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Final Report for Brain Tumour Foundation Canada

Project Title: Comparison of healthy tissue sparing using different delivery devices for focal irradiation of multiple brain metastases

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Summary:

The project involved development and evaluation of an arc-based technique using an emerging technology to effectively delivery focal radiation to multiple brain metastases. In 2013, the Agility linear accelerator (Elekta AB, Stockholm, Sweden) was just coming to market in Canada and consisted of features that could potentially reduce the normal tissue radiation dose received by the brain compared to the existing systems at that time. The primary objective was thus to implement the technique and measure reduction in normal brain tissue radiation dose compared to our standard technique. Additionally, we needed an improved method for quality assurance (QA) of the device to ensure safe treatment.

The primary objective was successfully completed and resulted in a published peer-reviewed article in the British Journal of Radiology, demonstrating the ability of the Agility system to lower the mean radiation dose to the brain, while maintaining equivalent or improved treatment of the brain tumours.(1) In the paper, treatment plans for 12 patients (having 36 tumours) were retrospectively generated on the Agility and compared to our standard. We also developed a novel QA device for effectively measuring the accuracy of the plans and reported the outcomes in the paper. The device itself has been disclosed as an invention and is still under review for patent.

There has been continuous activity in this field, as the numbers of brain metastases patients and the complexity of cases are increasing. Our group has been on the forefront of developing the framework for assessing emerging technologies for multiple brain metastases treatments in a consistent and standardized way. In addition to the output from the present grant, we have published several papers, book chapters, and white papers on technology assessment.(2-5) More recently, our centre has acquired a Gamma Knife radiosurgery device, which is a dedicated focal irradiation tool highly tailored to treating brain metastases. We are actively continuing our research into the optimal approach for brain metastases radiosurgery treatments using state-of-the-art Gamma Knife and linear accelerator technologies.

References:

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