CLINICAL IMPLEMENTATION OF TATTOOLESS TREATMENT FOR BREAST CANCER PATIENTS USING SGRT

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Overview department

Locations Rotterdam and Dordrecht, the Netherlands

6 Elekta Versa HD , 4 Ethos, 2 Cyberknifes,
Hyperthermia, Brachytherapy

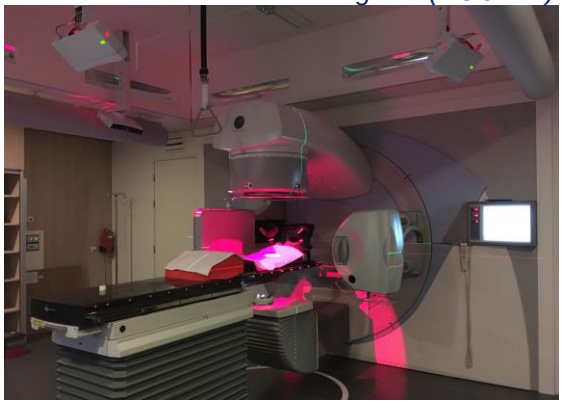
6 AlignRT systems on Elekta Versa HD
4 Identify systems on Ethos

Annually ~1000 breast cancer patients
Leftsided and < 70 yrs → DIBH

SGRT Timeline EMC

2017	First AlignRT systems installed in Dordrecht
2018	Clinical implementation AlignRT for DIBH breast patients
2021	Setup all breast patients with use of AlignRT
2021	Clinical implementation of Real Time Coaching device from AlignRT for DIBH breast patients
2022	Clinical implementation of VMAT-gated DIBH for breast patients using AlignRT
2023	Tattooless treatment for all breast patients @ location Dordrecht using AlignRT / Identify

AlignRT (VisionRT)

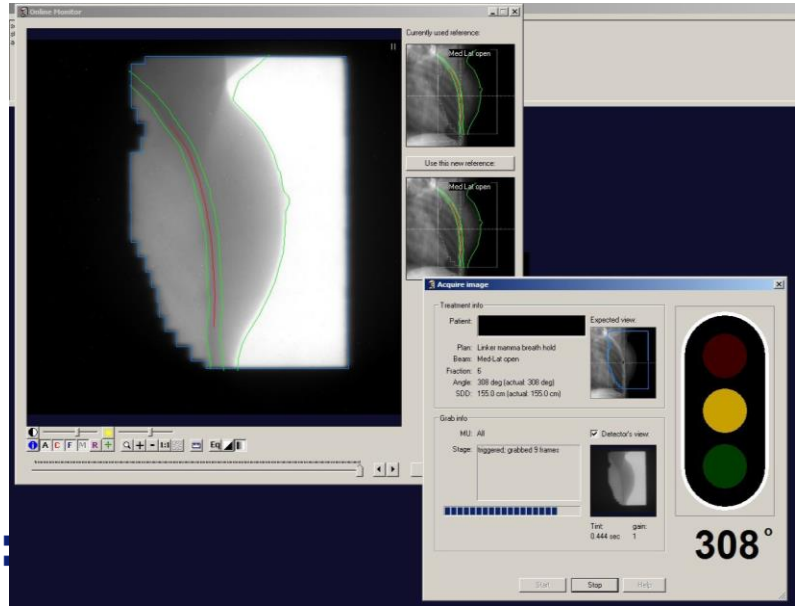


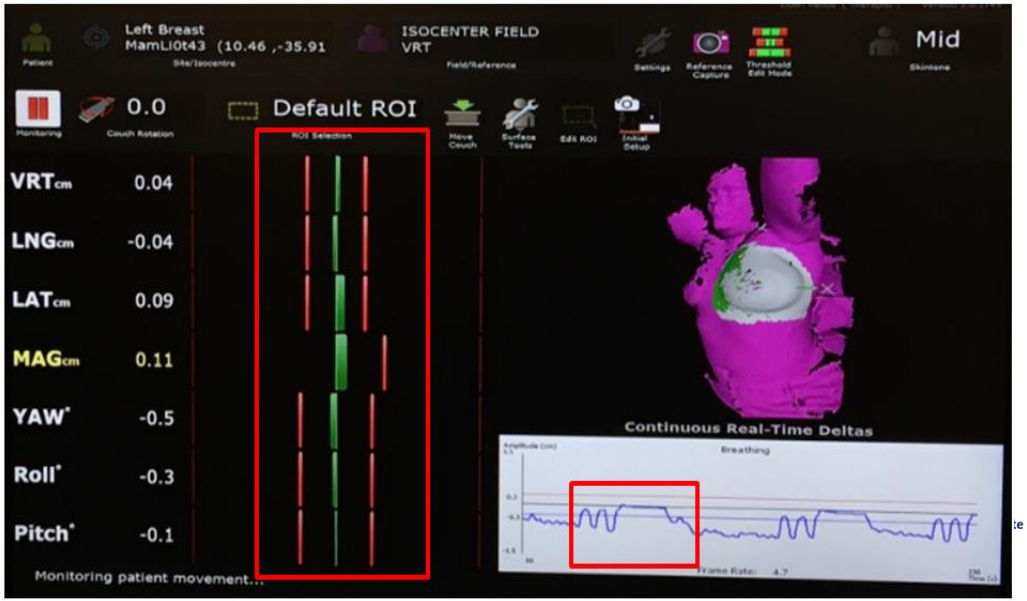
Identify (Varian)

Clinical implementation SGRT for leftsides DIBH breast patients

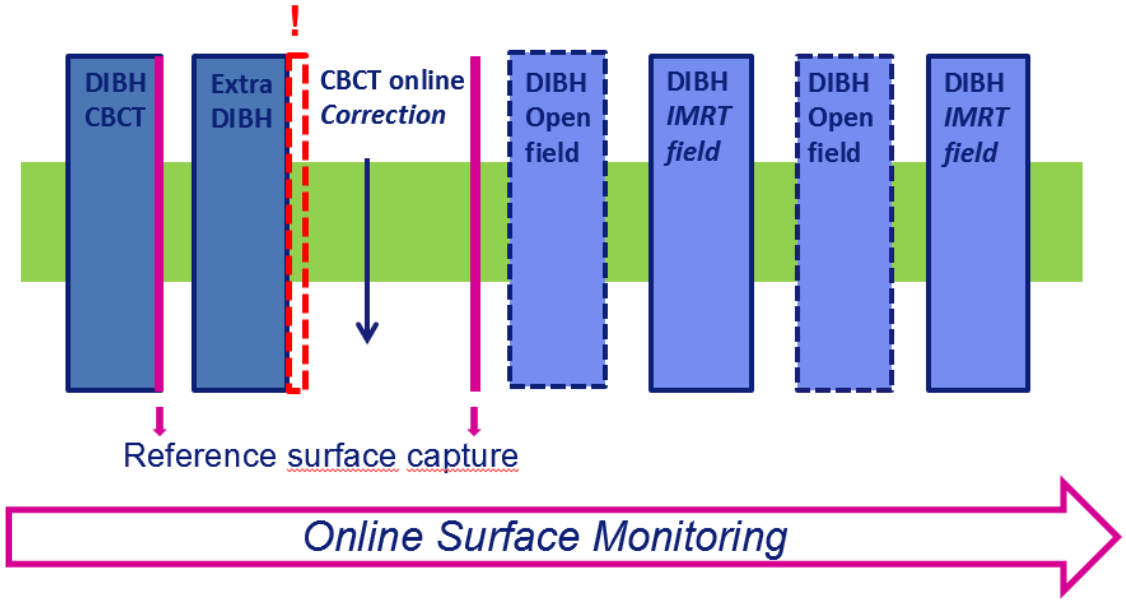
Study Online Treatment Monitor (Theraview NT) vs AlignRT (VisionRT)

- 2D versus 3D

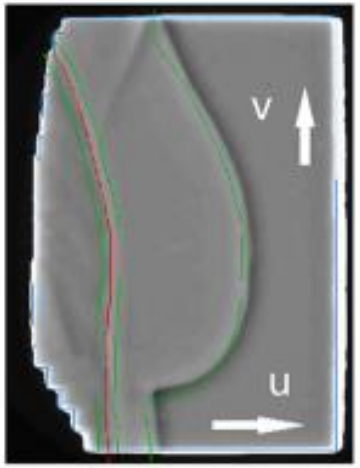


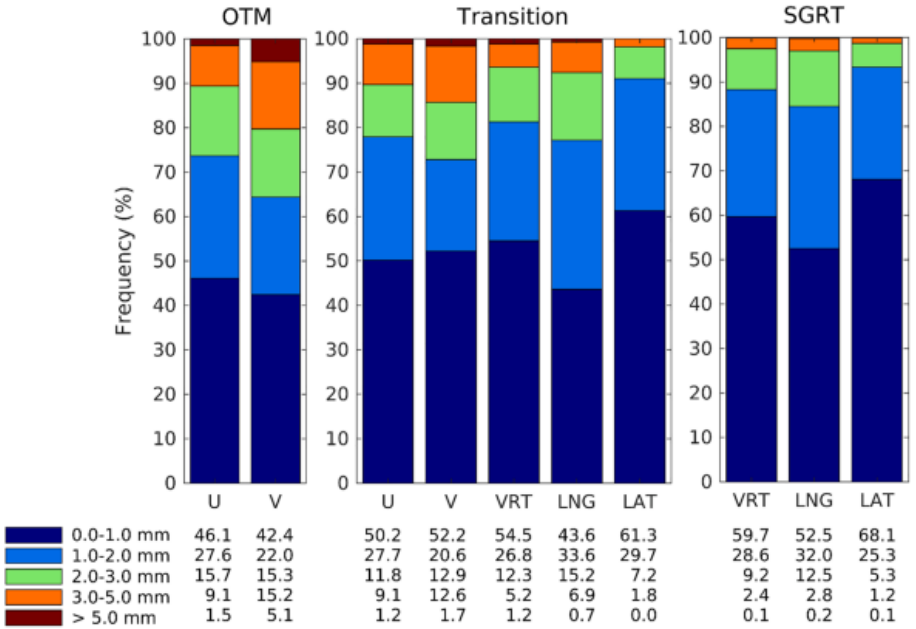


Monitoring during beam on open fields vs. Monitoring entire treatment



Good agreement between both systems, mean deviation < 1 mm (± 1 mm)

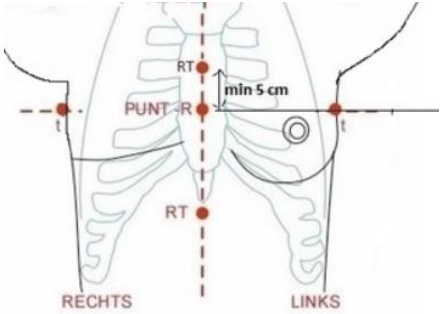


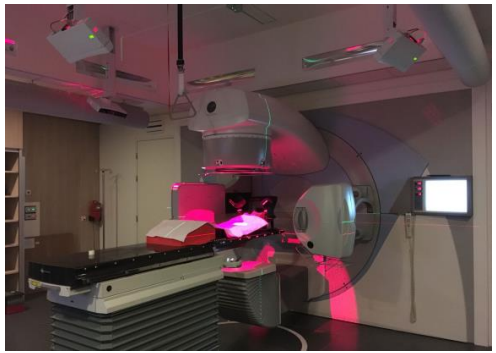


Penninkhof et al, TIPSRO 2022; 21: 51-57. doi: 10.1016/j.tipsro.2022.02.001

Setup breast patients using both tattoos and SGRT

- Tattoos placed on solid reference points
  - Necessary because not all linacs have SGRT
- Move couch to front and leftsided tattoo
  - Check position of the patient on breastboard
- Use Couch Move Assist (CMA) to go to isocentre
- Position patient with use of AlignRT and Postural Video
- CBCT online procedure
- Monitor patient during treatment using AlignRT
  - Manual interrupt if patient moves outside tolerance





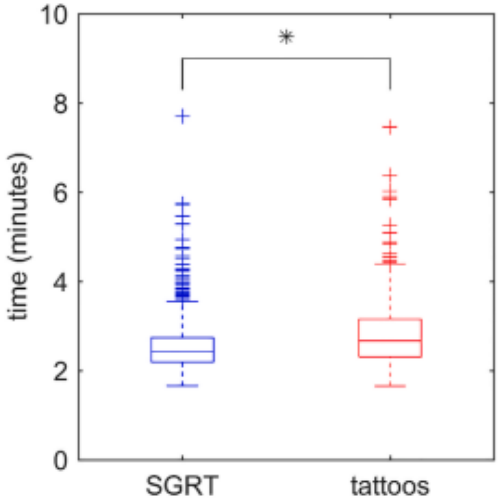
Results

Time to complete the imaging procedure for patients' setup based on tattoos versus setup using the SGRT system.

- 168.7 ± 44.0 s without SGRT-setup
- 152.8 ± 33.2 s with SGRT-setup.

Comparison of the online corrections (rotations and translations) between treatments with and without SGRT-setup revealed small differences, not considered clinically significant

Less CBCTs were needed for adequate positioning, especially the position of arm and chin.

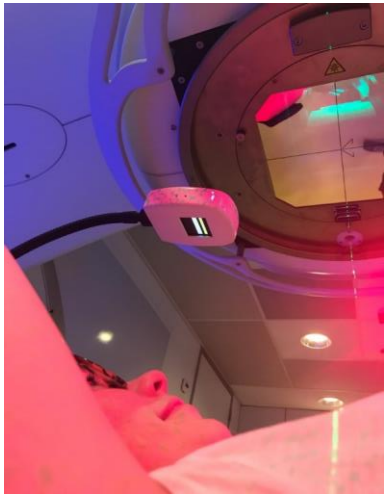


Clinical implementation of Real Time Coaching device for DIBH breast patients

- A visual feedback system for the patient improves patient compliance to DIBH

- Breathhold during CBCT similar as during the planning CT
  - Less rotations → less comprimising during CBCT match

- During treatment:
  - Smaller deviations in VRT- and LNG-direction and in amplitude
  - Better reproducibility between all breathholds within one fraction
  - Improvement in stability of the breathhold



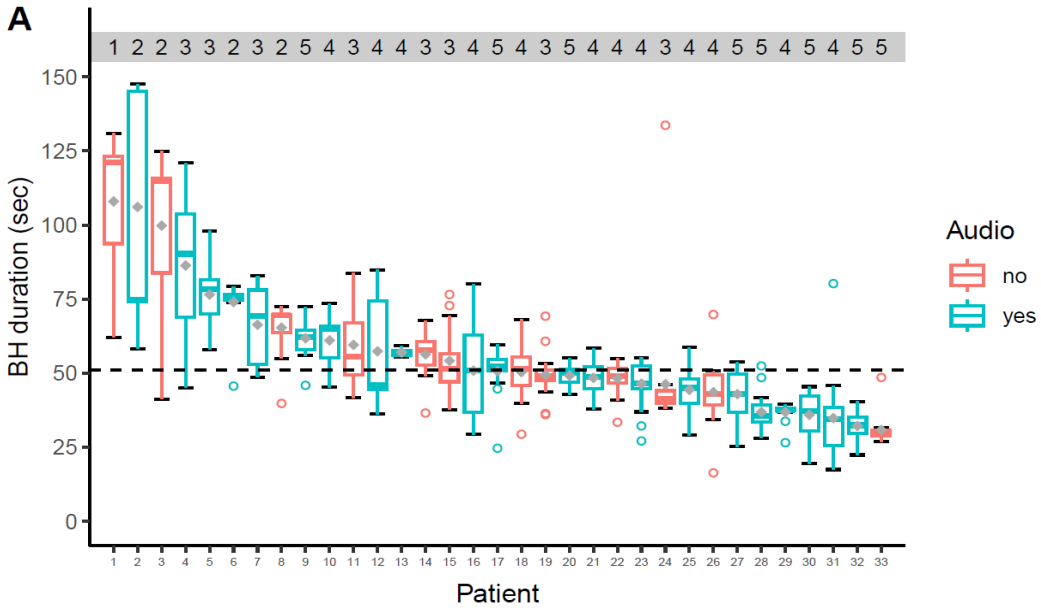
Clinical implementation of VMAT-gated DIBH for breast patients using AlignRT

As presented last year by Sophie Huijskens:

“SGRT-based automated VMAT gating for left-sided breast DIBH treatment proved highly efficient with a median 51sec beam-on time per BH, resulting in a median of 4 BHs per fraction, while staying easily within gating window tolerances.”

- 33 patients were included with difference of > 1 cm in SSD between FB and BH CT-scans
- median intra-DIBH and intrafractional DIBH reproducibility were ~1.0mm in each direction

- During the study the patients could choose if they wanted audio coaching from an RTT or do it themselves.
- The first fraction was always with audio coaching
- 36% chose to do it themselves



Identify on the Ethos

Different camera angles

Setup on reference points instead of isocentre

Slightly different ROI’s because of bore

No video function

Tattooless treatment for all breast patients @ location Dordrecht

2018: 2 linacs with AlignRT & 2 linacs without SGRT = tattoos necessary

2023: 4 linacs with AlignRT/Identify & 0 linacs without SGRT = tattoos no longer necessary

- ✓ Experience with patient setup using SGRT
- ✓ Experience with patient monitoring using SGRT
- ✓ CBCT online procedure

- ❑ Risk analysis
- ❑ A protocol on how to handle in case of technical failure of the SGRT system
- ❑ Fixed reference points, suitable for all breast/thoracic wall patients for setup
- ❑ A short presentation for the RTT's

Risk analysis

- No new system
- Similar patient positioning as before
- CBCT Online procedure
- All linacs equipped with SGRT

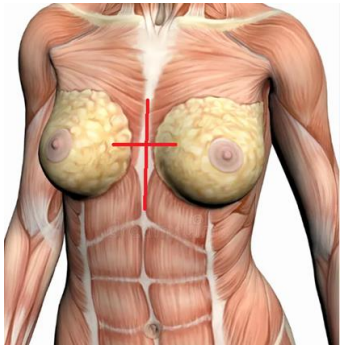
A protocol on how to handle in case of technical failure of the SGRT system

- Align patient on the fixed reference points
- Move couch to isocentre
- CBCT online procedure
- Use match criteria to judge if patient positioning is within tolerance
  - If not → re-align patient → new CBCT
  - Maximum of 3 CBCT's per fraction

Fixed reference points, suitable for all breast/thoracic wall patients for setup

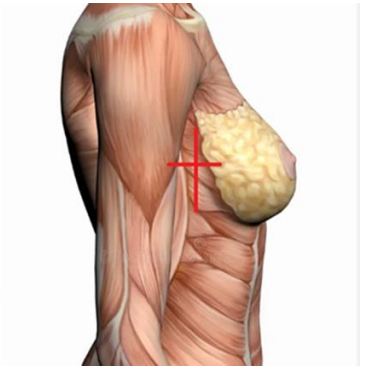
Length	nipple affected breast = position on the breastboard
Width	middle of the sternum
Height	dorsal side of the affected breast

Example: right breast



<u>Exceptions:</u>

- No nipple? → length of the nipple of the opposite breast
- No breast? → height on the dorsal side of the opposite breast
- No breasts? → height in the middle of the torso
  length on the scar of the affected side



So far

More than 140 breast patients scanned without tattoos for treatment

More than 80 patients finished their tattooless treatment.

The RTT’s are very positive; they now have a uniform workflow for positioning all breast/thoracic wall cancer patients.

In addition, the entire CT procedure is finished in a shorter time.

The patients react positively surprised; they no longer will experience the cosmetic and psychological impact of tattoos. Analysis of the accuracy of patient setup is ongoing.

Future

Based on the positive results, a similar procedure will be implemented at the linacs in our main location in Rotterdam early 2024.

In addition extension of tattooless treatments to other treatment sites will start.

By the end of 2024 our whole department will be tattooless

Maarten Dirkx
Joan Penninkhof
Kirsten Offereins
Cynthia van Wanrooij
Sophie Huijskens
Britt Kunnen
Sandra Quint

All my colleagues and patients @ location Dordrecht

Thanks for your attention!