The volume of the HR-CTV not covered with the prescribed isodose was 19.8 cm³. Oblique needles applied at the time of the second application contributed significantly to a better dose coverage of HR-CTV (D90=109%, D100=55%, V100=93%). The part of the volume not sufficiently covered with the prescribed dose in the first application was boosted using only oblique needles at the end of the second treatment until the dose restrictions for the OAR were reached (Figure 1b). DVF parameters for HR-CTV of the second application were improved accordingly: D90=119%, D100=61%, V100=96%. The volume of the HR-CTV not covered with the prescribed isodose was reduced to 2.4 cm³. The position on the ring, oblique angle and the insertion depth of the oblique needles in the second application were measured on the MR images and compared with the pre-plan. The average differences were relatively small (position on the ring: 10°, oblique angle: 8°, insertion depth: 4 mm).

Conclusion: Individualized approach to cervical cancer patients with extensive parametrial involvement at the time of brachytherapy can contribute significantly to an improved dose coverage of the HR-CTV. An individualized 3D printed interstitial cap for the ring applicator with oblique needles is an efficient option for these patients.

EP-1979
Adyuvant vaginal brachytherapy without external beam radiotherapy for endometrial cancer
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Purpose or Objective: The aim is to report the results obtained in patients diagnosed of endometrial carcinoma stage IA-IIA treated with surgery followed by adyuvant brachytherapy at our institution.

Material and Methods: From 2006 until 2013, 116 patients with endometrial carcinoma stage IA-IIA have been treated with surgery and exclusive vaginal brachytherapy. Median age of the series was 62 years. Total hysterectomy, double anecestomy, pelvic lymphadenectomy and peritoneal washing was made in 61.4 %. The majority of the pathological FIGO stages were IB (77.2 %). Exclusive brachytherapy was performed using vaginal cylinders with 3 cm of diameter (50.9 %). The reference isodose covering the proximal 3 cm of the vagina (96.4 %). The dose was specified at 5 mm distant from the surface of the cylinder. Dose schedule with high dose rate brachytherapy was 21 Gy in 3 fractions. The median of dose equivalent received in the rectum was 31.8 Gy and in bladder 38 Gy.

Results: At the moment of this analysis there are 4 relapses: 2 of them live with disease, and 2 death for tumor; 110 cases live without disease (94.82 %), and 2 cases death for another cause. With median follow-up of 26 months, free disease survival was 90.2 % and 2 years overall survival was 88.3 %. No toxicity was reported in the 52.6 %, and when it was present the most frequent was cystitis (12.3 %).

Conclusion: The exclusive vaginal brachytherapy is effective in ensuring vaginal control, with few toxic effects. So, this schedule should be an adyuvant treatment for these patients.

EP-1980
Lower dose per fraction brachytherapy for patients with stage I endometrial cancer following surgery
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Purpose or Objective: The purpose of this study is to analyze the efficacy and complication rates of postoperative high dose rate (HDR) vaginal brachytherapy(VBT) to determine whether VBT with lower dose per fraction(1-3 Gy/fraction) is as effective as pelvic external beam radiotherapy (EBRT) for patients with stage I endometrial carcinoma

Material and Methods: From March 2000 to April 2014, 43 patients with FIGO stage I endometrial cancer underwent adyuvant radiotherapy following surgery. Twenty five patients received postoperative HDR VBT alone, while 18 patients received postoperative EBRT to the whole pelvis. Among these patients, three patients were treated with EBRT plus VBT. The median treatment dose of EBRT was 50.0 Gy (45.0-50.4 Gy) and HDR VBT dose was five to six fractions of 3 or 4 Gy to a total dose of 15-24 Gy. The tumor dose was prescribed at a depth of 5mm from the cylinder surface and delivered twice per week.

Results: The median follow up period of all patients was 54.4 (range 9-142) months. Five year disease free survival rates (DFS) overall survivals (OS) for all patients were 91.5 % and 91.2 %, respectively. Five year DFS of EBRT and brachytherapy was 87.2 % and 96.0 %, respectively (p=0.46), and five year OS of EBRT and brachytherapy was 86.9 % and 95.7 %, respectively (p=0.43). There were no differences in 5 year DFS or OS according to radiation treatment group. There were no locoregional recurrences for all patients. Two patients who received EBRT and one patient who received brachytherapy alone developed distant metastatic disease. There were one patient who had grade 3 gastrointestinal complication and one patient who had pelvic bone insufficiency fracture. Two patients who had severe complication were treated with EBRT.

Conclusion: HDR VBT with lower dose per fraction alone showed high DFS and OS with no severe adverse effect. HDR VBT with small fraction size may be adequate for early stage endometrial cancer following surgery.

EP-1981
Comparing MRI vs CT based applicator reconstruction and planning techniques for adaptive cervix cancer BT
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Purpose or Objective: Controversies still exist in the method of treatment planning and applicator reconstruction in adaptive cervix brachytherapy. This study aims to compare any difference between MRI and CT applicator reconstruction and the treatment planning process at our institution.

Material and Methods: Our analysis included 15 patients from our institution with stage IB2-IVA cervical cancers between January to October 2015, all patients treated with chemoradiation and brachytherapy. We followed the Vienna schedule for HDR brachytherapy at week 6 and 7, with 2 weekly insertions with 2 consecutive fractions per week. MRI- and CT-based treatment planning and applicator reconstruction were done for every patient. Contours and dosimetry of tumor target (HRCTV D0) and organs at risk (Dmax bladder, rectum, sigmoid and small bowel) were compared. Applicator reconstruction techniques, possible challenges and errors between the 2 imaging modalities were analysed.

Results: Both CT- and MR- based applicator reconstruction uncertainties were less than 1 mm for either tandem-and-ovoids (T&O) or tandem-and-ring (T&R) applicators. Compared with T&B applicators, use of rigid T&R applicators gave more accurate applicator rotation. When an applicator library was used, the T&B reconstruction uncertainties always occurred in posterior-anterior direction while T&R reconstruction uncertainties were found when it rotated. Applicator holes for interstitial needles could provide additional markers to define correct applicator rotation on MRI. The Dmax rectum value was the most sensitive
to the T&O reconstruction. Without availability of MRI markers for needle visualization, manual MR-based needle reconstruction could be challenging especially in tissues of similar signal intensities. Measurement of remaining interstitial needle length outside patient could open up a potential solution path.

Conclusion: Despite minor distortions around centre of the magnet, MRI distortions do not play a major role in applicator reconstruction uncertainties. Both CT- and MR-based applicator reconstruction are feasible when used with applicator library, providing accurate source pathway reconstruction. Applicator holes for interstitial needles and physical measurement of needle outside patient could provide valuable information to improve the reconstruction accuracy.

Electronic Poster: Brachytherapy track: Head and neck

EP-1982
Adjuvant brachytherapy of the lip cancer after surgical resection
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Purpose or Objective: The aim of this work is to evaluate outcomes after adjuvant brachytherapy of the lip cancer after surgical resection with close (<5mm) or positive margins.

Material and Methods: A total of 20 patients (3 women and 17 men in median age of 65.5) diagnosed between 2010 ad 2014 with clinical T1 - T2 N0 lip carcinoma were treated primarily by surgical tumor resection with or without lymphadenectomy. After histopathological result (40% positive, 60% close margins) they were qualified for adjuvant brachytherapy. At the discretion of the attending physician 25% of patients were treated by high dose rate (HDR) and 75% by pulse dose rate (PDR) brachytherapy. The mean biologically effective dose (BED) given to the clinical target volume were 71,285 Gy (range 62.6 - 75 Gy). The mean follow up (counted from the end of BT course to the last control visit or recurrence) were 24 months. For statistical calculations we used the Kaplan-Meier method and the U Mann-Whitney test.

Results: Sole patient in the group had nodal recurrence 6 months after treatment. The rest of the patients had no evidence of recurrence during the follow up. Estimated 4-year disease-free survival rate was 95%. The acute skin toxicity according to RTDG scale was 65%, 30% and 5% for grade I, II, and III respectively; the late skin toxicity was 25%, 5% and 5% for grade I, II, and IV respectively. We also found a statistically significant correlation between the higher BED and appearance of acute toxicity greater than I grade (p=0.014) and occurrence of any late toxicity (p=0.047).

Conclusion: Adjuvant brachytherapy in the treatment of the T1-T2 lip tumors achieves a long loco-regional control with minimal treatment related toxicities.

EP-1983
Intensity modulated perioperative interstitial HDR brachytherapy for recurrent neck metastases
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Purpose or Objective: Patients with head and neck cancers can develop recurrences in previously treated areas, which usually involve the neighbor carotid artery. In the majority of these patients a complete surgical resection is not possible. R1/R2 resections are frequent. We proved the feasibility and long-term outcome of perioperative intensity modulated brachytherapy (IMBT) as a salvage treatment option for advanced neck metastases in combination of carotid artery preservation.

Material and Methods: From 2006 to 2014, nine patients at the University Hospital of Schleswig-Holstein Campus Luebeck had received an interdisciplinary salvage treatment with debulking surgery and perioperative HDR-IMBT for advanced recurrent neck metastases. Median age was 53 years, range: 38-66, the mean follow-up was 66 months. Surgery was performed with primary wound closure in seven patients, while myocutaneous flap was used in two patients. Active phase of IMBT started 4-12 days following surgery. The prescription dose was 2.5Gy twice daily (average total dose: 27Gy, range: 15-30Gy). Dose non-homogeneity ratio (DNR) never exceeded 0.42. We used the manual dose-volume optimization method and planned biologically correct hot/cold spot areas within the dose distribution. The reference isodose was defined within a maximum of 10 mm lateral distance from the interstitial tube and the Dmax was defined in 400% on the catheter surface.

Results: For initial treatments, all patients received previous surgery; eight patients received also external beam radiation with an average dose of 64Gy. Two and five year overall survival estimates were 78% and 67% respectively. The median survival rate was 65 months. Only two patients had a second neck recurrence after 62 and 65 months. Early toxicities (grade I-II) recorded in four patients and were limited to local edema and skin infection, no treatment related grade 3 or 4 toxicities recorded.

Conclusion: Salvage debulking surgery combined with perioperative HDR-IMBT seems to be feasible and safe treatment option for selected recurrent neck metastases with minimal treatment related toxicities.

EP-1984
Intertitial brachytherapy for the isolated lymph node metastasis from different solid cancers
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Purpose or Objective: To assess the feasibility, safety and clinical outcome of MRI based and ultrasound guided high-dose-rate interstitial brachytherapy techniques in isolated lymph node metastases from different solid cancers.

Material and Methods: From January 2013 to May 2014, 11 patients (six males and four females) with isolated nodal metastases were treated with MRI based and ultrasound guided high-dose-rate interstitial brachytherapy techniques in isolated lymph node metastases from different solid cancers.

Conclusion: MRI-based and ultrasound guided interstitial brachytherapy is feasible and safe for the management of isolated lymph node metastases from different solid cancers.