

Feasibility of Voluntary Deep Inspiration Breath-Hold Radiotherapy Technique Implementation without Deep Inspiration Breath-Hold-Assisting Device

Authors : Auwal Abubakar, Shazril Imran Shaukat, Noor Khairiah A. Karim, Mohammed Zakir Kassim, Gokula Kumar Appalanaido, Hafiz Mohd Zin

Abstract : Background: Voluntary deep inspiration breath-hold radiotherapy (vDIBH-RT) is an effective cardiac dose reduction technique during left breast radiotherapy. This study aimed to assess the accuracy of the implementation of the vDIBH technique among left breast cancer patients without the use of a special device such as a surface-guided imaging system. Methods: The vDIBH-RT technique was implemented among thirteen (13) left breast cancer patients at the Advanced Medical and Dental Institute (AMDI), Universiti Sains Malaysia. Breath-hold monitoring was performed based on breath-hold skin marks and laser light congruence observed on zoomed CCTV images from the control console during each delivery. The initial setup was verified using cone beam computed tomography (CBCT) during breath-hold. Each field was delivered using multiple beam segments to allow a delivery time of 20 seconds, which can be tolerated by patients in breath-hold. The data were analysed using an in-house developed MATLAB algorithm. PTV margin was computed based on van Herk's margin recipe. Results: The setup error analysed from CBCT shows that the population systematic error in lateral (x), longitudinal (y), and vertical (z) axes was 2.28 mm, 3.35 mm, and 3.10 mm, respectively. Based on the CBCT image guidance, the Planning target volume (PTV) margin that would be required for vDIBH-RT using CCTV/Laser monitoring technique is 7.77 mm, 10.85 mm, and 10.93 mm in x, y, and z axes, respectively. Conclusion: It is feasible to safely implement vDIBH-RT among left breast cancer patients without special equipment. The breath-hold monitoring technique is cost-effective, radiation-free, easy to implement, and allows real-time breath-hold monitoring.

Keywords : vDIBH, cone beam computed tomography, radiotherapy, left breast cancer

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