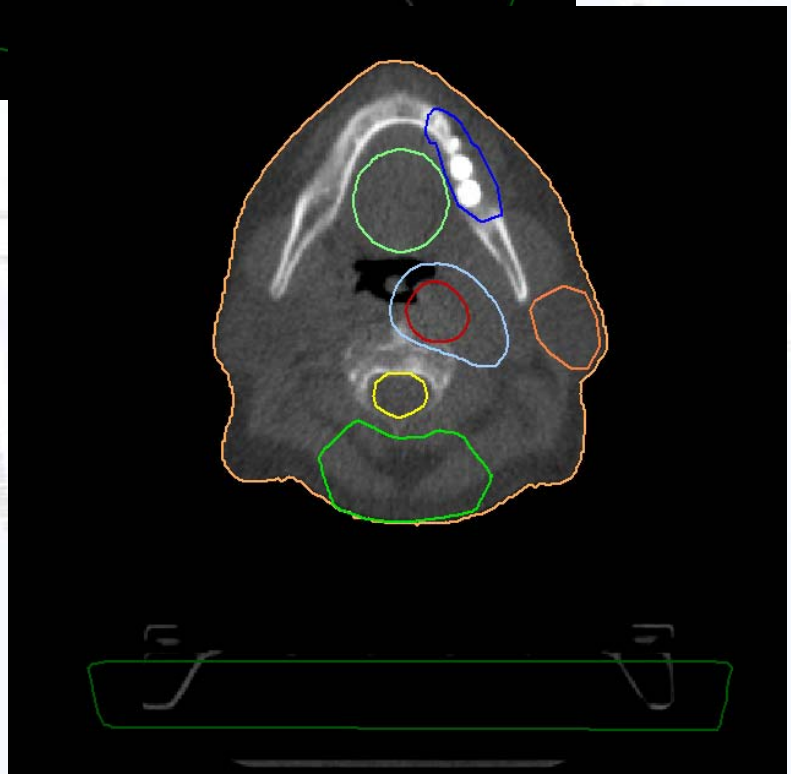


MVCT






Fusion series:



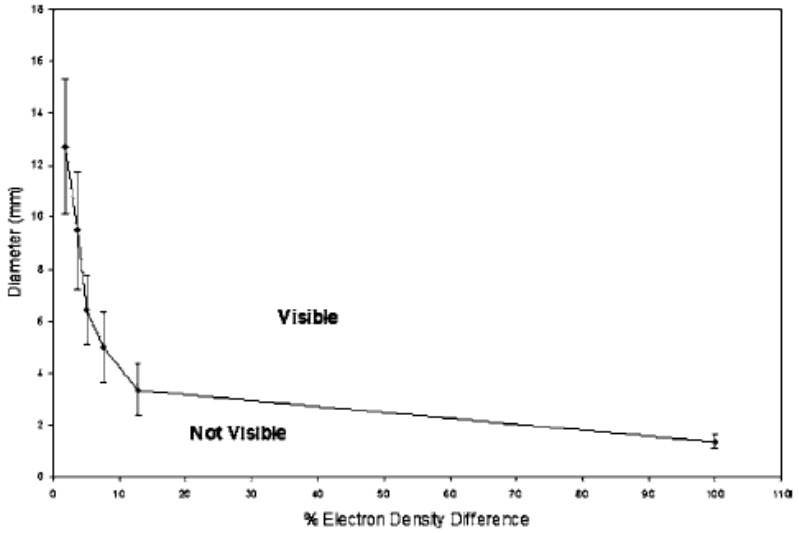
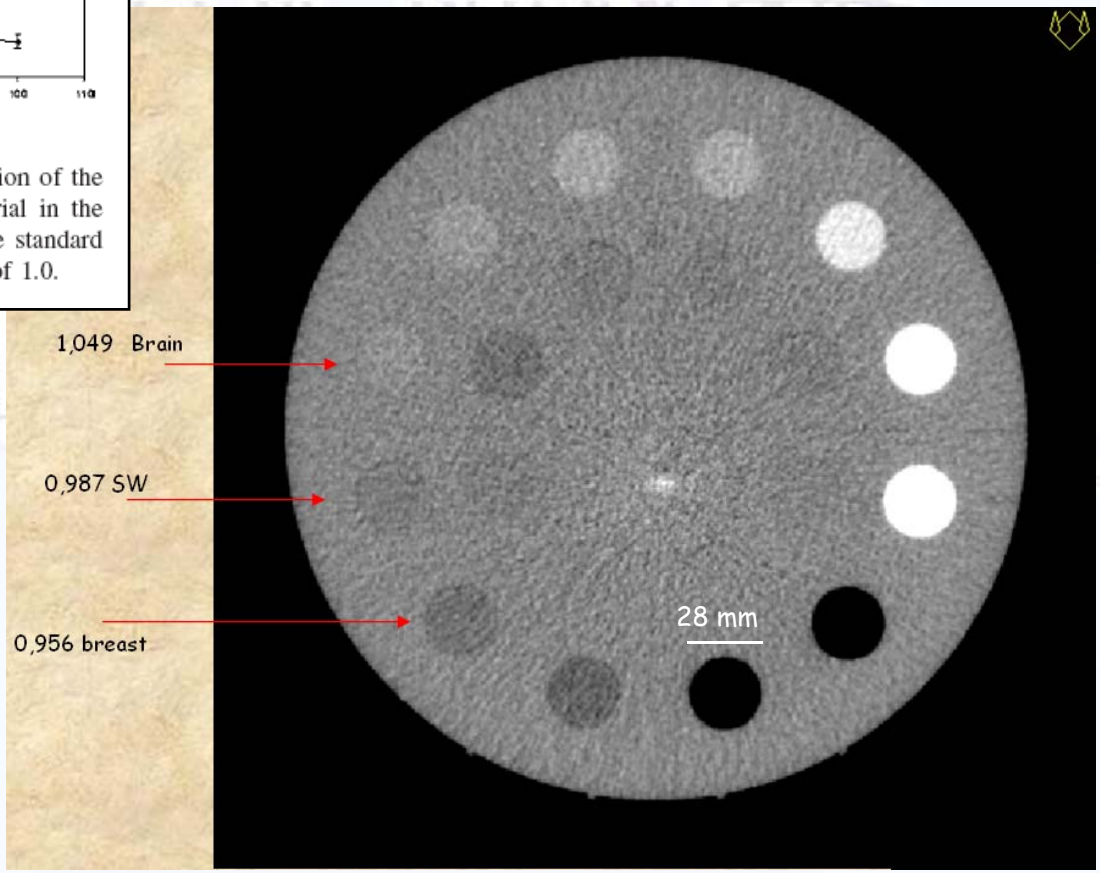


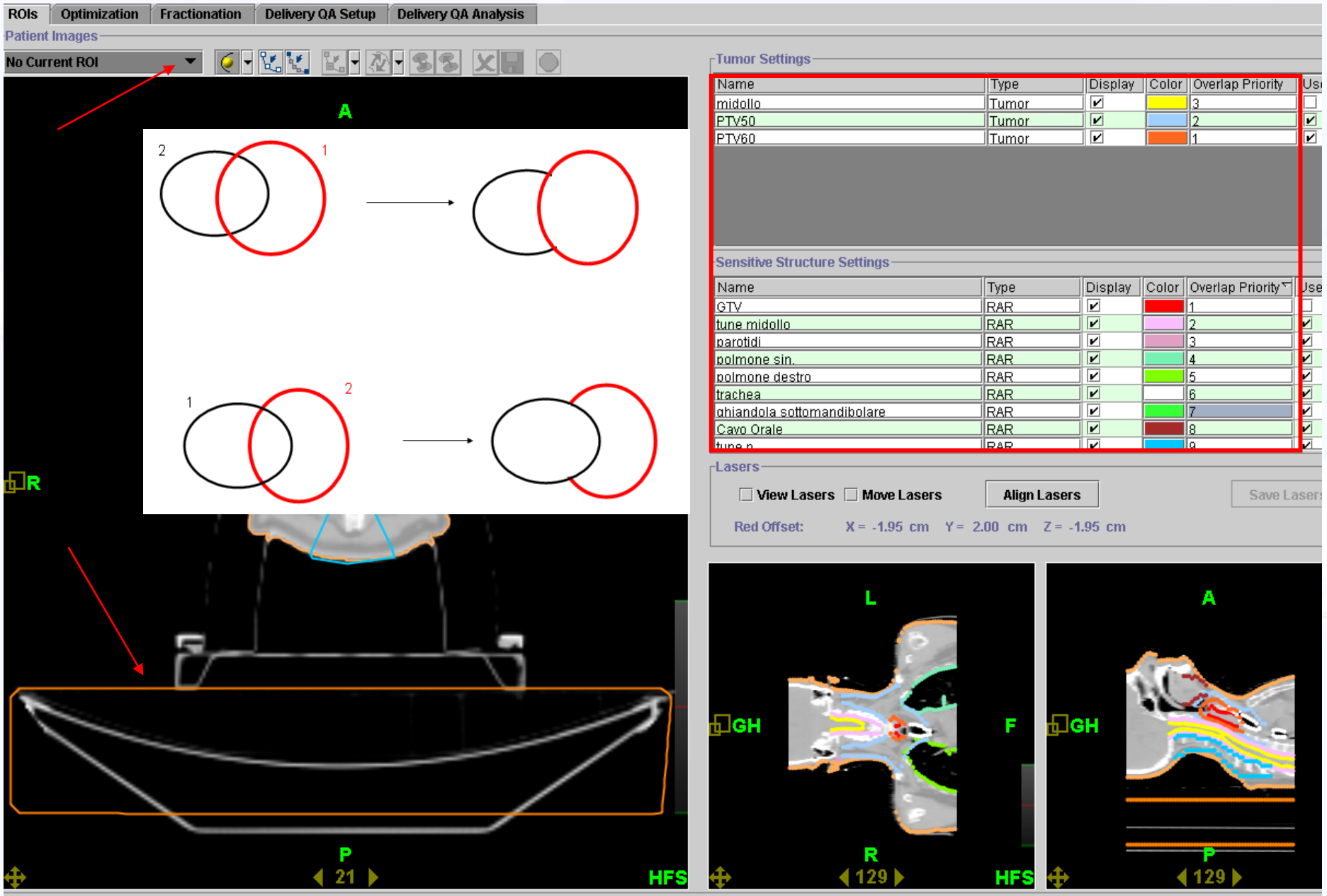
FIG. 4. The diameter of the smallest resolvable circle as a function of the percentage difference of the electron density (e-/cm^3) of material in the circle relative to the background. This curve is generated for the standard clinical setup: 512×512 reconstruction matrix and a pitch ratio of 1.0.

Per individuare oggetti di diametro 4 mm serve una differenza di densità elettronica relativa del 10 %

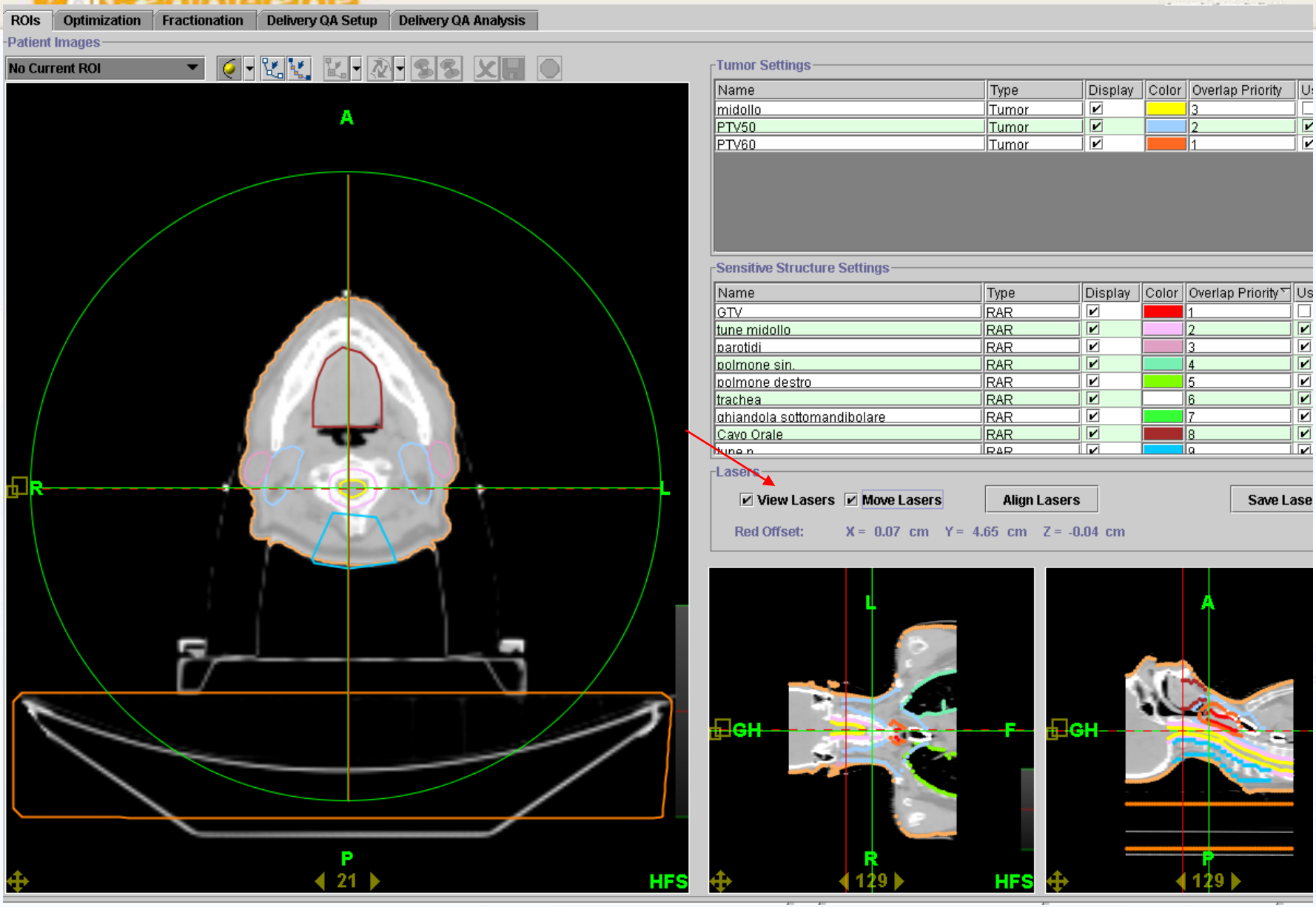


Per differenze di densità elettronica del 2% servono oggetti di diametro 20 mm

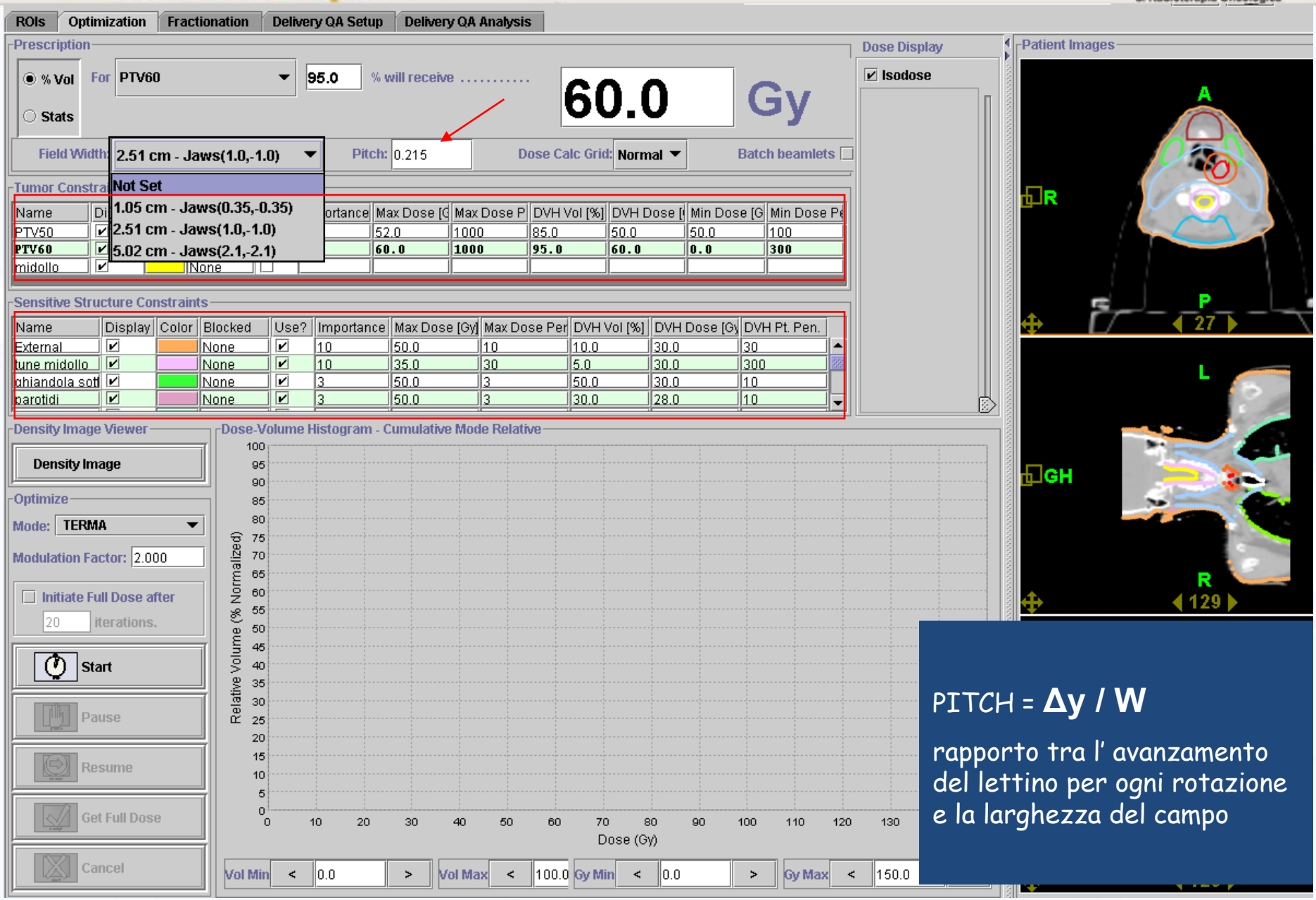
Planning workflow



Planning workflow



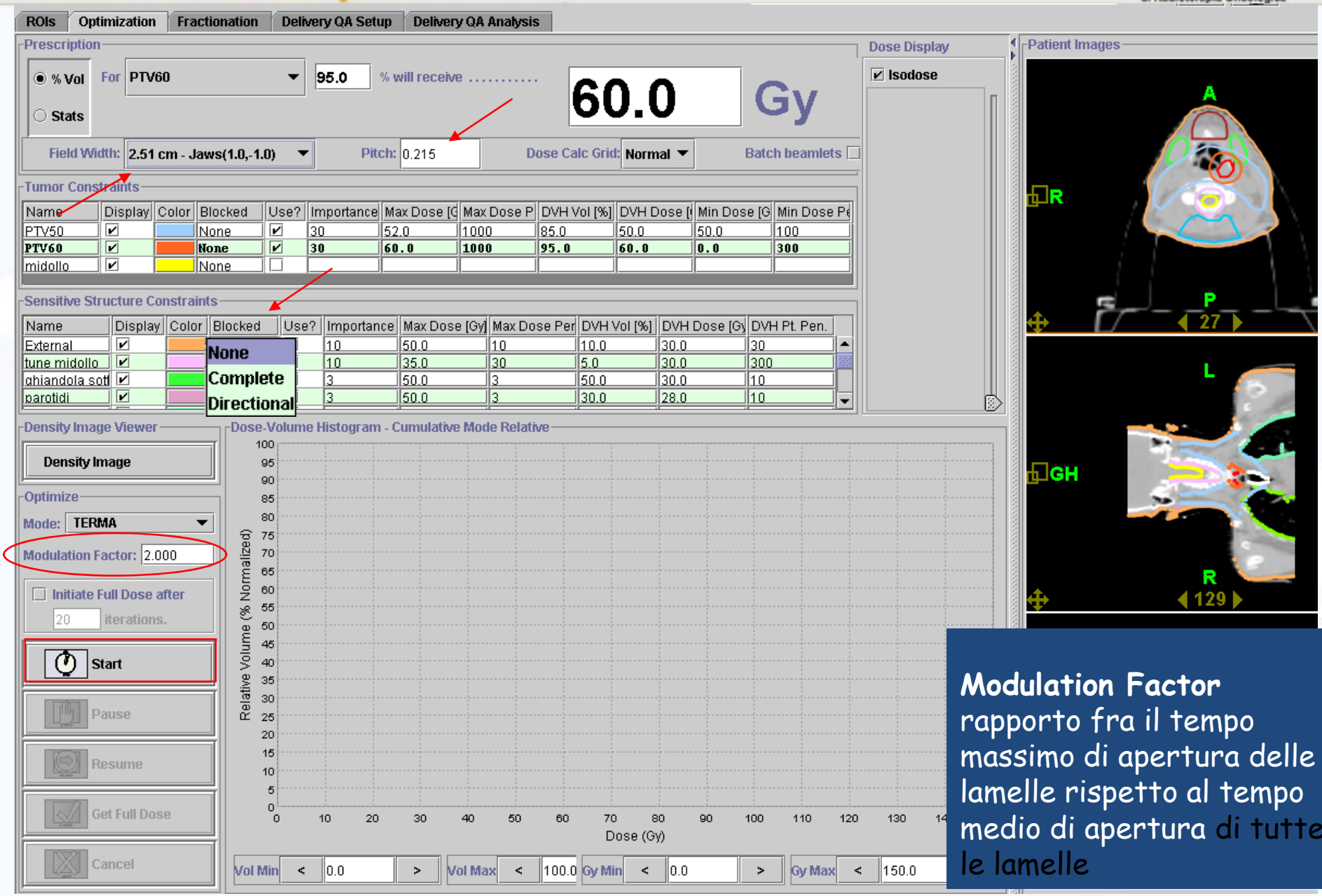
Planning workflow



PITCH = **Δy / W**

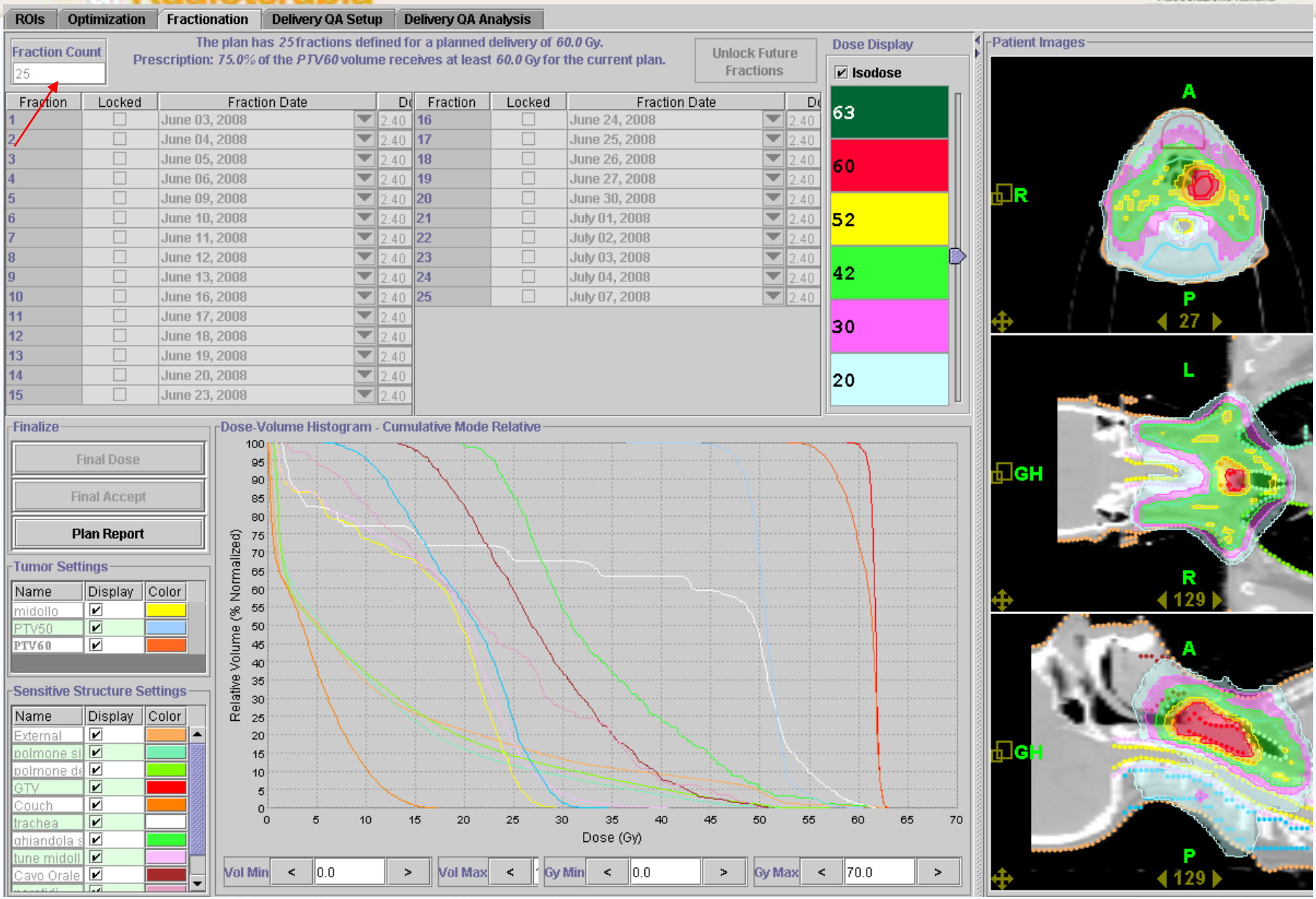
rapporto tra l' avanzamento del lettino per ogni rotazione e la larghezza del campo

Planning workflow



Modulation Factor
rapporto fra il tempo massimo di apertura delle lamelle rispetto al tempo medio di apertura di tutte le lamelle

Planning workflow



Plan Report: 0210071

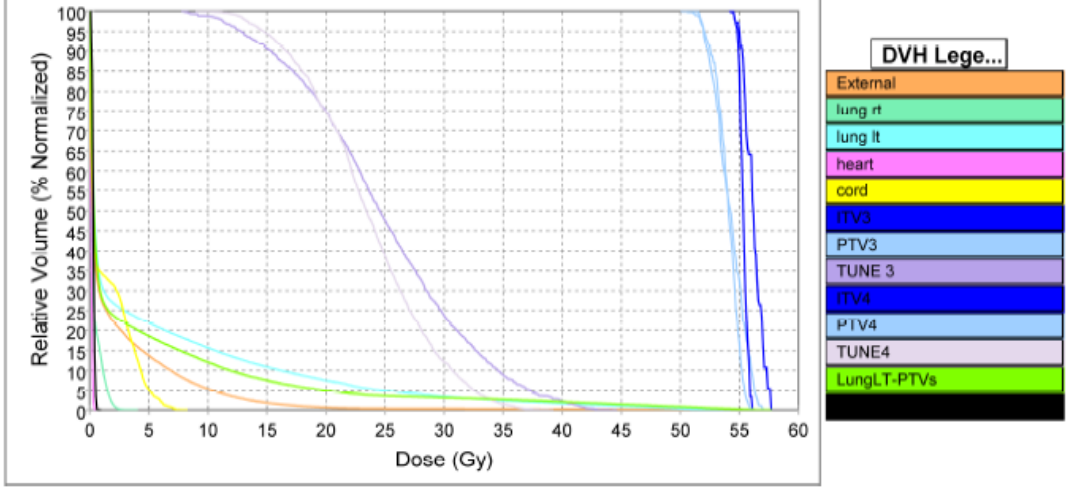
Plan Name: Plan_02

TomoTherapy

Prescription: 95.00% of the PTV4 volume receives at least 52.00 Gy for the current plan.
The plan has 8 fractions defined for a planned delivery of 52.00 Gy

Sex:	MALE
Date of Birth:	Apr 19, 1990
Disease Name:	21120
Plan State:	APPROVED
Machine Name:	0210071
Field Width:	2.5 cm
Pitch:	0.187
Sinogram Segments:	6.8
Planning Modulation Factor (Actual):	1.800 (1.797)
Relative Movable Laser Positions:	X = -0.0 cm, Y = -7.3 cm, Z = -0.5 cm
Delivered Dose:	.00% (.00 Gy of 52.00 Gy)
Plan Calculation Grid:	NORMAL (0.390 x 0.390 cm)
Approved By:	

Dose-Volume Histogram - Cumulative Mode Relative



Signature (date) _____

Plan Report: 0210071

Plan Name: Plan_02

TomoTherapy

Tumor Constraints

Name	Blocked	Use?	Importance	Overlap Priority	Max Dose Constr. [Gy]	Max Dose Pen.	DVH Vol [%]	DVH Dose [Gy]	Min Dose Constr. [Gy]	Min Dose Pen.	Max Dose [Gy]	Min Dose [Gy]	Median Dose [Gy]	Avg Dose [Gy]	StdDev Dose [Gy]	Physical Vol [cc]
lung lt		no									55.67	0.04	0.41	4.46	9.11	1,415.91
ITV3	None	yes	10	1	64.00	3	95.00	58.00	52.00	10	57.64	54.52	56.16	56.19	0.78	0.71
PTV3	None	yes	10	2	60.00	10	95.00	52.00	52.00	10	57.01	50.14	54.26	54.21	1.37	6.70
ITV4	None	yes	10	3	64.00	3	95.00	58.00	52.00	10	56.10	54.24	55.35	55.37	0.35	1.21
PTV4	None	yes	10	4	60.00	10	95.00	52.00	52.00	10	56.10	51.11	54.09	54.01	1.00	9.38

Plan Report: 0210071

Plan Name: Plan_02

TomoTherapy INCORPORATED

Planned Fractions Scheduled | Incomplete | Performed

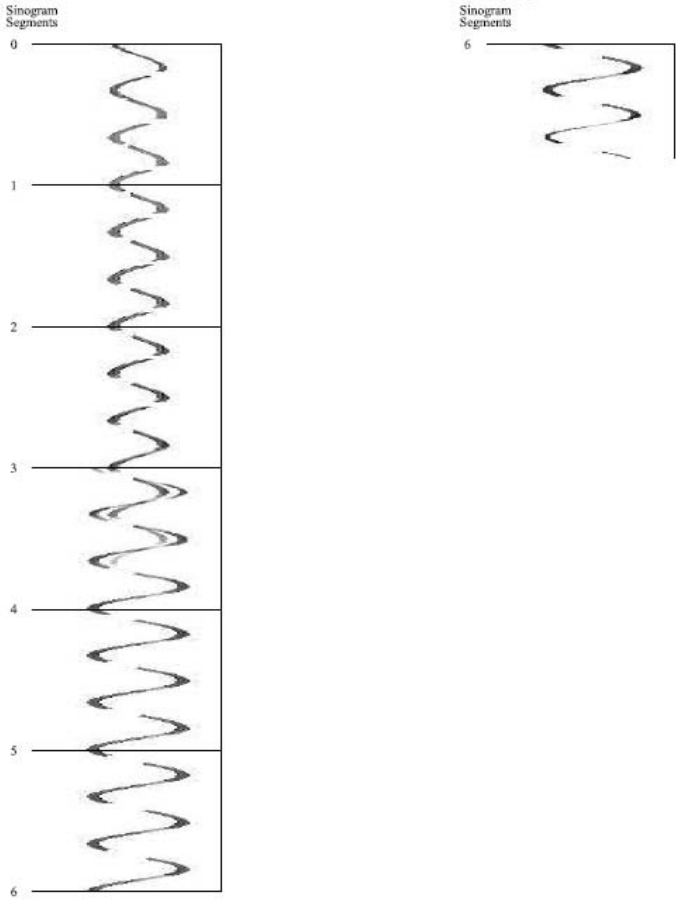
Fraction Number	Scheduled Fraction Date	Fraction Delivery Start Date	Delivery Machine	Dose (Gy)	Expected Duration (sec)	Gantry Rotations	Gantry Period (sec)	MU	Couch Travel (cm)	Couch Speed (cm/sec)	Field Widths
1.0	May 22, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
2.0	May 25, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
3.0	May 26, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
4.0	May 27, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
5.0	May 28, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
6.0	May 29, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
7.0	Jun 1, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9
8.0	Jun 2, 2009	N/A	N/A	6.50	848.9	20.7	41.0	12,040	9.7	0.011	4.9

Plan Report: 0210071

Plan Name: Plan_02

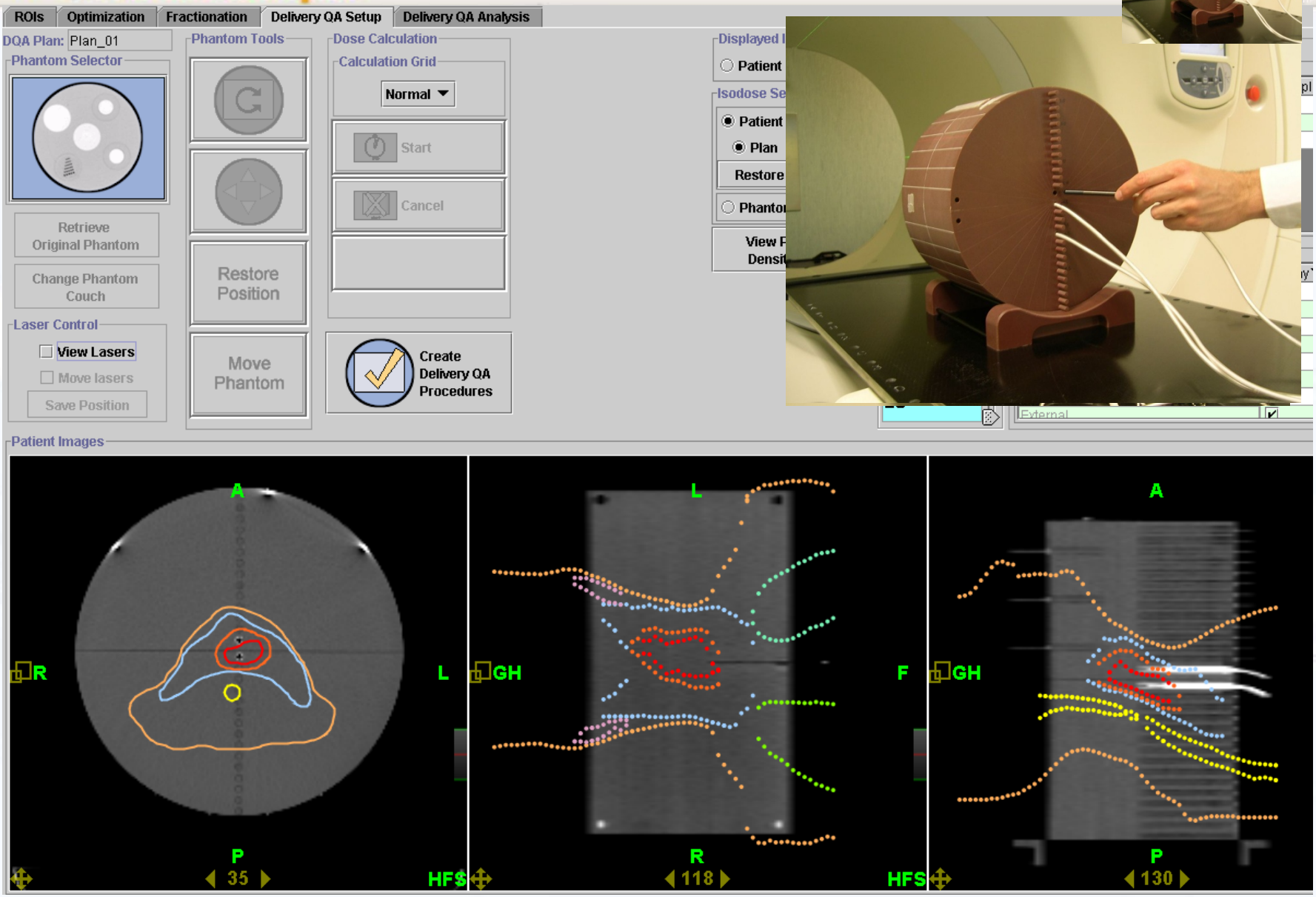
TomoTherapy

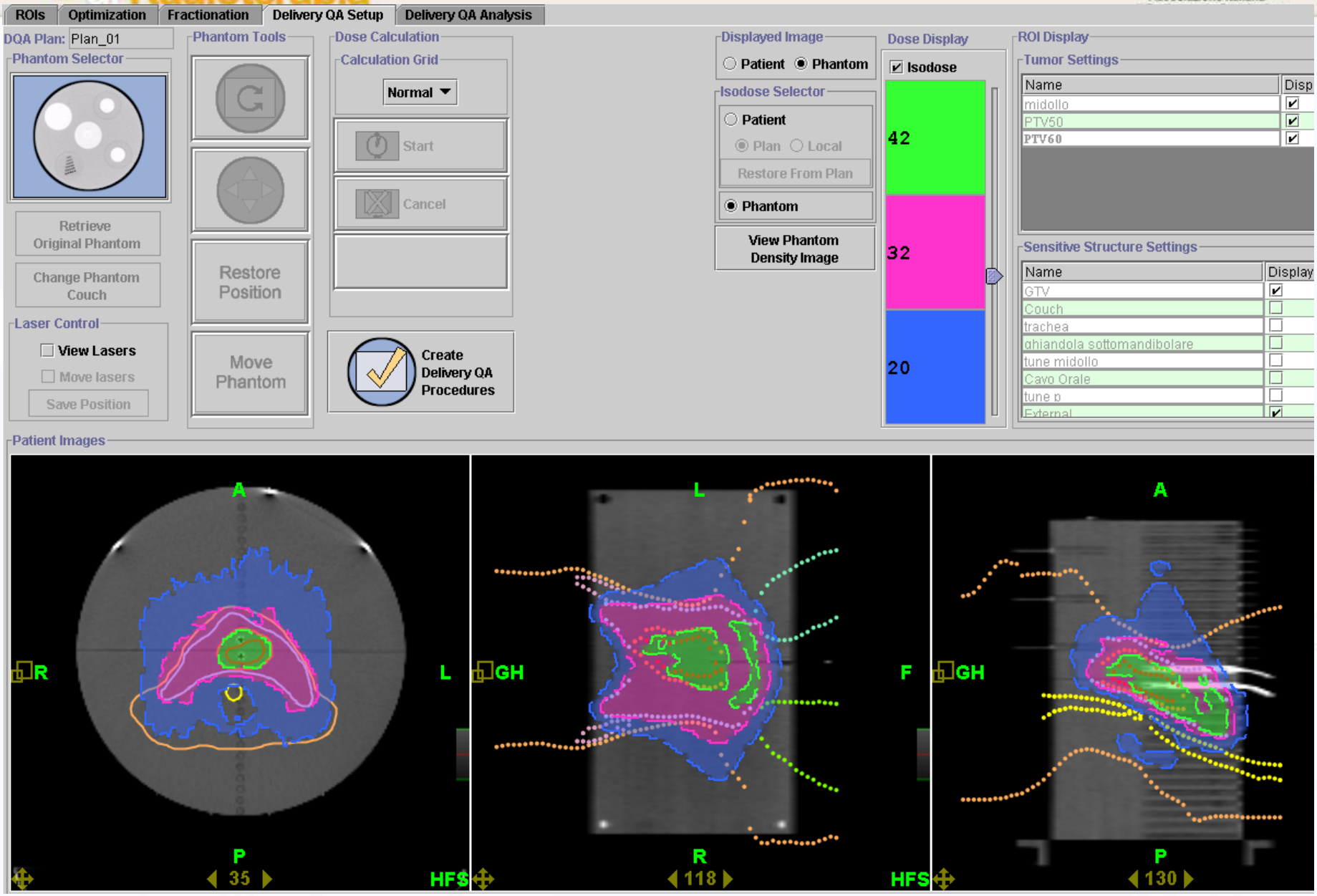
Planned Fluence Sinogram

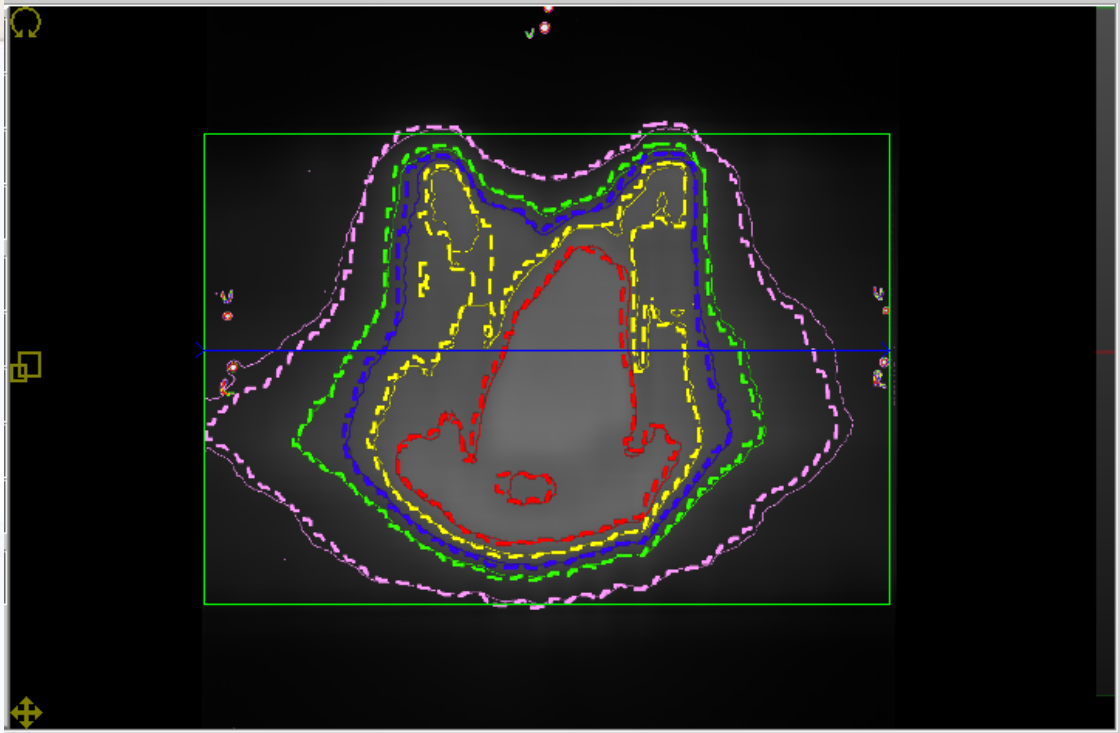


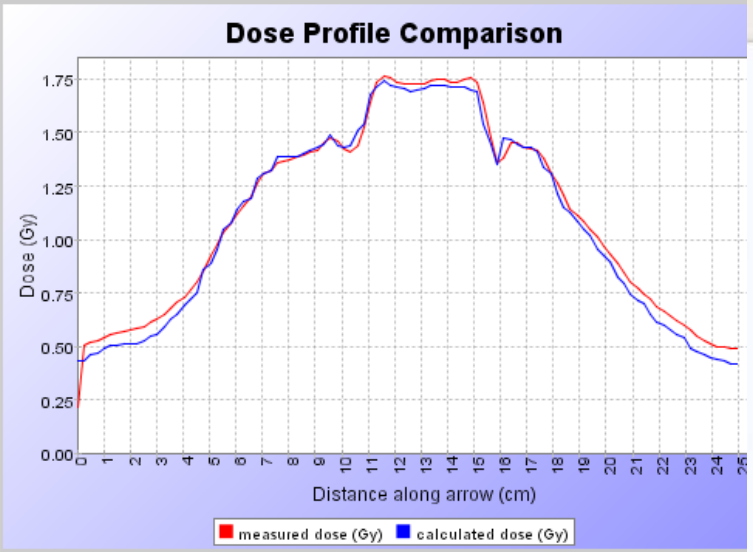
Signature (date) _____

Delivery Quality Assurance (DQA)




ROIs
Optimization
Fractionation
Delivery QA Setup
Delivery QA Analysis
DQA Plan: Plan_01
Phantom Selector
Retrieve Original Phantom
Change Phantom Couch
Laser Control
View Lasers
Move lasers
Save Position
Phantom Tools
Restore Position
Move Phantom
Dose Calculation
Calculation Grid
Normal
Start
Cancel
Create Delivery QA Procedures
Displayed Image
Patient
Phantom
Isodose Selector
Patient
Plan
Local
Restore From Plan
Phantom
View Phantom Density Image
Dose Display
Isodose
42
32
20
ROI Display
Tumor Settings
Name
Disp
midollo
PTV50
PTV60
Sensitive Structure Settings
Name
Display
GTV
Couch
trachea
ghiandola sottomandibolare
tune midollo
Cavo Orale
tune p
External
Patient Images
A
R
L
P
35
HFS
L
GH
F
R
118
HFS
A
GH
P
130





Display Options

- ○ No contours
- ○ Show gamma
- ◉ Show these contours:
- ☑ Show film contours
- ☑ Show calc contours
- ☐ Show patient ROIs

Save Film Data

Save POIs

- ☑ Show film profile
- ☑ Show calc profile
- ☑ Show background?
- ◉ Film background
- ○ Phantom background

Stop Gamma Calc

Calculate Gamma

Gamma Histogram

Search distance: (cm): 0.3

DTA tolerance (cm): 0.3

Dose tolerance (Gy): 0.0534 Change

Select Procedure

erence dose: 2.4 Gy

Proc number: 0

Read Film File

Read Cal File

Convert To Dose

Plot Cal Table

Extract Dose Plane

Flip Image

Scale Film Dose

Dose Display

☑ Isodose

1.6

1.4

1.2

1

0.6

Film Registration

Register Film Position

Registration type: CORONAL ORIENTATION patient slice: 118

Current step:

Accept Point | Cancel Registration

Points of Interest

Add Point of Interest

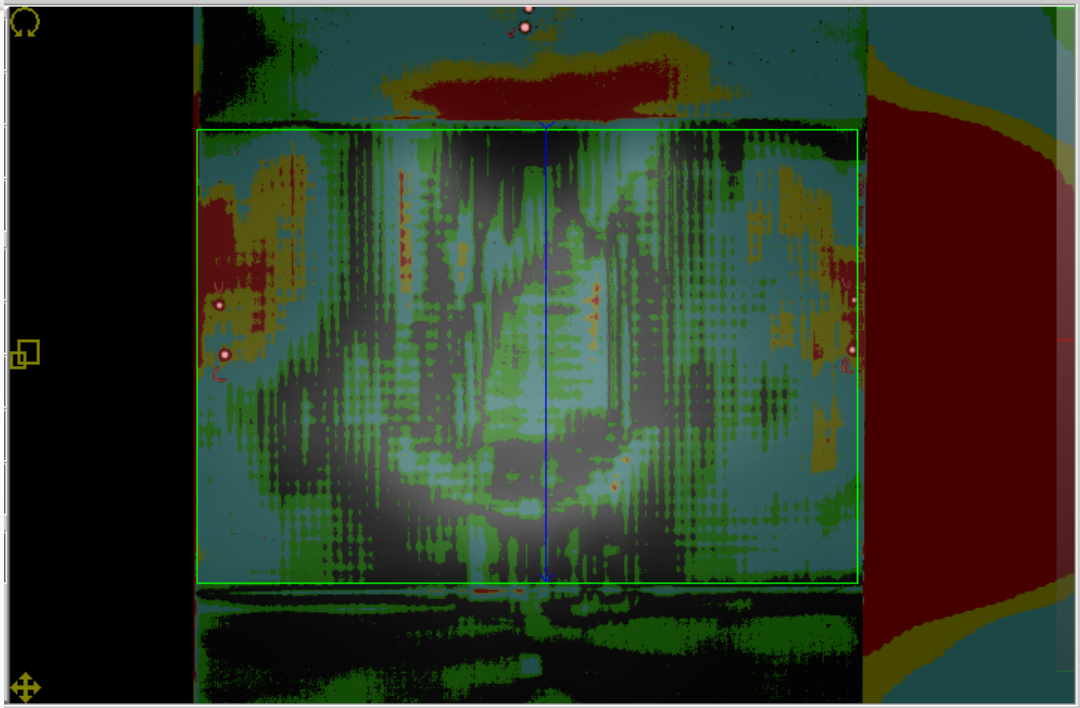
Remove Selected POI

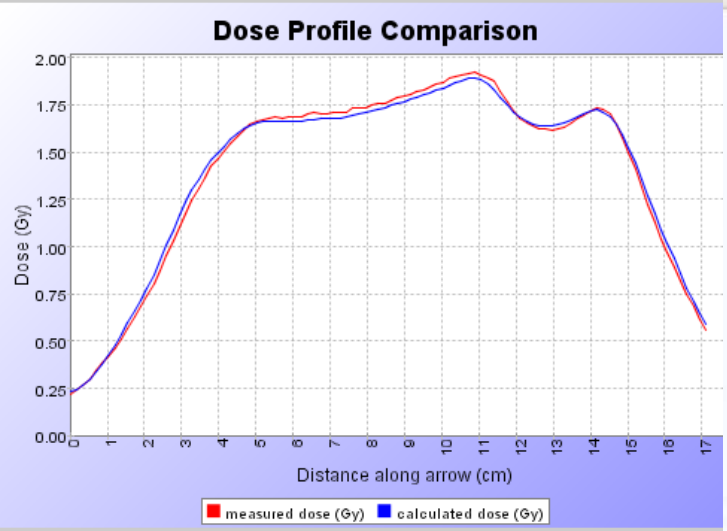
Show Selected POI

Move Selected POI

Name	Comment	Color	x (cm)	y (cm)	z (cm)	Calc Dose	Meas Dose	Diff (G
POI_00	ch1 +1 cm		0.10	-2.14	3.03	1.776	1.773	0.0
POI_01	ch 2 -0.5 cm		0.10	-2.14	1.46	1.740	1.749	-0.0
POI_02	ch3 -4.5 cm		0.10	-2.39	-2.64	0.693	0.695	-0.0
POI_03	film		0.10	-2.14	2.05	1.735	1.658	0.0

Optimization | Fractionation | Delivery QA Setup | Delivery QA Analysis





Display Options

- ○ No contours
- ◉ Show gamma
- ○ Show these contours:
- ☑ Show film contours
- ☑ Show calc contours
- ☐ Show patient ROIs

☑ Show film profile ☑ Show calc profile

☑ Show background?
- ◉ Film background
- ○ Phantom background

Stop Gamma Calc
Calculate Gamma
Gamma Histogram

Search distance: (cm): 0.3
DTA tolerance (cm): 0.3
Dose tolerance (Gy): 0.0534 Change

Save Film Data
Save POIs

Select Procedure

erence dose: 2.4 Gy

Proc number: 0

Read Film File
Read Cal File
Convert To Dose
Plot Cal Table
Extract Dose Plane
Flip Image
Scale Film Dose

Gamma Display

☐ Isodose

1.25
1
0.5
0.25

Film Registration

Register Film Position

Registration type: CORONAL ORIENTATION patient slice: 118

Current step:

Accept Point | Cancel Registration

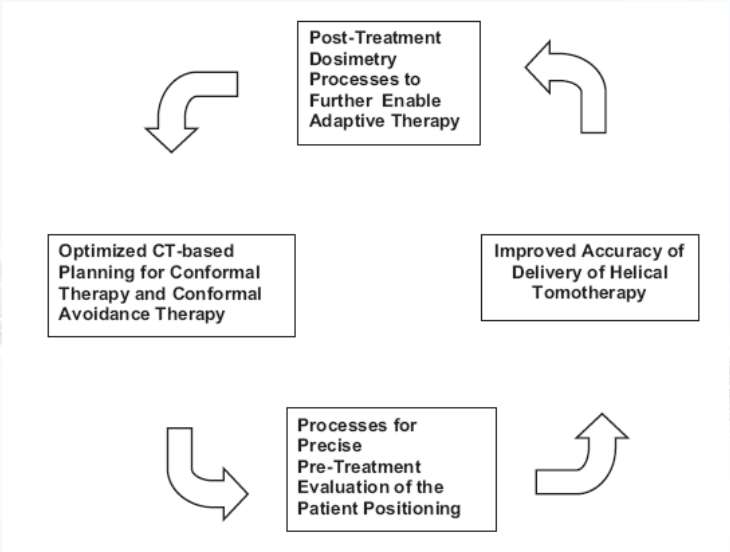
Points of Interest

Add Point of Interest
Remove Selected POI
Show Selected POI
Move Selected POI

Name	Comment	Color	x (cm)	y (cm)	z (cm)	Calc Dose	Meas Dose	Diff (Gy
POI_00	ch1 +1 cm		0.10	-2.14	3.03	1.776	1.773	0.00
POI_01	ch 2 -0.5 cm		0.10	-2.14	1.46	1.740	1.749	-0.00
POI_02	ch3 -4.5 cm		0.10	-2.39	-2.64	0.693	0.695	-0.00
POI_03	film		0.10	-2.14	2.05	1.735	1.658	0.07

Il software di pianificazione è relativamente semplice

Il sistema permette di progettare con un "ragionevole" sforzo piani molto complessi



Si possono realizzare trattamenti estesi senza ricorrere a giunzioni

la presenza dell' unità MVCT integrata e on line permette di verificare il posizionamento del paziente, la registrazione di Target/OAR (shift geometrico, variazioni in forma), e la ricostruzione della dose erogata

Il software per DQA è integrato e facile da usare

Il volume irradiato è esteso, se confrontato con CRT

Il tempo di trattamento è lungo (tempi morti, MVCT , beam on)

Il sistema è chiuso

grazie per l'attenzione