For the IMRT technique, forty percent of the dose was given with two open fields, and sixty percent with four inversely planned 'Step-and-Shoot' IMRT fields. For proton therapy a spot scanning technique with intensity modulation (IMPT) was used with a three beam set-up. In all plans the gantry angles were 345° (-15°), 27° and 75°. The spots were placed in such way that no spot was more than 0.2 cm outside the PTV and spots separated by 8 mm distance in the plane perpendicular to the beam direction. The spot layers were positioned 5 mm apart from each other.

For both techniques it was attempted to produce the most optimal plan in reducing the dose to the OARs as much as possible. All plans were adapted to the individual target volumes and OARs, using trial-and-error.

We compared IMRT and IMPT based on a FB as well as on a BH CT-scan for all patients.

Results: In all plans coverage of the PTV was adequate. Furthermore, the dose to the OARs was decreased in all IMPT plans compared to IMRT plans. There was only a small difference between BH and FB in the IMRT plans (see the table).

<table>
<thead>
<tr>
<th>Structure</th>
<th>Sørensen-Dice</th>
<th>p-value</th>
<th>Volume (ccm)</th>
<th>p-value</th>
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<tbody>
<tr>
<td>GTV-T</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>0.63 (0.24)</td>
<td>0.4</td>
<td>15.5 (9.6)</td>
<td>0.04</td>
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<tr>
<td>O-MAR</td>
<td>0.69 (0.16)</td>
<td></td>
<td>19.2 (13.0)</td>
<td></td>
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<tr>
<td>GTV-N</td>
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<tr>
<td>Standard</td>
<td>0.78 (0.09)</td>
<td>0.7</td>
<td>12.1 (10.0)</td>
<td>0.6</td>
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<tr>
<td>O-MAR</td>
<td>0.79 (0.07)</td>
<td></td>
<td>12.3 (10.4)</td>
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<tr>
<td>R. Parotid</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>0.69 (0.09)</td>
<td>0.005</td>
<td>19.1 (6.1)</td>
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<tr>
<td>O-MAR</td>
<td>0.74 (0.06)</td>
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<td>20.5 (6.7)</td>
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<td>L. Parotid</td>
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<tr>
<td>Standard</td>
<td>0.72 (0.17)</td>
<td>0.1</td>
<td>20.8 (8.2)</td>
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<tr>
<td>O-MAR</td>
<td>0.75 (0.18)</td>
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<td>22.1 (7.9)</td>
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</table>

Table 1: Mean Sørensen-Dice Indexes and mean volumes for delineated structures on standard and O-MAR reconstructions. Standard deviations are shown in brackets.

Conclusions: When comparing IMPT and IMRT, the dose reduction to almost zero in heart and LAD when using IMPT was better than using IMRT. With IMPT a breath-hold technique seems not possible as in IMRT. With IMPT a breath-hold technique seems not possible as in IMRT. With IMRT a breath-hold technique seems not possible as in IMRT. With IMPT a breath-hold technique seems not possible as in IMRT. With IMPT a breath-hold technique seems not possible as in IMRT. With IMRT a breath-hold technique seems not possible as in IMRT. With IMPT a breath-hold technique seems not possible as in IMRT.

Conclusions: Delineation of the parotid glands was more precise, and with larger volumes, after reduction of major metal artefacts with O-MAR reconstruction than standard reconstruction. Larger volumes were also observed regarding GTV volumes on O-MAR reconstructed images and consequently larger CTVs and PTVs impacting on dose-planning optimisation.

OC-0257
Delineation of organs-at-risk in the pelvic area: developing guidelines for RTTs
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1EORTC Radiation Oncology, Brussels, Belgium
2The Netherlands Cancer Institute- Antoni Van Leeuwenhoek Hospital, Radiotherapy, Amsterdam, The Netherlands

Purpose/Objective: To test the organ-at-risk (OAR) delineation guidelines developed for RTTs involved in EORTC multicenter clinical trials.

Materials and Methods: CT datasets of 4 patients with pelvic malignancies were used in this ongoing study. The OARs delineated by RTTs from 5 different centers following the guidelines suggested by the EORTC-ROC-RTT group were: the anus, rectum, sigmoid, femoral heads and penile bulb. A software package developed in the NKI-AVL, Amsterdam was used for delineation and assessment of delineation accuracy by measuring standard deviation (SD) of an OAR median volume delineated by all observers and then measuring a number of points from each observer’s delineation to the median delineation. If a SD was > 1 cm, the guidelines would be considered incomplete and require further refinement.

Results: Results of SD of the median volume for each OAR per patient and its mean are presented in the table below.
OC-0259
Radiotherapy/chemotherapy-related cardiovascular disease in breast cancer patients: a population-based study
N.B. Boekel1, M. Schaapveld1, J.A. Gietema2, O. Visser3, B.M.P. Aleman4, F.E. van Leeuwen5
1The Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Epidemiology, Amsterdam, The Netherlands
2University Medical Center Groningen, Medical Oncology, Groningen, The Netherlands
3Comprehensive Cancer Center, Research, Amsterdam, The Netherlands
4The Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Radiation Oncology, Amsterdam, The Netherlands

Purpose/Objective: Several studies have shown that breast cancer treatment may increase the risk of cardiovascular disease after ten or more years. However, most reports are based on older treatment regimens. It is not known whether more contemporary radiation techniques are associated with excess cardiovascular disease. In addition, it is not clear whether current chemotherapeutic regimens, especially regimens containing anthracyclines, increase the risk of cardiovascular disease in breast cancer survivors.

The aim of this study is to assess the effect of radiotherapy and chemotherapy for breast cancer on cardiovascular morbidity and mortality.

Materials and Methods: We have constructed a large population-based cohort of patients diagnosed with invasive breast cancer between 1989 and 2004 (n=93,630). Information on patient characteristics, primary and secondary malignancies, and basic treatment information (e.g. type of surgery, radiotherapy yes/no, chemotherapy yes/no) were provided by the Netherlands Cancer Registry. Detailed treatment information was collected through electronic files from radiotherapy institutes, trials, and regional studies. Date and cause of death were acquired through linkage with the Central Bureau for Genealogy and Statistics Netherlands, respectively, until January 2010. Data on cardiovascular morbidity were acquired through linkage with two registries: the Hospital Discharge Registry (LMR) and the Cardiac Interventions Registry (BHN).

Results: Of the initial 93,630 patients, 69,123 survived at least five years after breast cancer diagnosis. The median follow-up of five-year survivors was 9.7 years (range 5-21 years).

We distinguished four mutually exclusive treatment categories: surgery only (33%), radiotherapy with or without surgery (46%), radiotherapy and chemotherapy with or without surgery (15%), and chemotherapy with or without surgery (5%). 52% of the patients treated with radiotherapy were irradiated for left-sided breast cancer. Due to the anatomical position of the heart, the radiation-dose to the heart is higher during left-sided radiotherapy than during right-sided radiotherapy.

At the PREVENT meeting, results will be presented on the evaluation of mortality rates in comparison with the general population. Secondly, we will present comparisons of cardiovascular mortality rates and incidence of different cardiovascular diseases between the above stated treatment categories, and more specifically by type of chemotherapeutic, radiation field, and laterality.

Conclusions: Based on our results, conclusions will be drawn with respect to the effects of modern radiotherapy regimens and specific chemotherapeutics for breast cancer.

OC-0260
Effects of a tocotrienol-enriched formulation in a rat model of local heart irradiation
M. Boerma1, V. Sridhar1, P. Tripathi1, S. Sharma2, E.G. Moros3, N. Aykin-Burns4, M. Hauer-Jensen1
1University of Arkansas for Medical Sciences, Pharmaceutical Sciences, Little Rock, USA
2University of Arkansas for Medical Sciences, Radiation Oncology, Little Rock, USA
3Moffitt Cancer Center and Research Institute, Radiation Oncology, Little Rock, USA

Purpose/Objective: Radiation-induced heart disease (RIHD) is a long-term side effect of radiotherapy of intrathoracic and chest wall tumors when radiation fields encompass all or part of the heart. Tocotrienols are forms of vitamin E with potent radioprotective properties. This study investigates the effects of pre-treatment and effusion most likely is not the same as heart failure, one being an effect on the pericardium while the other an effect on the cardiac myocytes. Further work is needed to clarify the dose resulting in toxicity to each cardiac structure necessary to result in cardiotoxicity and why we see a difference between men and women.

OC-0258
Dosimetric modeling of cardiac toxicity in patients with esophageal cancer receiving radiotherapy
A. Kosinski1, M. Snyder2, P. Philip3, A. Shields4, W. Scott2, E. McSpadden3, J. Myers4
1Wayne State University, Radiation Oncology Department, Detroit, USA
2Wayne State University, Medical Oncology Department, Detroit, USA
3Fox Chase Cancer Center, Surgical Oncology Department, Philadelphia, USA
4Fox Chase Cancer Center, Radiation Oncology Department, Philadelphia, USA

Purpose/Objective: New treatments are being introduced in the treatment of locally advanced esophageal cancer. Some, such as trastuzumab, can potentially increase cardiotoxicity. The purpose of this study was to model cardiac toxicity using an empirical normal tissue complication probability (NTCP) model in patients with esophageal cancer treated in part with radiotherapy.

Materials and Methods: Cardiotoxicity as measured by Common Toxicity Criteria Adverse Events (CTCAE) v3.0 and Radiation Therapy Oncology Group (RTOG) toxicity grading scale was identified by comparison of total dose and dose fraction giving similar levels of toxicity.

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