February’10 to September’15. To be included in the study, the treatment had to fulfill the criteria: (1) include a previous treatment of at least 45 Gy of EBRT to the pelvis concomitant with cisplatin; (2) the BT boost consisted in insertion of interstitial Utrecht applicator under spinal anesthesia and individualized MRI planning. Each treatment was composed of 2 applications (7 days apart), with 2 separated fractions (in 24 hours) of nominal 7 Gy (the aim is to obtain the HR-CTV and IR-CTV D90 higher than 85 and 65 Gy EQD2 respectively keeping the OAR doses as low as possible with limits of D2cc of rectum and sigmoid lower than 70 Gy EQD2 and 85 Gy EQD2 in case of bladder). Applicator withdrawal was performed at the surgical theatre. Toxicity score (gynaecological bleeding) were defined by CTCAE v4.0.

**Results:** 110/122 (90.16%) patients were IIB stage or bigger, and in 68% of patients 6 needles were inserted in both applications. Median tumour volume at diagnoses was 39.8 cc (8.79-205) and median HR-CTV volume at first application was 18.01 cc (7.36-116.59). The final median biologically equivalent doses (EQD2) were D90 HR-CTV = 89.75 Gy10 (78.50-94.00) and D90 IR-CTV = 67.90 Gy10 (58.60-77.40).

For the first application, needles were used in all patients, and 4 (3.2%) patients required vaginal tamponade and/or stitch (Grade 2 CTCAE v4.0), and 2 (1.6%) patients required transfusion and/or endoscopic intervention (Grade 3 CTCAE v4.0).

For the second application, needles were used in 114 patients, and 5 (4.3%) patients required vaginal tamponade and/or stitch (Grade 2 CTCAE v4.0) without bigger toxicities.

**Conclusion:** Our results suggest that interstitial IGBT as recommended by the GEC-ESTRO, is a safe option without life-threatening consequences due to bleeding, and dosimetric results compare favorably with the traditional technique.

**PO-0960**

**Making MR-guided cervix cancer brachytherapy efficient: Are plan adaptation & daily planning needed?**

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**Purpose or Objective:** MR-guided brachytherapy (MRgBT) improves local control and survival in patients with cervical cancer. It is expected that MRgBT will be standard of care within 5 years. MRgBT is more demanding of resources and optimized processes will be of great importance in assuring its widespread availability. Our aim was to determine the value of imaging and adaptive replanning prior to each MRgBT fraction compared to a less resource intensive approach tailored to specific technique considerations.

**Material and Methods:** A total of 20 patients with cervical cancer who received external beam radiotherapy (EBRT: 45-50.4 Gy in 1.8-2 Gy fractions) and high dose rate MRgBT (28 Gy in 4 fractions using 2 insertions) were included in this study. A tandem/ring applicator (TR) was used in 9 patients, and a TR with interstitial needles in 4 patients for all 4 fractions. In 3 of these 4 patients, further plan adaptation with increase in number of needles was performed for fractions 3 and 4. In the remaining 7 patients, a TR alone was used for fractions 1 and 2 and a TR plus needles for fractions 3 and 4 to improve target coverage or OAR sparing. All patients underwent MR imaging, contouring and planning prior to each fraction. To simulate a more efficient approach with only one plan per insertion, optimized fraction 1 plan was applied to fraction 2 anatomy, and optimized fraction 3 plan was applied to the fraction 4 anatomy. To assess value of plan adaptation, projected total dose from first insertion was compared to the final total dose following plan adaptation.

**Results:** There was no systematic change in the high-risk clinical target volume (HRCTV) across fractions (mean range 41-44 cm3). Mean cumulative HRCTV dosimetry with daily plan optimization was 92 Gy10, and the mean rectal, sigmoid and bladder D2cc doses were 67, 65 and 83 Gy3 respectively. There were no clinically significant changes in the mean HRCTV or OAR D2cc doses with only two plans prior to fractions 1 and 3. The GEC-ESTRO HRCTV target dose >85 Gy10 was achieved in 16/20 patients with either daily plan optimization or planning only twice. All GEC-ESTRO OAR target doses (rectum <75 Gy3, sigmoid <75 Gy3, bladder <90 Gy3) were achieved in 14/20 patients with optimized daily replanning, and this was maintained when only two plans were used. Plan adaptation with addition of interstitial needles for second insertion resulted in improved HRCTV dosimetry in 8/10 cases and in improved OAR dosimetry in 1/10 cases.

**Conclusion:** MRgBT can potentially improve outcomes of cervical cancer patients but is more resource intensive. This study suggests that improvements in efficiency can be achieved through process analysis and optimization. While adaptive MR-based replanning is fundamental to achieving the benefits of MRgBT, replanning at strategic intervals may be as effective as daily replanning with considerable savings in resources.

**PO-0961**

**Retrospective dosimetric comparison of TG43 and a commercially MBDCA for gynecological brachytherapy**

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**Purpose or Objective:** To compare dosimetric plans using a commercially model based dose calculation algorithm (MBDCA) following TG186 recommendations, and the conventional TG43 method in an 192Ir high dose rate (HDR) gynaecological brachytherapy (BT) procedures using two types of cylindrical applicators.

**Material and Methods:** We analyzed the data of six patients with cervical carcinoma, receiving a 192Ir HDR brachytherapy treatment. The dose was delivered with a micro-Selectron afterloader. A treatment plan was performed using both the TG43 and TG186 dose calculation methods of the Oncentra Brachy v4.5 treatment planning system (TPS). Two cylindrical applicators, of 30 mm and 35 mm diameter were used: the Vaginal Applicator Set and the Shielded Cylindrical Applicator Set, by Nucletron. The treatment dose is prescribed at 0.5 cm distance from the cylinder wall (prescription point), with a treated extension of 3 cm. Analysis included dose volume histograms (DVH) for bladder and rectum and prescription point, according to American Brachytherapy Society (ABS) consensus guidelines (2012). The TG186 results were obtained using the standard accuracy level option of model-based algorithm (Oncentra Brachy-Advanced Collapsed cone Engine (ACE), Elekta), resulting in calculation times on the order of 40 s.
between the two described applicators (that had never been
recommended. Moreover, differences were found
method was lower than that obtained with the TG43
rectum.

Results: Differences were found between TG43 and TG186 results, for the dose points, bladder and rectum.

Conclusion: Differences were found between the two described applicators (that had never been noticed with the TG43). The prescribed dose and the dose to 2cc of the bladder and rectum varied as follows (figure 1): between 0.4% and 2.7% for the prescribed dose, between 0.6% and 2.5% for the bladder and between 0.9% and 2.7% for the rectum.

Conclusion: Differences were found between the TG43 and our model based dose calculation algorithm following TG186 recommendations. A deeper knowledge of this new algorithm and its applications in a more accurate dose calculation will be the future of this work.

PO-0962
Adjuvant brachytherapy as a part of a multimodal treatment for high-grade uterine sarcoma
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Purpose or Objective: To assess the loco-regional efficacy and toxicity of a multimodal strategy including brachytherapy (BT) as part of the adjuvant treatment of localized high-grade uterine sarcoma.

Material and Methods: A single center retrospective analysis of patients (pts) treated from 1985 to 2015 was conducted. 104 pts with high-grade uterine sarcoma were identified. 80 pts had leiomyosarcomas, 17 undifferentiated sarcomas, 3 rhabdomyosarcomas and 1 high grade adenosarcoma. 10 pts had a microscopic (n = 8) or macroscopic (n = 2) positive surgical margins.

Results: The median follow-up time was 5.4 years. 57 pts underwent perioperative chemotherapy, 102 pts underwent postoperative external beam radiation therapy (EBRT) followed by a BT boost, and 2 pts received BT without EBRT. The median pelvic EBRT dose was 45 Gy (range 25-50.4). 69 pts were treated with HDR BT (median dose = 10Gy), 33 with LDR (median dose = 15Gy), and 2 with PDR without EBRT (median dose = 60Gy). The 5-year local-regional failure-free survival and overall survival rates were 93% (CI 95% = 87-99%), and 73%(CI 95% = 0.63-0.84%) respectively. Only 5 vaginal recurrences were identified. 2 pts presented grade 3 late toxicity, all other side effects were grade 2 or less.

Conclusion: Adjuvant BT included in a multimodal treatment was associated with a high loco-regional control rate and acceptable acute and late toxicity in patient with localized high-grade uterine sarcoma.

PO-0963
Effectiveness of week 5 MRI virtual preplanning for Image-Guided Brachytherapy for cervical cancers
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Purpose or Objective: This study aims to demonstrate effective and non-invasive virtual pre-planning using week 5 MRI without the need of applicator in-situ for image-guided cervix brachytherapy.

Material and Methods: 15 patients with stage IB2-IVA cervical cancers were treated at our institution in January to October 2015 using chemoradiation and brachytherapy. All patients received whole pelvic radiotherapy 45Gy in 25 fractions over 5 weeks, with concurrent weekly cisplatin 40mg/m² for up to 6 cycles, followed by additional parametrial boosting 10-16Gy in 5-8 fractions over 1-2 weeks. HDR brachytherapy using Ir-192 was performed in all patients at week 6 and 7, using Vienna schedule of 2 weekly insertions with 2 consecutive fractions per week, and first insertion was approximately 4-7 days after completion of whole pelvic radiotherapy. Treatment aim was 7Gy to HRCVT D90 each for 4 fractions. Week 5 MRI was performed in all patients, and HRCVT was contoured. Virtual preplanning was done with proposed applicators according to pre-brachytherapy clinical assessment of dedicated oncologist. An estimated D90 for HRCVT (D90) was then compared with the actual D90 HRCVT at week 6 and week 7. Maximum diameter for HRCVT at week 6 were measured, and plans with suboptimal coverage after brachytherapy was regarded as having cumulative D90 HRCVT <= 83.9Gy.

Results: All 15 patients completed chemoradiation with schedule indicated. The choice of applicators was dependent on geometry of tumor (tandem and ovoids or ring or cylinder). Five patients were noted to have suboptimal tumor coverage, with cumulative D90 HRCVT dose ranging from 40.7 to 70.7 Gy. The corresponding maximum diameter of week 6 HRCVT was found to have significant correlation with cumulative HRCVT D90, and a cut-off value of tumor diameter 4.63cm could predict cumulative dose of 83.9 Gy. Based on the initial results, 2.5cm tumor radius from midline was decided to be the cut-off for using interstitial needles to improve dosimetry. With the implementation of interstitial needles in September 2015, one patient received needle insertion based on virtual preplanning with estimated needle position and depth of insertion from week 5 MRI. Estimated HRCVT D90 was tumor radius from midline was 3.6cm. Improvement of HRCVT D90 was from 4.9Gy and 8.33 Gy was noted before and after virtual needle insertion. The subsequent week 6 and 7 brachytherapy using the preplanning information showed excellent correlation in terms of HRCVT D90 dosimetry, with cumulative HRCVT <= 89.2Gy (dose per fraction was 7.8, 7.5, 8.6 and 8.6Gy respectively).

Conclusion: This study demonstrates the effectiveness of a non-invasive method using week 5 MRI for virtual pre-planning, with accurate estimation of HRCVT, that can guide needle insertion diligently. Tumor radius of 2.5cm was proven to be a good reference to select patients for interstitial needle insertion.