



“Living Well with Breast Cancer” Forum

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Overview of Presentation

Background of Radiation Therapy

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graph TD; A[Background of Radiation Therapy] --> B[Radiation Therapy Treatment Process]; B --> C[How Technology is Improving Outcomes]; C --> D[Supportive Care & Follow-Up];
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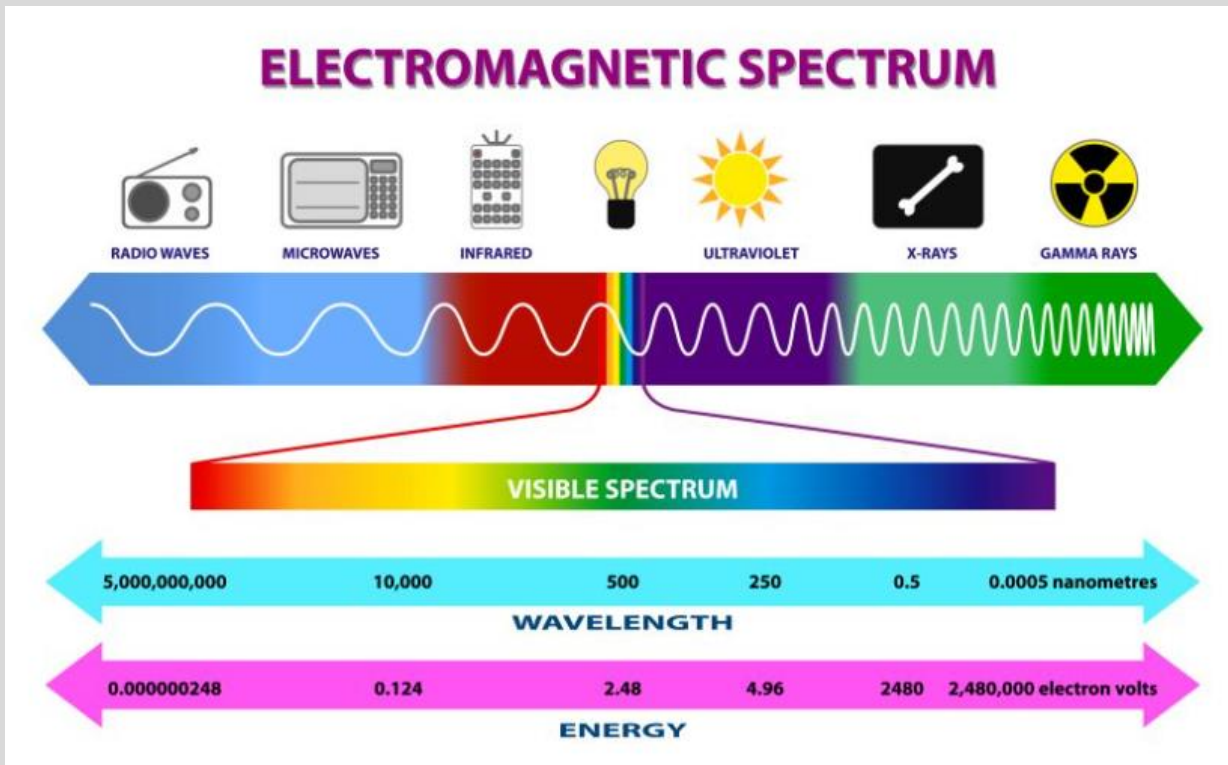
Radiation Therapy Treatment Process

How Technology is Improving Outcomes

Supportive Care & Follow-Up

What is Radiation Therapy?

- The medical use of ionising radiation
 - High energy x-ray photons or electrons

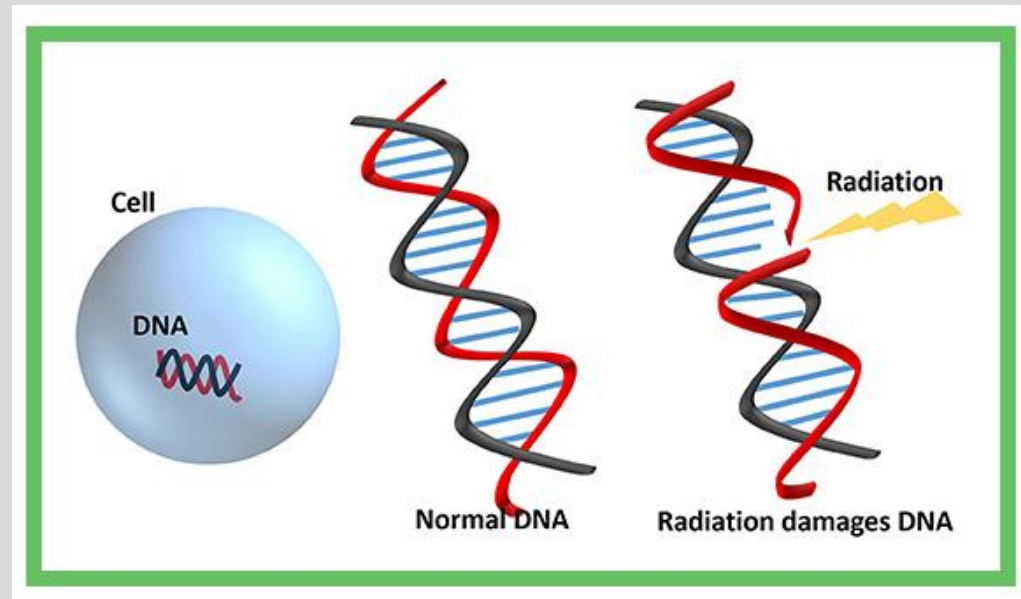


Diagnostic x-rays = kV

Therapeutic x-rays = MV
(1000kV = 1MV)

Why is radiation used?

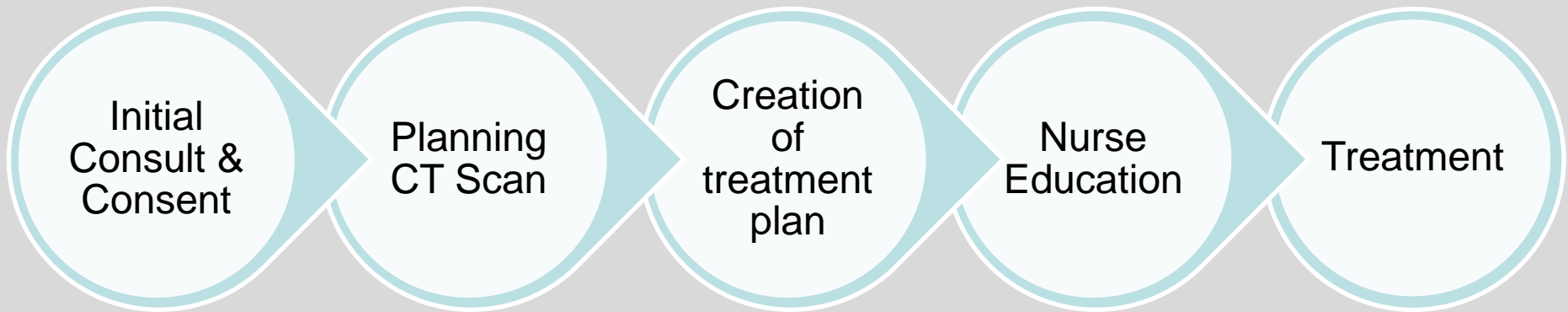
- Ability to control cell growth
 - Works by damaging the DNA of cancer cells so they cannot replicate → eventually cause cell death
 - Also affects normal tissues cells, but they have the ability to repair the damage



Common Treatment Regimes

- Evidence-based dose and number of treatments (also called fractionations)
 - Validated by clinical trials and long-term follow up data
- Most often used:
 - 50Gy / 25 fractions
 - 40Gy / 15 fractions
 - +/- 10Gy / 5 fraction boost to tumour bed depending on pathology and individual risk factors
- FAST-Forward Trial – comparing 15 fraction treatments with a 5 fraction regime
 - Not commonly utilised in Australia as limited long-term follow up data

Radiation Treatment Process



Initial Consult & Consent

- Rationale for treatment
- Expected outcomes
- Side effects
- Informed consent



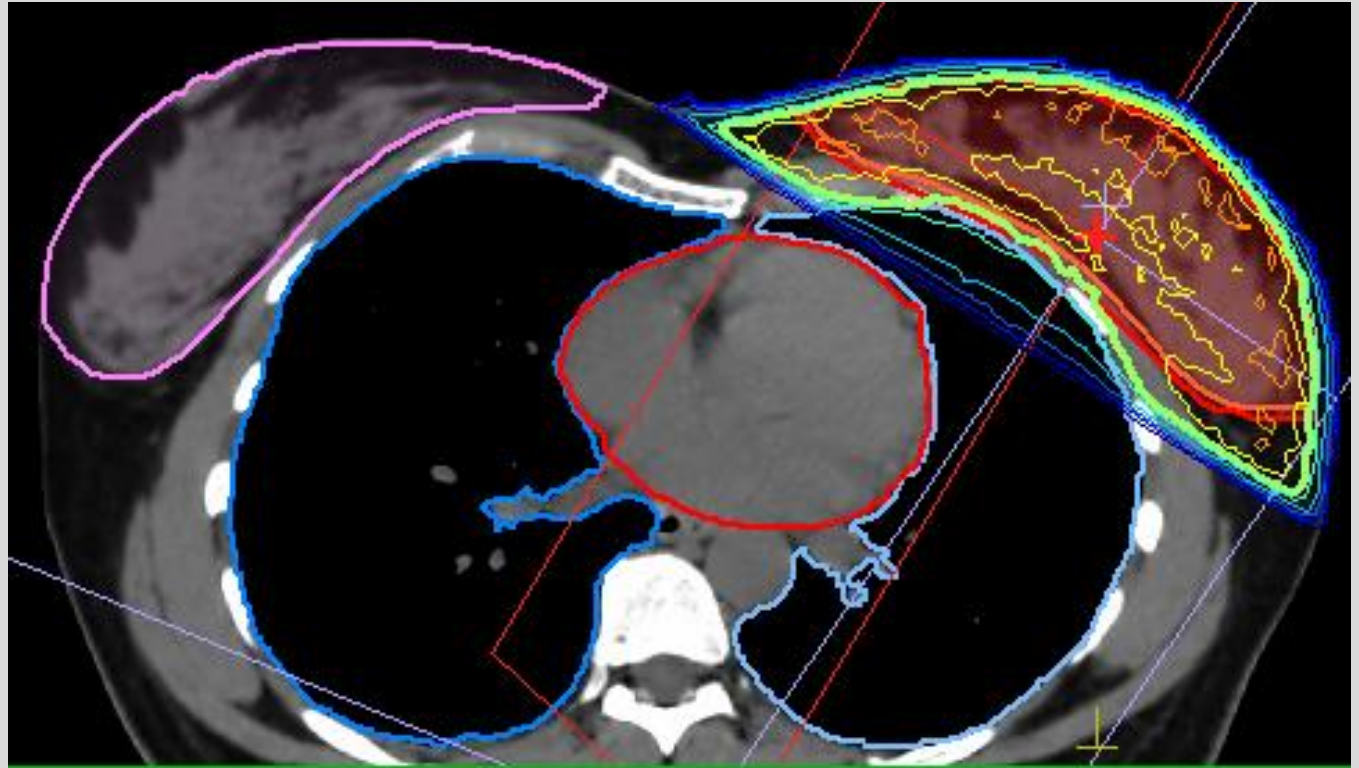
Planning CT Scan

- CT scan in treatment position
- References for accurate daily setup



Creation of treatment plan

- Individualised treatment plan
- Aim to deliver maximum tumour coverage with minimal dose to normal tissues & organs



Normal Tissue Doses

Organ	1.8-2 Gy fractionation regimen	Hypofractionation regimen • 40 Gy in 15 fx
Ipsilateral lung	<ul style="list-style-type: none"> • V20 Gy <30%¹⁹ • V5 Gy <70%²⁰ • For tangential fields it is recommended that central axis lung exposure should be <3 cm, ideally 2cm or less if achievable. 	<ul style="list-style-type: none"> • V17 Gy <35%¹² (combined dose from both chest wall/breast and nodal plans)
Contralateral lung	<ul style="list-style-type: none"> • V5 Gy <10% 	
Heart	<ul style="list-style-type: none"> • V25 Gy <10%²¹ • Mean Heart Dose (MHD) <5 Gy <ul style="list-style-type: none"> ◦ This dose constraint may be difficult to achieve and considered according to individual patient risk/benefit factors. 	<ul style="list-style-type: none"> • V17 Gy <10%
Contralateral breast	<ul style="list-style-type: none"> • V3 Gy <10%²⁰ 	
Spinal cord	<ul style="list-style-type: none"> • Acceptable: Max dose equivalent to ≤45 Gy in 2 Gy fractions. • Ideally max dose ≤40 Gy. 	

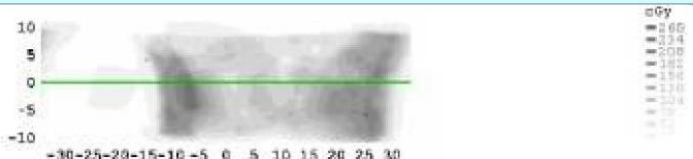
Quality Assurance

- Rigorous process
- Multi-layer check and re-check
- Independent check of calculated dose

Beam Data for CalcPt_1

Beam Desc.	Depth	Equiv. Path	SSD	OADx	OADz	Dose	RTP Dose	% Diff.
1 ARC2s	9.67	9.67	90.33	0.00	0.00	2.2190	2.2290	-0.4%

- Physics measurement on the machine

Field	γ -pass rate (%) 3%/2mm	Dose Map
ARC2s	99.7	

Nurse Education

- Introduce themselves and explain how they can help you throughout treatment
- Provide information about skin care & general well-being while receiving RT



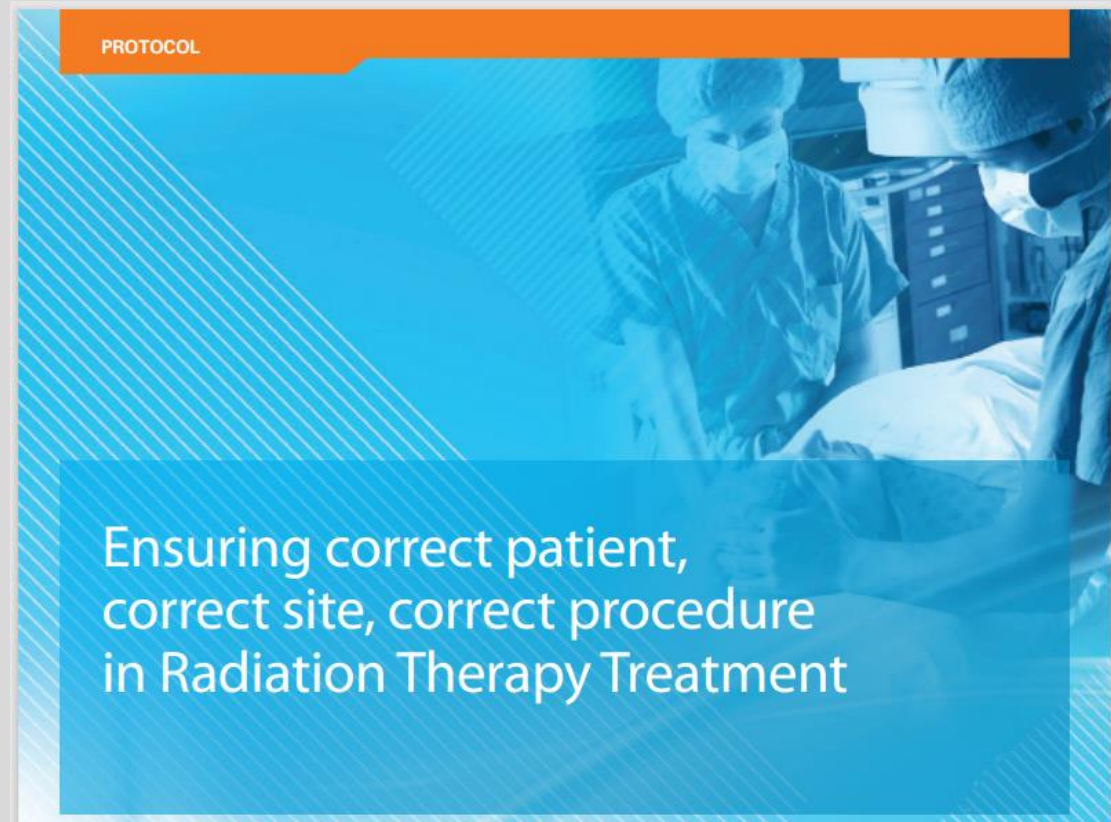
Treatment

- Positioned in the same way as the planning CT
- Quality assurance checks performed prior to delivering radiation
- Total treatment time approx. 15 minutes



Quality Assurance

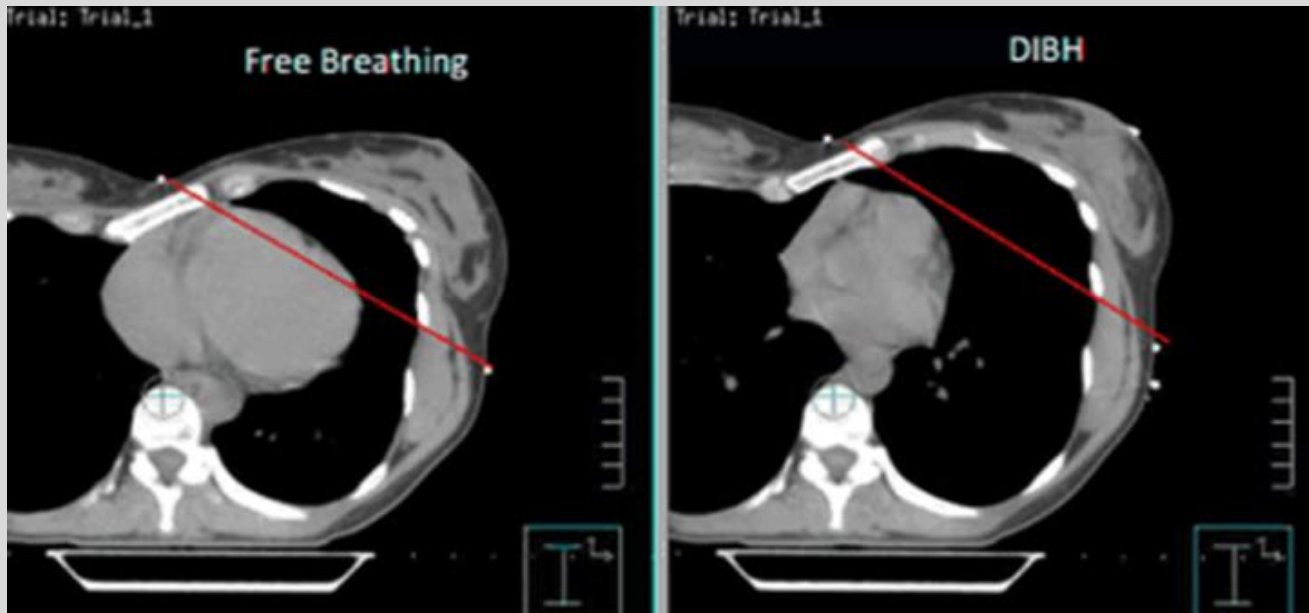
- Pre-treatment check of data
- “Time-out” before delivery
 - Correct patient
 - Correct site
 - Correct procedure



Improving Outcomes with Technology

Treatment in Breath Hold

- Commonly utilised for left-sided breast / post-mastectomy treatments
- Aim is to inflate the lungs so that the heart is pushed away from the ribs



Spirometry-based Breath Hold

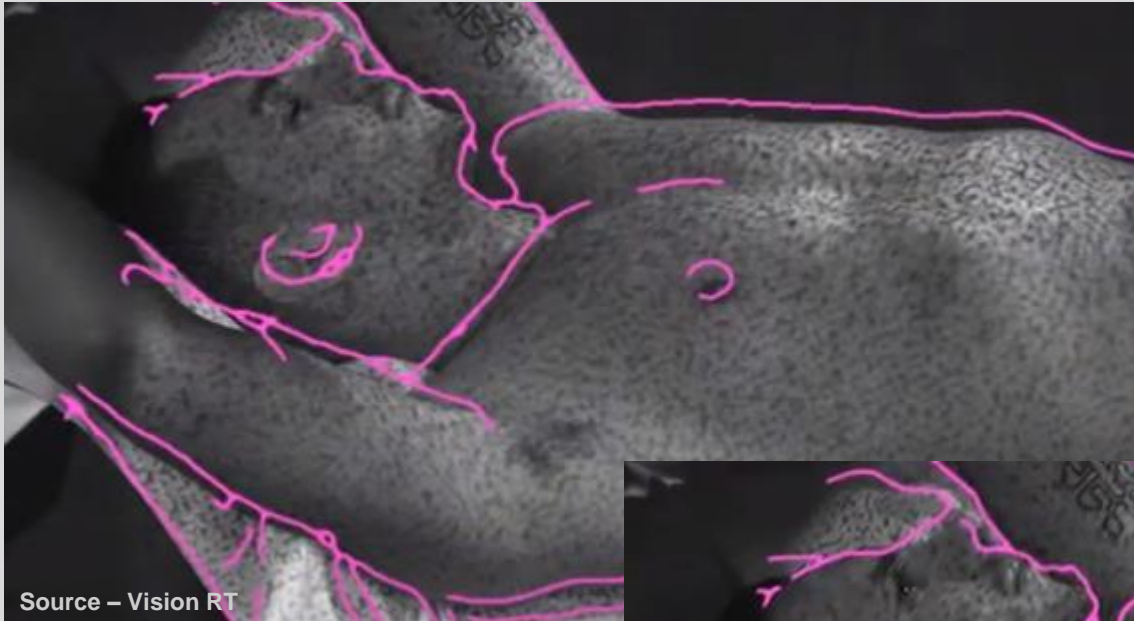


- Computer-controlled spirometer measures input and output of breath to display a breathing cycle
- Patient activates the system and takes a comfortable deep breath in
- The lung capacity at 'comfortable' inhale breath hold recorded at CT

- During treatment, the radiation is delivered only when the breath-hold volume is reached



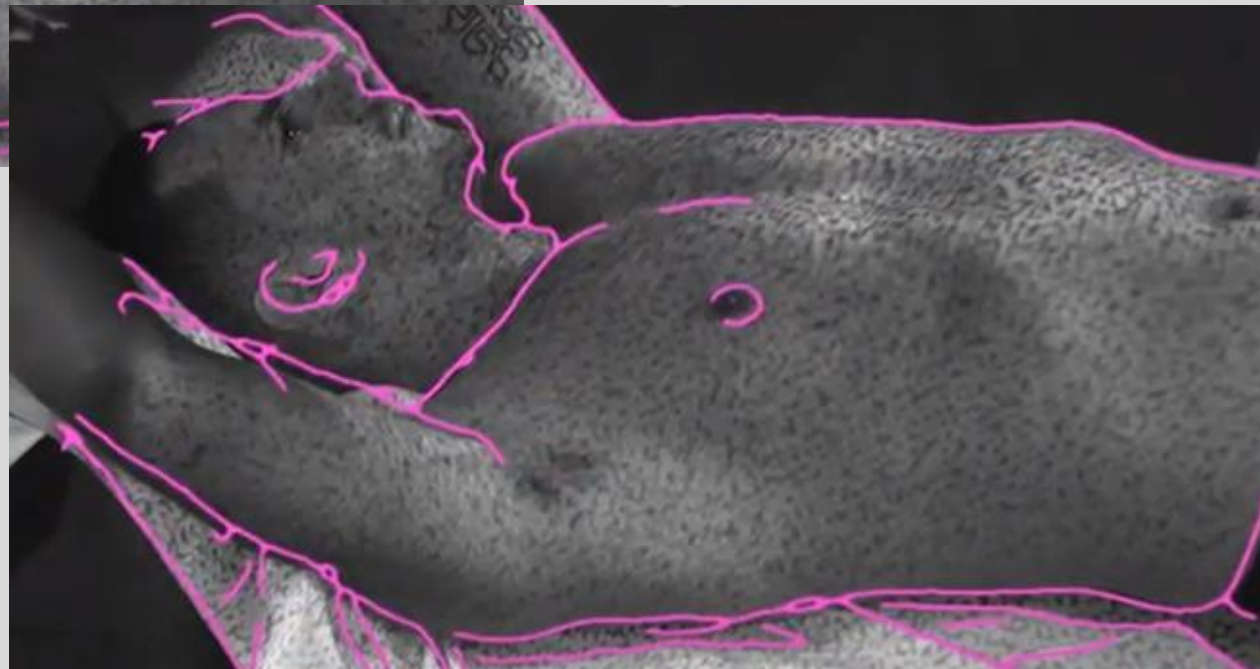
Surface Guided Breath Hold



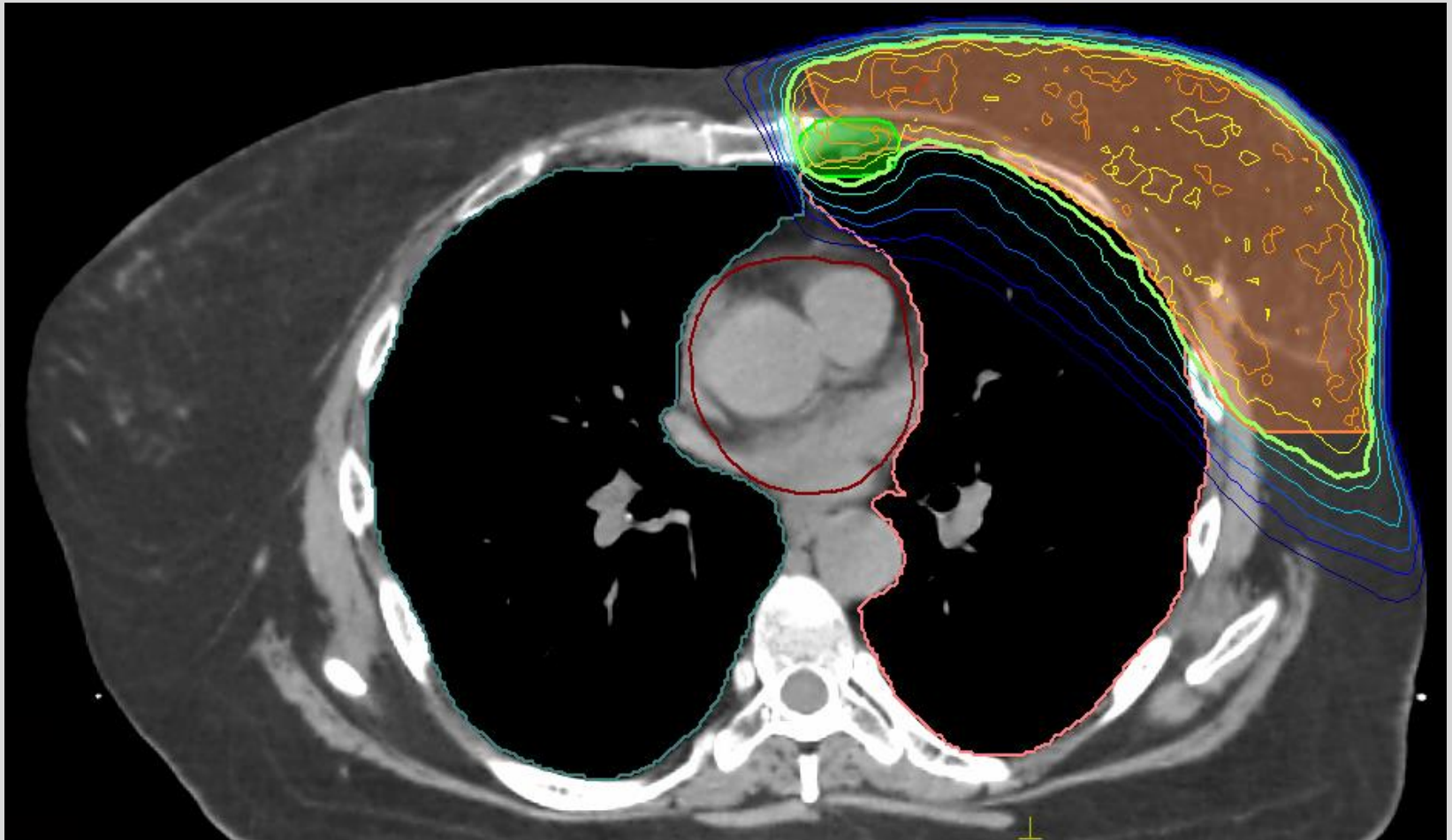
Source – Vision RT

- Reference outline (pink) acquired from planning CT

- Radiation delivered only when patient takes a breath in and their skin surface matches the reference outline



Volumetric Modulated Arc Therapy (VMAT)



Source --

Image-Guided Radiation Therapy

The screenshot displays a radiation therapy software interface for image-guided registration. It features three main view windows: Coronal (top left), Sagittal (top right), and Transverse (bottom left). Each view shows a patient's chest with overlaid registration contours and a dashed box indicating the registration area. The Coronal view is labeled 'Correction reference point = isocenter' and 'Slice 205 of 410'. The Sagittal view is labeled 'Registration for Clipbox' and 'Slice 205 of 410'. The Transverse view is labeled 'Slice 132 of 264'. A 'Reference' panel on the right contains checkboxes for 'Scan', 'Clipbox', 'Cor Ref', 'Structures', and 'Mask'. A 'Protocol' panel includes dropdowns for 'Registration' (Clipbox), 'Correction from' (Clipbox), and 'Correction by' (HexePOD). A 'Registration (Clipbox)' panel shows 'Method: Grey value (T * R)' and an 'Automatic Registration' button. A 'VolumeView Registration' window at the bottom displays the registration coordinates: X = 0.22cm, Y = 0.36cm, and Z = 0.06cm. The interface also includes a 'Dismiss' button and an 'Accept' button.

Coronal ok Sagittal Registration for Clipbox Image

Correction reference point = isocenter Slice 205 of 410 Slice 205 of 410

Transverse Slice 132 of 264

Reference

Scan Cor Ref Structures Mask

Clipbox

Protocol

Registration: Clipbox

Correction from: Clipbox

Correction by: HexePOD

Registration (Clipbox)

Method: Grey value (T * R)

Automatic Registration

Convert To Correction

VolumeView Registration

Dismiss Accept

X = 0.22cm
Y = 0.36cm
Z = 0.06cm

Supportive Care & Follow-Up

- Breast Cancer Nurse
- Weekly radiation nurse review
- Aboriginal Liaison Services
- Allied Health Services
 - Occupational Therapy
 - Physiotherapy
 - Psychology
- Mid & final treatment review with Radiation Oncologist (RO)
- Regular post-treatment follow-up with RO

