

Purpose

- **Breath hold** technique reduces the **high dose** regions in the heart, when using tangential fields for primary breast cancer patients (figure 1).
- For re-irradiation of a recurrence of left sided breast cancer the target volume is larger, therefore we use a VMAT technique.
- A VMAT treatment gives a large region with a **low dose**.
- The question is raised, when combining breath hold with VMAT, will this reduce the dose in heart and lungs further?

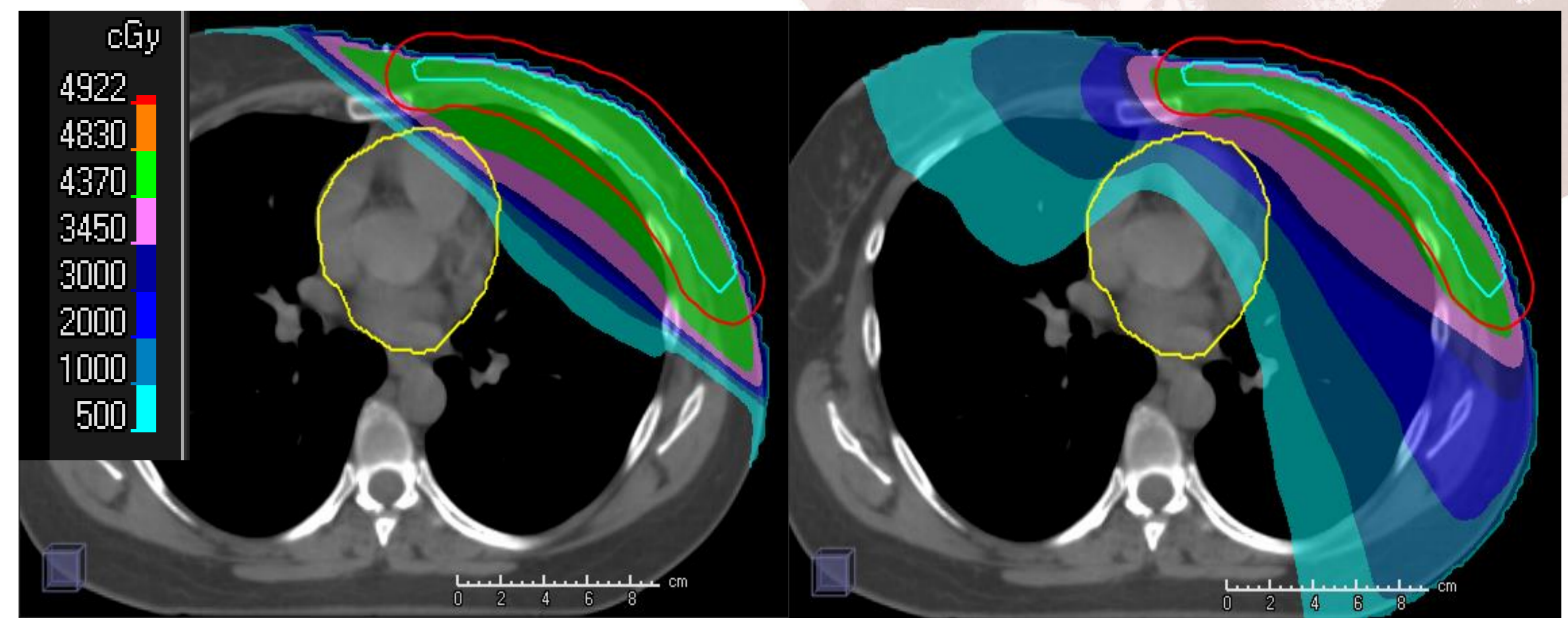


Figure 1. Dose distribution of tangential fields (left) and for VMAT (right). PTV in red, heart in yellow.

Objective:

To investigate if there is an added value of combining breath hold with VMAT for heart and lung dose for a local recurrent of left sided breast cancer in previously irradiated area.

MATERIAL AND METHODS

- Twenty patients, retrospectively selected, who had a free breathing and breath hold CT-scan (with SpiroDynr'X system).
- For both scans: GTV, CTV and also heart and lung was delineated.
 - ❖ CTV-PTV margin: 1 cm.
 - ❖ Prescribed dose: 46Gy in 23 fractions.
- A 220 degree, dual arc VMAT, Elekta Agility, 6MV treatment plan was made (figure 2).
- For planning, multi criterial optimization [MCO] within Raystation, (Version 6, Raysearch) was used.
 - ❖ The mean dose to the heart was reduced as much as possible without compromising the target coverage.
- DVH parameters of heart and lungs were compared using a paired sampled T-test.



Figure 2. A 220 degree, dual arc, was used for both scans.

RESULTS

	Range Of difference (Min)	Range Of difference (Max)	Mean free breathing	Mean breath hold	Mean difference	P-value
Heart D_{mean} (Gy)	-6.1	0.5	10.3	8.1	-2.2	<0.01
Heart D_{2cc} (Gy)	-11.2	0.0	38.2	34.0	-4.2	<0.01
Heart $V_{43.7Gy}$ (cc)	-6.2	0.0	0.7	0.1	-0.6	0.08
Lung D_{mean} (Gy)	-1.5	2.5	8.4	8.8	0.4	0.13
Lung V_{20Gy} (%)	-2.2	9.2	12.5	13.9	1.4	0.08
Lung V_{10Gy} (%)	-4.6	10.1	25.1	26.8	1.7	0.04

Table 1. Differences between breath hold and free breathing of all patients. Positive numbers indicates more dose in breath hold plans, negative numbers less dose.

- For breath hold the average mean heart dose was reduced with 2.2Gy compared to free breathing (figure 3).
- However the difference per patient is widely spread ranging from -6.1Gy to 0.5Gy.
- 16 out of 20 patients had a mean dose difference more than 1Gy for the heart.
- On average a slightly higher lung dose is found for breath hold. And individually there are some large differences in V_{20Gy} and V_{10Gy} .

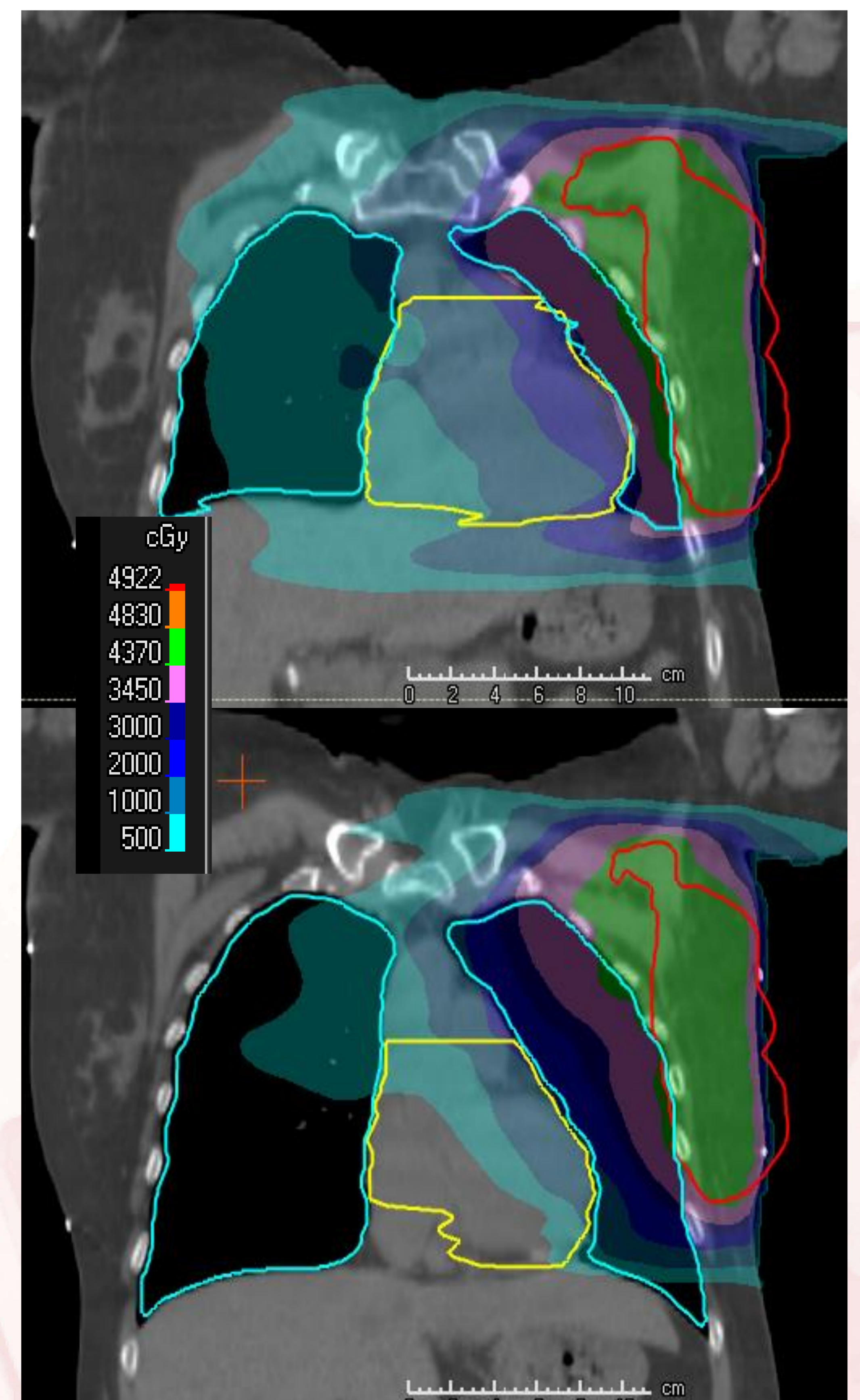


Figure 3. Best case scenario, for heart mean dose sparing. Dose distribution for free breathing (upper case) and breath hold (lower case). PTV in red, heart in yellow.

CONCLUSION

A breath hold technique combined with a VMAT plan reduces the mean heart dose significantly for a local recurrence of left sided breast cancer in previously irradiated area, compared to a free breathing VMAT technique.