



Total brain radiotherapy with the partial hair-sparing Technique - a feasibility study.

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Abstract

Whole brain radiotherapy (WBRT) is a common palliative treatment for brain metastases from solid tumours. Traditionally, it is given with opposed lateral fields causing total alopecia as hair-bearing scalp skin receives the full dose. Volumetric modulated arc therapy (VMAT) can deliver WBRT with a simultaneous integrated boost (SIB) to larger metastases

whilst minimising dose to critical structures such as the hippocampus. This feasibility study aimed to test the hypothesis that a reduced dose to the scalp using a VMAT hair-sparing WBRT protocol would spare scalp hair and reduce alopecia at four weeks post treatment without compromising disease control at three months.

Methods: The Hair Spare study (01.07 WBRTMel sub-study SS01.13) was an investigator-initiated, prospective feasibility study. A VMAT hair-sparing WBRT protocol was developed to limit the dose to the scalp to 16 Gray (Gy) in 15 fractions. The primary objective was the rate of alopecia at 4 weeks post RT as measured by CTCAE v4 and clinician and patient perception. Quality of life (QoL) was assessed at baseline, one month and three months

Post treatment with validated instruments including European Organisation for Research and Treatment of Cancer (EORTC) QoL Questionnaire (QLQ-C15-PAL+4) plus four additional questions specifically relating to hair, a visual analogue scale (VAS) to measure the perception of hair loss severity.

Results: Nine patients with brain metastases from melanoma (6), breast (2) and lung (1) cancer were enrolled at the Mater Sydney Hospital, Crow's Nest, and Australia. At 4 weeks, 5 patients were evaluable: 4 reported moderate alopecia (CTCAE v4 Grade 2) and 1 reported mild alopecia (CTCAE v4 Grade 1). All 5 wore wigs or scarves to hide hair loss. Any amount of hair loss impacted QoL. Reduced hair loss compared to complete alopecia, as usually found with conventional WBRT, did not translate to a mean improvement in QoL. There was no symptomatic intracranial progression of disease while the patients remained on study. Two patients had MRI at 3 months, and both had evidence of intracranial progression of disease within the volume that had received prescription WBRT dose. From the data collected it seems that VMAT hair-sparing WBRT was well-tolerated.

Conclusion: VMAT hair-sparing WBRT partially spared scalp hair at four weeks post WBRT and did not compromise symptomatic disease control during the study. The treating oncologists observed that the hair grew back quicker than with conventional WBRT, and that combined cytotoxic chemotherapy was additive to RT-induced alopecia. However, the study was not optimal in that data collection was hampered by patient availability. The patient population was too unwell to be followed up according to the protocol.

Keywords: radiotherapy, clinical trial, hippocampus, hair, quality of life, melanoma, brain, volumetric modulated arc therapy.

Introduction Whole brain radiotherapy (WBRT) is a common palliative treatment for brain metastases (BMs) from solid organ tumours. The aim of palliative treatment is to increase quality of life (QoL). WBRT is traditionally given with opposed lateral fields.¹ Hair-bearing scalp skin receives the full dose, resulting in long term alopecia and therefore decreased quality of life.² Volumetric modulated arc therapy (VMAT) can accurately deliver conformal radiotherapy (RT) dose distributions with fast delivery times.³ VMAT can deliver WBRT with hippocampal avoidance (WBRTHA) which is associated with preservation of memory and QoL.⁴⁻⁶ VMAT also allows simultaneous integrated boost (SIB) to regions of macroscopic tumor, all within the one RT course. VMAT uses megavoltage RT which is skin sparing. As VMAT treats from 360 degrees, the dose going through the scalp skin can be spread around its full circumference. As the maximum depth of hair follicles on the scalp is 4.5 millimeters (mm),⁷ it may be possible with VMAT to spare the first 5.0 mm of scalp skin to avoid alopecia when giving WBRT. Other groups have retrospectively reported scalp hair sparing with WBRTHA using VMAT.⁸ We present our experience in treating nine patients with various malignancies with a hair-sparing VMAT technique within a prospective feasibility study. The hypothesis was that VMAT hair-sparing WBRT could minimize dose to the scalp hair and therefore reduce alopecia at four weeks post treatment without compromising disease control at three months post treatment. **Methods** The Hair Spare study (01.07 WBRTMel sub-study SS01.13) was an investigator-initiated study sponsored by Melanoma and Skin Cancer (MASC) Trials and registered with Australia and New Zealand Clinical Trial Registry (ANZCTR) (ACTRN12617000507381). Ethics approval was granted by the Sydney Local Health District Human Research Ethics Committee (Reference: HREC/16/RPAH/553). Eligible patients were adults with brain metastases from any solid tumor who required WBRT, had hair worth conserving, a life expectancy of greater than four months and an Eastern Cooperative Oncology Group (ECOG) score of 0-2. The total anticipated accrual was 12 patients, including two bald control patients, to assess whether the skin dose could be delivered as planned.

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