

EDITORIAL

Proton stereotactic body radiation therapy as a new treatment regimen: Technical development and limitation with initial clinical experience

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Stereotactic body radiation therapy (SBRT) has been shown to achieve excellent local tumor control in many cancers, including early-stage lung cancers, prostate cancers, some gastrointestinal cancers, and oligometastases. However, toxicities of SBRT using photon beams can be a major limiting factor for certain tumor locations, which can lead to severe morbidities. Recently, SBRT using proton beams has appeared as an attractive alternative to photon SBRT to overcome these toxicities through the finite proton beam range, so called Bragg peak, with no exit dose beyond the proton range, thus allowing for better sparing of normal tissues. The NRG Oncology GI003 phase 3 clinical trial, near its completion, compares photon SBRT vs. proton SBRT for liver tumors, whereas the recently activated NRG LU008 phase 3 clinical trial allows both photon and proton SBRT. Additionally, the phase 3 RTOG 1308 randomized trial of proton vs. photon radiation in unresectable stage III non-small cell lung cancer has recently completed accrual. Motivated by the NRG Oncology-sponsored proton SBRT workshop in 2022, the *Journal of Radiosurgery and SBRT* dedicates this issue to invite the speakers involved in that symposium as well as the leading institutions and investigators of those trials to contribute expert opinion, critical review, and original research manuscripts on proton SBRT to better inform best practices while awaiting results from the previously mentioned phase 3 clinical trials.

According to NRG Oncology surveys¹ from 2019 to 2022 and the proton SBRT workshop, major hurdles in

physical dose calculation and optimization followed by motion mitigation in the use of proton SBRT were overcome by clinical use of Monte Carlo dose calculation and robust treatment planning. The remaining hurdles are the adoption of multi-energy computed tomography, use of in-room volume imaging capabilities, and optimally delivered with proton computed tomography. While technical progress is being made, proton facilities can be gradually ready to perform proton SBRT. Additionally, proton SBRT has a great potential to facilitate FLASH radiotherapy, which currently cannot be performed by photon SBRT, where radiation is delivered in milliseconds at an ultra-high dose rate and may further spare normal tissue toxicity. We believe that this focused issue may serve to provide a framework for future research in proton SBRT of the liver and lung.

The Guest Editors of the special issue on proton versus photon SBRT and the Editor-in-Chief of the Journal of Radiosurgery and SBRT

REFERENCE

1. Lin L, Taylor PA, Shen J, Saini J, Kang M, Simone CB 2nd, Bradley JD, Li Z, Xiao Y. NRG oncology survey of Monte Carlo dose calculation use in US proton therapy centers. *Int J Part Ther.* 2021 May 25;8(2):73-81. doi: 10.14338/IJPT-D-21-00004. PMID: 34722813; PMCID: PMC8489489.