computed tomography (CT); consequently, LN levels are delineated according to vessels and muscular boundaries. Magnetic resonance imaging (MRI) allows high resolution and high contrast images for explicit LN visualization in supine RT position. The purpose of the study was to assess effects of sentinel-node-biopsy (SNB) on MRI detection rate and on patient endurance, and relate MRI detection rate to CT.

Material and Methods: Currently, 8 of in total 25 female early-stage breast-cancer patients (cT1-3, N0) have been enrolled, scheduled for SNB and breast-conserving surgery (BCS). Additional to standard postoperative CT for RT planning, all patients were scanned on 1.5 T MRI, before and after BCS. CT and MRI were performed in supine RT position, with both arms abducted and supported. MRI comprised two T1-weighted (T1w) spoiled gradient echo techniques, two T2w fast spin echo methods, and diffusion-weighted MRI, all covering the axillary and periclavicular areas using posterior and anterior 16-array coils. MRI acquisition was limited to 20 minutes per session. Patient endurance to undergo MRI was monitored qualitatively. A radiation oncologist delineated LN levels on both MRI and CT (levels I-IV, interpectoral) according to ESTRO contouring guidelines. By inspection of all MRI scans acquired in one session, individual LNs were delineated. The detection rate, i.e. number of LNs identified, was determined for CT and for each MRI session. The pre- and postoperative MRI detection rates were compared to assess influence of SNB, and also compared to CT. For each LN, the corresponding LN level was denoted.

Results: The number of LNs on postoperative MRI exactly matched the preoperative number for all 8 patients (range: 19 – 42), when adding the excised SNs. All SNs were retrospectively identified in level I on preoperative MRI. In 7 out of 8 patients, spatial correspondence of all other LNs between MRI sessions was established. In one patient, a post-SNB seroma was visible, but detection number was unaffected. The majority of LNs were located in the LN levels, while up to 7 were found outside (up to 6 mm). LN detection on CT (7 – 21 LNs) was much lower than MRI. Endurance was excellent and unaffected by BCS/SNB.

	Numbers of LNs					*Location of LNs*					
Patient number	Preop MRI	Postop MRI	Postop CT	Pre- vs. postop MRI	SNs excised	Level I (SNs)	Level II	Level III	Level IV	Level IP	Ext.
1	28	27	21	1	1	15 (1)	7	1	2	0	3
2	42	40	21	2	2	28 (2)	6	3	3	0	2
3	35	33	16	2	2	22 (2)	3	1	2	2	5
4	26	25	10	1	1	13 (1)	4	3	0	2	4
5	34	33	7	1	1	18 (1)	8	1	0	0	7
6	30	29	8	1	1	20 (1)	2	2	0	3	3
7	19	18	7	1	1	13 (1)	2	0	1	3	1
8	23	22	10	1	1	10 (1)	2	2	0	3	6

Table 1: Numbers of LNs found in each patient, on pre- and postoperative MRI, and postoperative CT. The difference between MRI sessions is denoted, as well as the number of SNs excised during SNB. Numbers of LNs per axillary contour, or outside, are listed. IP = inter-pectoral. Ext. = exterior LNs, i.e. those located outside of the standard levels.

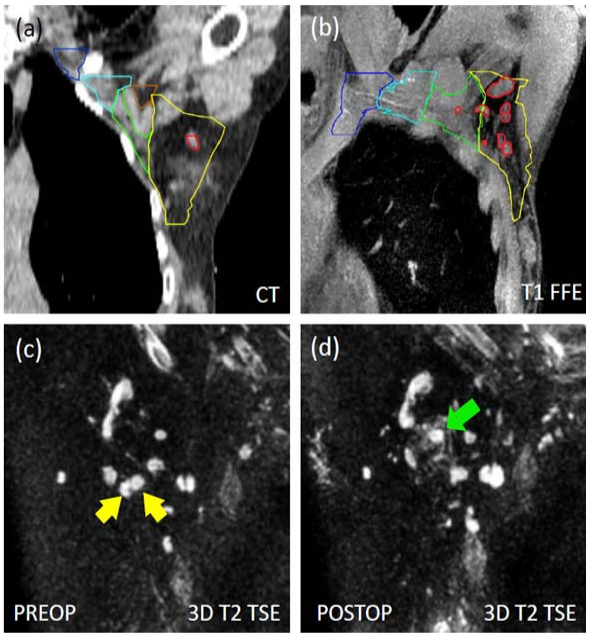

Figure 1: (a) Coronal CT scan with axillary levels contoured (axillary levels I-IV are yellow, green, sky blue, dark blue; inter-pectoral level is brown), according to ESTRO delineation guidelines. (b) Coronal T1-FFE MRI scan with in red individually delineated axillary LNs. (c) Preoperative coronal 3D T2 TSE scan where individual LNs are clearly visible (showing hyper-intense signal). The yellow arrows point to the two SNs which are excised during SNB. (d) The corresponding postoperative 3D T2 TSE; the SNs are now absent, while seroma due to the SNB is visible, as indicated by the green arrow.

Conclusion: MRI after SNB is able to identify the exact numbers of LNs as found on pre-SNB MRI. CT detection rate is much lower than MRI. SNB does not affect patient endurance. All excised SNs were identified on preoperative MRI. Some LNs were located just outside the LN levels. MRI in RT planning may lead to better target definition compared to CT. In future studies, we will study personalized RT using MRI guidance, possibly leading to reduced target volume. Based on current patient inclusion rate, updated results on all 25 patients are expected soon.

EP-1162

Cyberknife stereotactic partial breast irradiation for early stage breast cancer

O. Obayomi-Davies[1], S. Rudra[1], L. Campbell[1], S.P. Collins[1], B.T. Collins[1]

[1]*Georgetown University Hospital, Radiation Oncology, Washington DC, USA*

Purpose or Objective:

Background: Partial breast irradiation (PBI) is an attractive treatment option for well selected women undergoing breast conserving therapy for early stage breast cancer. In properly selected women, outcomes following PBI are comparable to conventional whole breast radiation. The CyberKnife linear accelerator may offer meaningful technical improvements to existing PBI techniques. We report our experience with CyberKnife stereotactic accelerated partial breast irradiation (CK-SAPBI).

Material and Methods: Between 11/2008 and 09/2015, CK-SAPBI was attempted on 21 patients with early stage breast cancer. Four to six gold fiducials were implanted around the lumpectomy cavity prior to treatment. Fiducials were tracked in real-time using the CK Synchrony tracking system. Prior to 2014, the clinical target volume (CTV) was defined on contrast enhanced CT scans using surgical clips and the obvious post-operative cavity. A 5 mm uniform expansion was added to generate the planning treatment volume (PTV). Starting in 2014, the CTV was defined on contrast enhanced CT scans as the lumpectomy cavity plus a 10 mm uniform expansion confined to the breast tissue. A 3-5 mm uniform expansion was added to generate the PTV. All patients received 30 Gy in five fractions delivered to the PTV. Dosimetry was assessed per institutional protocol, the National Surgical Adjuvant Breast and Bowel Project B-39

guidelines, and TG-101. Cosmesis was assessed using the Harvard Breast Cosmesis Scale.

Results: Twenty patients were treated successfully. At a median follow-up of 18 months (1-78), all patients remain locally controlled (100%) and no significant adverse events have occurred. All patients continue to experience good-excellent cosmetic outcomes. At least 3 fiducials were tracked in 85% of cases. Fiducial tracking was not successful in one patient. The mean number of beams delivered was 145 (77-196). The mean treated PTV30Gy was 74 cm3 (15-142 cm3) with a mean prescription isodose line of 82% (75-86%). 99% of the PTV30Gy received the prescription dose (95-100%) with a mean maximum dose of 36 Gy (34.5-40Gy). The mean ipsilateral breast V30Gy and V15Gy were 12% (3-26%) and 30% respectively (8-58%) sparing significant amounts of normal breast tissue. Patient tolerance was excellent and acute toxicity was rarely observed. 2 patients experienced grade 1 localized dermatitis at the initial 4 week follow-up visit.

Conclusions: CyberKnife stereotactic accelerated partial breast irradiation is a suitable radiotherapy technique for the delivery of partial breast irradiation. The CK platform produces highly conformal treatments with excellent normal tissue sparing and offers improvements over existing PBI techniques. Our experience indicates that CK-SAPBI delivered in five fractions is well tolerated with excellent short term local control and breast cosmesis. Longer follow-up is needed for assessment of late toxicity and oncologic outcomes.

EP-1163

Selection of patients with left breast cancer for Deep-Inspiration Breath-Hold Radiotherapy Technique

B. Czeremszynska[1], S. Drozda[2], M. Górzyński[1], L. Kępka[1]
[1]*Independent Public Health Care Facility of the Ministry of the Interior, Radiotherapy Department, Olsztyn, Poland*
[2]*University of Warmia and Mazury, Faculty of Mathematics and Computer Science, Olsztyn, Poland*

Purpose or Objective: The voluntary deep-inspiration breath-hold radiotherapy technique (DIBHRT) in the treatment of left breast cancer has the ability to reduce doses to heart left anterior descending coronary artery (LAD) and lung. Before introduction of DIBHRT into routine clinical practice, we conducted a prospective study to assess the extent of dosimetric benefit of this technique in order to select a group of patients for whom this technique should be routinely applied

Material and Methods: Thirty one consecutive patients qualified for whole breast irradiation (WBI) with tangential fields following breast conserving surgery for left-sided early breast cancer were included. All patients underwent breath-hold training, free-breathing (FB) and DIBH planning-CT. Separate radiotherapy treatment plans for WBI in total dose of 39.9Gy in 15 fraction were prepared based on both planning-CT. Doses like mean heart, heart V20Gy, maximum LAD, left lung V20Gy were calculated for each plan and the difference of respective values (delta) for FB and DIBH were calculated. If relative improvement of at least 20%for any evaluated dosimetric parameter were found for DIBH plan without significant worsening of other measures, this plan was selected for treatment. Daily tree-dimensional surface imaging (VisionRT) and weekly electronic portal imaging were performed. The data distribution were assessed using chi^2 test, correlations were analyzed using the Pearson test. Furthermore, receiver operating characteristic (ROC) analysis was performed.

Results: In 30 of 31 patents a reduction at least 20% in one or more evaluated parameters (i.e.mean heart, heart V20Gy, maximum LAD and left lung V20Gy in 29, 29, 26, and 7 patents respectively)was achieved. The relative worsening of left lung V20Gy was found for in 10 and cases and of maximum LAD in 2 cases. Eventually 25 patients were qualified to DIBHRT. Mean delta(Gy) were:mean heart 1.51 (range:0.06-6.45),heart V20Gy:3.0 (range:0.0-6.59),maximum LAD:18.5(range:-3.29-36.68), left lung V20Gy:1.7(range:-2.71-8.7). Correlations between delta values of mean heart, maximum LAD, heart V20Gy with length of cardiac contact distance (CCD) ($p< 0.05$, AUC>0,6) and maximum LAD, heart V20Gy with Body Mass Index (BMI)($p<0.05$;AUC>0.6) were found. ROC analysis showed that a 2.5 cm of CCD is a threshold for reduction at least 20% in one or more parameters. For BMI no specific threshold for predefined improvement of any dosimetric parameter was identified, which means that despite correlation of dosimetric cardiac benefit with higher BMI, some patients with low BMI may also have cardiac doses reduced with DIBHRT.

Conclusion: In our center we have prospectively confirmed an ability of DIBHRT for heart and LAD but not for lung-sparing. We are going to use this technique routinely for left-sided breast cancer patients with CCD above 2.5 cm

EP-1164

Outcomes of postmastectomy radiotherapy in patients with 1 to 3 positive nodes in single institute

Y. Kumai[1], M. Oguchi[1], Y. Miyagi[2], Y. Ito[2], T. Iwase[2], F. Akiyama[3], K. Yoshida[4], A. Harada[1], H. Okubo[1], T. Asari[1], K. Murofushi[1], T. Toshiyasu[1], T. Kozuka[1], M. Sumi[1]
[1]*Cancer Institute Hospital, Radiation Oncology, Tokyo, Japan*
[2]*Cancer Institute Hospital, Breast Oncology Center, Tokyo, Japan*
[3]*Cancer Institute Hospital, Division of Pathology, Tokyo, Japan*
[4]*Showa General Hospital, Radiology, Tokyo, Japan*

Purpose or Objective: Post-mastectomy radiation therapy (PMRT) is standard care for breast cancer patients with high risk for locoregional recurrence after mastectomy. The indication for PMRT in patients with 1 to 3 positive nodes has been in discussion. We reported that patients concomitantly with 1 to 3 positive nodes and extensive lymphatic invasion, who had not been treated with PMRT from 1990 to 2000, had 13.1% (12/92) of locoregional recurrence rate. Since then we have performed PMRT for patients with 1 to 3 positive nodes and extensive lymphatic invasion.
To investigate the effectiveness of PMRT for patients with 1 to 3 positive nodes and extensive lymphatic invasion.

Material and Methods: Between 2005 and 2013, 639 patients were treated with PMRT and 277 patients of those have not been without neoadjuvant chemotherapy until the lymph node dissection. Among these patients, 81 were diagnosed with 1 to 3 positive nodes pathologically, 65 were with 1 to 3 positive nodes and extensive lymphatic invasion. The 3-D conformal RT, using the partial wide tangent technique to the chest wall, internal mammary lymph nodes and supra-clavicular nodes, was applied for all patients, delivering 50 Gy in 25 fractionation over 5 weeks. In the patients with positive surgical margin, 10 Gy of electron boost to the tumor bed was added. We retrospectively reviewed and compared locoregional recurrence rates of 65 patients with 1 to 3 positive nodes and extensive lymphatic invasion treated with PMRT and that of 92 patients without PMRT.

Results: Baseline patient characteristics; the median age of these patients was 47 years old (range; 34-76). Survivals; the median duration of overall survival was 114 months (30 to 121 months), the five-year survival rate is 97%, and the median progression-free survival time after PMRT was 93 months (7.0 to 110 months). Of the 65 patients in the current analysis, 58 patients (89%) were alive and free of cancer. Initial failure patterns; the locoregional recurrence was observed in 3 patients (4.6%), classifying into 1 chest wall, 1 regional lymph node, and 1 both. All patients with locoregional recurrence were developed the distant metastases then after. As toxicity; radiation induced pneumonitis graded 1 was observed in 9 patients, nor been graded 2 or more observed. Acute radiation induced dermatitis was observed almost all patients at least grade 1, grade3 was observed in 9 patients. One patient denied continuing PMRT at dose of 46Gy, 7 months later her chest wall recurrence was observed.