Conclusions: Compared to CR, VMAT greatly improves conformity and reduces mean dose and dose delivered from 20 Gy and higher to the lungs and the body. These results led us to plan a new dosimetric comparison between VMAT and Helical Tomotherapy. This will be the subject of a forthcoming study.

**EP-1040**

Dosimetric comparison of 3DCRT, IMRT and Cardiot sparing IMRT in breast cancer patients

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**Purpose/Objective:** The proximal carotid artery is often included within a supraclavicular RT field in patients with node-positive disease. It is rational that these patients have a greater risk of cerebrovascular events, which has been shown after head and neck irradiation. The purpose of our study was to determine the radiation doses to carotid artery among three dimensional conformal radiotherapy (3DCRT) and intensity modulated radiotherapy (IMRT) and to perform carotid sparing intensity modulated radiotherapy (CS-IMRT) without compromising target volume coverage.

**Materials and Methods:** Ten patients who were treated with comprehensive 3DCRT were selected. DICOM data were used to create virtual IMRT and CS-IMRT plans. The carotid artery was retrospectively contoured. The inverse planning for IMRT was constituted and 5-field beam arrangement was used. The optimization objectives of the CTV, PTV and organ at risks were defined as used for 3DCRT. The dose constraints for organ at risk were as follows: V20% for ipsilateral lung; V30% for heart; V10% for contralateral lung; V10% for contralateral breast; 50 Gy for ipsilateral brachial plexus. For CS-IMRT, V35% for ipsilateral carotid artery was additionally defined. The prescription dose was 50 Gy at 2 Gy per fraction for three planning. ≥95% of the PTV received 100% of the prescription dose. The parameters used for comparison of planning were V20% for ipsilateral lung; V30% for heart; V10% for contralateral lung; V10% for contralateral breast, mean, and median maximum dose along with V35 and V50 for bilateral lung; V30<10% for heart; V10 for contralateral lung; V10 for contralateral breast; 50 Gy for ipsilateral brachial plexus. For CS-IMRT and IMRT, V10% for contralateral lung volume and had significantly lower percentages of V10 contralateral lung volume compared to 3DCRT plans. With 3DCRT planning, V35% and V50% for contralateral lung were significantly increased with IMRT planning, V35% and V50% for contralateral lung was observed between IMRT plans, the percentage of V10 contralateral lung was lower in the CS-IMRT plans compared to IMRT plans. Cardiotoxicity doses were significantly increased with IMRT compared to 3DCRT plans. With IMRT planning, V30% and V50% were increased by 63.5% and 44% (p<0.005). After application of dose constraints to the carotid arteries, these parameters were found as 61% and 0% in CS-IMRT planning without compromising target volume coverage. The results of dose parameters for planning were summarized in Table 1.

**Results:** There was a difference in terms of HI and CI among the three treatment plans. After pairwise comparison; 3DCRT plans had higher HI and had less CI than IMRT and CS-IMRT plans. 3DCRT plans had significantly higher percentages of V20 ipsilateral lung volume and had significantly lower percentages of V10 contralateral lung volume compared to IMRT plans. CS-IMRT plans had significantly lower percentages of V10 contralateral lung volume compared to IMRT plans. CS-IMRT plans had significantly lower percentages of V10 contralateral lung volume compared to IMRT plans.

**Conclusions:** TD has demonstrated to be a feasible and efficient mean to deliver accelerated hypofractionated adjuvant radiation in EBC patients after conserving surgery, with an optimal dose distribution, negligible toxicity and encouraging clinical results. This technical solution is a valid IMRT option for breast radiation treatment.

**EP-1039**

Hypofractionated breast radiation and simultaneous integrated boost with TomoDirect: a prospective phase II trial

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**Purpose/Objective:** To evaluate feasibility, early results and toxicity profile of post-operative whole breast irradiation after conserving surgery for early breast cancer (EBC) delivered with TomoDirect (TD), static angles Tomotherapy, within an accelerated hypofractionated (HF) schedule employing a simultaneous integrated boost (SIB) to the tumor bed. We present present early results of a prospective phase II trial, undergoing at Ospedale Regionale ‘U. Parini’, AUSL valle d’Aosta. Histologically proven left- and right-sided breast cancer patients after conserving surgery for early breast cancer (EBC) delivered with TomoDirect (TD), were prescribed 45 Gy/20 fractions to the whole breast with a concomitant delivery of a SIB dose to the lumpectomy cavity of 0.25 Gy daily, employing the TD system. The 95% percentage PTV volume was generally well tolerated; 42 patients (81%) had G0-G1 skin late effects, while 10 patients experienced RTOG G2 erythema (19%); no grade 3 toxicities were reported. Up to 30 patients achieved a minimal follow-up time of 6 months; among them mild skin late effects were observed (mainly hyperpigmentation; 4% LENT-SOMA G1). Skin toxicity was judged optimal/good in almost all of these patients (98%). Quality of life was generally good (both globally with QLQC-30 and specifically with QLQ-BR23). As expected no local or systemic relapse were detected.
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 19 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 the completion of the treatment in HF-RT group. Volumetric analysis of the brachial plexus and the volume of this organ at risk receiving 45,48, and 50Gy. Using standard tangential fields V95% for axilla level I was 39.6% and for level II 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 levels III and 53.2Gy for full nodal treatment. The mean irradiated BP volume receiving > 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-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-inflamatory 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 histologically in 30 patients (57.7%). Anthracycline- 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 (15.5%). 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 lesion was 74.6%. Uniivariate risk factor analysis revealed ypT 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: For the control 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 needed to confirm this finding.

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