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The results from the ultrasound and IBU-guided brachytherapy planning in locally advanced cervical carcinoma.

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Objective: To perform dose-volume statistics comparison of the ultrasound and IBU-guided brachytherapy treatment plans in locally advanced cervical carcinoma using 3D CT and/or MR imaging. **Material and methods:** From April to September 2016, 14 patients with locally advanced cervix carcinoma were treated in N.N. Alexandrov National Cancer Centre of Belarus. All patients underwent EBRT 50Gy/25 fractions to the entire pelvis region (3D CT-based treatment planning). After that, all patients received 5Gy/fraction intracavitary brachytherapy (5 fractions in 3 weeks). All applications were performed under the ultrasound control. The bladder was filled with 100 ml saline to ensure good visualization and to avoid the bulb. IU-channel for the ring applicator was selected according to the size of the uterus (obtained using ultrasound imaging). US-guided treatment planning enables visualization of the cervix and uterus and allows sparing of the normal tissues. This planning is aimed to cover a whole cervix volume with 100% of the prescribed dose. X-ray imaging was performed using IBU-Digital. 5Gy isodose was normalized to Manchester points A. According to GEC-ESTRO recommendations CTV High Risk (CTV HR) was identified using the CT and MRI fused image. The bladder, rectum and sigmoid were outlined as OARs. US and IBU-based calculated treatment plans were transferred to the 3D CT or MRI scans to define D2cc OARs and D90 CTV HR. The total accumulated dose value for EBRT and brachytherapy boost were evaluated in terms of equivalent dose in 2 Gy per fraction (EQD2), using $a/b = 3$ Gy for OARs and $a/b = 10$ Gy for CTV HR. **Results:** Figure 1 shows the relationships between the D90 of CTV HR and OARs. No clear relationships between D90 of CTV HR and OARs D2cc dose were observed. The OARs D2cc mean dose value in IBU-based treatment plans was higher than in US-based plans. Furthermore, the mean total dose value was higher on US-based plans.

Figure 1. Dose-volume statistics for the US and IBU-guided brachytherapy treatment plans

Conclusion: Using ultrasound in gynaecologic brachytherapy to guide the applicator placement allows to avoid perforation and optimize the applicator position within the uterine canal, and thus to improve the quality of implants. Ultrasound-guided brachytherapy planning in locally advanced cervical carcinoma in comparison with IBU-based planning has increased target coverage and reduced overall dose to the OARs.

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