Conclusions: IMRT planning achieves better dose coverage and homogeneity in comprehensive irradiation in breast cancer; however, it increases dose to carotid artery as compared to conventional 3DCRT. Byspecifying dose constraint to the carotid artery, it is possible to reduce carotid artery doses in IMRT plans by improving dose conformity and homogeneity. It seems reasonable to designate carotid artery as a dose limited structure for long term survivors with high risks for vascular disorders.

EP-1041

Acute and late toxicity with hypofractionated radiation therapy for early breast cancer compared to conventional RT

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Purpose/Objective: The purpose of the present study is to evaluate toxicity and cosmetic outcome in breast cancer survivors treated with hypo-fractionated adjuvant radiotherapy (HF-RT) and to identify risk factors for toxicity, with special focus on the impact of age, co morbidities and chemotherapy. For comparison, a group of 65 patients with similar characteristics and consecutively treated with conventional fractionation was retrospectively selected.
Materials and Methods: From April 2010 and May 2012, 190 women with early breast cancer were treated with HF-RT, after conserving surgery. The patients received 40.05 Gy in 15 fractions. The boost to the tumour bed was administered with a total dose of 9 Gy in 3 consecutive fractions in 50 women due to young age (< 50 yrs) or to positive margins. Physician-rated toxicity and cosmetic outcomes were prospectively assessed during yearly follow-up after radiotherapy.
Results: In the HF-RT group, the mean age was 69 years. 11% and 32% patients were affected by diabetes mellitus and hypertension, respectively. 13% had tumors that were 2 cm or larger in diameter; pTis = 17%, pT1a= 6%, pT1b= 23%, pT1c=41%, pT2=13% ; 10% had estrogen-receptor-negative disease and 29 % had high-grade disease. Pre-operative chemotherapy was administered in 10 patients; adjuvant systemic therapy and hormone therapy were given in 19 patients, while 11 and 115 patients received chemotherapy or hormone therapy alone, respectively. The mean follow-up was 19 months (range 6-32 months). The median time from surgery was 29 days, with overall median treatment duration of 22 days. At last follow up all patients are alive without local recurrence. By the end of RT 18% of the patients treated with HF-RT developed no toxicity, while 55.7% showed grade 1 and 13.3% grade 2 acute skin toxicity. Only one patient experienced a grade 3 acute skin toxicity. In the control group, early G1 reactions were observed in 24 patients (42%); 19% of patients showed G2 acute toxicity and only one patient developed G3 acute reaction. Neither grade 4 skin ulceration nor soft tissue necrosis was observed. Late toxicity was assessed after 6 months from RT completion in 120/190 patients in the hypofractionation group and in 51/65 patients in the standard RT group. Late toxicity according to the RTOG criteria was observed in 9 patients (7.5%) in the HF-RT group and in 4 patients (8%) in the conventional fractionated radiation group. The difference was not statistically significant. Cosmetic result was assessed and scored at the RT end and 6 months later: at last follow up, 71% of women in the control-group as compared with 68.8% of the women in the HF-RT group had a good or excellent cosmetic outcome.
Conclusions: Our results confirm the feasibility of the HF-RT with 2,67 Gy/fx to a total dose of 40,05 Gy in patients with breast cancer. If compared with conventional RT group, the hypofractionation not seems to increase the late toxicity. Long-term follow up is need to confirm this finding.

EP-1042

Preliminary results of neoadjuvant chemotherapy for cN3 breast cancer patients

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Purpose/Objective: To analyze the treatment results of cN3 breast cancer patients who treated with neoadjuvant chemotherapy
Materials and Methods: Between 2003 and 2009, Of 241 breast cancer patients who received neoadjuvant chemotherapy, 52 cN3 non-inflammatory patients were included. Median age was 43 years (range 25-75). Clinical T-stage were T1 (5.8%), T2 (38.5%), T3 (48.0%) and T4 (7.7%). Clinical N-stage were N3a (11.5%), N3b (25.0%), and N3c(63.5%). N3 lesions were detected on PET-CT in 43 patients (82.7%) and confirmed histolotically in 30 patients (57.7%). Antracycline- and/or taxane-based neoadjuvant chemotherapy were delivered to 98.1% of patients. Breast conserving surgery was enabled to 14 patients (26.9%), others received mastectomy alone (59.6%) or mastectomy with immediate reconstruction (13.5%). Excision of N3 lesion was performed in 18 patients (34.6%). Adjuvant radiation therapy were performed in 44 patients (84.6%), and 23 patients received radiation dose more than 50.4 Gy to N3 region.
Results: Median follow-up period was 41 months. Actuarial four-year overall, disease-free, locoregional-recurrence-free survival rate were 72.4, 49.1, and 70.7% respectively. Actuarial four-year control rate of N3 region was 74.6%. Univariate risk factor analysis revealed ypN stage and ypStage as significant risk factors for loco-regional, disease-free, and over survival rate. Excisional biopsy and higher dose to N3 region were proved not to be correlated with regional control rate.
Conclusions: Neoadjuvant chemotherapy followed by curative resection and adjuvant radiation therapy accomplished comparable treatment results for regionally-advanced breast cancer patients. More patients and longer follow-up are mandatory to investigate the optimal locoregional treatment regimen after neoadjuvant chemotherapy.

EP-1043

Target coverage and brachial plexus dose in regional adjuvant radiotherapy for breast cancer

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Purpose/Objective: This study aims to estimate the dose received by the supraclavicular fossa (SCF) and levels I,II and III of the axilla in patients with breast carcinoma undergoing regional adjuvant radiotherapy using routine planning techniques. Dose to the brachial plexus was also evaluated.
Materials and Methods: A CT-planning study of 24 patients was conducted. The BP and nodal target volumes were contoured and five treatment plans were generated for each patient. Treatment techniques included (i) standard tangential fields; (ii) high tangential fields (HTF); (iii) 3-field technique targeting the SCF; (iv) 3-field technique targeting the SCF and axilla level III; (v) technique targeting the full nodal region, the SCF and axilla levels I-III. Dose-volume histograms were used to evaluate the percentage volume of the target covered by the 95% isodose (V95%) to assess target coverage, and the maximum and mean dose to the brachial plexus and the volume of this organ at risk receiving 45,48, and 50Gy.
Results: Using standard tangential fields V95% for axilla level I was 39.6% and for level II was 2.7%. Using HTF the V95% for axilla level I was 90% and 55% for level II. Suboptimal coverage of the SCF target volume was noted for each of the three techniques targeting this volume. The mean maximum BP dose was 50.9Gy for treatment to the SCF alone, 51.1Gy for treatment to the SCF and axilla level III, and 53.2Gy for full nodal treatment. The mean irradiated BP volume receiveg > 45Gy was 49.5%, 65.4% and 77.7% for these groups respectively.
Conclusions: It is important to be aware of the expected coverage for axillary levels I-III when using common radiotherapy regimens particularly given the current controversy over axillary management. Using conventional tangential fields suboptimal coverage of level I was achieved and Level II received only a minimal dose. Axillary levels should be contoured in node positive patients and coverage should be documented. As with previous studies our study shows that routine radiation prescriptions do not optimally cover intended targets for every patient. The BP dose should be considered for patients undergoing full nodal treatment.

EP-1044

Delineation of clinical target volumes for radiotherapy of the breast: consequences for treatment plans

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Purpose/Objective: The delineation of target and organs at risk (OARs) is a central part of the treatment planning of postoperative radiotherapy for breast cancer patients. We performed an investigation of the consequences of inter-observer variation in the delineation of the clinical target volume (CTV), heart and left anterior

descending coronary artery (LADCA) for the dose distribution for a left sided breast cancer patient.
Materials and Methods: One left-sided breast cancer patient treated with adjuvant radiotherapy after a breast-conserving operation in November 2012 was chosen randomly. The patient was scanned with 2.5 mm slice thickness without contrast. Oncentra® External Beam v3.3 (Nucletron, An Elekta Company) was used for delineation and planning (collapsed cone algorithm).The individual delineations (IDs) of the CTV, heart and LADCA were performed by six experienced radiographers and one experienced radiation oncologist according to our written clinical guidelines. Finally, two experienced radiographers and two radiation oncologists agreed on consensus delineation (CD) of all three volumes.The dice similarity coefficient (DSC) was used to evaluate the overlap accuracy between the CTV and the heart for each ID using the CD as a reference. Treatment plans for each of the seven IDs and the CD were optimised according to the clinical guidelines by one radiographer. The volume of the CTV receiving 95 % of the prescribed dose (50 Gy/25 fractions) or higher ($V_{95\%}$) and dose to heart and LADCA from each treatment plan were found for the CD structures.
Results: The volumes of the CD CTV and heart were 664.5 cm^3 and 550.8 cm^3, respectively. For the seven IDs the median value for the CTV and heart were 672.1 cm^3 (range 641.4 – 692.5 cm^3) and 546.7 cm^3 (539.9 – 561.5 cm^3), respectively. Median values of DSC for the CTV and heart were 0.96 (0.94 – 0.98) and 0.97 (0.95 – 0.98), respectively. All ID structures were delineated in the same slices as the CD ± one slice except for one LADCA delineation that differed by two slices. Delineations in one slice are shown in Figure 1. For the seven treatment plans, the median $V_{95\%}$ for the ID CTVs was 97.8 % (97.3 – 98.0 %). Evaluation of dose to CTV as defined on the CD from each of the seven treatment plans resulted in a median $V_{95\%}$ of 97.9 % (97.8 – 98.0). Dose constraints for the heart (V_{20Gy}<10 %, V_{40Gy}<5%) and LADCA (D_{max}<20 Gy) were not violated in any of the seven treatment plans.
Conclusions: The results of DSC for the delineated CTV and OARs for a left sided breast cancer patient show only a slight variation in delineation. No clinical relevant differences in delineation of CTV were seen between radiographers and the oncologist when using the same clinical guidelines. This is believed to be due to precisely described guidelines and education. Furthermore the small variations in delineations is believed to have no clinical influence on the treatments as seen from the very small differences in dose coverage for the CD CTV as well as the dose to the CD OARs in the treatment plans based on the IDs.

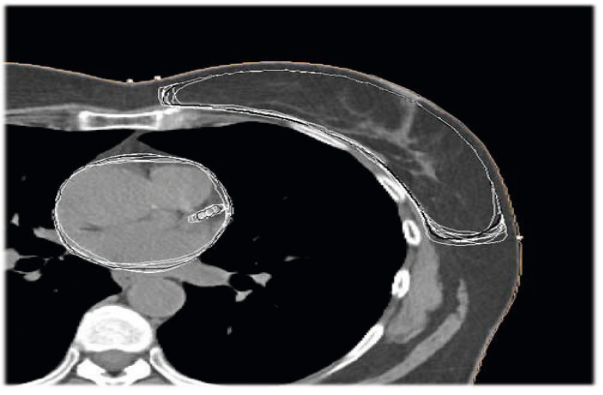

Figure 1. Delinations of CTVs, heart and LADCA: black concensus delination, white: individual delinations

EP-1045
Quality of life and cosmetic results in breast cancer patients after whole breast or partial breast irradiation
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Purpose/Objective: In early breast cancer patients conservative therapy followed by whole breast radiotherapy (WBI) offers a good quality of life (QoL). Although partial breast irradiation (PBI) is increasingly used as an alternative to WBI in selected groups of patients, its impact on QoL has not been extensively studied. This study assessed patients' QoL after PBI with high-dose rate interstitial brachytherapy (BRT) compared with WBI.
Materials and Methods: QoL was evaluated in 39 PBI patients, enrolled in a phase II prospective study (32 Gy in two daily fractions over 4 days) and in 78 matched WBI controls (50 Gy standard fractionation ± 10 Gy boost). Ten-item self-administered close-response questionnaire, exploring body image, fear of recurrence, satisfaction with treatment and cosmetic results, was administered twice during follow-up at a mean of 20 and 80 months after treatment. Italian version of questionnaire was asseverated. Physicians' and patients' cosmetic assessments were compared. Chemotherapy and hormonal therapy effect on cosmetics was analysed. The Mann-Whitney test and Wilcoxon test compared the results. The X^2 test was used for categorical data. For concordance between judgements was used Cohen's k-test of inter-rater agreement. Strength of agreement was interpreted according to the Landis and Koch's gradation. P <0.05 was considered significant.
Results: The two groups were well matched, except higher chemotherapy-treated patients in WBI group (41% vs 15%, p = 0.004). At first analysis no significant difference emerged on body image and fear of recurrence scales. PBI patients were more satisfied with treatment (p=0.019) and cosmetic outcome (p=0.0001). Second analysis included 96 patients, 33 in the PBI group, 63 in the WBI group. No significant differences were found on body image or fear of recurrence scales. Cosmetic outcome was better in PBI group (p=0.002). Results from the first and the second analysis were compared into each treatment group. Body image scale was significantly better at the first analysis in both groups (p=0.001 for PBI; p=0.0001 for WBI). Fear of recurrence scale was unchanged. No differences were found in cosmetic outcome as assessed by patients. In the first analysis physicians assessed cosmetic outcome as significantly better in PBI group (p= 0.0001) and confirmed it at second analysis. Physicians' and patients' opinions on cosmetics diverged (k = 0.148 at 2 years, 0.023 at 5 years) with physicians judging outcomes better than patients. Adjuvant chemotherapy had no impact of on cosmetics in either group according to physicians and patients.
Conclusions: Even at longer follow-up, QoL is similar after BRT PBI or WBI in terms of body image, fear of recurrence and satisfaction with treatment; PBI provides a significantly better cosmetic outcome.

EP-1046
Comparison between different forms of assessment of in-air PTV in breast irradiation with forward IMRT
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Purpose/Objective: The ICRU Report 83 suggests several methods to evaluate a PTV extending outside the contour of the body, ensuring an adequate treatment of the CTV volume. When Forward IMRT (F-IMRT) techniques are used, as is common in breast cases, tools like automatic fluence extension sometimes are not available. The purpose of this study was to analyse different approaches to correctly evaluate PTV dose in breast F-IMRT.
Materials and Methods: We analyzed data from 40 patients undergoing radiotherapy after breast conserving surgery. The patients were submitted to a CT for virtual simulation with 3 mm slices. Target volumes were outlined: breast CTV and PTV (expansions of 10 mm were made for all directions except for the posterior one, which was 7 mm). This PTV extends outside the body surface. Two sub-volumes of PTV were further established: a PTV-SV1, corresponding to the PTV 3 mm inside the body, and a PTV-SV2, corresponding to the rest of the PTV (mostly air). Treatment plans were made with a forward IMRT technique using ELEKTA XiO 4.70 treatment planning system, with a superposition calculation algorithm. To each patient 3 dosimetric plans, to be delivered with a 6 MV SIEMENS Primus linac, were calculated according to the following situations:
Plan 1. Using the delineated PTV extended outside the body surface.
Plan 2. Extending the body surface to include all PTV volume.
Plan 3. Same as Plan 2 but attributing a density to PTV-SV2 equal to the mean breast density.
For each of these situations we evaluated the mean dose to PTV and PTV-SV1 according to the ICRU 83 Report.
Results: We have obtained different results for each of the studied situations. In all approaches the Dmean to PTV-SV1 was similar to the prescription dose of 50Gy. However, only when a density was atributted to PTV-SV2 (Plan 3) the Dmean in PTV approached the prescription dose.