

Assessing the intima-media thickness and Young modulus changes of the common carotid artery in the neck region external radiotherapy based on the processing of ultrasonic images

A. Mohammadkarim¹, M. Mokhtari-Dizaji^{*1}, A. Kazemian², H. Saberi³, S. Kalbasi Anaraki⁴

1. Department of Medical Physics, Faculty of Medical Sciences, Tarbiat Modares University

2. Radiation Oncology Research Center, Cancer Institute, Tehran University of Medical Sciences

3. Department of Radiology, Imam Khomeini Hospital, Tehran University of Medical Sciences

4. Faculty of Dentistry, Qazvin University of Medical Sciences

Abstract

Since it is too vital to the prevention of carotid disease in the vascular system, it seems necessary to the estimation of the elastic behavior of the carotid artery in head and neck external radiotherapy. In the present study, a total of 24 neck carcinoma patients treated with external radiotherapy had been studied. The carotid mean dose values were determined for each case by contouring the common carotid artery in consecutive CT scan images. Ultrasonography was performed from the wall region of each subject before and after the radiotherapy process. The instantaneous changes of intima-media thickness and radial movements in the arterial wall were extracted by the implementation of a maximum gradient algorithm. The results indicate that the normalized rate of absorbed dose of carotid from prescriptive dose is about 0.82 ± 0.24 . Moreover, the normalized value of Young modulus of radiation-induced carotids compared to non-irradiated carotid arteries along with increasing the intima-media-thickness is 1.58 ± 0.21 . These changes may be lead to stroke symptoms in the future.

Keywords: Ultrasonic imaging, Young modulus, Carotid artery, Image processing, External radiotherapy, Intima-media thickness.

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* Corresponding author E-mail: mokhtarm@modares.ac.ir