Abstract

Proton therapy has become one of the most effective treatment for prostate cancer because of it's precise dose delivery to cancer area while minimizing damage to healthy tissues. This is due to Bragg Peak property of protons which release most of their energy just before coming to a stop. This study aims to simulate impact of proton beam orientation on organ at risk (OAR) doses during prostate cancer treatment. A dose of 75 Gy is targeted at prostate cancer using proton pencil beams. Simulations were performed using Geant4 with International Commission on Radiological Protection (ICRP) 145 computational phantom. Three proton beam orientations were analyzed: posterior beam, anterior beam, and lateral beam. Results showed that for posterior beam primary OAR was rectal wall receiving a dose of 10.525 Gy. For anterior beam insensitive and sensitive parts of bladder received doses of 4.263 Gy and 3.909 Gy. For lateral beam femur and cancellous bone received doses of 11.820 Gy and 4.427 Gy. All doses received by OARs were below TD 5/5 tolerance limits for radiation therapy, indicating that these beam configurations are optimal for achieving prostate cancer dose target without causing significant complications to healthy tissues.

Keywords: *Bragg Peak, Dosimetry Simulation, Organ at Risk, Prostate* Cancer, Proton Therapy.