Purpose/Objective: To analyse 4 field conventional radiotherapy (4FRT), intensity modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT) in the definitive management of cervical cancer and to assess whether any dosimetric differences persist with the use of larger geometric PTV margins to account for daily variability in uterine position.

Materials and Methods: CT datasets were obtained for 20 consecutive patients with intact cervix cancer previously treated with definitive external beam radiotherapy (with or without chemotherapy). The clinical target volume was contoured to encompass gross tumour and potential microscopic disease including the remaining cervix, uterus, upper vagina, parametrium, adnexa and regional lymph nodes. The planning target volume (PTV) was generated with uterine margins of 1.5cm, 2cm, 2.5cm, 3cm and 4cm used to account for internal motion of the uterus, generating five PTVs for each patient: PTV1.5, PTV2, PTV2.5, PTV3 and PTV4. The rectum, bladder, bowel and femoral heads were contoured as organs at risk (OARs). For each patient, a 4FRT plan was generated based on conventional field borders ensuring coverage of PTV1.5. IMRT and VMAT plans were generated for each PTV, except when the PTV extended outside 4FRT fields. Prescription dose was 45Gy in 25 fractions. Plans were evaluated for target coverage, conformity, dose homogeneity and dose to OARs. Planning time, total monitor units and estimated delivery time were also evaluated.

Results: The median patient age was 56 years (range: 27-84 years), Stage 1, 2, 3 and 4A disease was seen in 11, 12, 4 and 3 patients respectively with nodal involvement in 13 patients. PTV2.5, PTV3 and PTV4 extended outside the 4FRT fields in 9 (45%), 13 (65%) and 20 (100%) patients respectively. Target coverage was excellent for the 4FRT, IMRT and VMAT plans generated, with no significant difference between techniques, however, IMRT and VMAT plans were associated with a reduction in dose to OARs compared to 4FRT. Mean monitor units was lowest with 4FRT, followed by VMAT then IMRT.

Conclusions: IMRT and VMAT are associated with dosimetric advantages over 4FRT when margins less than 3cm are used, with exceptional target coverage and superior OAR sparing. Uterine margins of 3cm or greater commonly resulted in the PTV extending outside conventional radiotherapy fields, demonstrating no benefit for these advanced planning techniques in patients with large variation in uterine position. Furthermore, accurate uterine localisation with image guidance is critical when considering implementation of IMRT or VMAT for cervix cancer treatment. Prospective studies are also needed to verify that these newer techniques reduce the rates of acute and late toxicities without compromising long-term disease control.

Purpose/Objective: Evaluate the diagnostic capabilities of MRI in the detection of neoplastic lesions of the vagina, as well as to optimize the protocol complex MR examination of the pelvic organs in clinical use in the planning and monitoring of HDR brachytherapy in patients with gynecologic cancer with primary or metastatic lesions of the vagina.

Materials and Methods: With the purpose assess the state of the vagina performed 179 MR studies of the pelvic organs in 108 women with gynecologic cancer, mean age was 58.5 years. In order to volumetric 3D-planning performed 56 MR studies 31 patients with primary and metastatic tumors of the vagina treated with brachytherapy in automated complex ‘Microselektren HDR’ – equipped with isotope 192Ir, using the planning system Oncentra Brachy (Nucletron®). Complex MRI (Toshiba Vantage Atlas, 1,5 T) pelvic examinations with contrast enhancement consisted of native scanning, DWI, dynamic contrast enhanced (DCE) examination with additional endovaginal MR-compatible applicator introduction. All patients previously carried out at different times external beam radiotherapy with a total boost dose 46-60Gr. Re-planning during treatment was performed in 23 patients. In ultrasonography study to delineate the boundaries of the tumor visualized in 62.5% of cases; in CT imaging - in 37.5%. For planning we used colpostat diameter of 20 mm.

Results: Neoplastic lesions in vagina were found during complex MRI (CMRI) in 58 (51,7%) pts, at lower third - in 5 (8,6%), as endometrial and vulvar cancer progression, at middle third - in 11 (18,9%) pts, at upper third - in 42 (72,4%), included 18 (31%) pts with vaginal cuff relapse. It was revealed as a zone with increasing signal in T2-weighted sequence and contrast accumulation in the arterial and venous phases. Differential diagnosis with post-radiation fibrosis demanded image fusion of T2WI fat sat, DWI and DCE with endovaginal MR-suitable applicator, which created conditions for better visualization of vaginal wall structure and tumor localization because of fold smoothing. In all cases, MRI was able to determine the boundaries of the tumor process necessary for contouring. At the same time 25% of patients with symptoms of tumor progression (MRI), intimate adhere to vaginal tumors of the bladder or rectum involving retro-vesicle, recto-vaginal tissue, demanded change of treatment programs, the volume of irradiation, the planned total doses, but did not result in rejection of a planned rate brachytherapy. According to the dynamic MRI performed during the course of radiotherapy, more than 50% regression of tumor volume was determined in 50% of patients, which in some cases entailed a change in the volume of targeted areas.

Conclusions: CMRI increases the accuracy of primary and recurrent vaginal tumors determination and treatment results.