correlations between the slope, D5_v, D2_v, HRCTV D90, HRCTV volume, and the RV point.

**Results:** Total doses from 3 fractions for the D5_v median 48.7Gy (range 31.4 - 76.6Gy), D2_v median 64.0Gy (range: 43.2 - 112Gy) and RV median dose 16.3Gy (range: 11.6 - 25.3Gy). The RV point exhibited a weak correlation with D2_v (r=0.56; p=0.0001) and D5_v (r=0.55; p=0.0001) respectively. A moderate correlation was observed between the HRCTV volume and D2_v (r=0.69; p=0.0001), the HRCTV volume and D5_v (r=0.73; p=0.0001) and a weak correlation with the HRCTV volume and the RV Point (r=0.57; p=0.0001). The slope correlated with D2_v (r=-0.96; p=0.0001) and D5_v (r=-0.87; p=0.0001) and a weak correlation with the RV point (r=-0.52; p=0.0002). No correlation was found between the HRCTV D90 and the D2v (r=0.20; p=0.1826), the D5v (r=-0.24; p=0.1082), or the RV Point (r=0.02; p=0.8431).

**Conclusion:** The expansion volume of the ring applicator cap can provide a suitable surrogate for determining the vaginal mucosa dose, as this part of the vagina is in close proximity to the ring and tandem contributing to the volume of vaginal mucosa receiving the highest vaginal dose. The RV point does not correlate with the D2v and D5v and therefore cannot to be use as a suitable surrogate point for the dose to the vaginal mucosa. Additional work is currently ongoing to correlate the D2v and D5v with clinically measured vaginal morbidity.

**EP-1969**

**High-dose-rate image-guided interstitial brachytherapy for recurrent cervical adenocarcinoma**

K. Yoshida1, H. Yanazaki2, T. Takenaka3, T. Kotsuma4, K. Masui5, Y. Uesugi6, T. Shimbo7, N. Yoshikawa1, H. Yoshikoa1, Y. Yoshikoa1, E. Tanaka8, Y. Narumi9

1Osaka Medical College, Radiology, Takatsuki, Japan
2Kyoto Prefectural University of Medicine, Radiology, Kyoto, Japan
3National Hospital Organization Himeji Medical Center, Radiology, Himeji, Japan
4National Hospital Organization Osaka National Hospital, Radiation Oncology, Osaka, Japan
5Osaka University Graduate School of Medicine, Radiation Oncology, Suita, Japan

**Purpose or Objective:** In order to evaluate the usefulness of high-dose-rate image-guided interstitial brachytherapy (HDR-ISBT) for recurrent uterine cervical adenocarcinoma, we analyzed our clinical experience.

**Material and Methods:** We investigated 28 patients treated with HDR-ISBT at National Hospital Organization Osaka National Hospital between May 2003 and December 2010. All patients received radical surgery and 7 patients also received post-operative radiotherapy as previous treatments. Histologic finding was adenocarcinoma and squamous cell carcinoma for 11 and 17 patients. In 11 adenocarcinoma patients, 6 patients had endometrioid adenocarcinoma and the other 5 patients had mucinous adenocarcinoma. The median tumor size was 23 mm (range: 9-79 mm). In 21 patients who had no irradiation history, 9 patients were treated with HDR-ISBT alone and the other 12 patients were treated with HDR-ISBT plus external beam radiotherapy (EBRT). Forty-eight to 54 Gy in 8 to 9 fractions were delivered as monotherapy and 30 to 33 Gy in 5 to 6 fractions as combination of EBRT. In 7 patients who had irradiation history, slight lower doses (42 to 48 Gy in 7 to 8 fractions) were selected. We implanted 7-15 (median, 12) applicators under transrectal ultrasonography guidance. We used free-hand implantation with ambulatory technique for later 25 patients. Magnetic resonance imaging (MRI)-assisted image-based treatment planning was performed for later 17 patients. Clinical target volumes (CTV) were the gross tumor volume with or without 10 mm of vaginal margin for patients with or without non-irradiation history.

**Results:** The median follow-up time was 43 months (range: 4-115 months). The median D90(CTV) was 120% prescribed dose (PD), 122%PD and 118%PD for patients who had endometrioid adenocarcinoma, mucinous adenocarcinoma and squamous cell carcinoma. The 3-year local control and overall survival rates were 72% and 73% for adenocarcinoma. The 3-year local control and overall survival rates were 88% and 77% for squamous cell carcinoma. No significant difference was observed. The 3-year local control rates were both 67% for endometrioid adenocarcinoma and mucinous adenocarcinoma. Grade 3-4 late complications occurred by HDR-ISBT in 5 patients (18%).

**Conclusion:** Our treatment result of image-based HDR-ISBT showed that slight inferior result was observed in cervical adenocarcinoma although there was no significant difference.

**EP-1970**

**Dose to organs at risk on CT versus MRI based brachytherapy for cervix cancer**

K. Akbarov1, I. Isayev1, E. Gulyev1, N. Aliyeva1

1National Oncological Centre, Radiotherapy, Baku, Azerbaijan

**Purpose or Objective:** Brachytherapy is one of the most important components in the treatment of cervical cancer. Recently 3D planning for brachytherapy has been used which could be done both by CT and MRI imaging based. We compared the high risk clinical target volumes contoured on CT and MRI and dose distribution in the target volumes and organs at risk.

**Material and Methods:** Twenty-three patients with IIa-IIb stage cervical cancer were planned for HDR brachytherapy with ring-tandem applicators. Treatment consisted of four 7 Gy fractions by two insertion procedures. On MRI and CT sets we contoured HR CTV and organs at risk on 42 plans: for 19 patients two plans and for four patients only one. Medical physicists received task to make planning on CT and MRI images independently at the same day before irradiation. The mean HR CTV volume, dose received by at least 90% of the volume (D90) and the dose to 2 cc for the organs at risk were evaluated.

**Results:** The mean volume of HR CTV was 77.5 cc on CT based contours and 60.3 cc on MRI imaging. This difference in HR CTV volume reflected on the dose to organs at risk - physicists have to increase it to achieve prescribed dose in target volume. Thus, while assessing mean D2cc for rectum, bladder and sigmoid we find out that it was lower in case of MRI based planning compare to CT based planning - 66.2 Gy and 70.3 Gy, 85.1 Gy and 89.6 Gy, 62.3 Gy and 66.7 Gy respectively. Mean D90 also was significantly higher in MRI compared to CT imaging plans - 94.2% versus 79.4% of prescribed dose.

**Conclusion:** In spite that superiority of MRI compared to CT imaging based contouring and planning for HR CTV dose distribution has been already showed in previous studies we found that it also allows indirectly significantly decrease the dose to organs at risk during HDR brachytherapy for cervical cancer.

**EP-1971**

**Result of IGBT for cervical cancer using ring applicator with ‘Siriraj Ring Cap’ extension**

P. Dankulchai1, Y. Changsila1, J. Petsusikri1, L. Tuntipumiamorn1, P. Nakkasair1, C. Kakanaporn1

1Faculty of Medicine Siriraj Hospital Mahidol University, Radiology, Bangkok, Thailand

**Purpose or Objective:** To retrospectively assess treatment outcome of image-guided brachytherapy (IGBT) with or without hybrid technique for cervical cancer using VarisourceTM titanium ring applicator with ‘Siriraj Ring Cap’ extension (as figure 1). In case of narrow vaginal opening, hybrid brachytherapy technique could be performed using this applicator with extension.

Figure 1: VarisourceTM titanium ring applicator with ‘Siriraj Ring Cap’ extension
Material and Methods: Between January and December 2014, 29 patients with locally advanced cervical cancer were underwent combination external beam radiotherapy with or without concomitant chemotherapy and IGRT with or without hybrid technique using VariSourceTM ring applicator with ‘Siriraj Ring Cap’ extension (at least one fraction). 117 dosimetric planning and clinical outcome of treatment were evaluated.

Results: For high risk clinical target volume (HR CTV) the median was volume 37.4 cm³ (range; 15.3-76.1 cm³) and the median of D90 was 85.3 Gy (range; 76.4-90.5 Gy). The median of D2cc for bladder, rectum, sigmoid, and bowel loop were 84 Gy (range; 68.3-89.7 Gy), 66.1 Gy (range; 56.8-76.3 Gy), 65.6 Gy (range; 49.7-77.1 Gy), and 61.9 Gy (range; 45.8-78.5 Gy), respectively. 81.2% (95 of 117 plans) were performed using VariSourceTM ring applicator with ‘Siriraj Ring Cap’ extension, while mean of coverage of the HR CTV was 89.2% (range; 57-99%), 18.8% (22 of 117 plans) were applied using tandem with ovoids, and mean of coverage of the HR CTV was 79.9% (range; 53-96%). Median follow up was 10.6 months. The actuarial 1 year loco-regional recurrence free survival rate was 90.5% (95% confidence interval (CI); 71-99%), and overall survival rate was 90.5% (95% CI; 67-98%), progression free survival rate was 85.7% (95% CI; 62-98%), and 5-year overall survival was 79.9% (range; 53-96%). No one local recurrence were observed, regional recurrence in 2 (2 and 7 months), distant metastasis in 1 (12 months). The patients have undergone the treatment satisfactorily. In 3-5 late complications have been recorded so far.

Conclusion: IGRT with or without hybrid technique using VariSourceTM titanium ring applicator with ‘Siriraj Ring Cap’ extension is applicable for locally advanced cervical cancer resulting in an excellent local control rate and limited morbidity.

EP-1972
Application of adaptive brachytherapy in the treatment of cervical cancer in accelerated mode
O. Kravets1, A.A. Fedyanina1, O.V. Kozlov1, M.A. Kuznetsov1, A.V. Gavrilova1, E.A. Romanova1
1 Russian Federation

Purpose or Objective: The effectiveness of radiation therapy in the management of cervical cancer of all stages is well established. Radiation therapy usually consists of a combination of external beam therapy and brachytherapy. Further exploration of new approaches and methodologies is a promising direction of development. Given the radiobiological aspects and an important economic factor, i.e. reduction of hospital stay. The aim of this study was to estimate the effectiveness of the treatment of cervical cancer patients using adaptive image-guided brachytherapy (IGBT) during split course.

Material and Methods: In the period from May 2014, 38 patients with primary cervical cancer were treated with combined radiotherapy using the new split-adaptive methodology for IGRT. We used conformal radiatIGRT. We used conformal radiation techniques: BOX method, IMRT or RapidArc. Total dose on the pelvic area and regional metastases was 50 Gy. Further HDR IGBT brachytherapy was followed with dosimetry planning MRI - images. The treatment was on 1st and 2nd and 6th and 9th days, ring tandem applicators implantation under general control anesthesia. Between the fractions 1 and 2 and 3 and 4, the patients were with applicator under the supervision of medical staff during the day. Monitoring planning was conducted according to MRI-studies; as a result treatment plan was composed for every 2 fractions. The position of the applicator in relation to the tumor and critical organs during the day doesn’t change provided that the methodology is being correctly observed. Dose plans were optimized for maximal tumor dose (D90) and coverage (V100 and V80). The dose parameters in the target volume are the following: D 90 = 7.3 (5.9-9.1) Gy, V 100 = 91.5 (79.2-99.1) %, V 80 = 97.8 (90.5 -100). Of the patients it was T2bN0M0 – 7 patients, T3bN0M0 - 5, T2b-3bN1M0- 18, T2b-3bN1M1 - 8.

Results: in the results the values of dose rates (D 2 cc / D 0.1 cc) to organs of risk (bladder, rectum and sigmoid) are the following: 3.7 (1.7-7) / 4.8 (2.2 -9.4) Gy; 3.1 (1.2-6) / 4.2 (1.4 - 8.3) and 3.9 (2.2-5.7) / 5.5 (3.5 -7.6) Gy. During follow-up time for 12 months no any acute or late toxicity of grade 2 were observed and not observed any difference in comparison with the fractionation scheme used previously. No one local recurrence were observed, regional recurrence in 2 (2 and 7 months), distant metastasis in 1 (12 months). The patients have undergone the treatment satisfactorily. The number of surgical implantations decreases from 4 to 2. According to preliminary data, local radiation reactions are not multiple.

Conclusion: The main advantage of this method is the dose delivery in a shorter period of time, which allows for a greater control of the tumor. This method allows to reduce the time of course of brachytherapy to 9 days. Evaluating the effectiveness of treatment shows good tolerance of this treatment with satisfactory results. This clinical study is currently ongoing.

EP-1973
MRI-guided brachytherapy and 3D/IMRT radiotherapy for cervical carcinoma. A prospective study
E. Villafranca Iturri1, P. Navarrete Solano1, A. Sola Galzarra1, J.C. Muruzábal1, C. Sánchez1, M. Rico1, M. Errasti1, M. Barrado1, M. Campo1, I. Viss1
1 Hospital of Navarra, Radiation Oncology, Pamplona, Spain
2 Hospital of Navarra, Gynecology, Pamplona, Spain
3 Hospital of Navarra, Radiology, Pamplona, Spain

Purpose or Objective: To evaluate dosimetric and clinical findings of MRI-guided HDR brachytherapy (HDR-BQ) for cervical carcinoma.

Material and Methods: From 2008 to 2014: 50 patients. All patients had a CT, MRI and pelvic-paraortic lymphadenectomy. Treatment: pelvic(+)-para-aortic3D/IMRT radiotherapy(45Gy) and weekly cisplatin followed by HDR-BQ and pelvic node/parametrial boost 60Gy. Two implants at week 6th and 7 th were done: 5 fractions of 66Gy and from 2011 4 fractions of 7Gy. MRI/TAC was done in each implant. There where defined: GTV, CTH-HR, CTV-IR; OAR: rectum, bladder and sigmoid.

Results: Patients: T1b2-T2a: 3p, T2b 36p. T3a: 2p; T3b 9p; N0: 31p, N1 19p. With a median follow up of 50.6 months(8.1 - 89.2 months), 5 patients had local recurrence, 6 lymph node recurrence, 6 distant metastasis and 36 without recurrence. Local control at 5 years was 88%; ib2-1bB: 93%; iiB: 76%, (p<0.07). Lymph node Regional Disease Free Survival(RDFS) 5y was 88%; ib2-1bB: 89%, IIb: 83% (p<0.05); for pN0: 94%; pN+ iliac-paraortic: 77% (p: 0.08). Metastasis Free Survival 5y was 78%; IBNO: 78%, IBB1: 89%, III: 63%. Overall
