Intensity modulated radiotherapy reduces side effects in patients with early breast cancer

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Intensity modulated radiotherapy (IMRT) gives better results than standard radiotherapy in patients with early breast cancer, according to results from a randomised trial presented today (Sunday) to the 2nd Forum of the European Society for Radiotherapy and Oncology (ESTRO). IMRT is an advanced, high-precision form of radiotherapy that can deliver an even dose of radiation, thus reducing the cosmetic problems that can often occur after breast radiotherapy.

"We believe that this study, the largest prospective trial in the world to test breast IMRT against standard two-dimensional radiotherapy, will be practice-changing at an international level," said Dr Charlottes Coles, from Addenbrooke's Hospital Oncology Centre, Cambridge, UK. "Analysing the results five years after treatment, we saw significant benefits in patients who had received IMRT."

The researchers analysed the radiotherapy treatment plans of 1145 patients with early breast cancer who had previously had breast-conserving surgery. The plans were screened to see if they would produce an uneven radiation dose with standard two-dimensional radiotherapy (2DRT). A total of 71% of the plans fell into this category, and those patients were randomised between standard 2DRT and IMRT. The 29% of patients whose plans would not produce an uneven dose were treated with standard 2D RT, but still followed up within the trial.

One of the aims of external radiotherapy is to treat the target – in this case the whole breast – with an even dose distribution, i.e. within a range of 95% to 107% of the prescribed dose. Too low a dose can risk tumour recurrence, and too high a dose can cause undesirable side-effects such as skin changes.

"The problem with 2D breast radiotherapy is that the dose distribution is only recorded across the central part of the breast. Usually it meets the 95-107% constraints, but the shape of the breast changes, so if the same plan is looked at in 3D, then there may well be areas with overly high doses. By modulating the intensity of the radiation beam, IMRT can be used to correct for this and smooth out the dose," said Dr Coles.

The researchers set out to see whether the effect of using IMRT in those patients who would have received a dose greater than 107% to parts of their breast with 2DRT would translate into clinical benefit. IMRT planning uses results from scans to determine the dose intensity that will best treat the tumour, and therefore is more complex and time-consuming than 2DRT planning, so there was an important need to see a clear advantage to patients from the use of the procedure.

The only previous study looking at this was much smaller, and rather than picking out all patients with doses greater than 107% and randomising them, it only included women with larger breasts who are already known to be more likely to have regions of dose above the upper limit. "Our trial was more inclusive as all women were able to take part and we could quantify those who would receive an uneven dose," said Dr Coles.

"We saw that fewer patients in the IMRT group developed skin telangiectasia (dilated blood vessels near the surface of the skin), and the overall cosmetic effect in the breast was better," she said. Although there was no significant difference between the two groups in breast

shrinkage, breast oedema, breast induration (hardening), and pigmentation changes, the benefits of using IMRT in these patients were clear.

The researchers intend to follow up their work by analysing the patients' questionnaires to see whether IMRT has an influence on quality of life. The trial has also contributed 1000 blood samples to the UK translational research study RAPPER (Radiogenomics: Assessment of Polymorphisms for Predicting the Effects of Radiotherapy), which aims to ultimately develop individualised radiotherapy plans based on the analysis of individual patients' genetics.

"Although IMRT is employed increasingly in breast cancer, its use is far from universal throughout the world. We hope that the evidence of benefit shown in our trial will encourage its greater use, resulting in improved patient access and, ultimately, improved outcomes for breast cancer patients," said Dr Coles.

President of ESTRO, Professor Vincenzo Valentini, a radiation oncologist at the Policlinico Universitario A. Gemelli, Rome, Italy, said: "This study not only shows a better outcome for the women treated with IMRT, but has an additional value in defining the selection criteria for providing treatment to those patients who will benefit from new frontline technologies. In the study design, the patients who could be treated satisfactorily by standard technology were not referred for IMRT, avoiding the use of a complex technique where it was not necessary. At a time when resources are limited, individualised medicine can help us offer new technology only to those patients who will have a tangible benefit from it."

More information: Abstract no: OC-0202, Symposium/ Breast at 08.45 hrs (CEST) on Sunday 21 April, Auditorium

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