

## A Cost-Effective Solution to Providing Bio-Positional Feedback To DIBH Patients Treated with SGRT

M. Reyhan<sup>1</sup>, B. Swann<sup>2</sup>, K. Greene<sup>2</sup>, M. McKenna<sup>1</sup>, R. Singh<sup>1</sup>, N. J. Yue<sup>1</sup>

<sup>1</sup>Rutgers Cancer Institute of New Jersey, New Brunswick, New Jersey, USA

<sup>2</sup>Robert Wood Johnson Hospital, Hamilton, New Jersey, USA

### INTRODUCTION

- Deep Inspiration Breath Hold (DIBH) is a technique used in external beam breast radiation therapy to spare dose to the heart.
- AlignRT can be utilized for DIBH by acquiring a breath held CT simulation scan and contouring the patient surface. The breath-held surface is then utilized by the AlignRT for daily setup based on the patient's surface, Surface Guided Radiation Therapy (SGRT).
- Displaying real-time feedback based on breathing can help patients participate in their own treatment, ease the setup process, and help deliver a more effective breath hold.
- Recumbent glasses allow a patient in a supine position to see almost 90 degrees from his/her original line of vision, Figure 1. Recumbent glasses provide a cost-effective, ~\$50, solution to providing bio-positional feedback to the patient.

### AIM

To create a cost-effective solution to providing patient access to the visual positional feedback monitor of AlignRT to improve setup and treatment times

### METHODS

- The VisionRT in-room monitor was placed on a counter perpendicular to the treatment couch, allowing the patient to see the visual positional feedback from the AlignRT system, while wearing the recumbent glasses, Figure 2.
- The therapist team explained to the patient the meaning of the red/green indicators in the AlignRT software and coached the patient through a practice breath-hold with the system on the first day of treatment.
- Analysis of each patient's AlignRT reports and Truebeam treatment times were performed for a total of 11 DIBH left breast patients, undergoing Canadian fractionation radiotherapy. 6 of the patients received treatment without the recumbent glasses.
- The VisionRT report total patient monitoring time was averaged across each of the 16 fractions as was the total treatment time from Aria's RT summary. Both were used to assess improvement in treatment time due to the glasses.

### RESULTS

- The average AlignRT patient monitoring time per fraction was  $8.58 \pm 2.2$  minutes for patients treated without glasses and  $8.61 \pm 0.81$  minutes for patients treated wearing the glasses.
- The average total treatment time per fraction from Aria's RT summary was  $5.16 \pm 1.95$  minutes and  $4.32 \pm 1.04$  minutes, for patients treated without and with glasses respectively, demonstrating a reduction in average treatment time per fraction when using the glasses.
- The average number of MV portal images acquired over the course of treatment was  $7.5 \pm 2.99$  versus  $9 \pm 3.72$  for patients treated without and with glasses.

Table 1. Summary of Data	Avg time over 16 fx		Images	Glasses	Age (yr)
	AlignRT (min)	Aria (min)			
Patient 1	6.60	4.67	10	No	85.0
Patient 2	13.23	9.11	13	No	47.0
Patient 3	8.30	5.64	6	No	60.0
Patient 4	6.97	3.33	6	No	79.0
Patient 5	8.75	4.85	5	No	76.0
Patient 6	8.16	3.33	7	Yes	42.0
Patient 7	8.43	4.19	7	Yes	65.0
Patient 8	8.28	3.83	6	Yes	61.0
Patient 9	10.20	6.33	16	Yes	70.0
Patient 10	7.97	3.93	7	Yes	61.0
Patient 11	7.64	3.35	5	No	59.0
<b>Average with Glasses</b>	<b>8.61</b>	<b>4.32</b>	<b>9.00</b>		<b>59.8</b>
Standard deviation with Glasses	0.81	1.04	3.72		9.5
<b>Average without Glasses</b>	<b>8.58</b>	<b>5.16</b>	<b>7.5</b>		<b>67.7</b>
Standard deviation without Glasses	2.20	1.95	2.99		13.3

### DISCUSSION

The use of bio-positional feedback to DIBH patients improved the reproducibility of treatment time. The average fractional treatment time was similar with and without the glasses. MV portal imaging was comparable between the groups treated with and without the glasses. The average age of patients treated with and without the glasses was comparable. Time may not be the best way to quantify the differences between using and not using the glasses, as patient compliance and understanding can greatly influence how long a DIBH treatment can take.

Radiation therapists provided positive feedback regarding use of the glasses and felt the overall therapist and patient experience of DIBH was better with the glasses. However, the glasses do need cleaning between patients. For patients with extremely large body habitus the patient's belly can obscure the line of site to the AlignRT monitor. While the recumbent glasses can be worn over reading/distance vision glasses, poor or impaired vision will impact the usability for bio-positional feedback.

### CONCLUSION

The use of recumbent glasses for DIBH patients treated using VisionRT decreased the average per fraction treatment time and improved patient setup consistency.

### REFERENCES

1. Darby SC, Ewertz M, McGale P, et al. Risk of ischemic heart disease in women after radiotherapy for breast cancer. *N Engl J Med*. 2013;368(11):987-998. doi:10.1056/NEJMoa1209825
2. Boda-Heggemann J, Knopf AC, Simeonova-Chergou A, et al. Deep Inspiration Breath Hold-Based Radiation Therapy: A Clinical Review. *Int J Radiat Oncol Biol Phys*. 2016;94(3):478-492. doi:10.1016/j.ijrobp.2015.11.049
3. Zagar TM, Kaidar-Person O, Tang X, et al. Utility of Deep Inspiration Breath Hold for Left-Sided Breast Radiation Therapy in Preventing Early Cardiac Perfusion Defects: A Prospective Study. *Int J Radiat Oncol Biol Phys*. 2017;97(5):903-909. doi:10.1016/j.ijrobp.2016.12.017
4. Keeler R, Singh AD, Dua HS. Recumbent spectacles: taking it lying down. *Br J Ophthalmol*. 2010;94(5):535. doi:10.1136/bjo.2010.185744.

### CONTACT INFORMATION

Meral Reyhan, Ph.D. email: reyhanme@cinj.rutgers.edu

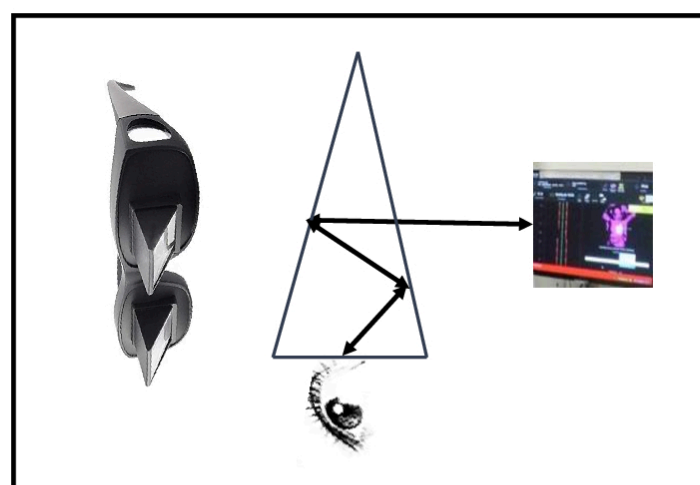


Figure 1. Schematic of light reflecting within the recumbent glasses. Recumbent glasses are shown on right.

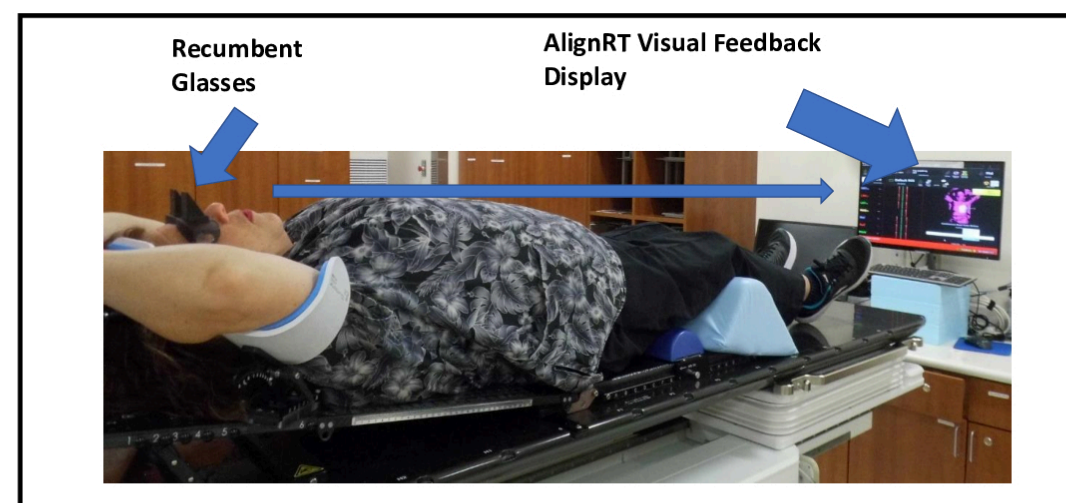


Figure 2. Example of patient in treatment position with recumbent glasses positioned to view the AlignRT Visual Feedback Display.