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Role of SGRT in Breast and Pediatric tumors

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SGRT technology setup on machine

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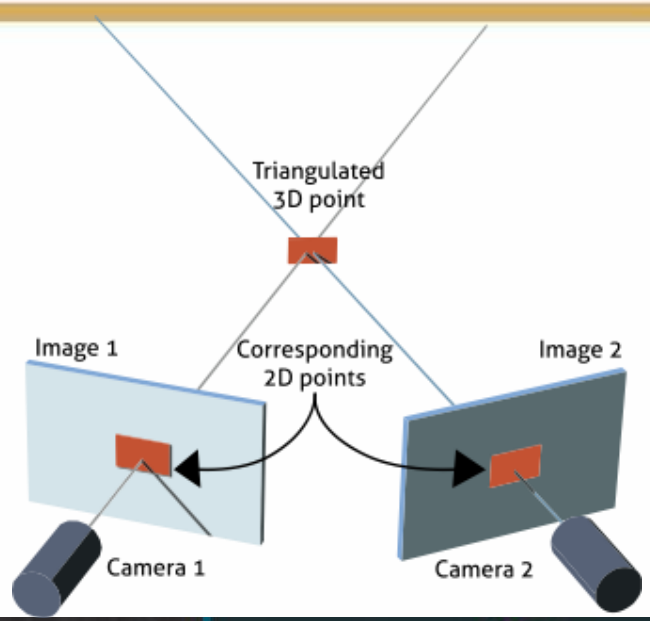
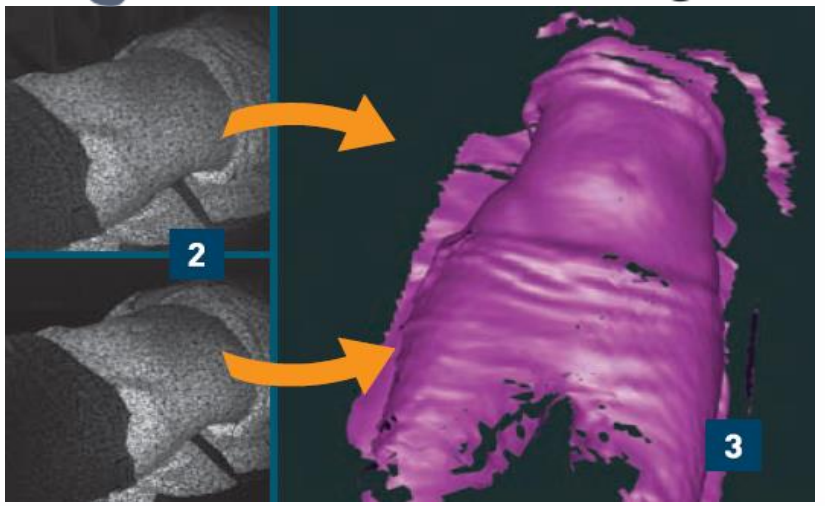
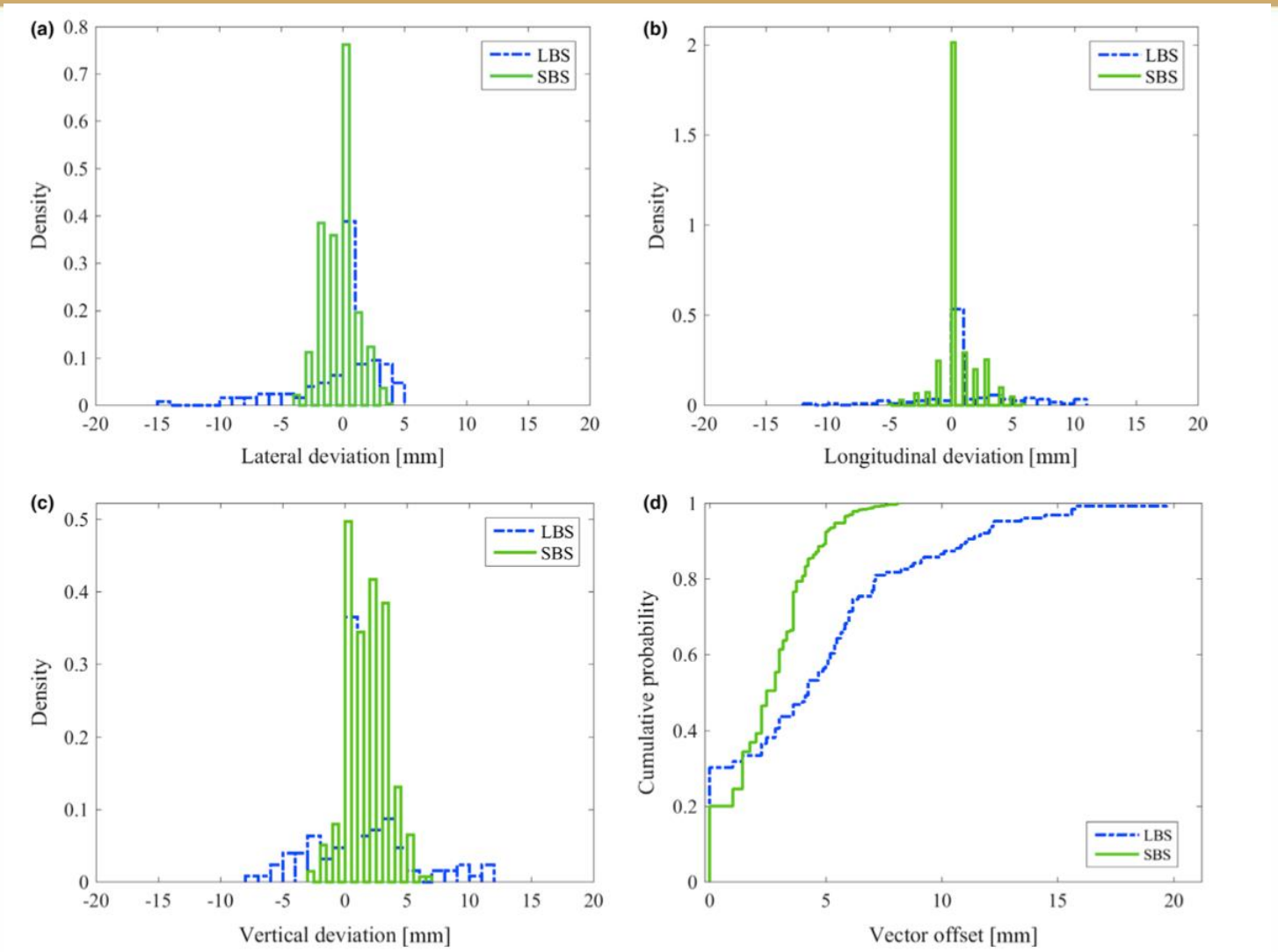
DATA CAMERA
WHITE LIGHT LED
SPECKLE
PROJECTOR
visionrt
DATA CAMERA

Technology: How does it work?

- Near infrared light in random speckle pattern
- Image processing frame rate - Typically 3-5 frames / second
- Sensor resolution- 2048 x 1024 (HD)
- 3D surface reconstruction
- No external body markers or implanted fiducials
- Non ionizing radiation
- Automated Rigid registration algorithm
- Sub-millimetre accuracy in all 6 D

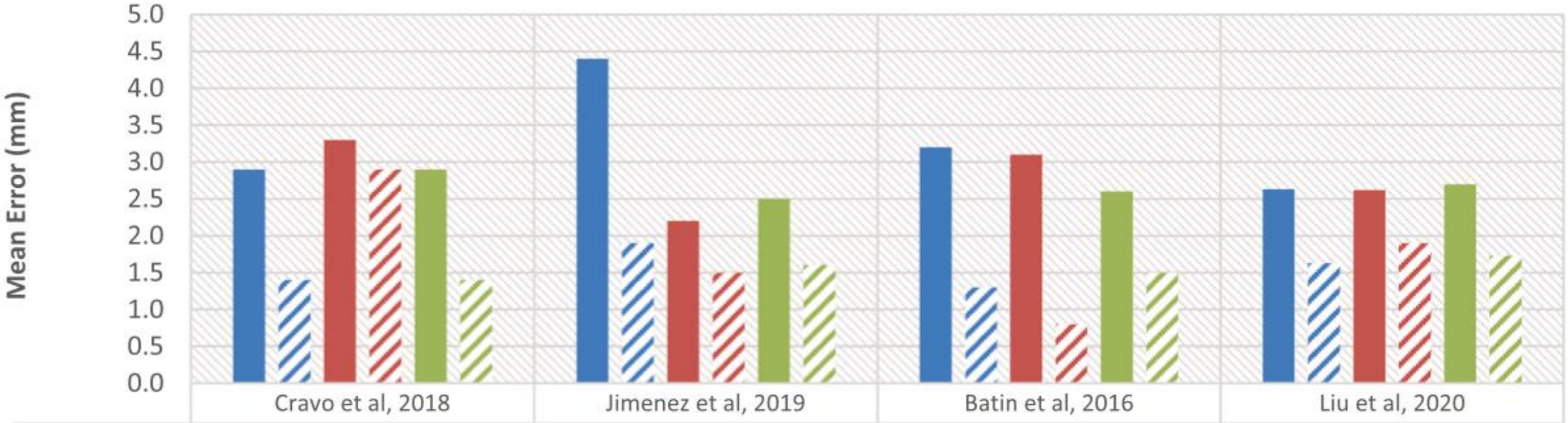






Malin at al, J Appl Clin Med Phys 2019; 20:9: 61–68

Mean Systematic Errors: Translations



	Cravo et al, 2018	Jimenez et al, 2019	Batin et al, 2016	Liu et al, 2020
VERT-Tattoos	2.9	4.4	3.2	2.6
VERT-SGRT	1.4	1.9	1.3	1.6
LNG-Tattoos	3.3	2.2	3.1	2.6
LNG-SGRT	2.9	1.5	0.8	1.9
LAT-Tattoos	2.9	2.5	2.6	2.7
LAT-SGRT	1.4	1.6	1.5	1.7

Naidoo et al, Technical Innovations & Patient Support in Radiation Oncology 22 (2022) 39–49

Radiotherapy causes significant cardiac perfusion defect

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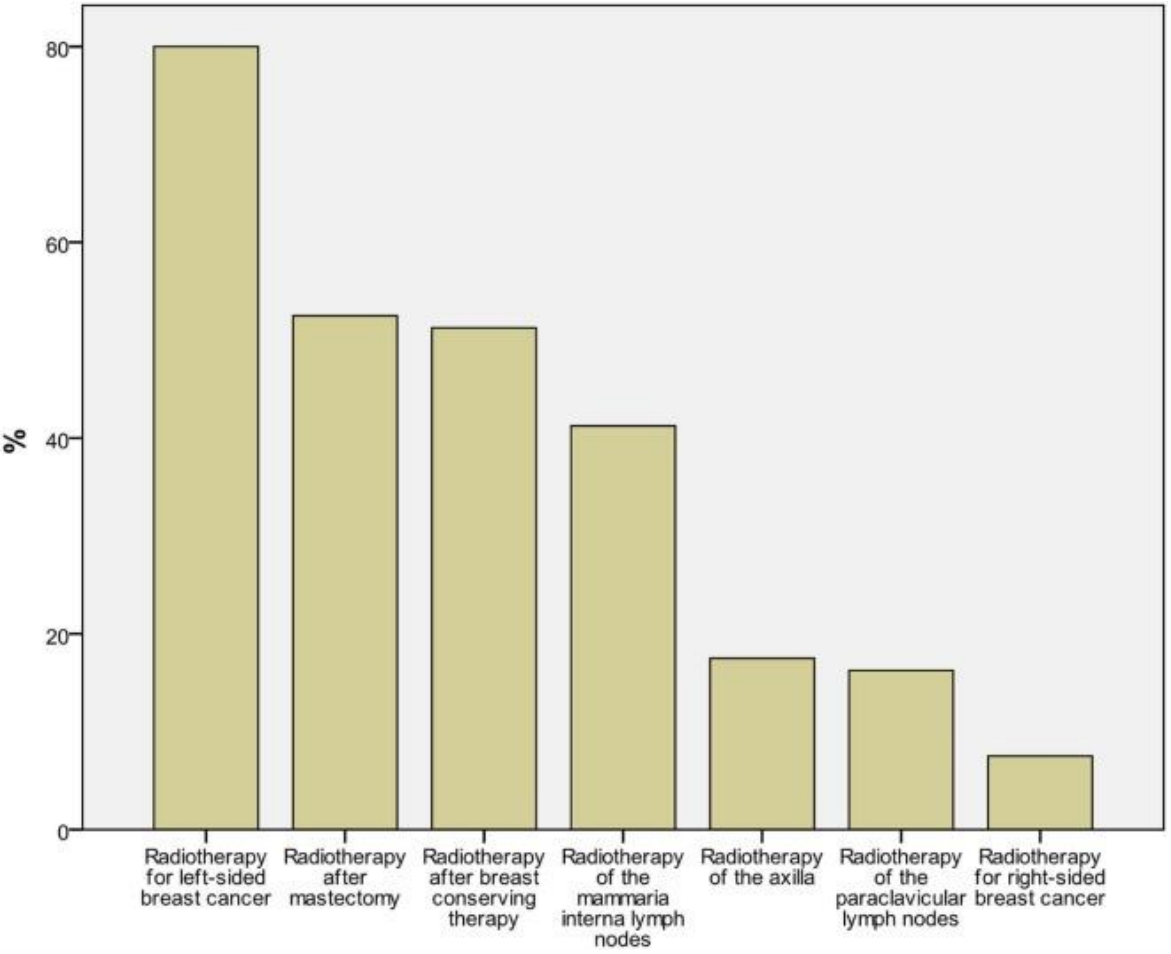
Table 3. Incidence of new perfusion defects in patients with normal pre-RT SPECT scans

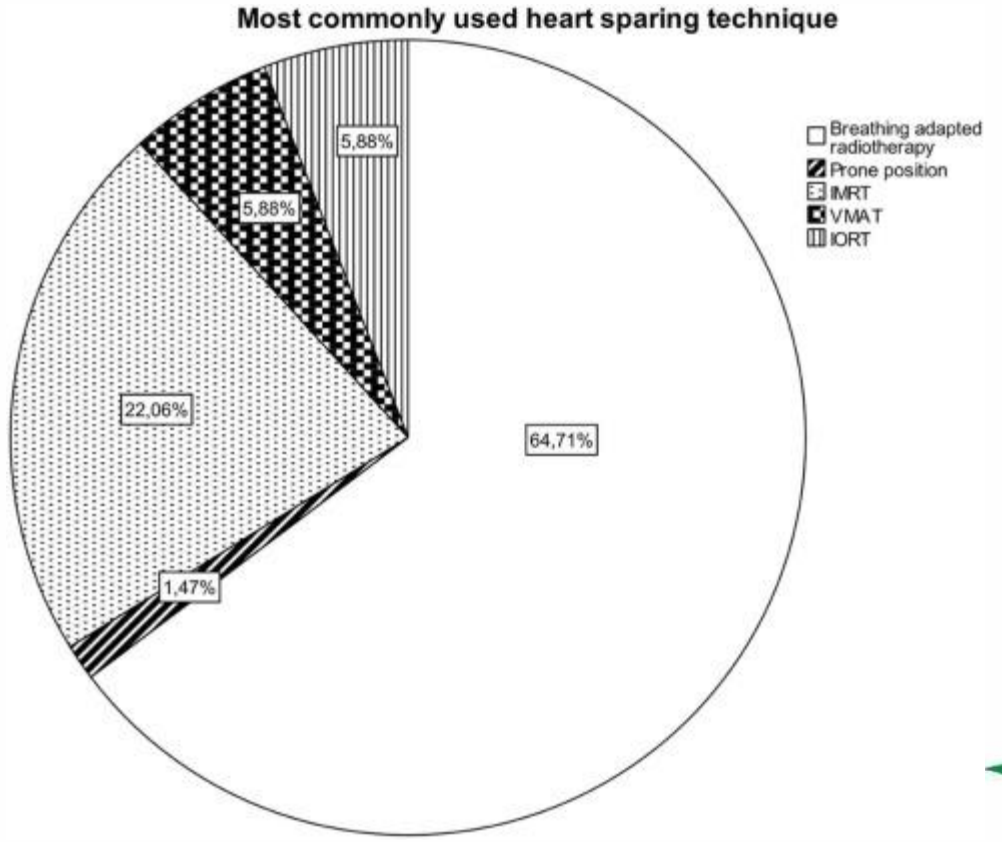
	Percent of left ventricle in RT field				
Months after RT	<1%	1–5%	5–10%	> 10%	*p* value*
6	4% (1/26)	22% (4/18)	50% (8/16)	62% (8/13)	0.00008
12	12% (2/17)	27% (4/15)	50% (5/10)	56% (5/9)	0.016
18	20% (2/10)	22% (2/9)	63% (5/8)	57% (4/7)	0.33
24	0/3	20% (1/5)	55% (6/11)	57% (4/7)	0.084

Abbreviations: RT = radiation therapy; SPECT = single-photon emission computed tomography.
* Two-tailed Fisher's exact test.

Jason C et al, Clinical Breast Cancer, 2015-02-01, Volume 15

Breathing adapted RT is used most often to spare the heart

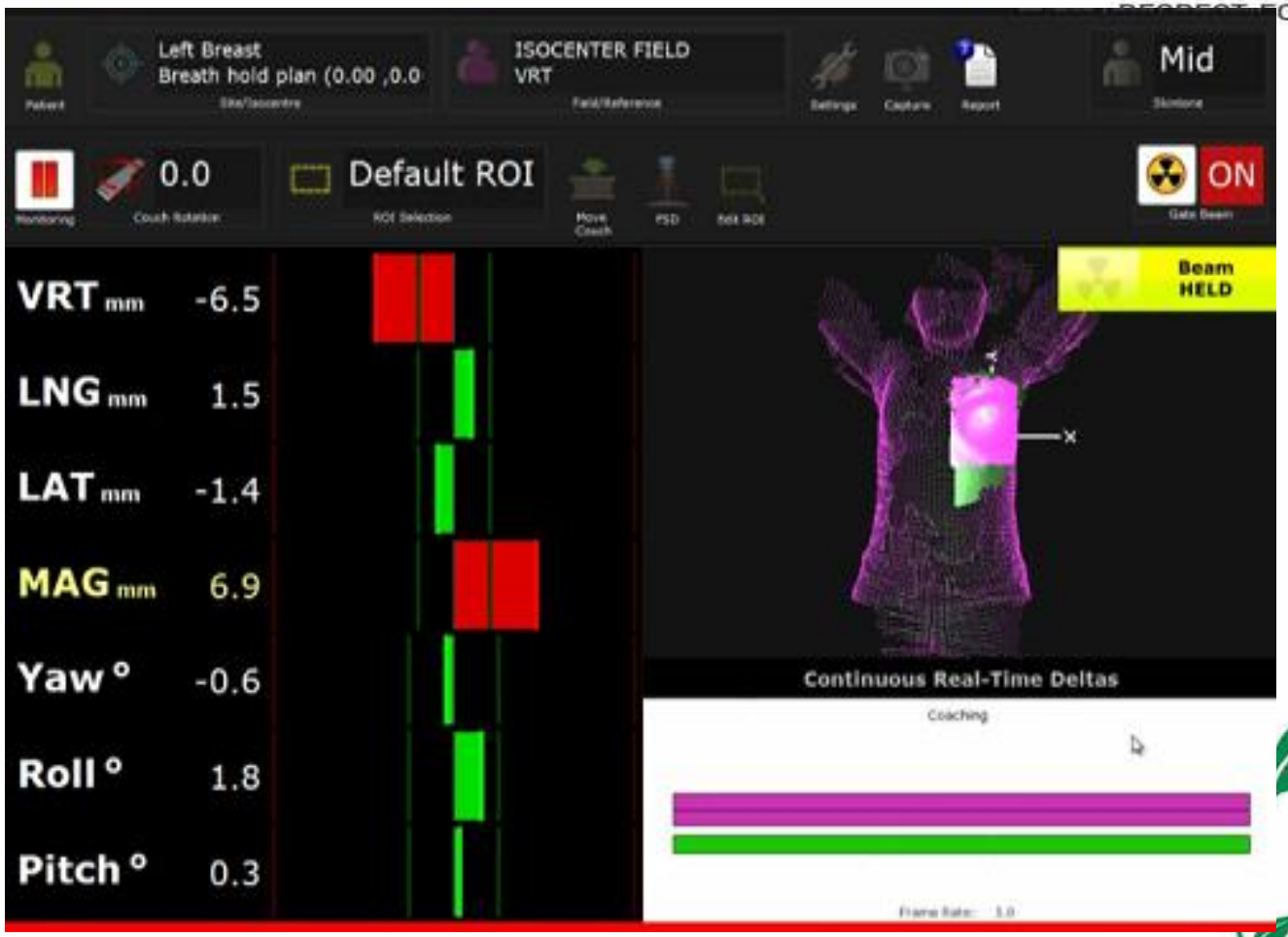


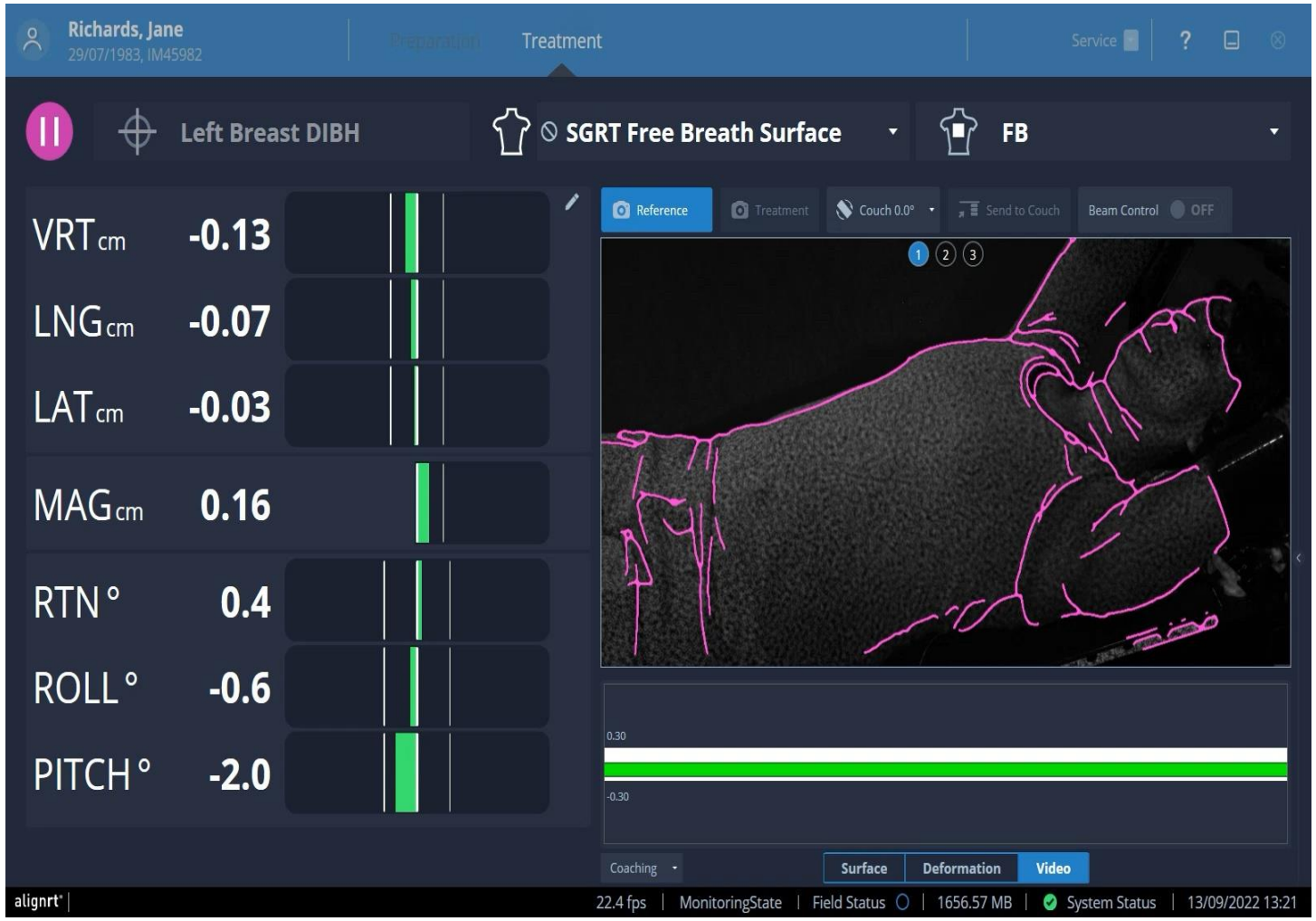


Duma et al, Medical Dosimetry, 2017-09-01, Volume 42, Issue 3, Pages 197-202,

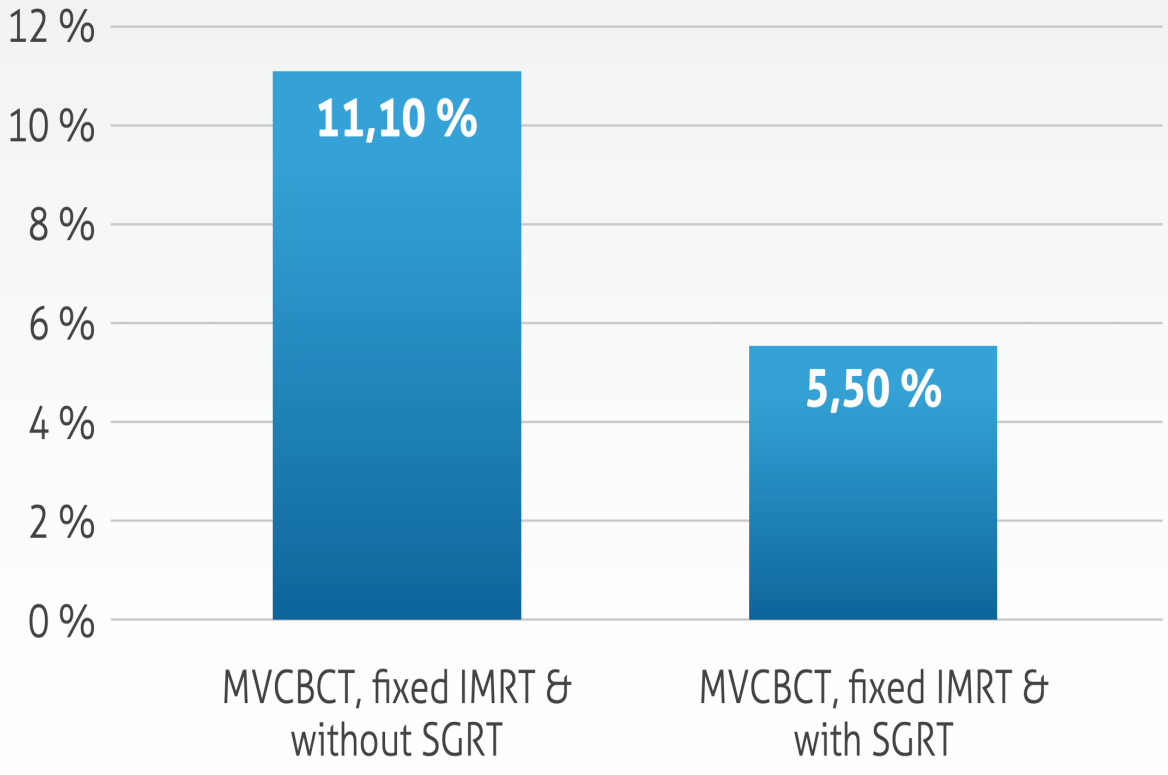
ROI & threshold

- Reference image – CT body
- Map of ~20,000 points of patient's external anatomy
- ROI size can be optimised for maximum performance
- Only the region of interest is monitored during treatment
- Deformable tissue can be ignored if necessary





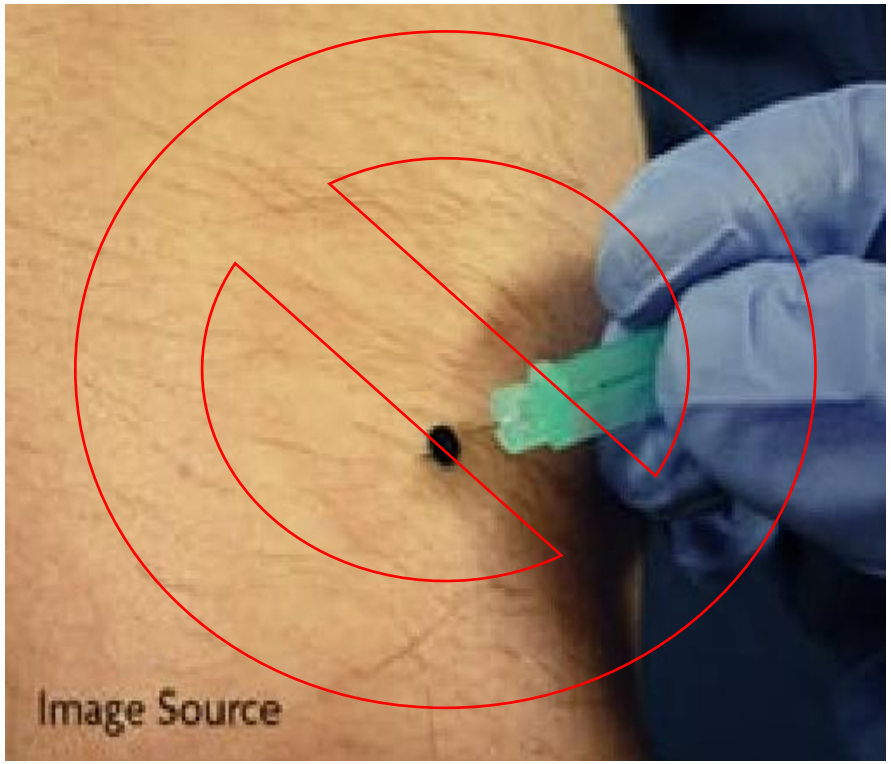
Provides clear positional guidance in real-time to make patient setup and correction even faster.

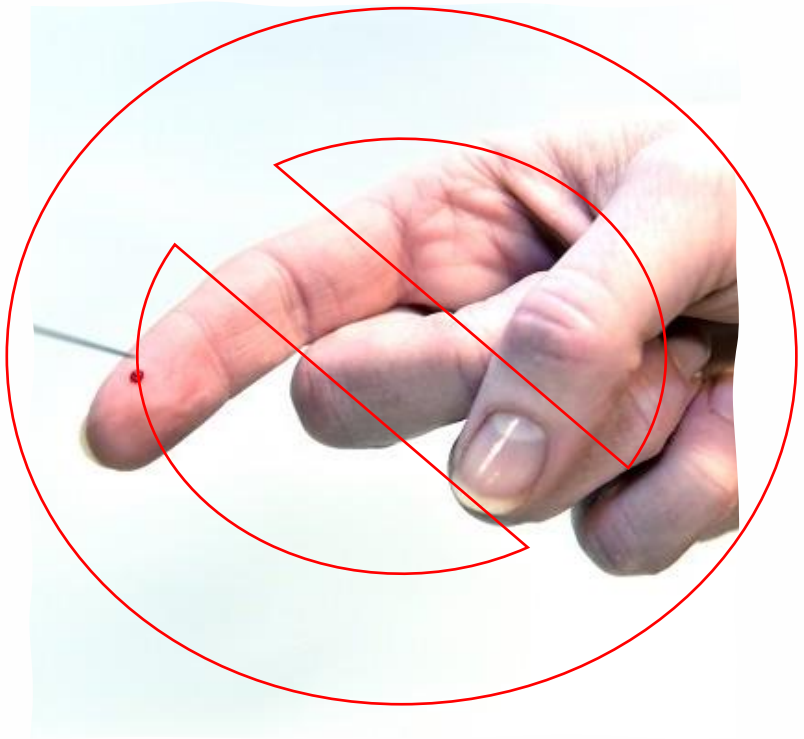


Percent of fractions with multiple imaging fields

Up to 50% reduction in the number of fractions requiring setup correction and additional imaging fields

Tattooless setup





AlignRT for setup – Breast

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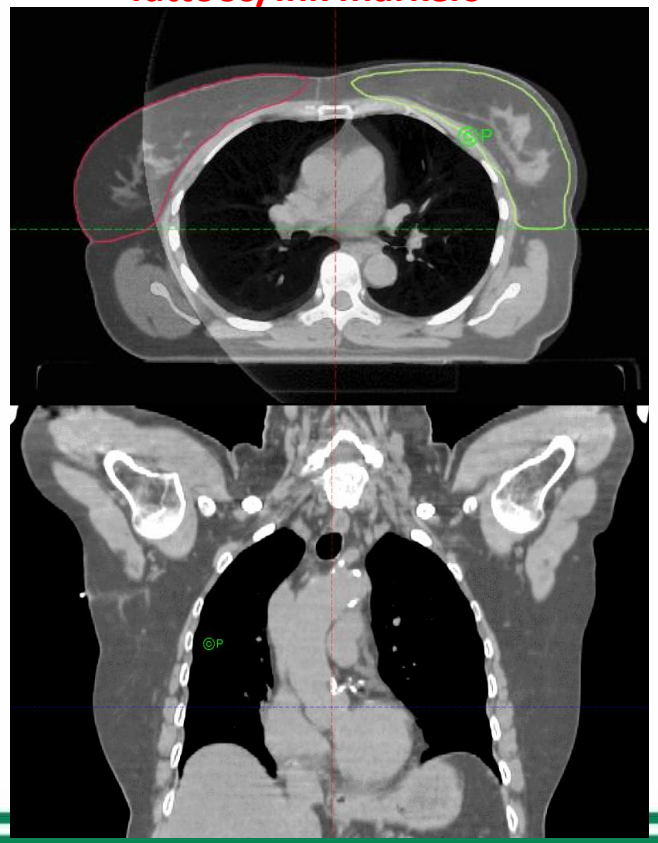
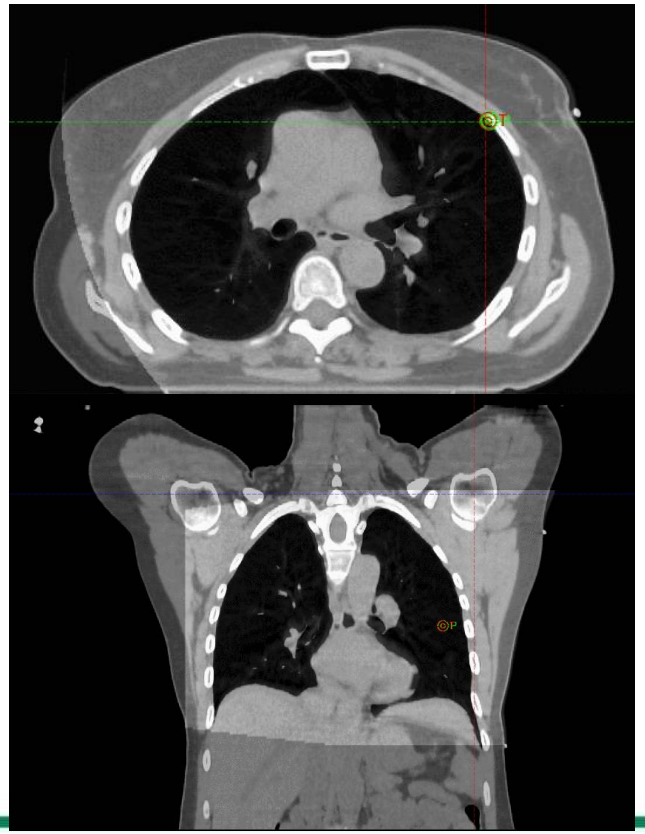
Postural setup vs. tattoos

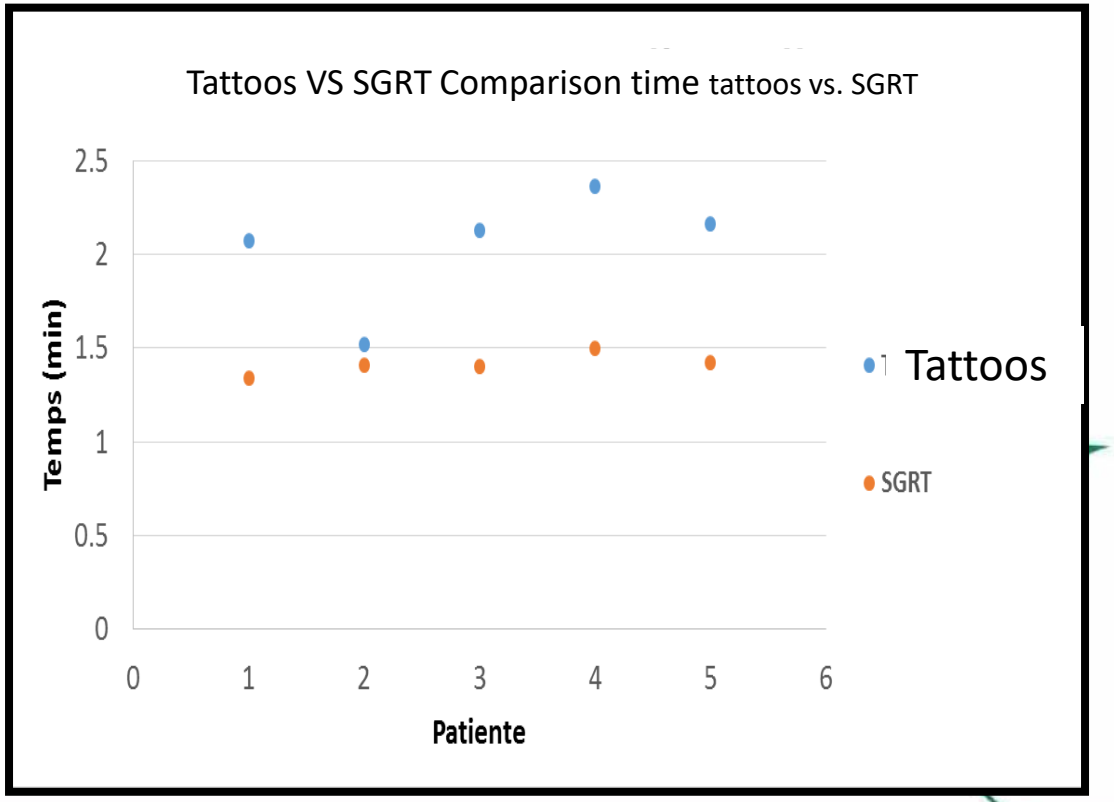
- ❑ Improved postural setup and correction for rotations
- ❑ Time saving (end to end 6 - 8 min vs. 10 - 15 min with tattoos)
- ❑ Tattoos can be avoided

Tattoos/Ink markers



SGRT





SGRT in Pediatric cancer

Major concerns for treating pediatric patients

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- Use of painless, stress and anxiety free methods.
- Quick Setup
- Need for good immobilization during treatment for accuracy and precision.
- Anesthesia requirement, That adds into overall cost, burden on resources and substantially increases treatment time.
- Robust intra-fraction motion management after acquiring CBCT.
- Re-setup and exposure to repeated imaging.

Benefits of SGRT in Pediatric patients

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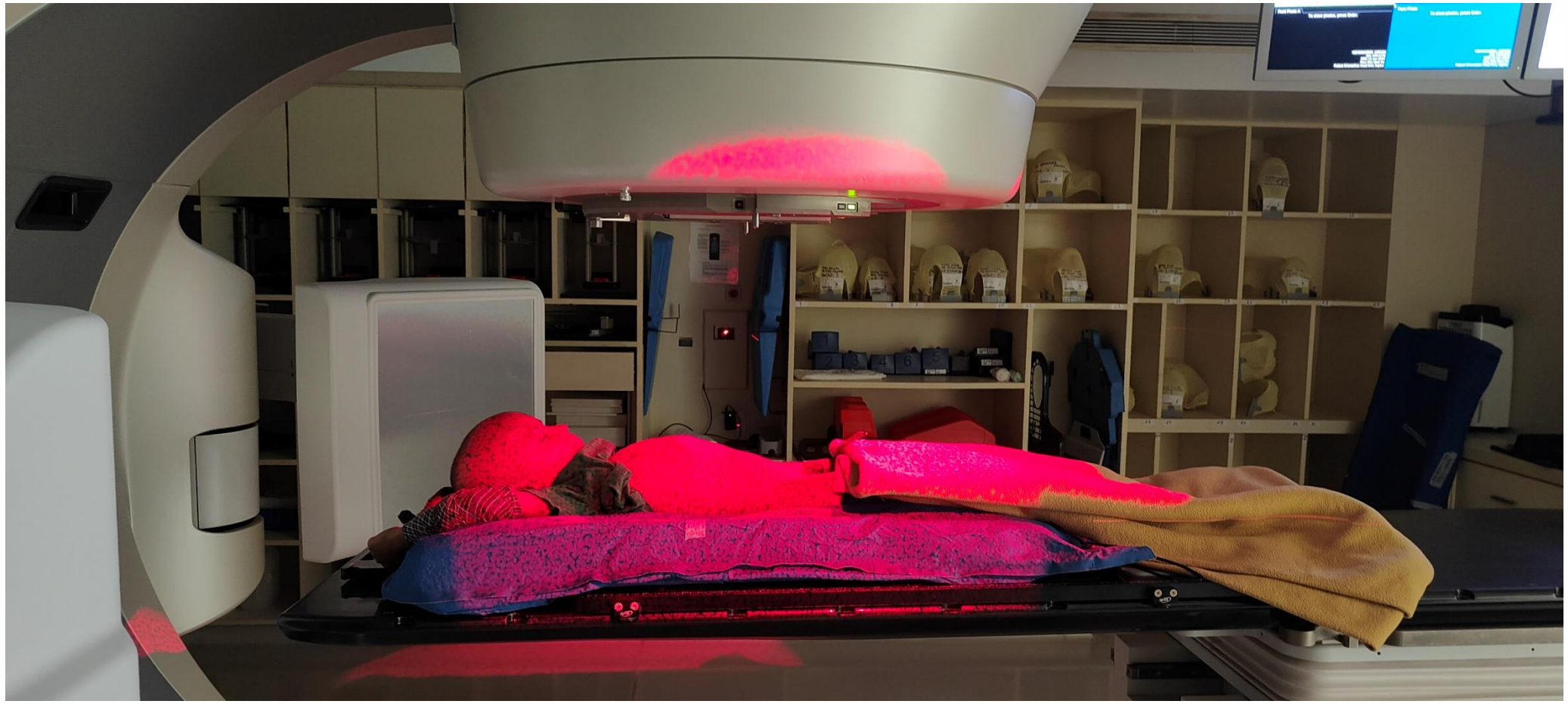

Benefits of SGRT in Pediatric patients

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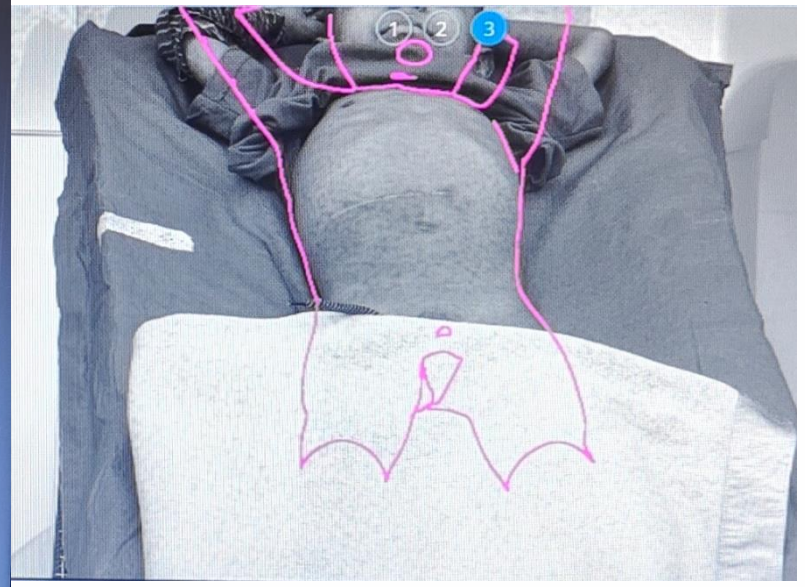

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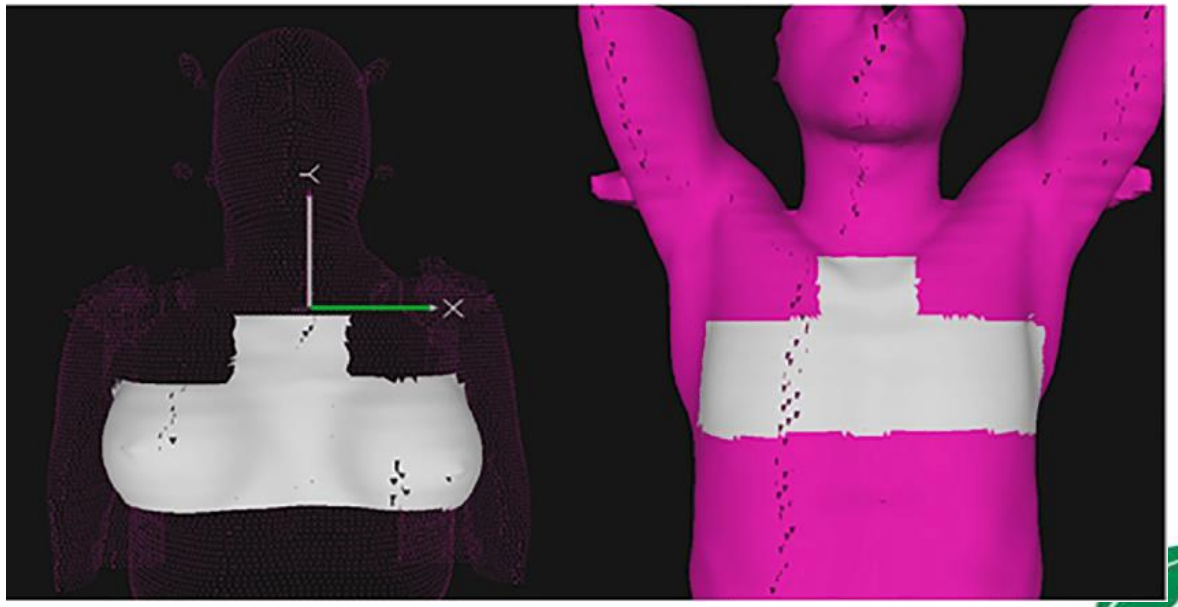
Autobeam hold

3D Topographic imaging spatial resolution



- Compatibility with Anesthesia

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- Minimize the use of accessories
- Reduce the errors and uncertainties of accessories.
- Effective further reduction in setup time.
- SGRT usage decreased the need of making thermoplastic mold for Non head neck malignancies such as chest, abdomen and pelvis.

Preliminary data of SGRT in Pediatric cancer patients

	Shifts		Shifts of Gamma index (Acceptance value 3% /3mm)		
Site/Region	Planned Gamma index		3mm	5mm	7mm
	value	Tolerance			
Abdomen	97.5	95	93.8	85.7	82.8
Abdomen	97.4	95	93.8	86.3	81.9
Thorax	98.7	95	96.5	89.5	86.5
Abdomen	99.5	95	97.3	86.1	80.5
Abdomen	99	95	96.1	89.5	86
Abdomen	95.4	95	74.4	50	40.8
Abdomen	95.6	95	87.1	74.1	64.6
Abdomen	98.3	95	83	58.7	42.7
Pelvic	100	95	80.2	56.4	42.8
Pelvic	99.7	95	97.1	90.2	86.8
	98.11	95	89.93	76.65	69.54

Total body Irradiation with SGRT setup

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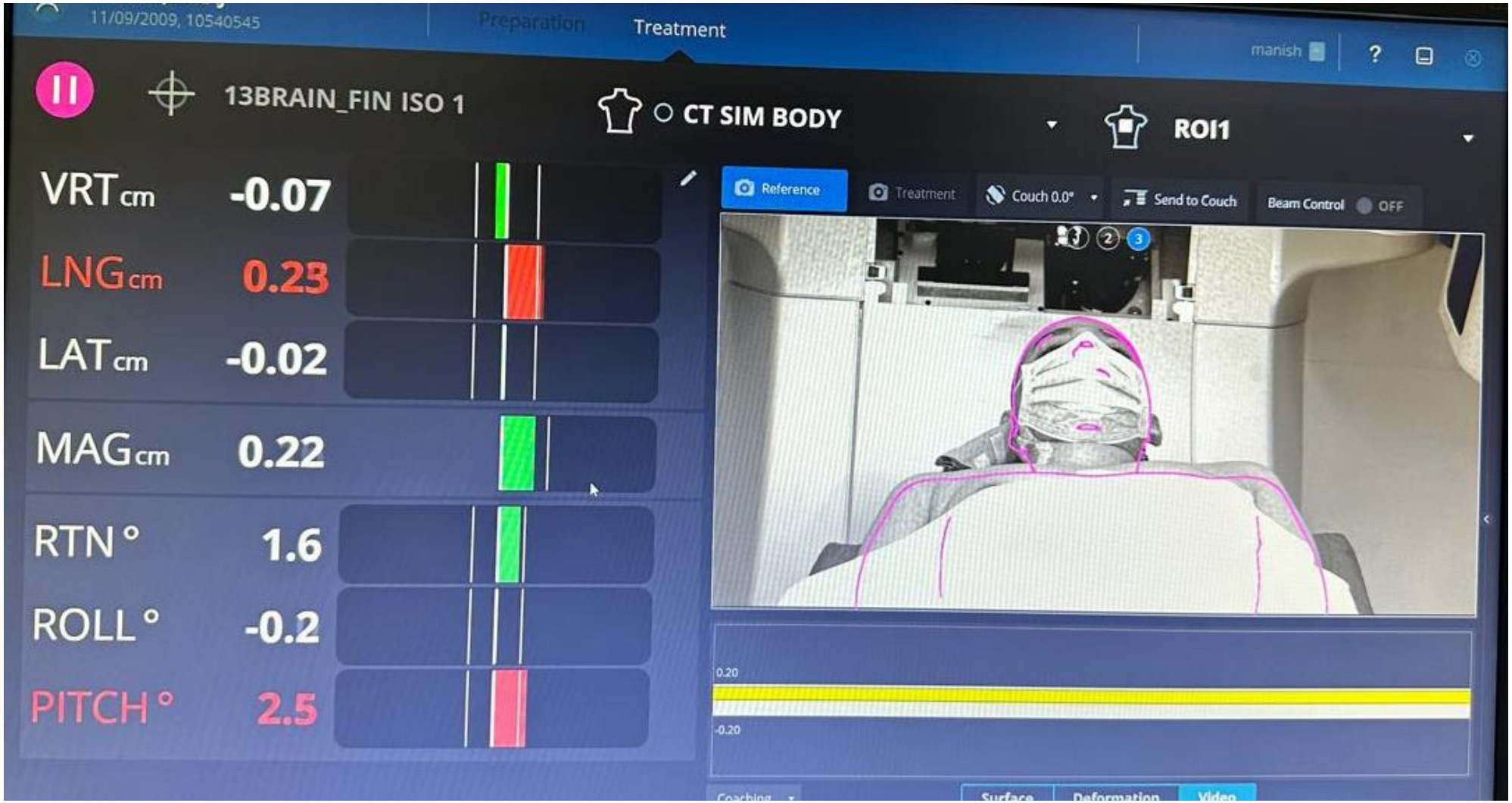
TBI with SGRT- No mask



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journal homepage: www.thegreenjournal.com

Guidelines

ESTRO-ACROP guideline on surface guided radiation therapy

P. Freislederer [a,1,*], V. Batista [b,c], M. Öllers [d], M. Buschmann [e], E. Steiner [f], M. Kügele [g], F. Fracchiolla [h], S. Corradini [a], M. de Smet [i], F. Moura [j], S. Perryck [k], F. Dionisi [l], D. Nguyen [m], C. Bert [n], J. Lehmann [o,p,q]

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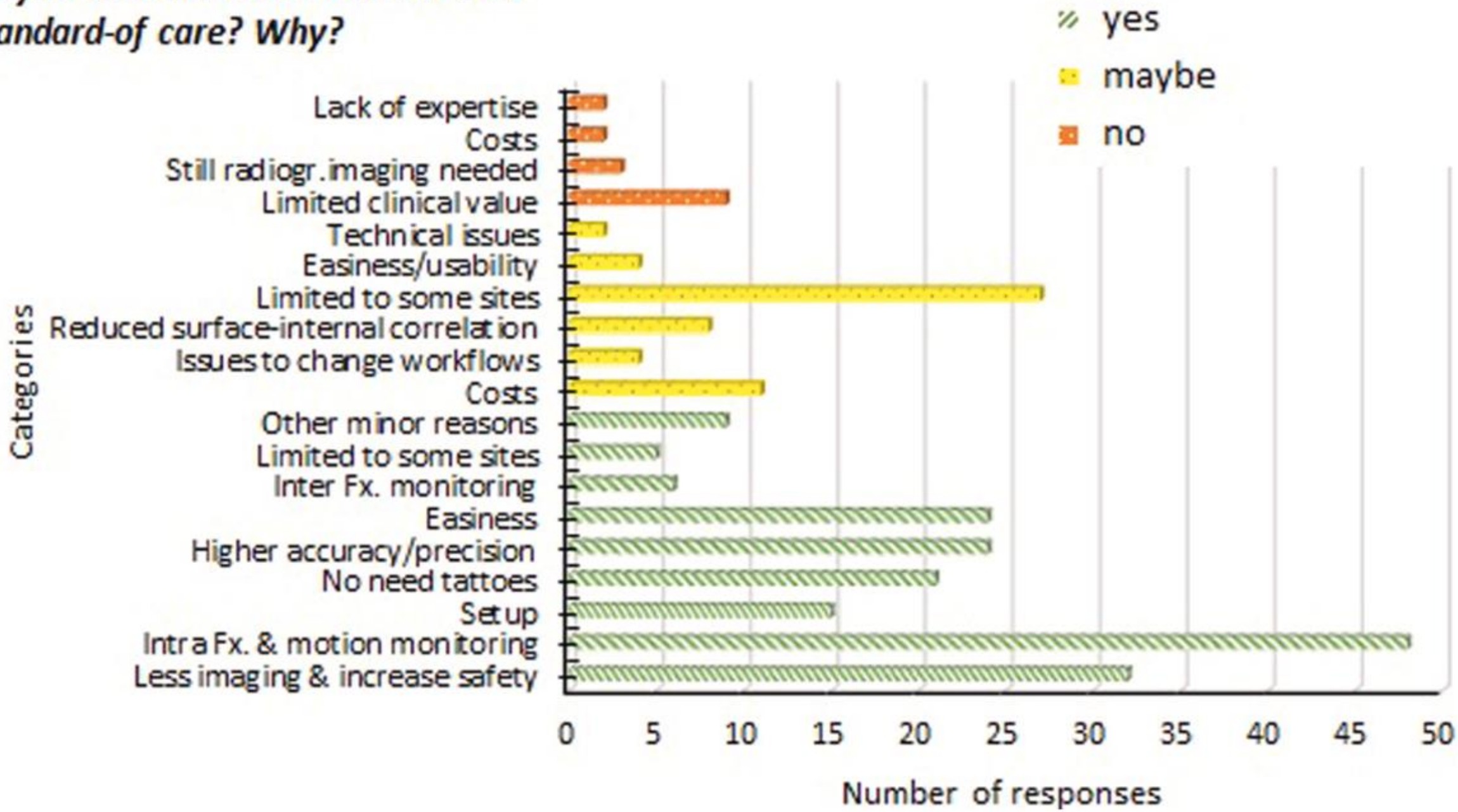
Do you consider that SGRT will be a standard-of care? Why?



Additional benefits of SGRT

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- Marker-less tracking for 4D image reconstruction
- Biometric patient identification
- Immobilization device identification
- Augmented reality
- Adaptive radiotherapy
- Dose verification
- Re-planning decisions
- PTV margin decisions

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Thank you