
DIBH Radiation Therapy: Breathing new life into breast treatments

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Service Improvement

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Summary

Adjuvant radiation therapy (RT) for breast cancer significantly reduces local recurrence and improves long term survival, however can be associated with an increased risk of cardiac mortality with studies

finding that there is no "safe" cardiac dose. For left-sided breast cancer RT, Deep Inspiration Breath Hold (DIBH) is a new technology that has been developed to facilitate reduction in cardiac dose by achieving maximum separation between the treatment area and heart.

Key dates

Mar 2016

Dec 2019

Implementation sites

Radiation and Oncology at Princess Alexandra Hospital

Partnerships

consumers. Collaborative partnerships with Medical Imaging and Cardiology departments of PAH

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Aim

To successfully implement a DIBH technique for breast cancer patients receiving RT treatment at Princess Alexandra Hospital.

Benefits

As a result of the positive findings of the pilot study, DIBH has been utilised in 32 per cent of patients who have received RT for breast cancer in the past 12 months with this number expected to continue to increase.

Background

Adjuvant radiation therapy (RT) for breast cancer significantly reduces local recurrence and improves long term survival, however can be associated with an increased risk of cardiac mortality with studies finding that there is no 'safe' cardiac dose. For left-sided breast cancer RT, Deep Inspiration Breath Hold (DIBH) is a new technology that has been developed to facilitate reduction in cardiac dose by achieving maximum separation between the treatment area and heart.

Solutions Implemented

The Elekta Active Breathing Coordinator (ABC) system was implemented to facilitate DIBH treatment. The ABC system uses a mouthpiece attached to a spirometer to regulate the patient's breathing. This allows the amount of air that a patient breathes in to be precisely set and consistently move the heart away from the treatment field.

Evaluation and Results

A pilot study was conducted with the following aims:

1. To achieve a greater understanding of the patient's experience when using the breath hold device for DIBH treatment.
2. To assess whether DIBH decreases the incidence of subclinical myocardial dysfunction as determined by 2-dimensional strain imaging echocardiography. This study found that the DIBH technique was acceptable to patients and did not cause any additional distress, assisting in creating a positive treatment experience. The cardiac outcome arm of the study, consisting of 40 patients (30 treated in DIBH and 10 in free breathing) has shown there was a significant difference in Left

Ventricular Global Longitudinal Strain (LVGLS) over time between the two groups ($p < 0.05$) with LVGLS deteriorating as free breathing RT progresses when compared with DIBH. This trend was found to continue six months after RT completion (refer to attached document). This strongly suggests that DIBH is beneficial in protecting the heart.

These positive results have led to the commencement of a more in-depth study utilising cardiac MRI in conjunction with Echocardiography to better understand what sections of the heart are more susceptible to structural and functional damage. The results of this study will be used to direct RT planning and treatment strategies to maximise breast cancer patient outcomes.

Lessons Learnt

This project highlighted that when implementing new technology, the importance of multidisciplinary collaboration, including consumer input, is crucial to the project's success. A lesson learned from this project was also the importance of comprehensive staff and patient education and training and the need to close the feedback loop to ensure procedures are refined and improved as required.

References

1. Australian Institute of Health and Welfare. Cancer in Australia 2019. Cancer series no.119. Cat. no. CAN 123. Canberra: AIHW 2019
2. Darby S, Ewertz M, McGale P, Bennet A, Blom-Goldman U et al. Risk of ischemic heart disease in women after radiotherapy for breast cancer. *N Eng J Med.* 2013; 368: 987.
3. Beaton N, Watson S, Browne P, Sharma H, Mai G, Harvey J, Bernard A, Brown E, Hargrave C, Lehman M. Deep inspiration breath hold in breast cancer: Development and analysis of a patient experience questionnaire *J Med Imag Radiat Oncol* 2018;62(6):854-60.