Deep Inspiration Breath Hold for breast cancer patients

Experiences at Institute of Oncology Ljubljana, Slovenija

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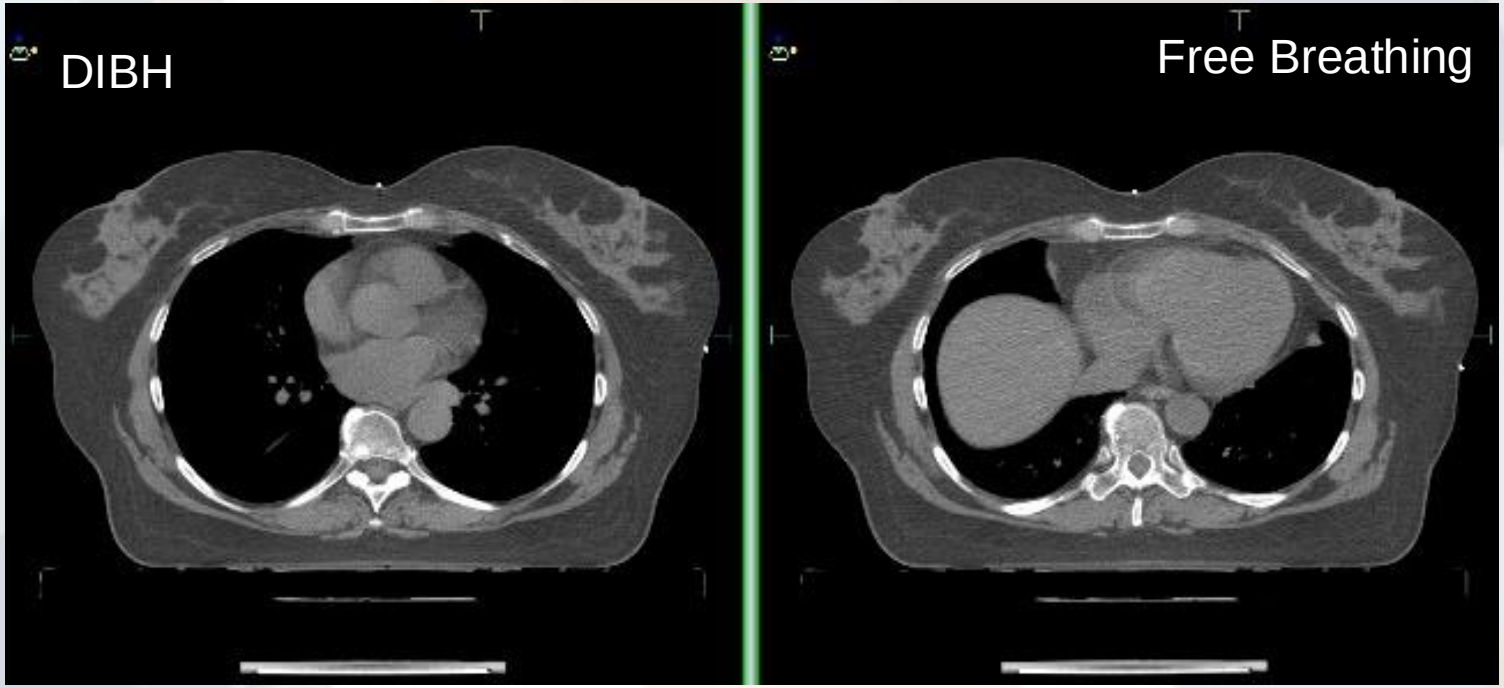
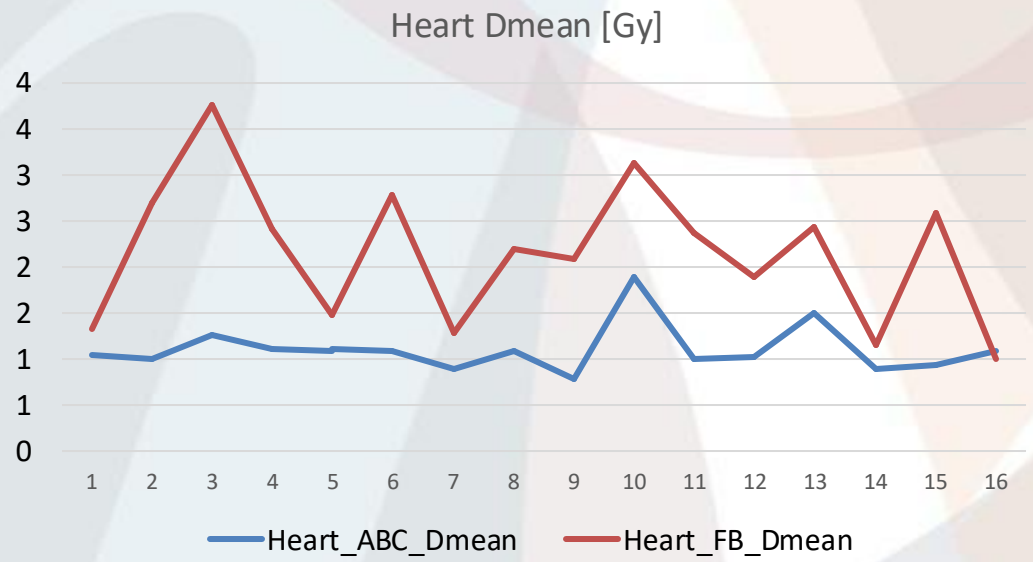
Deep Inspiration Breath Hold - DIBH

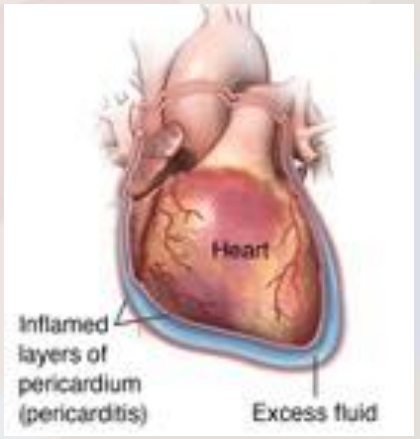
- Flattens diaphragm
- Expendes lungs
- Heart shift

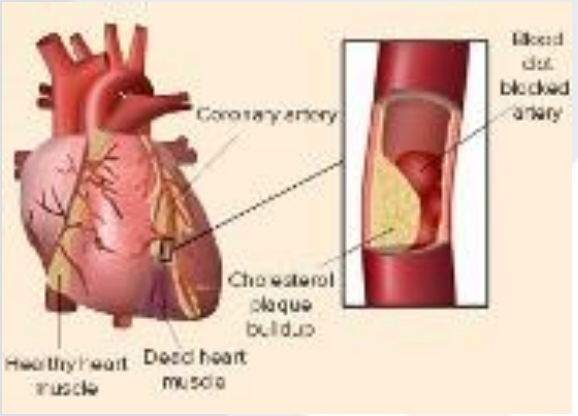
- Increases target to OAR distance.

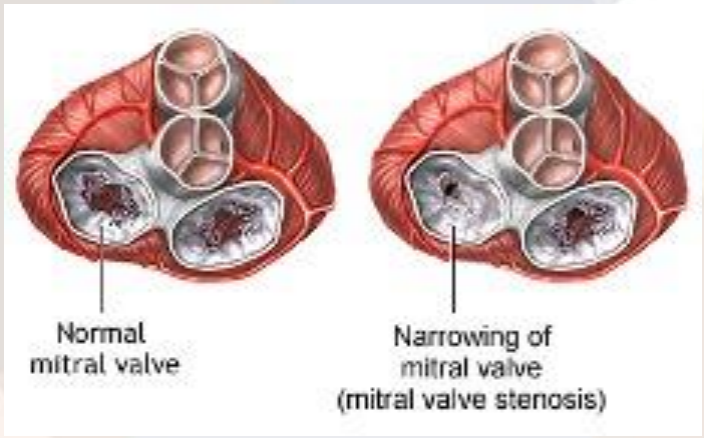


DIBH - why









VERBANČIČ, J et al. Improvement in cardiac and lung dosimetric metrics with deep inspiration breath hold in left-sided early breast cancer radiation therapy. V: A best of ASCO meeting : book of abstracts. Zagreb: Penta, 2017. Str. 4. [COBISS.SI-ID 2718331]

	Breath-hold with ABC, mean ± SD	Free-breathing, mean ± SD	p-value
HEART			
Dmean, Gy	1.1 ± 0.26	2.16 ± 0.77	0.00001
V40, %	0.00 ± 0.01	0.65 ± 0.77	0.004
V20, %	0.04 ± 0.09	1.69 ± 1.46	0.0004
V10, %	0.15 ± 0.27	2.70 ± 2.02	0.0001
Volume, mL	547.99 ± 104.25	640.92 ± 102.81	0.0008
LADCA			
Dmean, Gy	3.15 ± 1.47	11.23 ± 7.70	0.0008
Dmax, Gy	8.86 ± 7.78	32.08 ± 16.56	0.0001
V20, %	0.69 ± 2.02	19.57 ± 20.53	0.002
LEFT LUNG			
Dmean, Gy	6.64 ± 1.17	8.93 ± 2.36	0.0002
V30, %	9.28 ± 2.00	13.96 ± 5.05	0.001
V20, %	11.92 ± 2.24	16.84 ± 5.56	0.002
V5, %	26.57 ± 4.94	33.15 ± 10.09	0.001
Volume, mL	2742.52 ± 329.42	1471.72 ± 296.02	<0.00001
RIGHT LUNG			
Dmean, Gy	0.44 ± 0.08	0.47 ± 0.10	0.007
RIGHT BREAST			
Dmean, Gy	0.74 ± 0.46	0.78 ± 0.69	0.55
Dmax, Gy	7.57 ± 11.79	6.64 ± 11.74	0.61
PTVeval			
Volume, mL	1026.71 ± 674.59	1011.17 ± 639.29	0.43
Coverage, %	95.67 ± 1.69	96.66 ± 1.76	0.20

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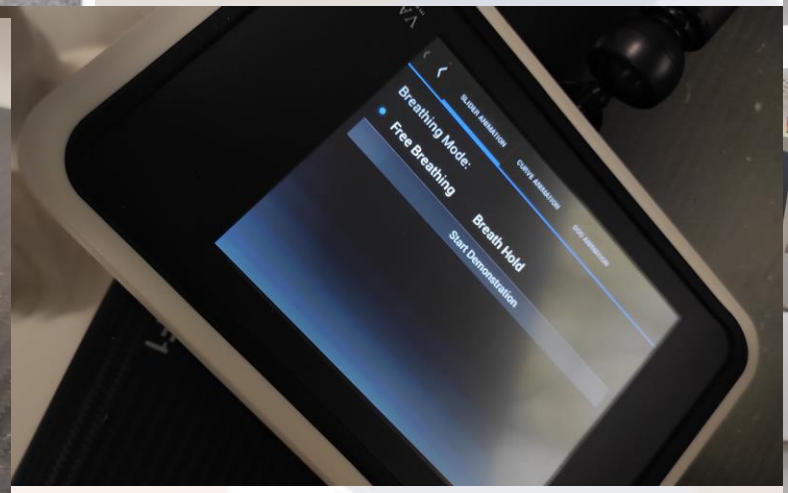
DIBH - how


civco

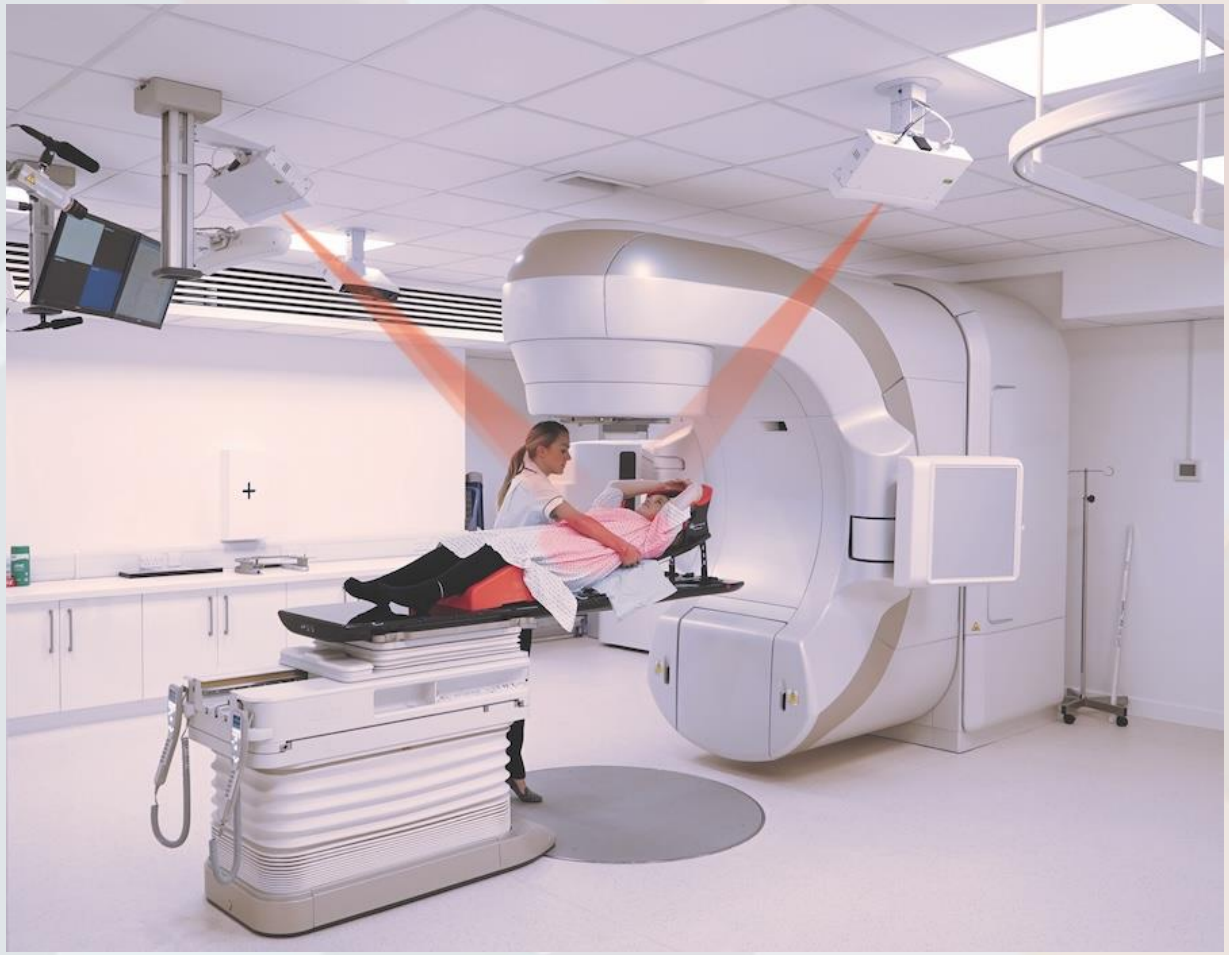

VARIAN
medical systems

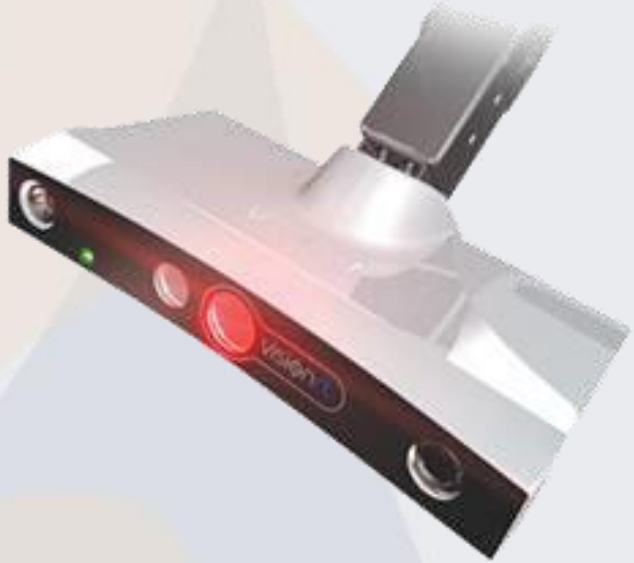

catalyst


Breathing Mode:
Free Breathing
Breath Hold
Start Demonstration


trueBEAM

SGRT






VRT cm -0.01
LNG cm -0.01
LAT cm -0.03
MAG cm 0.03
YAW ° 0.4
ROLL ° -0.4
PITCH ° 1.1

Align RT

Align RT


Import DICOM
Set Treatment
Treatment Course
Plan Name
Active
Plan1_FIF [Breast DIBH]
ISO 1 [111.0, -356.7, 120.6]
CT SIM Body_free 14/10/2024 14:33:40
Setup Surface Only
ROI1 [Isocentric]
Add ROI
CT SIM BODY 14/10/2024 14:33:40
Done
System Status


VRT cm -0.01
LNG cm -0.01
LAT cm -0.03
MAG cm 0.03
YAW ° 0.4
ROLL ° -0.4
PITCH ° 1.1

Workflow

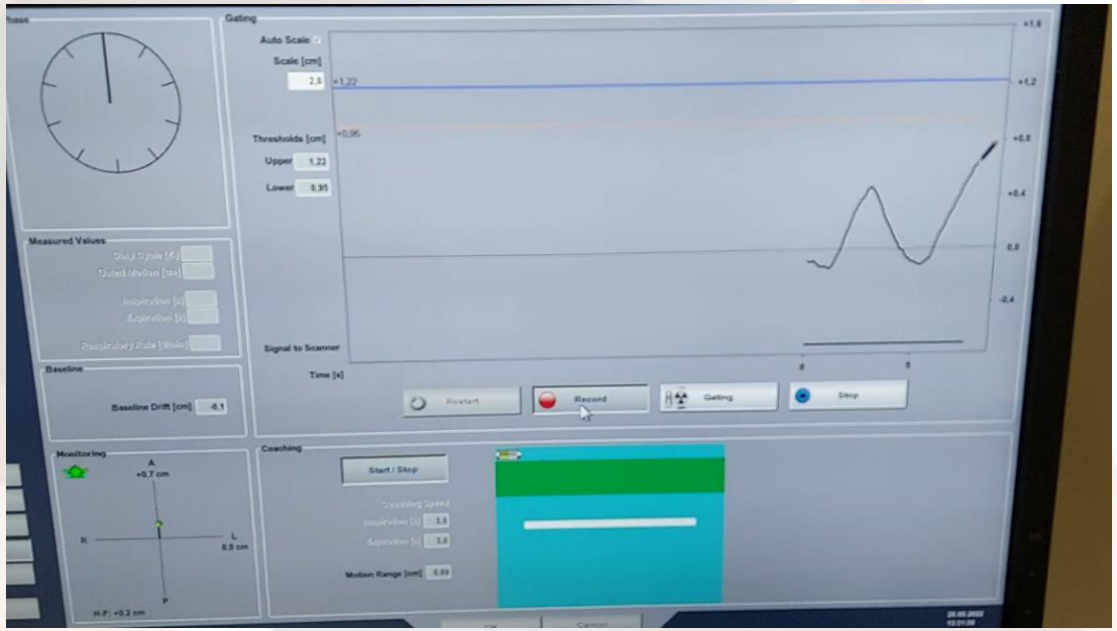
- Selecting the patients who are suitable for DIBH
- Selecting the patients who are capable to perform DIBH technique.

- Ability to undergo irradiation in DIBH is assessed on depth and duration of their breath hold.

Simulation

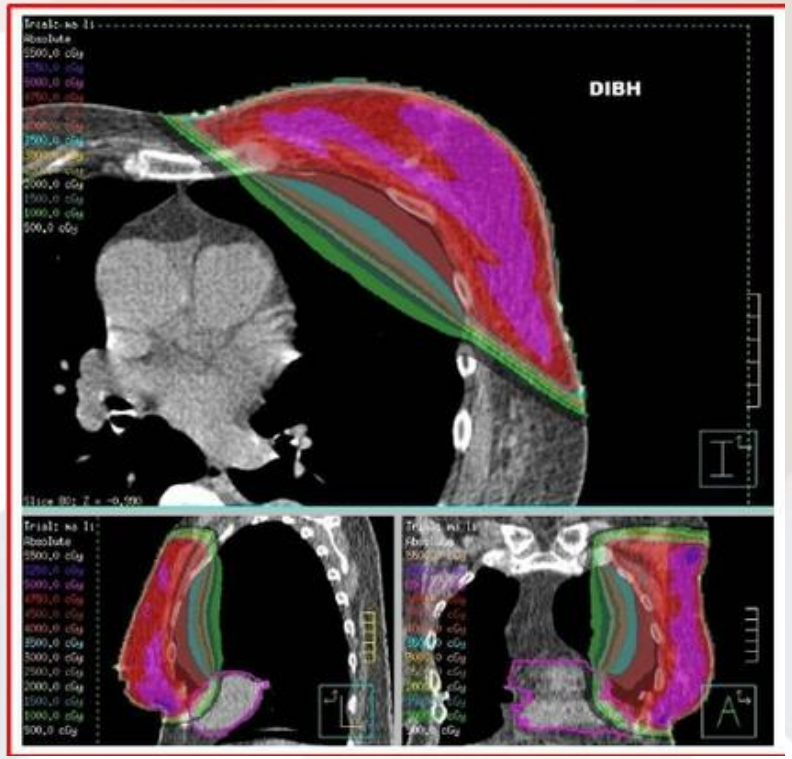
- Imobilization
- The process is explained to the patient,
- The practise is performed before the scan.

- Two sets of CT images are taken:
  - Free breathing set (CT_FB)
  - DIBH set (CT_DIBH)



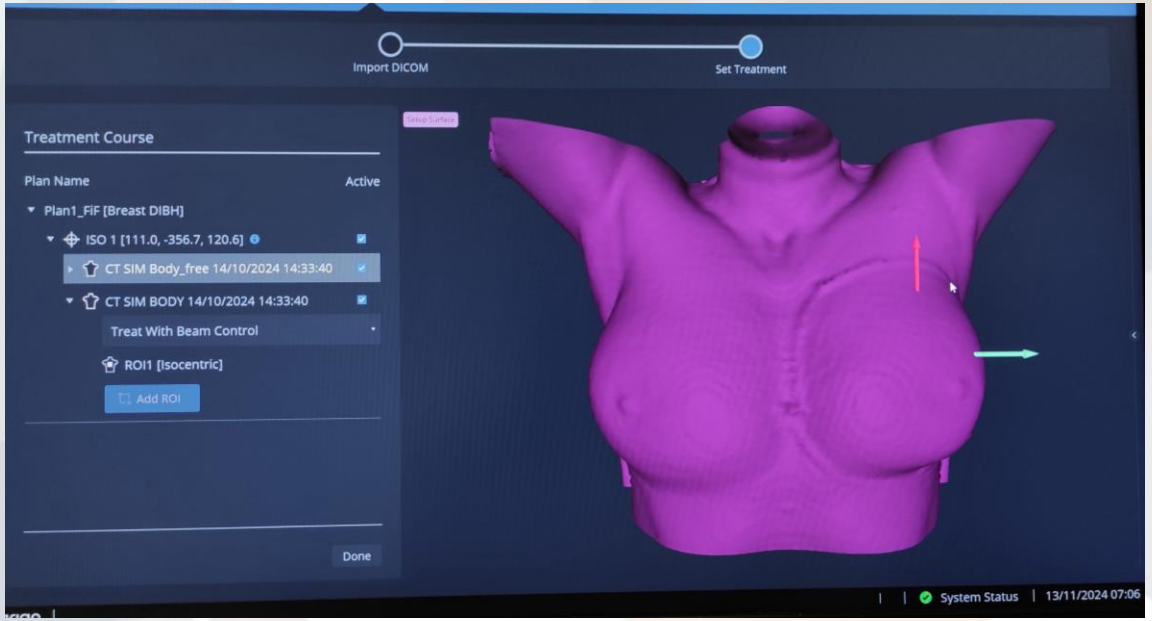
Conturing and planing

- Both sets are exported to the planing system.
- Treatment volumes and OAR are contured on CT_DIBH set.
- Treatment plan is calculated on CT_DIBH set.



Treatment - ROI

- On the treatment site reference surface image in free breathing and reference surface image in DIBH are imported from DICOM into AlighRT OSMS system.
- Registration of the current daily and reference surface is performed only in the selected region of interest – ROI.



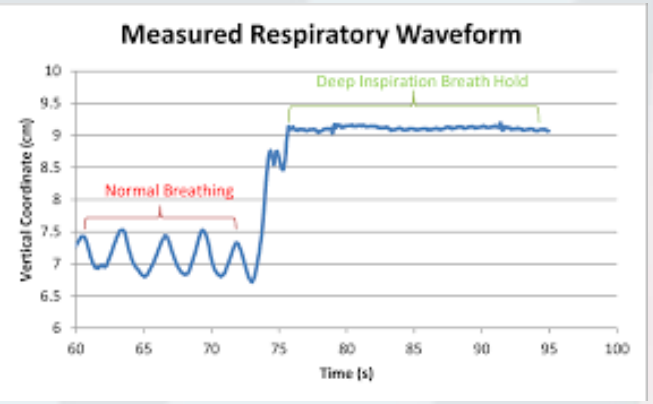
ROI

- It is recommend that the ROI include the breast, sternum, and the strip of skin under both breasts.
- The same ROI is marked on both surfaces.

- The free-breathing surface is only used for the initial patient setup,
- while the DIBH surface is used for IGRT and treatment.
- Patient track their breathing throu real time couching device.

- Good communication between the patient and RTT is key for successful irradiation with DIBH treatment technique:
  - patients monitor their breathing visually using a coaching device while the RTTs guide the irradiation process with simple instructions.

Free Breathing	DIBH	Free Breathing	DIBH	Free Breathing	DIBH
	Image captures	Image review	Treatment table movment	Adjustment of treatment fields	Irradiation



Experiences - difficulties

- Belly breathers
- Uncapable of breath hold

- Maintaining a stable breath hold
- Not understanding or unable to read coaching device
- Subsequent use of bolus material
- Privacy

Experiences – advantages

- Reduce preparation time
- Simplifies patient setup
- Technically and functionally user-friendly for both RTTs and patients
- Tattooless
- Monitoring in all six directions
- comfortable

Conclusion

- SGRT is super suitable technique for DIBH:
  - Easy to use
  - Precise
  - Trecking in all directions
  - Tatooless
- SGRT should not be used without IGRT
- The dose to the OAR is reduced
- Satisfaction

literature

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