rence, and complication rate of rectum and bladder between HDR and LDR ICR in each study. Homogeneity tests were conducted before the integration of each effect size into a common effect size. The common effect sizes and 95% confidence intervals (CI) were calculated using either the fixed or the random effect model according to the results of the homogeneity tests.

Results: We performed meta-analysis with the data of 18,629 patients including 10,689 patients receiving HDR ICR and 7,940 patients receiving LDR ICR in 14 selected articles. The common effect sizes for 5-year survival rate, 5-year disease free survival rate and local recurrence rate were 1.1869 (95% CI: 0.9875-1.4264), 1.2037 (95% CI: 0.6284-2.3059), and 0.8926 (95% CI: 0.7330-1.0869). The common effect sizes for moderate to severe complication rates of rectum and bladder were 0.8625 (95% CI: 0.5877-1.2657) and 1.0937 (95% CI: 0.778-1.5375). There were no significant differences in 5-year overall survival, 5-year disease free survival, local recurrence and complication rates of rectum and bladder between HDR ICR and LDR ICR.

Conclusions: This study suggests that conventional LDR ICR could be replaced by HDR ICR which is safer and more convenient for patients and medical personnel. To determine the proper fractionation scheme for HDR ICR, additional well-designed prospective studies should be followed.

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CT-based three-dimensional intracavitary brachytherapy planning in cervix cancer: Is it always better than conventional planning?

K.H. Shin, T.H. Kim, J.K. Cho, S.Y. Park, D. Park, J.W. Kim, E.K. Chie, H.Y. Pyo, D.Y. Kim, K.H. Cho. *National Cancer Center, Radiation Oncology, Proton Therapy Center, Koyang, Kyonggi, Korea*

Background: Intracavitary brachytherapy in cervix cancer is usually based on conventional orthogonal radiography-based planning (CP) notwithstanding the advances of imaging and three-dimensional planning technique (3DP). The purpose of this study is to compare CP with CT-based 3DP and to find the problems adapting 3DP into routine practice.

Materials and Methods: Thirty cervical cancer patients receiving Ir-192 HDR brachytherapy after external 30-40Gy RT were investigated. All patients underwent CT scanning and 3DP with CT images. For the CP, CT images, not orthogonal radiography, were used by digitizing point A, rectum, bladder points on CT to keep the same patient 's position and applicator geometry of two planning methods. Fractional 100% dose was prescribed to point A in CP and PTV (GTV+safety margin) in 3DP. Rectal-bladder ICRU and maximum point doses, volumes receiving 100% dose, surplus volumes (100% volume minus PTV) and rectal, bladder DVH were analyzed. The planning system PLATO was used.

Results: The mean pre-RT tumor size by MRI was 4.1cm. The mean volumes of GTV, PTV, rectum and bladder were 15.6, 31.5, 72.3 and 127.4cm^3, respectively. Patients were divided into Group A and B by which 100% isodose line prescribed to point A fully encompasses PTV or not. The number of Group A patients whose PTVs are fully surrounded by 100% line was 20 and Group B was 10. The mean GTV (11.6 cm^3) and PTV (24.9 cm^3) of Group A were smaller than those (23.7, 44.7 cm^3) of Group B ($p=0.003$). For the CP, the results of point doses and volumes showed no difference between two groups. For the 3DP, Group B suffered from large normal tissue doses and volumes significantly ($p<0.05$). In comparison between CP and 3DP in all 30 patients, though the mean 100% dose volume and surplus volume of 3DP were smaller ($p=0.003$ and 0.004), the results of organs at risk showed no difference except dose % irradiating to 50% volume of bladder (CP 36.4% vs 3DP 27.2%, $p=0.03$). In Group A, 3DP showed significant superior results to CP including organs at risk doses and volumes ($p<0.05$). However, in Group B with large tumors, the mean rectal and bladder irradiating doses and volumes were much higher in 3DP ($p<0.05$).

Conclusions: Although CP with point A prescription generally overestimates PTV, CT-based 3DP gives too much irradiation to organs at risk in large tumors. Other technique including interstitial implant or dose supplement to PTV without organs at risk should be considered in these cases.

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Dosimetric study of boron neutron capture therapy (BNCT) for multiple liver tumors: dose-volume histogram analyses using the simulation environment for radiotherapy applications (SERA) treatment planning system

M. Suzuki[1], Y. Sakurai[2], S. Masunaga[1], Y. Kinashi[1], K. Nagata[1], K. Ono[1]. *[1] Research Reactor Institute, Kyoto University, Radiation Oncology Research Laboratory, Kumatori-cho, Japan; [2] Research Reactor Institute, Kyoto University, Division of Radiation Life Science, Kumatori-cho, Japan*

Background: Using a rat liver tumor model, we have successfully selectively accumulated high 10-boron concentrations in experimental liver tumors by intra-arterial administration of borocaptate sodium (BSH)/lipiodol emulsion. The present study aimed to investigate the feasibility of treating multiple liver tumors with boron neutron capture therapy using BSH/lipiodol emulsion (BSH/lipiodol-BNCT), from the viewpoint of dosimetry using the Simulation Environment for Radiotherapy Applications (SERA) system; a currently available BNCT treatment planning system.

Material and methods: Computed tomography images of four patients with multiple liver tumors were incorporated into the SERA system. Three treatment plans for irradiating the whole liver with BSH/lipiodol-BNCT using two or three epithermal neutron beams in one fraction were generated for each patient. The beam directions were as follows; anterior-posterior (AP), anterior-right (AR), and anterior-right-posterior (ARP). The 10-boron concentrations in the tumor and the liver applied in the present study were 197.3 and 15.3 ppm, respectively; the levels were obtained from experimental studies in animals. For comparison among the treatment plans, all plans were normalized to deliver a mean dose of 5 gray-equivalent (Gy-Eq) to the whole liver. The mean doses and the therapeutic gain factors for the tumors, defined as minimum dose to the tumor / maximum dose to the liver, and the inhomogeneity index of the thermal neutron fluence for the whole liver, defined as maximum fluence - minimum fluence / mean fluence were evaluated in each plan.

Results: Dose volume histogram analyses were applied separately to tumors in the left and right lobes. The mean dose delivered to the tumors in the right lobe by ARP-beams was significantly higher than that by AP-beams (65.1 $\pm$ 19.5 vs. 45.6 $\pm$ 19.1 Gy-Eq). The therapeutic gain factor for the tumors in the right lobe by ARP-beams was significantly greater than those by AP- or AR-beams (6.1 $\pm$ 2.1 vs. 3.8 $\pm$ 1.8; and 6.1 $\pm$ 2.1 vs. 4.5 $\pm$ 2.1). The mean dose delivered to the tumors in the left lobe by AP-beam was 53.3 $\pm$ 23.4 Gy-Eq, which was higher than 45.1 $\pm$ 19.4 Gy-Eq by AR-beams or 39.9 $\pm$ 15.5 Gy-Eq by ARP-beams, but not significantly. The therapeutic gain factors for the tumors in the left lobe were 3.8 $\pm$ 2.4 (AP), 3.5 $\pm$ 2.2 (AR) and 3.5 $\pm$ 1.8 (ARP), respectively. The inhomogeneity index of the thermal neutron fluence for whole liver using ARP-beams was lower than those by AP- or AR-beams.

Conclusions: ARP-beams can deliver the most homogeneous distribution of thermal neutron fluence to the whole liver, and provide the greatest therapeutic gain factors for tumors in the right lobe, along with approximately equal therapeutic gain factors for tumors in the left lobe, compared with the AP- or AR- beams. From a dosimetric viewpoint, the BSH/lipiodol-BNCT treatment plan using three epithermal neutron beams is the most suitable for treatment of multiple liver tumors.

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Effects of topographic distribution of small bowel and field sizes on acute diarrhea in gynecologic patients undergoing pelvis irradiation

E.-Y. Huang[1], C.-J. Wang[2], L.-M. Sun[2], H.-C. Hsu[2]. *[1] Kaohsiung Chang Gung Memorial Hospital, Chang Gung University, Radiation Oncology and Graduate Institute of Clinical Sciences, Kaohsiung Hsien, Taiwan; [2] Kaohsiung Chang Gung Memorial Hospital, Radiation Oncology, Kaohsiung Hsien, Taiwan*

Background: To find the topographic distribution of the small bowel within target and correlate both target volume and small bowel amount of full dose and risk of diarrhea during pelvic irradiation in patients with gynecologic malignancies.

Materials and Methods: We reviewed 295 patients with cervical or uterine cancer managed by 4-field pelvic irradiation from January 2000 through January 2003. According to contrast within small bowel in simulation films, we categorized small bowel volume of full dose as no volume within target (NVWT) , small volume within target (SVWT) , and large volume within target (LVWT) group. External pelvic irradiation (39.6-45 Gy/ 22-25 fractions) was delivered to all patients initially. For investigating effect of field size, we categorized fields as whole pelvic (WP), inadequate whole