

Abstract

ONCODAILY MEDICAL JOURNAL

FLASH radiotherapy: A Potential Way to Protect the Developing Brain in Pediatric Oncology

Authors: Shinyoung An¹,✉

Affiliation: ¹University of Lancashire

Corresponding Author: san2@lancashire.ac.uk

DOI:10.69690/ODMJ-018-0826-7952



2nd Annual National Undergraduate Oncology Conference
Northwest (NUOC Northwest 2026)

Published: August 25, 2026

Abstract

FLASH radiotherapy: A Potential Way to Protect the Developing Brain in Pediatric Oncology

Authors: Shinyoung An¹,✉**Affiliation:** ¹University of Lancashire**Corresponding Author:** san2@lancashire.ac.uk

ABSTRACT

Introduction: Modern Paediatric Oncology is more focused on quality of survival than actual survival due to the advanced technology. Curative radiation is used for paediatric Central Nervous System (CNS) malignancies, frequently leading to the damage such as neurocognitive decline due to the high radiosensitivity of the developing brain. FLASH radiotherapy (FLASH-RT) is considered to be a potential game-changer; technique to deliver ultra-high dose radiation in milliseconds at minimum 40 gray per second (Gy/s) to separate normal tissues from malignant tissues. However, it is largely “unexplored” in clinical practice for young patients.

Methods: This study synthesises recent preclinical findings and early-phase clinical data to assess the feasibility of delivering FLASH-RT to young patients. We analyse outcomes highlighting on synaptic plasticity and neuroinflammation markers, comparing FLASH-RT and conventional radiotherapy (CONV-RT).

Results: In the preclinical studies, considerably less neuroinflammation was detected in FLASH-RT than CONV-RT where dendritic spine density was more preserved. In rodent studies, the level of cognitive performance was indistinguishable between 10 Gy FLASH irradiated cohorts and non-irradiated control

cohorts, whereas CONV-RT cohorts resulted in distinct cognitive decline. Mechanically, FLASH-RT demonstrated to minimise the production of Reactive Oxygen Species (ROS) and keep Long-term Potentiation (LTP) function of the hippocampus. As FLASH-RT has not been published yet, the paediatric clinical trials have not been authorised.

Conclusions: While FLASH-RT could be a potential strategy for transformative improvement in the quality of survival, it currently remains experimental. Future research must be established to overcome the current technical hurdles and standardise long-term safety profile.

License

© Author(s) 2026.

This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, and unrestricted adaptation and reuse, including for commercial purposes, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

To view a copy of this license, visit
<https://creativecommons.org/licenses/by/4.0/>