ITV coverage was then evaluated by comparing the volume covered by the prescription isodose on full bladder CT-planning and CT-control. Patients were asked to have full bladder but they did not follow specific recommendation for rectum. We investigated the correlation of 3D vector and loss of dosimetric coverage with bladder volume, rectal volume, maximum rectal diameter and AP rectal diameter at tip of coccyx level.

Results: The ITV displacements turned out to be (mean ± SD) 0.17 ± 0.12 cm (range 0.01-0.50 cm) in Left-Right, 0.41 ± 0.31 cm (0.03-1.26) in anteroposterior and 0.35 ± 0.28 cm (0.00-0.93) in craniocaudal direction. Mean 3D vector was 0.64 ± 0.32 cm (0.09-1.30). All patients with 3D vector < 0.7 cm (59.3%) showed a loss of coverage less than 10%. The rest of patients had a 3D vector > 0.7 cm, but only 15% (4/27) had a loss of coverage higher than 10% (range 16.4-20.2%).

We found a correlation between the 3D vector and the loss of coverage (Pearson correlation 0.51; p = 0.007). We did not find any significant correlation of different rectal and bladder parameters with the 3D vector and loss of dosimetric coverage.

Conclusions: Although vaginal movement was observed for the patients, only few of them showed a significant loss of coverage. We were unable to find that rectum and bladder filling had significant effect on the ITV displacement or loss of dosimetric coverage. Vaginal ITV is a good procedure to ensure an acceptable dosimetric coverage.

PO-0753
The role of 18F-fluorodeoxyglucose Positron Emission Tomography in pretreatment evaluation of cervical carcinoma
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Purpose/Objective: Aim of this study was to assess the role of whole-body 18F-fluorodeoxyglucose Positron Emission Tomography (18F-FDG PET) and Magnetic Resonance Imaging (MRI) in the management of cervical cancer.

Materials and Methods: In pretreatment staging, 93 patients with histological diagnosis of cervical cancer, underwent 18F-FDG PET in addition to routine protocol including International Federation of Obstetrics and Gynecology (FIGO) staging and MRI.

Results: In all patients both 18F-FDG PET and MRI detected the primary tumor. In 67 patients (72%) the result of 18F-FDG PET and MRI was the same, but in 29 patients (31.2%) the result was different: 18F-FDG PET detected pelvic nodal metastases not seen by MRI in 11 cases (11.8%) and MRI detected pelvic nodal metastases not seen by 18F-FDG PET in 15 cases (16.1%). In 3 cases (3.2%) both exams was positive, but 18F-FDG PET showed a higher number of pelvic nodal metastases than MRI. Furthermore in 20 cases (21.5%) 18F-FDG PET showed para-aortic nodal metastases.

Conclusions: Integrating two imaging techniques allowed the identification of a higher number of pelvic nodal metastases, achieving a better initial staging and subsequent appropriate treatment. Finally, whole-body 18F-FDG PET was useful for staging extrapelvic nodal metastases.

PO-0754
Conformal radiotherapy technique with radiobiological support in patients with locally advanced cervical cancer
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Purpose/Objective: Application of conformal radiotherapy (CRT) with different regimes of dose fractionation in patients with locally advanced cervical cancer is a promising technique to increase the treatment effectiveness. The purpose of the presented work was to evaluate the efficacy and toxicity of the regime of accelerated fractionation during CRT and in vivo cytogenetic monitoring in patients with locally advanced cervical cancer.

Materials and Methods: A course of combined radiotherapy for 37 patients with locally advanced cervical cancer treated on the phase I with CRT by Clinac 2100/CD linear accelerator with 6 MeV bremsstrahlung radiation in two regimes: fractionated regime of 1.3 Gy per fraction delivered twice daily with 4 h interval to the total focal dose of 39 Gy for the tumor node and 44 Gy for the pelvic lymph nodes (group I, n = 16) vs. standard fractionation regime of single 2.0 Gy dose exposure to the total focal dose of 45-46 Gy on the pelvic area (group II, control, n = 21). In phase II of the radiotherapy course intracavitary brachytherapy with high-activity 136Cs source (‘Gyne Source’) was used in the treatment of all patients in the regime of single 5 Gy dose exposure of the p. A 2 given twice daily to the total dose of 35-40 Gy/7-8 fractions. Peripheral blood lymphocytes (PBL) of the cancer patients were the objects of cytogenetic analysis (chromosomal aberrations). Blood sampling in patients of group I was performed three times: before the CRT, and during the first treatment exposure; in patients of group II - twice: before the CRT and 24 h after first fraction.

Results: In group I complete regression (CR) of tumors was registered in 21.4%, partial tumor regression (PR) - in 50.0%, stabilization process - in 28.6% of patients; in group II (control) it was 18.3%, 42.1% and 39.6% of patients with locally advanced cervical cancer, respectively. Analysis of the in vivo release of radiation markers in PBL of CC patients showed that accumulation rate of dicentric and ring chromosomes after the first treatment at the regime of dose accelerated fractionation (group I) was significantly lower in comparison with standard fractionation schedule (group II): 1.01 ± 0.05 per 100 metaphases after the first fraction of 1.3 Gy, 1.9 ± 0.15 per 100 metaphases after total daily dose of 2.6 Gy and 2.6 ± 0.1 per 100 metaphases analyzed, respectively.

Conclusions: Analysis of the direct efficacy and toxicity of the treatment of the patients with locally advanced cervical
cancer shows the effectiveness and the absence of excess toxicity (above the level II) after the CRT with accelerated fractionation dose in CBT. It is assumed to analyze the dynamics of accumulation of cytogenetic markers in PBL and their deviation from the normal distribution in the course and after the CRT of cancer patients.

PO-0755
Organ shape variations influencing PTV concepts for cervix cancer ART
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Purpose/Objective: Adaptive radiotherapy approaches for cervical cancer patients can have different levels of update frequency, varying between re-planning halfway along the treatment, weekly re-planning and plan of the day approaches. We investigated the variation in organ shape within a treatment week and the exemplarity of different adaptive strategies.

Materials and Methods: For 8 cervical cancer patients we obtained weekly CT scans and daily CBCT scans. The primary and nodal GTVs, bladder, rectum, sigmoid, bowelbag were delineated in all 215 scans by a radiation oncologist. Six patients were classified as mover (>2.5 cm top of uterus motion), two as non-mover. In order to assess the appropriateness of different adapted PTV concepts, the volume of the cervix-uterus CTV that exceed those PTVs was calculated for a static PTV based on planning scan, a weekly update of the PTV based on weekly CT scan, a PTV of the CT scan with a similar bladder filling status, and based on a plan of the day (PoT) approach that consists of an empty - half full PTV and a half full - full PTV.

Results: For the commonly used planning strategy that uses one planning CT scan with arbitrary bladder volume, up to 40% of the daily CTV can be outside the PTV during one or more fractions of the treatment; for movers with a large bladder filling variation, on average 20-25%. Adaptation of the PTV by re-planning on a weekly CT scan, or re-planning based on a CT scan with similar bladder volume, decreased the volume of the daily CTV outside the PTV somewhat (Figure). Besides bladder filling also the status of the rectum influenced the position. A PTV created with a PoT approach, resulted in acceptable small volumes outside the PTV (average 2%). For three mover patients the uterus flipped backwards for a few days during treatment and a non-mover changed into a mover for a few fractions.

Conclusions: We found that re-planning based on weekly imaging, although this gives a good idea about organ position variability and tumor shrinkage, is not sufficient to reflect the full extent of internal organ motion because the patient changes daily and often weekly scans are not made at the same time point (and organ configuration) as the treatment fraction itself. Furthermore, bladder volume-dependent cervix-uterus motion models that were prepared in the planning phase should be monitored carefully throughout the treatment because they can change.

PO-0756
Carbon-ion and photon radiation effects on HPV-positive and negative cervical carcinoma cells
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Purpose/Objective: To compare the effect of photon and carbon-ion radiation on four cell lines with different HPV-status regarding cell cycle regulation and HPV associated protein expression. Hypothesis is that carbon ion radiation might overcome radiation resistance of HPV-negative cells or cells with integrated HPV.

Materials and Methods: W12 cell line was derived from a low grade cervical lesion by Stanley MA et al. 1989, and is unique among HPV16-containing cell lines in carrying its HPV 16 genome as a multicopy episome. W12 cells contain episomal HPV 16 genomes, whereas S12 cells, which derived from the W12 line, contain HPV DNA as integrated copies. Caski cells have their origin in epidermoid cell cervical cancer and are reported to contain an HPV 16 genome as well as sequences related to HPV-18. C33A is a HPV-negative human cervical cancer derived cell line. Cell cycle analyses were performed using flow cytometry (PI staining) 24 h and 48 h after RT with 2 and 7 Gy using photon RT and 2 GyE and 7 GyE carbon ion RT(C12). Expression of pRb and p53 after irradiation with 2 and 7 Gy were analyzed by flow cytometry using intracellular staining comparing the mean fluorescence of 10000 gated cells.

Results: C33A cells (HPV-negative) showed a minimal enhanced expression of pRB after RT with photons or C12 (0 Gy=1.0, 2 Gy=1.09, 7 Gy=1. 4, 2 GyE= 1.3, 7 GyE=1.1). There was no effect of photon or C12 irradiation on p53 expression in C33A cells. Caski cells (HPV16/18 positive) showed increased expression of pRB after photon RT (2 Gy=1.3, 7