Purpose: The purpose of this study is to investigate the tolerance limits of IMRT dose verification for establishing the Japanese IMRT QA guideline. For this purpose, we analyzed the results of IMRT dose verification of multicenter in Japan by statistical means.

Methods: In this study, we studied head and neck field by field plan, head and neck hybrid plan, prostate field by field plan and prostate hybrid plan, separately. For 6 institutes in Japan, we analyzed the absorbed dose differences of IMRT dose verification plans between measurement and calculation which is expressed as percentage of calculation. In first, we evaluated the statistical nature of these dose differences. Then, to estimate the tolerance limit for IMRT absorbed dose verification, we calculated the confidence limit of the above dose differences, which was introduced by Palta.

Results: For all of treatment sites and dose verification plan types, the frequency distributions of the dose differences showed the normal distribution. While the mean values of the dose differences were about equal in every case, the standard deviations for head and neck cases, in either plan type, were larger than prostate cases. The confidence limits of each case, head and neck field by field plan, head and neck hybrid plan, prostate field by field plan and prostate hybrid plan, were 4.5%, 4.0%, 3.0% and 2.4%, respectively. In head and neck cases, field by field plan, hybrid plan, the rate of the dose verification point passing criterion that 3.0% were 85.2% and 86.1%, respectively.

Conclusions: The results of our study showed that 3% is an appropriate tolerance limit of IMRT absorbed dose verification for Japanese IMRT QA guideline. However, this tolerance limit may be slightly strict for head and neck cases. In the future, it may need to set the tolerance limit for every site.

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