AbstractID: 3890 Title: Regional change in brain perfusion, in irradiated normal tissue: Correlation study between perfusion MRI and spatial distribution of radiation dose delivered

Purpose: When irradiating the normal brain, one of the principal causes of complications is damage to the cerebral vasculature, particularly the micro-vasculature. This is of particular concern when treating diseases which are slow-growing or are not malignant. While there is some data relating loss of perfusion to radiation dose in other tissues such as lung, there is very little data for the brain. We intend to determine the relationship between the change due to irradiation in hemodynamic measures, such as relative regional Mean Transit Time (rrMTT) and relative regional Cerebral Blood Volume (rrCBV), and the radiation dose delivered to the normal brain tissue.

Method and Materials: We acquired data in the form of perfusion weighted images (PWI) for two patients. We used a 3.0 T magnet at the Seaman Family MRI Centre at the Foothills Medical Centre and a single-shot echo-planar imaging (EPI) sequence following the injection of a paramagnetic contrast agent (Gd-DTPA-Magnevist; Berlex, Wayne, NJ). These images have been processed to yield rrCBV and rrMTT. The patients had previously been treated with surgery, but had received no chemotherapy.

Results: Our preliminary results show that with a follow-up time of 4 months after receiving approximately 5000 cGy/25 fractions, in normal brain tissue the rrMTT is reduced by approximately 2% (1.8 ± 0.5) and the rrCBV is reduced by almost 12% (11.8 ± 2.2). The tumor showed reductions in both rrMTT (1.2 ± 1.5)% and rrCBV (19.9 ± 3.5)%. It is expected that these changes will increase with longer term follow-up.

Conclusion: Perfusion Weighted MR Imaging can be used to assess the change in hemodynamic measures in the normal brain tissue after radiotherapy.