AbstractID: 13539 Title: Proton ultra high dose-rate effect on HSG cell survival curve

Purpose: One of the important issues that we are facing in the current radiation process is the long treatment time for irradiating protons to the tumor moving with respiration. In order to improve this problem, we are currently developing the highly precise and very short time proton IGRT using the high intensity beam from cyclotron and the real-time images acquired by two flat panel detectors attached to the gantry. The dose-rate by using this method will reach 10 to 100 times of the present one. The purpose of this study is to investigate the relative biological effectiveness(RBE) of HSG cell in such an ultra high dose-rate regime and its LET dependence by using the colony assay method. **Material and method:** We attached the HSG cells at the bottom of the plastic chamber, and irradiated the spatially and temporally homogeneous proton beam. We used 235MeV proton beams with the different beam current of 10nA and 300nA in order to study the dose-rate effect. The chamber was molded in a Polyethylene block with a hole which fits tightly to the chamber. It was placed at plateau(1.75, 114Gy/min, y_D=0.56keV/μm), then at Bragg-peak(8, 325Gy/min, y_D=3.19keV/μm) to see the LET dependence of RBE at high dose-rate. **Result:** There were no significant splits observed in survival curves of HSG cell over the proton dose-rate. The ratio of RBE at lower dose-rate to that at higher dose-rate was 0.98-+0.08 at Bragg-peak and was 0.96-+0.11 at plateau. On the other hand, the RBE ratio at Bragg-peak to plateau was 1.13-1.20, which suggests that the position dependence of RBE cannot be neglected. **Conclusion:** We conclude that in the therapeutic planning of high dose-rate radiation, the present RBE can be consistently used. Instead, the RBE enhancement toward the Bragg-peak and beyond should be reconsidered.