techniques, including three-dimensional conformal irradiation may offer advantage in minimizing irradiated volume and sparing surrounding healthy tissues and protect critical structures. Quality assurance procedures during therapy include: -dosimetry in vivo -positioning accuracy revealed by simulation films and portal images registration Material and Methods: Between 1999 and 2002 42 children with brain tumors were treated in our department with conformal radiotherapy. They were irradiated in supine position with immobilization by orfit masks. During radiotherapy there were 68 dosimetries in vivo of beam axis performed. The portal images were taken at the beginning of treatment and were compared with simulation film. X, Y and Z deviation vectors were calculated. When the action level was unacceptable the patient was repositioned and the procedure started again.

Results: The result showed mean deviation of the ratio of measured to calculated dose at the reference point of 1.4%(-1.9 to 4,2%) SD= ±1.76%. From an analysis of portal films a deviation of the position was 2 mm to 5 mm.

Conclusions: The quality assurance procedures during radiotherapy offers possibility of precise and reproducible treatment. Our system is suitable for routine verification dose delivered to patients and monitoring patients treatment position.

531 POSTER

Radiosentiviity enhancement by a histone deacetylase inhibitor (HDACI), trichostatin A in human glioblastoma cell lines

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Background: Histone deacetylase inhibitors (HDACI), novel cytotoxic agents, show *in vitro* and *in vivo* anti-tumor activity for many types of cancer cells and are under clinical trials. But studies addressing the combination with radiation are rare. The purpose of this study is to assess the effect of trichostatin A (TSA), a HDACI, on the radiosensitivity of human glioblastoma cells.

Material and methods: Exponentially growing asynchronous U373MG and U87MG cells were exposed to TSA for up to 24 hrs before irradiation with 4 MV X-ray, and survival was measured by clonogenic assay. The effect of TSA on the cell cycle and apoptosis induction was analyzed by the flow cytometry.

Results: Prior treatment of TSA increased sensitivity of U373MG and U87MG cells at 2 Gy. This effect of TSA was concentration-dependent, but 200 nM TSA was associated with significant direct cytotoxicity as well as radiosensitization with sensitization enhancement ratio of 1.4 to 1.5. Flow cytometry of asynchronous cells exposed to TSA showed the arrest of cell cycle at the G2/M phases and the G1/S transit. Moreover TSA induced apoptosis of glioblastoma cells in a concentration- and time-dependent manner.

Conclusions: This study firstly demonstrated that TSA enhanced radiosensitivity of human glioblastoma cells at as low concentrations as not to cause direct cytotoxicity. Further study addressing the combination of other HDACIs and radiation is going on.

532 POSTER

Analysis of dose-volume parameters for reporting dose distribution in the target volume

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Background: Although the dose at the International Committee of Radiation Units and Measurements (ICRU) reference point, the maximum dose and the minimum dose to the target volume are recommended to be reported as a basic requirement, these parameters may not represent inhomogeneous dose distribution in the target volume. We analyzed them together with other dose-volume parameters.

Material and methods: We prescribed radiation doses based on dose-volume histogram (DVH) evaluation and made every effort to minimize the target volume which received less than 95% and greater than 105% of the prescribed dose. In many cases, the mean dose in the target volume was selected for dose normalization and it was occasionally different from ICRU reference point dose. We analyzed the relationship between the reference point dose and dose distribution using DVH in 62 patients with various tumors treated in our hospital.

Results: The doses at the ICRU reference point were smaller than the prescribed doses with a mean of 1.6% and by 3% or more in 13 of 62 cases because we decreased them to avoid hot spots. The mean doses in the target volume corresponded well to the prescribed dose, the difference between them was less than 2% except for one case. The difference between the median dose in the target volume and the prescribed dose was very small and less than 1.2% in all cases. The difference between the maximum dose and the minimum dose ranged from 4 to 77.7% of the prescribed dose with a mean of 24.3%. This difference correlated closely with the difference between the minimum dose and the prescribed dose. This result means that the range of dose inhomogeneity within the target volume reflect cold spot in the target volume. The equivalent uniform dose (EUD) was also calculated, and it seemed reasonable one dose parameter representing both dose level and inhomogeneity. We compared it with ICRU reference point dose, then the difference between them was more than 3% of EUD in 15 cases with a mean of 3.1%.

Conclusions: The ICRU point doses were substantially different from the prescribed doses and EUDs in some patients actually treated in our hospital with our treatment planning method. The maximum and minimum dose could reflect small hot or cold spot which may not have any clinical value. EUD would be a good dose-volume parameter although it should be evaluated with clinical data.

533 POSTER

Hyaluronic acid bladder instillations in the prevention of radiation-induced cystitis

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Backgound: Radiation-induced cystitis (RIC), a complication of pelvic cancer irradiation therapy, disrupts the radiation treatment schedule and may hinder the continuation of the therapy completely. The objective of this study was to assess the efficacy of hyaluronic acid (HA, Cystistat®) bladder instillations in the prevention of RIC.

Material and Methods: 90 patients with uterine or cervical cancer (FIGO 3) were reviewed. The patients were divided into 2 consecutive sub-groups of 45 patients, recruited in 2001-2002, and treated within a single center. The 1st sub-group was treated with a standard ambulatory radiation protocol (external radiotherapy: 46-50Gy, brachytherapy: 20-22Gy). The second sub-group received the same radiotherapy plus preventative HA bladder instillations. The instillations of 40 mg/50 mL solution were given during the weekly brachytherapy through the urethral catheter used for the opacification of the bladder. The HA was kept during the dose calculation time for 30-35 min. Evaluations were performed at baseline, 48 hours following each brachytherapy session as well as monthly for three months.

Results: The weekly instillations of HA decreased the risk of infection. Four patients in the first sub-group receiving standard of care had an episode of bacterial cystitis versus none in the second sub-group receiving standard of care and HA bladder instillations ($p<0.002$). There was a decrease in toxicity due to radiation within the sub-group treated with HA. The toxicity (RTOG/EORTC Radiation Toxicity Score) was on average 1.33 in the 1st sub-group versus 0.71 in the sub-group receiving the HA instillations ($p<0.005$) at week 4. At the completion of radiotherapy, the toxicity was 1.24 in the 1st sub-group versus 0.71 in the sub-group receiving HA ($p<0.004$). Two patients of the 1st sub-group reached the grade 3 toxicity versus none in the HA sub-group ($p<0.04$). At the 2 month point of follow-up, nine patients of the 1st sub-group were still experiencing grade 1 toxicity versus none in the sub-group of HA recipients ($p<0.04$). The weekly instillations of HA also positively affected the completion of the treatment within the scheduled time period. The radiotherapy schedule needed to be delayed for two patients in the first sub-group receiving standard of care versus none in the sub-group receiving the HA instillations ($p<0.04$).

Conclusion This retrospective study demonstrates that weekly instillations of HA (Cystistat®) protected the bladder from radiation induced damages and might enhance the comfort and quality of life in these patients. The protective effect in this indication will be the subject of prospective studies.

534 POSTER

Analysis of dose volume histograms in proton therapy for prostate cancer.

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Backgrounds: Proton beam, with its physical characteristics, can make it possible to deliver high dose to the target volume without increasing the influence on the surrounding normal tissues. The aim of this study is to