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Testing the reliability of gamma analysis used for the control of IMRT and VMAT plans with the incorrect dose method

Purpose Gamma index analysis and equipment are the most commonly used methods and equipment for dosimetric control. Gamma index analysis is influenced by multiple factors, and its accuracy is contingent upon various parameters and variables. However, there has been limited research on how variations or errors in dose delivery impact the results of gamma analysis, especially when conducted on a faulty system. The purpose of this work is to determine Gamma Pass Rate (GPR) consistency when across a dosimetric error and compare the different equipment results. Method A total of 12 plans were selected. For each IMRT and VMAT plans dose distribution measured with both electronic portal imaging device (EPID) and MapCHECK 2 (MC2). 49 fields evaluated. These measurements are taken with 2 different output values (100 cGy = 100 MU / 104 cGy = 100 MU). %3/3mm and gamma index > %95 used for the evaluation. Results All our measurements were pass at 100 cGy = 100 MU for the two equipment. In case of 4% error (104 cGy = 100 MU), 38 fields were acceptable for EPID and 15 fields were acceptable for MapCHECK 2. Many fields were acceptable level even if there was an error in the dose. Conclusion It is important to realize the results of gamma index analysis are not directly proportional to the decrease or increase at dose. Although the dose was incorrect, the plans were found to be feasible. Also, the results may vary depending on the equipment used. the presence of different results in each variable reduces the reliability of the results. For this reason innovative approaches should be investigated to improve results.

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