

ABSTRACT

The consistency of Linear Accelerator (LINAC) output is one of the key parameters in radiotherapy quality assurance, as it directly affects the accuracy of radiation dose delivery. In the treatment of nasopharyngeal cancer, the eye lens is considered a critical Organ at Risk (OAR) due to its high radiosensitivity and susceptibility to radiation-induced cataracts. This study aimed to evaluate the effect of LINAC output consistency on the radiation dose delivered to the eye lens in patients with nasopharyngeal cancer treated using Intensity-Modulated Radiation Therapy (IMRT) and to determine whether the delivered dose remained within the recommended clinical tolerance limits. A quantitative study was conducted using secondary data obtained from the daily quality control (QC) records of a Varian Unique 6 MV LINAC and eye lens dose data from the Treatment Planning System (TPS). The study included five nasopharyngeal cancer patients who received radiotherapy in 35 treatment fractions. The actual eye lens dose was calculated based on daily LINAC output variations and compared with the planned dose and the established dose tolerance. The results showed that the actual dose was slightly higher than the planned dose in all patients, with an average dose deviation of 0.37%, which remained well below the $\pm 5\%$ dose accuracy tolerance recommended for radiotherapy. The mean actual doses delivered to the right and left eye lenses were 764 cGy and 791.8 cGy, respectively, and all measured doses remained below the maximum tolerance limit of 10 Gy (1000 cGy). Although a positive linear relationship was observed between LINAC output consistency and the eye lens dose, the effect was minimal and not clinically significant. These findings indicate that stable LINAC output, supported by routine quality assurance procedures and the use of IMRT, is capable of maintaining accurate dose delivery while keeping the radiation dose to the eye lens within clinically acceptable limits.

Keywords: *Nasopharyngeal cancer, Linear Accelerator, output consistency, Intensity-Modulated Radiation Therapy, eye lens dose, quality assurance.*