Cureus

Open Access
Abstract

Micro-Lattice Therapy with CK for rSCCHN, A Dosimetric Study

Weisi Yan [1] , Jiajin Fan [2]

1. Radiation Oncology, Sidney Kimmel Medical College - Thomas Jefferson University, Philadelphia, USA
2. Radiation Oncology Services, USA Mitchell Cancer Institute, Mobile, USA

Corresponding author: Weisi Yan, weisiyan@gmail.com

Categories: Medical Physics, Radiation Oncology
Keywords: grid, spatially fractionated radiation therapy (grid), lattice, lattice radiotherapy, microbeam radiotherapy

How to cite this abstract
Yan W, Fan J (August 21, 2018) Micro-Lattice Therapy with CK for rSCCHN, A Dosimetric Study. Cureus 10(8): a349

Abstract

OBJECTIVES: Treatment for unresectable locoregionally recurrent or second primary squamous cell carcinoma of the head and neck (rSCCHN) that was previously irradiated poses a challenge. Concurrent chemoradiation therapy frequently leads to severe late toxicity. SBRT can offer similar local control with potential decrease in toxicity, however, its application is often limited by tumor size and location.

Lattice therapy (LRT) is an advanced technique that extrapolates the traditional 2D GRID procedure. LRT could achieve brachytherapy level of dose concentrated in small spheres called vertices. They can be placed inside the tumor in a desirable dosimetric distribution manner which allows lower dose in the periphery of the tumor, thus not violating the tolerance of the organs at risk. Due to the dosimetric limitation of conventional Linac-Based LRT, clinical trials for LRT are mainly designed for treating large, bulky tumors. With the application of CyberKnife, we can fine tune the size of vertices in tumor and make LRT applicable to smaller sized tumor (2-5cm).

METHODS: We have used a previously treated patient with unresectable locoregionally tumor next to carotid artery as a clinical model. Two new structures (LRT Target and LRT Avoidance) were generated inside the PTV structure. The LRT Target is a set of 5mm diameter spherical structures with 10 mm center-to-center distance. The LRT Avoidance is created by extracting the LRT Target from the PTV. Treatment plans were designed to achieve mean PTV dose of about 40%-50% of the prescription dose of the Dmax inside PTV. The dose to critical OAR was optimized by setting optimization goals to lover their doses.

RESULTS: LRT can be employed to deliver ablative doses to tumor with a safe dose range to structures outside of the tumor. CK based Micro-Lattice made it possible to treat smaller sized tumor, which would lead to improved local control with similar toxicity to current SBRT techniques (BED and NTCP calculations). LRT with proper planning would prevent carotid blow-out (CBO) syndrome caused by SBRT given its intrinsic properties.

CONCLUSIONS: New clinical trials should generate data regarding the efficacy and toxicity of Micro-LRT in head and neck cancer recurrence.

Open Access
Abstract
Published 08/21/2018