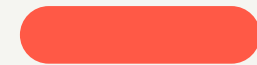





ACCURAY

Enhanced Planning Capabilities using VOLO™ Ultra Optimizer for the Radixact® System – Lynn Cancer Institute Findings

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Institute, FL





VOLO™ Ultra Optimization for Radixact® System- Lynn Cancer Institute Findings

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Accuray Disclaimers and Disclosure

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Most side effects of radiotherapy, including radiotherapy delivered with Accuray systems, are mild and temporary, often involving fatigue, nausea, and skin irritation. Side effects can be severe, however, leading to pain, alterations in normal body functions (for example, urinary or salivary function), deterioration of quality of life, permanent injury and even death. Side effects can occur during or shortly after radiation treatment or in the months and years following radiation. The nature and severity of side effects depend on many factors, including the size and location of the treated tumor, the treatment technique (for example, the radiation dose), the patient's general medical condition, to name a few. For more details about the side effects of your radiation therapy, and if treatment with an Accuray product is right for you, ask your doctor.

Content

- ▶ Lynn Cancer Institute at a Glance
- ▶ First Impression
- ▶ Appearances
- ▶ Normal Tissue Objectives
- ▶ Overlap Priority
- ▶ Snapshots
- ▶ Prescription-Rescale Dose
- ▶ LCI Findings: Pros/Cons

Lynn Cancer Institute at a Glance



Boca Raton

701 NW 13th St Floor 3, Boca
Raton, FL 33486



Delray Beach

16313 South Military Trail
Delray Beach, FL 33484



Bethesda Health City in Boynton Beach

10301 Hagen Ranch Road,
Suite A-960
Boynton Beach, FL 33437

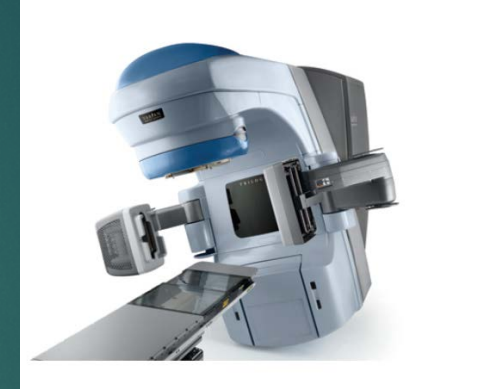
Current Radiotherapy Technology at LCI



Varian® TrueBeam™



Varian® Novalis Tx



Varian® Trilogy



Radixact® System



CyberKnife® M6™



Elekta Flexitron

Current Treatment Planning Software at LCI



**Varian Eclipse™ TPS for
Varian Linear Accelerators**



**Accuray Precision® TPS for
Radixact® and CyberKnife®**



**Oncentra® TPS for HDR
Brachytherapy**

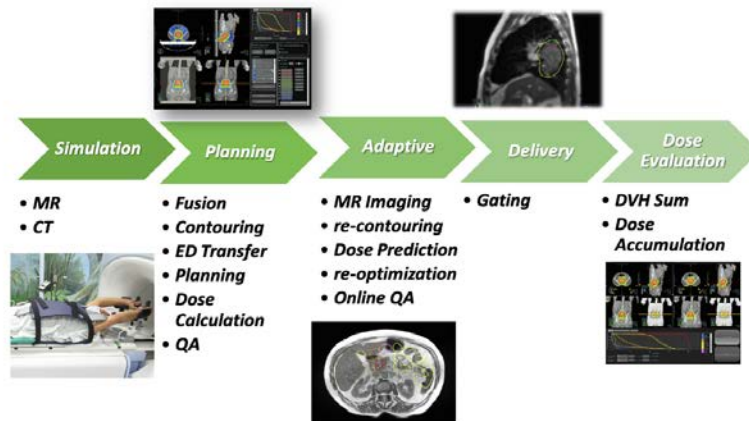
What's Coming at LCI?



Expected to Go-Live in late 2022

L. Placidi et al./Technical Innovations & Patient Support in Radiation Oncology 15 (2020) 15–21

The MRIdian workflow



What's coming at LCI?



- ▶ RapidArc Treatment Delivery
- ▶ kV Imaging System
- ▶ Advanced imaging
- ▶ Gated CBCT
- ▶ 4D CBCT Imaging Package
 - ▶ Acquire an 4D CBCT images for patient positioning
 - ▶ Review target motion analysis at the time of treatment delivery
 - ▶ post treatment delivery

Addition of TrueBeam Linear Accelerators in 2022

What's coming at LCI?

Single Room Proton Therapy System



My Radixact[®] Journey So Far

- ▶ Radixact[®] System was installed and started clinical operation in October 2020 at LCI
- ▶ I started working at LCI in March 2021
- ▶ Learned Accuray Precision[®] Treatment planning system and functionality of Radixact from scratch
- ▶ Reduced treatment planning time from weeks to days
- ▶ With VOLO[™] Ultra treatment planning is now matter of couple of hours

VOLO™ Ultra First Impressions

- ▶ Quick and very fast-real time optimization
- ▶ No overlap priority
- ▶ More freedom to prescribe the dose as compared to classic optimization
- ▶ Normal Tissue Objectives (NTO) feature added
- ▶ Requires less numbers of rings/helping structures
- ▶ Intractive DVH-Freedom to choose Max, Min or Mean dose
- ▶ Snapshots

Appearances

VOLO™ Ultra

classic

Tools | VOIs | Display

Script [Icons]

Prescription
Fx: 23 Dose: 4600 cGy
Prescription

Plan Setup
Jaw Mode: Dynamic
Field Width: 2.5 cm - Jaws(1.00, -1.00)
Pitch: 0.438
Accelerate Treatment: 0 to 10

Optimization
Resolution: High
Optimize: [Play] [Trash]
Auto Final Dose
Snapshots [Icons]
Final Dose Resolution: High
Clear Final Dose
Show Optimization Results
Rescale Dose

Goals | NTO | Parameters | Beam Intersection

Target Goals

VOI	Goal Type	Weight	Specified Dose (cGy)	Achieved Dose (cGy)	Volume (cm ³)	Volume (%)
oPTV_46Gy	Min	125.0	4600	4002	180.66	100.0
	Max	150.0	4700	4874	0.00	0.0
GTV1	Min	1.0	4600	4619	17.87	100.0

Critical Goals

VOI	Goal Type	Weight	Specified Dose (cGy)	Achieved Dose (cGy)	Volume (cm ³)	Volume (%)
Ring1_46Gy	Max	10.0	4600	4720	0.19	0.1
	Max	10.0	4250	4368	28.23	15.0
	Max	10.0	4100	4184	56.46	30.0
Ring2_46Gy	Max	10.0	4000	4089	0.24	0.1
	Max	10.0	3200	3243	35.69	15.0
	Max	10.0	2950	2894	71.38	30.0
Ring3_46Gy	Max	10.0	3000	3480	0.70	0.1
	Max	10.0	2050	2166	104.67	15.0

NTO: Off
DVH Properties Selected DVH: GTV1

Tools | VOIs | Display

Script [Icons]

Plan Setup
Jaw Mode: Dynamic
Field Width: 2.5 cm - Jaws(1.00, -1.00)
Pitch: 0.200
Modulation Factor: 1.950
Optimization Resolution: High
Resume
Cancel
Initiate Final Dose After: 20
Show VOI Overlap Effect
Final Dose Resolution: High
Clear Final Dose
Show Optimization Results

Prescription % Volume For PTV4256_Lt 94.50 % will receive 4256 cGy in 16 Fractions

Target Objectives

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
LCTVtB+2	1	✓	100	4256	2000	98.50	4256	4256	2000
PTVn_LMN_R	2	✓	100	4256	2000	98.50	4256	4256	1000
PTV 3860_Rt	3	✓	100	3860	2000	95.00	3860	3860	1000
PTV4256_Lt	4	✓	100	4256	2000	95.00	4256	4256	1000

Critical Constraints

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
Skin Rind	1	Allowed	✓	10	4000	100	45.00	3300	7500
							30.00	3400	7500
							15.00	3500	7500
Tune_Medial	2	Allowed	✓	10	3800	10000	30.00	2400	100
							10.00	2900	100
Ring4256_Rt_3MM	3	Allowed	✓	10	4450	10000	10.00	1	1
Ring4256_Lt_6MM	4	Allowed	✓	10	4450	10000	1.00	1	1
Tune1_Lt Lung	5	Allowed	✓	10	4000	100	40.00	2100	750

DVH Properties Selected DVH: Lt Tumor Bed

Fast Optimization-Time savings

- ▶ As we know, our time is essential and compared to classic optimizer, VOLO™ Ultra is a very fast optimizer
- ▶ Intractive DVH-can change goal type (Min, Mean or Max) any time, can add up to 5 DHV Goals (control points) and drag the arrow to adjust the volume
- ▶ Freedom to include or exclude desired Target volume/OAR's at any stage of optimization without losing calculated dose
- ▶ Option to control the "Beam on Time," by using either accelerate treatment tab or by choosing time manually
- ▶ Option to accelerate the time of optimization

Fast Optimization-Time savings

Tools VOIs Display

Goals NTO Parameters Beam Intersection

Script [Icons]

Prescription
Fx: 23 Dose: 4600 cGy
Prescription

Plan Setup
Jaw Mode: Dynamic
Field Width: 2.5 cm - Jaws(1.00, -1.00)
Pitch: 0.438 Calc
Accelerate Treatment: 0 to 10

Optimization
Resolution: High
Optimize: [Play] [Trash]
Auto Final Dose
Snapshots: [Icons]
Final Dose Resolution: High
Clear Final Dose
Show Optimization Results
Rescale Dose

Target Goals

VOI	Goal Type	Weight	Specified Dose (cGy)	Achieved Dose (cGy)	Volume (cm³)	Volume (%)
oPTV_46Gy	Min	125.0	4600	4002	180.66	100.0
	Max	150.0	4700	4874	0.00	0.0
GTV1	Min	1.0	4600	4619	17.87	100.0

Critical Goals

VOI	Goal Type	Weight	Specified Dose (cGy)	Achieved Dose (cGy)	Volume (cm³)	Volume (%)
Ring1_46Gy	Max	10.0	4600	4720	0.19	0.1
	Max	10.0	4250	4368	28.23	15.0
	Max	10.0	4100	4184	56.46	30.0
Ring2_46Gy	Max	10.0	4000	4089	0.24	0.1
	Max	10.0	3200	3243	35.69	15.0
	Mean	1.0		2144		
	Max	1.0		4224	0.00	0.0
	Max	10.0	2950	2894	71.38	30.0

NTO: Off
DVH Properties Selected DVH: Whole Brain

Tools VOIs Display

Goals NTO Parameters Beam Intersection

Script [Icons]

Prescription
Fx: 23 Dose: 4600 cGy
Prescription

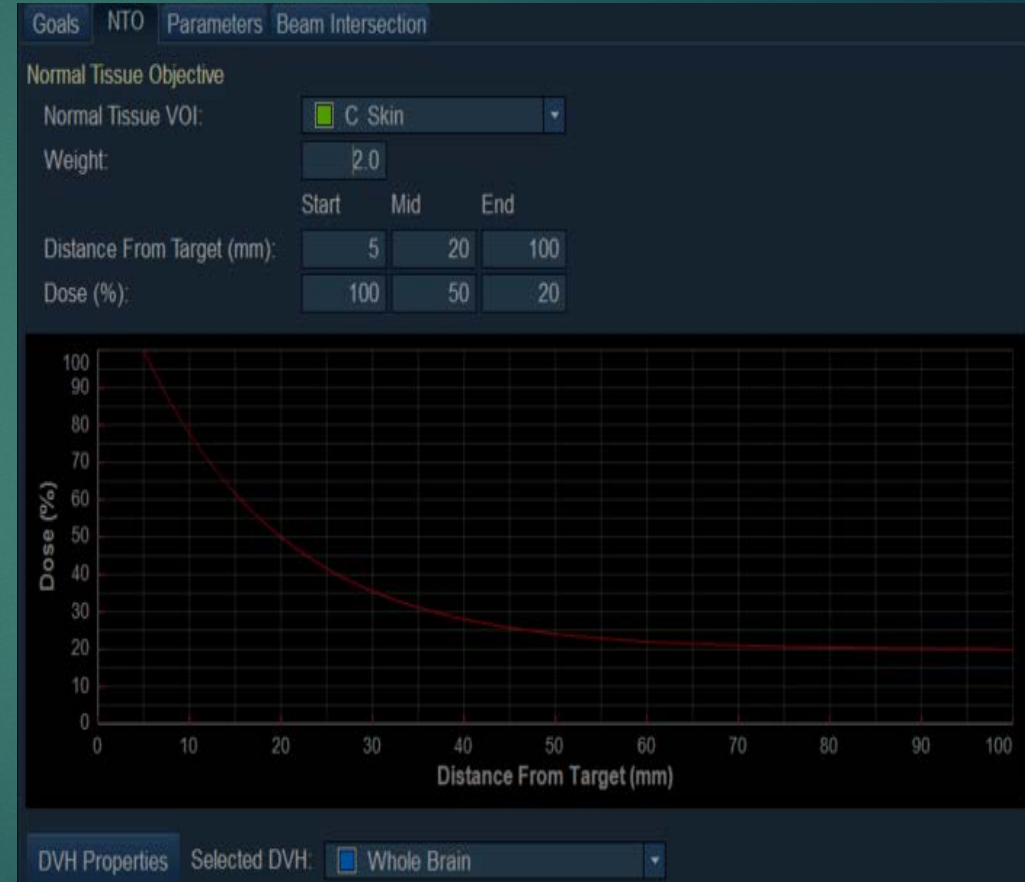
Plan Setup
Jaw Mode: Dynamic
Field Width: 2.5 cm - Jaws(1.00, -1.00)
Pitch: 0.438 Calc
Accelerate Treatment: 0 to 10

Delivery
Leaf Open/Close Time Cut-Off: 20 ms
Max Beam On Time: 104 sec Auto

Performance
Accelerate Optimization: 1
Min # Iteration Rounds: 3

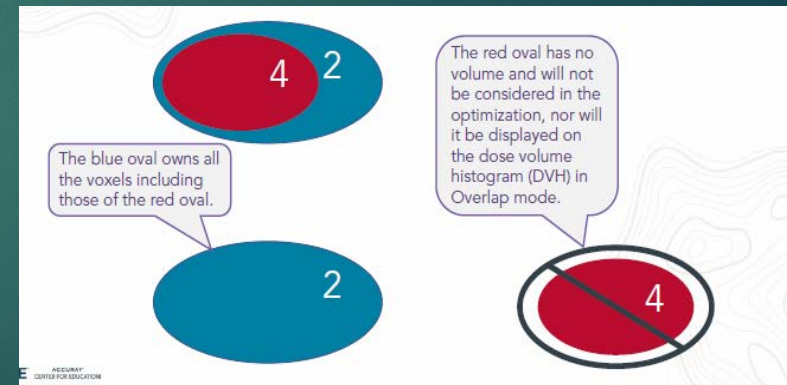
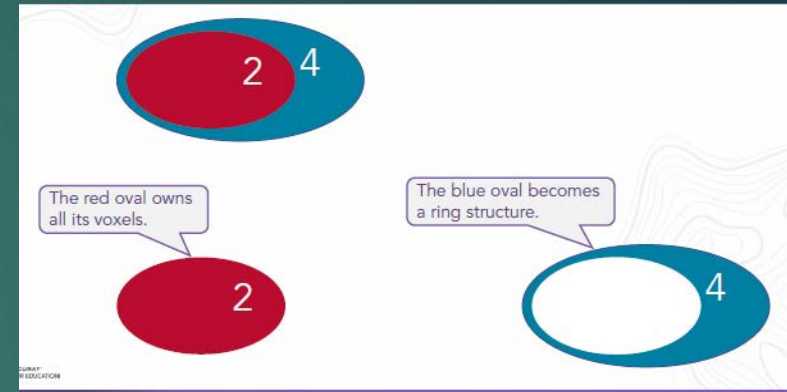
Normal Tissue Objective

- ▶ NTO is a new feature that is added to VOLO™ Ultra
- ▶ Controls the gradient outside of the target volume
- ▶ Due to this feature, a fewer number of rings/dose limiting structures are required, saving contouring time
- ▶ Start gently with low priority so that target coverage can be achieved



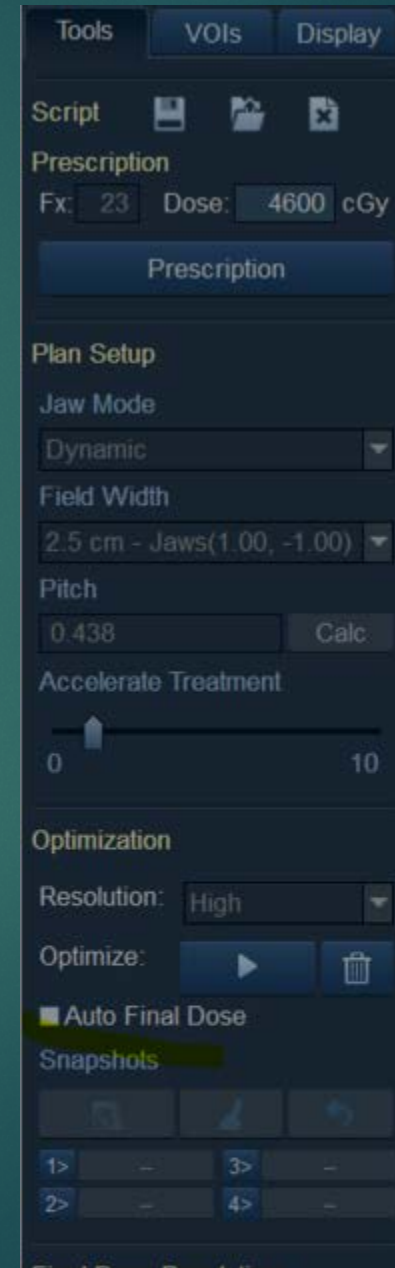
No Overlap Priority

- ▶ In the classic optimizer, overlap priority is a deciding factor and cannot be ignored. It determines the ownership of shared voxels for optimization
- ▶ Needs to be considered even if structure is not being used for optimization
- ▶ With VOLO™ Ultra, it can use sub structures at any time during the optimization to achieve your goals



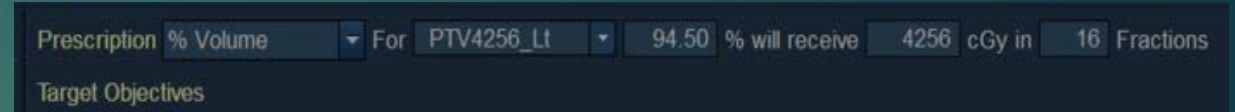
Snapshots

- ▶ There are 4 Snapshots that are available for comparison during the planning process
- ▶ Select the number and save the plan with unique identity like 98% converge, 105% Hotspot etc.
- ▶ Ease to select the plan using snapshots as it shows a comparative DVH
- ▶ Save the snapshot before exiting, once you close the plan, unsaved snapshots will delete automatically

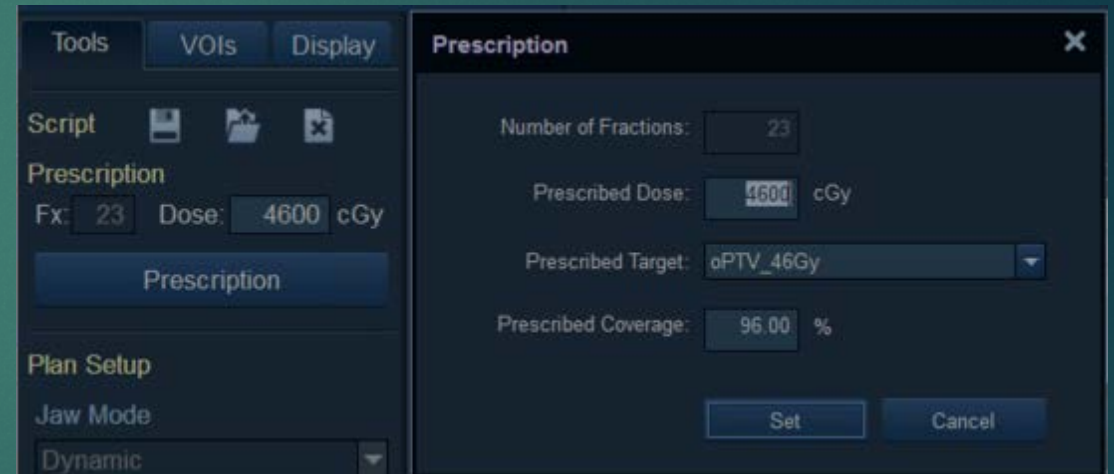


Prescription

- ▶ Prescription opens with initial access to the plan tab
- ▶ Prescription is used for the isodose display in VOLO™ Ultra
- ▶ In classic optimization, the result is normalized to the prescription



Classic Prescription



VOLO Ultra Prescription

Prescription - Rescale Dose

- ▶ Rescale dose is another new feature added to VOLO™ Ultra
- ▶ Run the final dose calculation prior to using this feature
- ▶ Try to deviate only 1-2% change between the desired and current dose
- ▶ It is recommended to try to re-optimize if difference between desired and current dose is significant



LCI Findings:

Pros

- ▶ No Overlap Priority
- ▶ NTO- Rings or NTO are used to control the dose outside of the target
- ▶ Rescale final dose option
- ▶ Interactive DVH
- ▶ Can control the Beam on Time
- ▶ Control over Leaf Open/Close time, Cut-Off feature helps Physics to pass QA easily

Cons

- ▶ In VOLO™ Ultra, the planner does not control the modulation factor directly
- ▶ No unlimited number of total rounds of calculation, as in VOLO Ultra, there are 1-10 rounds in total and each round has 20 iterations
- ▶ To overcome Modulation Factor selection, use time manually

Reference:

- ▶ Accuray training materials
- ▶ Accuray Exchange <https://accurayexchange.com/>