ductal carcinoma in 2013. The idea is to develop a short course C-ion RT to be finished in one week, which, we believe, could replace surgery and more than 5 weeks of radiotherapy. The purpose of this report is to evaluate preliminary treatment results.

**Material and Methods:** There are 2 treatment studies. One is phase I/II clinical trial and the other is “general treatment protocol” (GP). In clinical trial, candidates are patients with low-risk stage I breast cancer who are suitable for APBI in ASTRO consensus statement. A dose escalation study was designed as a phase I clinical trial. Total dose is 48.0 GyE, 52.8 GyE and 60.0 GyE in 4 fractions within 1 week. In phase I, patients planned to undergo surgery for pathological evaluation 90 days after C-ion RT and then received endocrine therapy. In phase II, patients had C-ion RT at recommended dose and then received endocrine therapy. Three-field C-ion beams with 290 MeV/n energy are used by means of passive broad beam methods using individual collimators and a compensation bolus absorber. Irradiation is performed using respiratory gating. The other study, GP is for the patients desiring to receive C-ion RT but ineligible to enroll in the clinical trial due to minor variance or refusal to enroll in the clinical trial. The first 2 patients of this GP were treated by 52.8 GyE and the others by 60 GyE. All patients were suitable for endocrine therapy after RT.

**Results:** From April 2013 to October 2015, 18 patients were treated. There were 3 cases of 48 GyE and 52.8 GyE and 1 case of 60 GyE of phase I, and 2 cases of 52.8 GyE and 9 cases of 60 GyE of GP. Median age was 66 (44 – 81). Median tumor size was 12 mm (4 – 20 mm). Median t/t up period was 12 mos. No normal tissue adverse events were observed except for grade 1 skin reaction of CTC-AE v4 in 9 cases. At the time of analysis, 7 patients underwent surgery and 2 of them reached pCR. Of the GP patients, 6 reached CR, 4 reached PR and 1 developed PD on MRI. It took 3 months to 2 years with a median of 6 months to reach CR on MRI. So the pathological evaluation in phase I trial after 3 months must be too early for evaluation. The PD patient with basal subtype tumor was successfully salvaged by mastectomy.

**Conclusion:** C-ion RT for primary tumor of breast needed long time to reach CR on MRI. Low grade stage I breast cancer has a potential to cure by accelerated partial breast irradiation with C-ion RT.

**EP-1176**

Abstract withdrawn

**EP-1177**

**Hypofractionated radiotherapy with concomitant boost for breast cancer: a dose escalation study**

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**Purpose or Objective:** To test the maximum tolerated dose (MTD) of a concomitant boost to the tumor bed for patients at high risk of recurrence treated with whole breast radiotherapy (RT). The secondary endpoints are to evaluate the acute and late toxicity and the cosmetic result recorded by appropriate scales.

**Material and Methods:** Between June and August 2014 we selected 9 patients with histologically proven breast cancer with pathological stage pT1-2 and at least one of the following risk factors for local recurrence: N1 disease, lymphovascular invasion, extensive intraductal component, close margins, non hormone sensitive disease, grading G3. All patients were treated with hypofractionated RT to whole breast to a dose of 40.05 Gy in 15 fractions. The dose escalation to the tumor bed was delivered through a daily concomitant boost technique at 3 levels of dose: 48 Gy (3.2 Gy/die), 50.25 Gy (3.35 Gy/die) and 52.5 Gy (3.5 Gy/die) for the first, second and third level, respectively. We included 3 patients for each step (3 additional patients if a dose limiting toxicity (DLT) Grade 2 occurred); dose escalation to a higher step was allowed if all patients of the lower one had completed the treatment without DLT. MTD was defined as the dose level below the dose induced DLT in at least 3 patients treated at a given dose level. A clinical evaluation of the patients was carried out before treatment, 2 times a week during RT, at the end of the same, at 3, 6 and 12 months after the end of RT. In addition to skin toxicity a cosmetic evaluation was performed by radiation oncologist, an in-training physician and by the patient herself. The latter also filled the EORTC QLQ - C30 / BR23 on quality of life at each evaluation.

**Results:** We enrolled a total of 9 patients (3 each dose level) with a median age of 62 years (range 44-83). Patients' characteristics are reported in Table 1. No dose limiting toxicity Grade ≥ 2 occurred. The maximum toxicity collected during RT was G2 skin toxicity in 7 (77%) patients (2 patients with brisk erythema and 5 with moist desquamation). This toxicity resolved at the first follow up. At a median follow up of 11 months we recorded G2 induration/fibrosis in 3 (33.3%) patients, one for each level of dose. There was a worsening in the self perception of cosmetic outcome at the end of treatment in 6 cases (66%) even if with no statistical significance. Moreover, patients at the end of treatment, reported a worse (not statistically significant) cosmetic outcome compared to that expressed by the in-training physician and the radiation oncologist. The evaluation of QoL found an improvement of the score at the end of treatment compared to initial in 7 of 9 patients (77%), above all in elderly patients (≥ 62 years).

**Conclusion**

The 3-week course of postoperative RT with dose escalation to the tumor bed to 52.5 Gy has been achieved without dose limiting toxicities. Long-term follow-up data are needed to assess late toxicity and clinical outcomes.

**EP-1178**

Predictive factors of patient compliance for breath-holding during radiotherapy for breast cancer

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**Purpose or Objective:** Radiation to the heart during radiotherapy (RT) for breast cancer may lead to increased risk of ischaemic heart disease years afterwards. A proposed method of reducing cardiac dose is with breath-holding techniques. Patients undergoing adjuvant breast RT form a heterogenous group in terms of demographics and co-morbidities. We aimed to determine what proportion of patients from an unselected group eligible for adjuvant RT would be able to comply with a simple breast-holding technique pre-treatment, and whether any individual characteristics may help predict success or failure.
Material and Methods: We prospectively identified all patients due to receive adjuvant RT to left breast after surgery for early breast cancer, and offered participation. After RT planning scan patients were kept in treatment position and asked to hold their breath for 20 seconds twice, with one minute between attempts. Demographics and patient factors were recorded. Treatment was subsequently delivered as normal with no breath-holding used.

Results: Fifty-eight patients were included, median age 60.0 years (range 35.1-85.2), median body mass index 26.8 (18.1-39.3). WHO Performance status was 0-1 in 56, and 2 in 2 patients; 3 patients had mobility issues, 2 were unable to climb on the scanner couch unaided. Seven patients had a diagnosis of chronic respiratory disease, 7 using inhalers regularly. Thirty-one patients were ex-smokers, 7 current smokers, 31 never smoked. At diagnosis, 6 patients (10%) had ductal carcinoma in-situ, 36 (62%) T1, 15 (26%) T2, and 1 (2%) T3 disease; 9 (16%) had nodal disease; 7 (12%) had full axillary node clearance and 16 (28%) had chemotherapy prior to RT. Fifty three (91%) were successful in breath-holding for both 20 second periods, 2 (3%) were unsuccessful on both attempts. Two (3%) were unsuccessful first, but successful a minute later; 1 (2%) was successful for the first period but not the second.

Conclusion: The vast majority of patients from an unselected cohort of patients due to undergo adjuvant RT to the breast or chest wall were able to maintain breath-hold successfully for two 20-second periods one minute apart in a simulated treatment position. No consistent patient factors were identified that would reliably predict success or failure to breath-hold. We anticipate most patients will tolerate breath-holding techniques during breast RT should they be employed more in the future. In the era of stereotactic ablative RT, breath-holding may also become important in other patient cohorts.

EP-1179
Preoperative parallel PET/CT/MR predicts the disease free survival in patients with breast cancer
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Purpose or Objective: The aim of this study was to determine whether PET/CT/MR could predict disease-free survival (DFS) in patients with operable breast cancer.

Material and Methods: Seventy-eight patients with breast cancer were included. All patients underwent preoperative parallel PET/CT/MR: whole body PET/CT at 1 h after 18F-FDG injection, breast dynamic contrast enhanced MR, and breast PET/CT at 2h after 18F-FDG injection sequentially in prone position. All patients were analyzed by diverse parameters (maximum SUV at 1 h [SUV1], maximum SUV at 2 h [SUV2], retention index of SUVmax [RI], metabolic tumor volume [MTV], total lesion glycolysis [TLG], initial slope of the enhancement curve [IS], transfer constant [Ktrans], reflux constant [Kep], extravascular extracellular space volume fraction [Ve], and initial area under the curve [IAUC]) . A relationship between covariates and DFS or chest operation was analyzed using Kaplan-Meier method and multivariate Cox proportional-hazard regression method.

Results: The median follow-up of 78 patients was 55 months (31-67 months), and 9 (11.5%) patients developed recurrence or metastasis. Among parameters, higher RI (p = 0.0010), lower Ktrans (p = 0.0046), and lower Ve (p = 0.0035) were significantly associated with poorer DFS. In contrast, SUV1, SUV2, MTV, TLG, IS, Kep, and IAUC were not. On multivariate analysis, RI (p = 0.016; HR = 5.20; CI 1.4-19.7), and Ktrans (p = 0.035; HR = 2.22; CI 0.054-0.89) were found as independent predictors of DFS. Patients with higher RI and lower Ktrans revealed a significantly higher recurrence rate (66.7%) than the rest of patients (6.9%, P<0.0001).

Conclusion: RI and Ktrans measured by preoperative parallel PET/CT/MR can predict DFS in patients with operable breast cancer. The combination of these parameters could make improvement of patients care because tailored surveillance would be applied for high risk group.

EP-1180
Postoperative IMRT with helical tomotherapy for breast cancer: outcome and toxicity analysis
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Purpose or Objective: Radiation therapy (RT) plays a key role in the management of breast cancer. Intensity-modulated radiotherapy (IMRT) has been shown to provide a more homogeneous dose distribution and to decrease skin toxicity. It covers a wide spectrum of techniques, ranging from static IMRT to helical tomotherapy (HT). HT could be relevant for complex volumes and/or difficult anatomies, but it needs to be evaluated since clinical data are still limited. The objective of this retrospective study is to investigate the short-term outcome and toxicity in a series of patients treated with adjuvant breast HT.

Material and Methods: Patients with an indicated breast adjuvant radiotherapy using an IMRT technique were included after a staff discussion. The treatment was performed with HT with concomitant boost if needed: 50 Gy (2 Gy/fraction) over the breast or the chest wall and lymph nodes, 60 Gy (2.4 Gy/fraction) on the tumor bed, 58 Gy (2.33 Gy/fraction) on the mastectomy scar if indicated. Toxicities were evaluated according to the NCI-CTCAE v4.0. A search for factors related to toxicity was conducted using univariate and multivariate analysis.

Results: 98 patients were treated between January 2013 and September 2014. The following target volumes were irradiated: breast (53.4%) or chest wall (46.6%), locoregional lymph nodes i.e. internal mammary chain, infra and supracavitular levels (79.6%), 54.4% of them were treated for left side breast cancer. The acute toxicities were mainly skin toxicity (grade (gr) 1: 63.1%; gr 2: 28.2%; gr 3: 3.9%) and esophagitis (gr 1: 42.9%; gr 2: 15.3%). Other acute toxicities were gr 1 laryngitis (2.0%); gr 2 pneumonitis (1.0%); gr 1 (3.1%) and gr 2 (1.0%) cough. With a median follow-up of 8.4 months (1.1-20.7), there were skin toxicity (gr 1: 41.2%, gr 2: 2.1%) and dysphagia (gr 1: 1.0%). No local recurrence occurred, two metastatic relapse occurred and one patient died (death related to cancer). Factors significantly (p<0.05) correlated with toxicity in multivariate analysis were: breast size and average skin dose for acute skin toxicity; chemotherapy, esophageal D2%, average esophageal dose, esophageal V30Gy and V45Gy for esophagitis. For the short-term skin toxicity, PTV volume, PTV D2% and average PTV dose were associated with toxicity.

Conclusion: In this retrospective study with a short follow-up, postoperative breast HT is a well-tolerated treatment for patients in need of a complex irradiation. Several clinical and dosimetric parameters related to toxicity have been identified.