AbstractID: 13104 Title: Does breath-hold immobilization affect tumor radioresistance in breast?

Purpose: A 15-30s Breath Hold (BH) is often used in radiation therapy for breast cancer patients to minimize heart dose, however its effect on tumor oxygenation and radiosensitivity is unknown. The purpose of this study is to utilize published data on the physiological changes induced by BH to predict the effect of BH on breast tumor oxygenation and radiosensitivity.

Methods and Materials: We utilized the arterial hemoglobin de-saturation of oxygen due to BH measured by Ferretti *et al.* (J Appl Physiol, 1991) to calculate arterial oxygen tension before and after BHs of 30, 60, 90, 120, and 150s. The change in tissue oxygenation due to BH was then estimated by modifying the pO_2 distribution for breast tumor measured by Vaupel *et al.* (Wien Med Wochenschr, 2002) according to the relationship expected from the Krogh oxygen diffusion model assuming either a constant oxygen consumption rate, or that the hypoxic fraction remains unchanged. Finally, the mean Oxygen Enhancement Ratio (OER) was calculated before and after BH.

Results: Before BH, the mean tumor OER was 2.2 (standard deviation = 0.2). For a 30s BH, the mean OER decreased to 2.1 (standard deviation = 0.2) assuming a constant hypoxic fraction and to 1.6 (standard deviation = 0.3) assuming a constant oxygen consumption rate. The percent decrease in mean OER after BHs of 30, 60, 90, 120, and 150s was 4%, 6%, 9%, 10%, and 12% assuming a constant hypoxic fraction, and was 29%, 37%, 40%, 41%, and 42% assuming a constant oxygen consumption rate.

Conclusion: De-saturation of arterial oxygen during a 30s BH may cause a reduction in mean tumor OER of between 4-29%. However analysis with additional parameters and experimental validation is required and will provide added insight into effects of BH.

Conflict of Interest: None.