



Heart sparing radiotherapy for Left Sided Breast Cancer using Active Breathing Coordinator (ABC) and Response automatic gating control system at the Cancer Centre London.

The Cancer Centre London (CCL) is committed to ensuring that all patients receive first class, personalised care that goes beyond compliance, through the use of innovative technology.

As more patients survive breast cancer, the long term toxicities of treatment become more important. Patients receiving radiotherapy to the left breast are at risk of heart disease induced by radiotherapy after surviving breast cancer. Therefore decreasing the dose to the heart tissue during left breast radiotherapy is critical to improving outcomes in breast cancer survivors.

Heart sparing left sided breast radiotherapy using Active Breathing Coordinator (ABC) and Response automatic gating system was implemented into clinical practice at CCL in Spring 2015. To date eighteen (18) patients have been treated using this technique on our Elekta VersaHD linear accelerator radiotherapy treatment machine.

The technique involves the patient holding their breath during radiotherapy. This moves the heart backwards and downwards away from the breast area. The heart is moved out of the way of the radiation beam, reducing the possibility of damage to the heart.

The ABC system is used to help the patient hold their breath during radiotherapy. When radiation treatment is delivered, patients use a specialist mouthpiece to breathe in, and then a valve in the mouthpiece closes to help them to hold their breath for about 20 seconds. The radiographers monitor the patient's breath hold on a lap top outside the treatment room during treatment delivery. After the 20 seconds treatment time has elapsed the valve re-opens and the patient can breathe normally.

At any point during the treatment, the patient can press a button that they hold in their hand; this will release the valve in the mouthpiece and allow the patient to breathe normally. This gives the patient a sense of control and the reassurance if they are struggling to hold their breath or if they panic, they can pause the treatment and continue from where the treatment stopped, without compromising any aspect of their treatment. The radiographers outside the room can also interrupt the breath hold if required.

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The automated Response gating control links the Elekta VersaHD linear accelerator to the ABC system and ensures that the radiation beam is switched on only when the patient is in breath hold. Therefore any breath hold interruption by the patient or the radiographer automatically switches off the radiation beam instantaneously, ensuring that the patient's heart is not treated, thereby eliminating radiation induced damage.

Image Guided Radiotherapy (IGRT) is used to verify each patient's position in breath hold before radiotherapy is delivered. This provides radiographic confidence that the patient's heart is truly removed and is not being treated. The negligible heart dose that results from this technique is also confirmed on each patient's individualised treatment plan.

Combining these technologies have truly revolutionised the approach to heart sparing during left breast radiotherapy at the Cancer Centre London. This procedure is unique to CCL and first in the UK. All radiographers underwent application specialist training to use the equipment and follow documented protocols and procedures.

Feedback from patients demonstrate that they tolerate the technique exceptionally well with the confidence that whilst they are receiving radical radiation therapy that will help them survive left breast cancer, the heart-sparing technique at CCL can beat the lethal side-effect of damage to the heart.

548 Words