ABSTRACT

Proton therapy is a promising radiotherapy method for tumor treatment, as it is able to deliver high doses precisely to tumors and minimize exposure to healthy tissues. This study analyzed the radiation dose distribution in proton therapy for pituitary adenoma tumors using various beam configurations, including one superior-inferior beam, one right lateral beam, one left lateral beam, two lateral beams, and three combination beams. The focus of the study was the dose received by the planned target volumes of gross tumor volume (GTV), clinical target volume (CTV), planning target volume (PTV), as well as organs at risk (OAR) such as brain, eye lens, eye cornea, vitreous, and cervical spine. Simulations were conducted using PHITS version 3.34 and an adult male mesh-type phantom model and a validated nozzle from Ryckman's (2011) study. The results showed that the total dose to the GTV, CTV, and PTV ranged from 44.1 Gy to 48.4 Gy, with secondary doses from very small neutron particles and photons ranging from 10-1 Gy to 10-5 Gy. The dose at OAR is below 1 Gy. The superior-inferior configuration tends to increase the dose to the brain, while the lateral configuration is more protective of the eyes. This study emphasizes the importance of beam direction selection to optimize the balance between therapeutic effectiveness and healthy tissue protection.

Keywords*: proton therapy, pituitary adenoma, organs at risk* (OARs)*, dose, PHITS, beam configurations.*