occurred during concomitant EBT-C-T and resolved after a week of medical therapy. At 12 months from the end of treatment, response rate was 87.5% (35/40); we recorded 4 persistent disease and 1 locoregional recurrence (after 6 months), occurred in all patients with stage III. After 12 months of follow-up, we reported disease progression (1 central and 1 systemic) in 2 patients (5%), respectively at 17 and 48 months from the end of radiation therapy. Patient showing central relapse underwent radical hysterectomy and patient with systemic disease started chemotherapy.

Conclusion: In our experience, the association of concomitant EBT-CT and HDR-BRT (Fletcher applicator) represents a well-tolerated treatment for patients with advanced cervical cancer, with good results in terms of acute and late toxicity and local control.

EP-1977
The importance of immobilization of gynecological applicators in high dose rate brachytherapy
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Purpose or Objective: To investigate the need for the implementation and development of immobilization and localization devices and other improvements in safety measures in addition to those currently in use in current HDR treatment protocols involving gynecological applicators.

Material and Methods: 55 treatment plans from 27 cervical cancer patients treated with three to five intra-cavity cylinder insertions were used. We performed a retrospective study of a dosimetric evaluation due to a possible minor displacement of the cylinder after scanning to the treatment delivery time. The 55 plans that were dosimetrically analyzed post treatment involved treatments for 27 different patients. 22 patients had a hysterectomy with bilateral salpingo-oophorectomy. In 16 of these twenty-two patients the procedure had an abdominal hysterectomy bilateral salpingo-oophorectomy. Three of the patients had hysterectomies only. The vaginal cylinder applicators which were placed within the patients by a radiation oncologist for administering the treatments included the Capri, Miami, and multi-lumen catheter applicator.

Results: For the 55 patients whose point dose data were gathered, dose variation at the hottest spot due to a simulated 1 mm displacement in the superior inferior direction calculated by normalizing to the average of the endpoints was found to have a minimum value of 6.02% and a maximum value of 12.66% with an average value of 1.43% and a standard deviation of 2.02%. Dose variation at the hottest spot due to a simulated 1 mm displacement in the medial lateral direction calculated by normalizing to the average of the endpoints was found to have a minimum value of 12.32% and a maximum value of 22.71% with an average value of 16.96% and a standard deviation of 2.76%. The measurement of dose variation due to a displacement of one degree of rotation along the central axis of the applicator was found to have a minimum value of 0.00% and a maximum value of 13.71% with an average value of 2.15% and a standard deviation of 3.00%.

Conclusion: The point dose variation due to hypothetical 1 mm medial lateral displacement of a vaginal cylinder applicator make a difference in terms of Grade 1 rectal toxicity as defined by Common Terminology Criteria for

Adverse Events v 4.0 in some patients receiving HDR VCBT alone or shortly after EBT. The point dose variation due to hypothetical 1 mm medial lateral displacement of a vaginal cylinder applicator according to this analysis did reach a crudely obtained cutoff value for RTOG grade greater than or equal to 2 late rectal morbidity for any of the patients receiving HDR VCBT alone or shortly after EBT.

EP-1978
Individualized approach to brachytherapy in cervical cancer patient: a case report study.
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Purpose or Objective: In some cervical cancer patients with extensive parametrical involvement, not all of the tumor can be sufficiently covered with MRI-based image guided brachytherapy using a standard intracavitary/interstitial applicator. An approach with individually designed applicator with oblique needles offers a possibility of better tumor dose coverage in these patients. In this study we tested the feasibility of the 3D printing for the individualized brachytherapy applicator add-on.

Material and Methods: A patient in this case report study had extensive parametrical involvement to the pelvic wall. In order to improve the tumor dose coverage we decided to use additional oblique needles for the second application. A preplan for the second application was created based on the dosimetry information from the first application. The information on the optimal location of the oblique needles in the preplan was used to design an individualized interstitial template cap for the ring applicator, which was manufactured with a 3D printing technique. The whole procedure of the cap design and manufacture was performed in 5 days.

Results: The HR-CTV coverage at the time of the first application (Figure 1a) was suboptimal (D90=69%, D100=35%, V100=77%).

![Image](image-url)
The volume of the HR-CTV not covered with the prescribed isodose was 19.8 cm. 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). DVH 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 cm. 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 parametral 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
Adyvant 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 adyvant 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 anexectomy, 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 isodosis 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 toxicities 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 adyvant treatment for these patients.

EP-1980
Lower dose per fraction brachytherapy for patients with stage 1 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 (3-4 Gy/fraction) is as effective as pelvic external beam radiotherapy (EBRT) for patients with stage 1 endometrial carcinoma.

Material and Methods: From March 2000 to April 2014, 43 patients with FIGO stage I endometrial cancer underwent adyvant 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 5 mm 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 survivals (DFS) and 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 ping 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 Dmean) and organs at risk (D2cc 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&O applicators, use of rigid T&R applicators gave more accurate applicator rotation and organ contours. When an applicator library was used, the T&O reconstruction uncertainties were 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 D2cc rectum value was the most sensitive