

Penentuan Normal Tissue Objective (NTO) pada Kasus Tumor Otak

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Abstrak

Salah satu *objective* dalam teknik IMRT adalah *normal tissue objective* (NTO). NTO memiliki beberapa parameter yang harus dikombinasikan untuk memperoleh hasil perencanaan yang optimal. Oleh karena itu, tujuan dari penelitian ini adalah menentukan pengaturan NTO paling optimal berdasarkan distribusi dosis yang diperoleh saat perencanaan tumor otak. Perencanaan dibuat dalam tiga pengaturan NTO yaitu pengaturan tanpa NTO, automatic NTO dan manual NTO. Perencanaan dilakukan pada 15 pasien tumor otak dengan beberapa variasi parameter NTO yaitu: variasi *priority* NTO 1, 50, 100, 150, 200, dan 500, variasi *fall off* (0.05, 0.1, 0.2, 0.3, 0.5, 1 dan 5) mm^{-1} dan variasi jarak NTO ke tumor x_{start} (0-10) mm. Parameter tetap yaitu: dosis awal $f_0 = 105\%$, dosis akhir $f_\infty = 60\%$. Perencanaan dievaluasi menggunakan beberapa index yaitu : conformity index (CI), homogeneity index (HI), gradient index (GI), modified gradient index (mGI), monitor unit (MU) dan comprehensive quality index (CQI). Perbedaan antara tanpa NTO, automatic NTO, dan manual NTO ditentukan menggunakan wilcoxon signed rank test. Perbandingan antara tanpa NTO dan manual NTO diperoleh: CI (0.77 vs 0.96) $p = 0.002$, GI (4.52 vs 4.69) $p = 0.233$, mGI (4.93 vs 3.95) $p = 0.001$, HI (1.10 vs 1.10) $p = 0.330$, dan MU/cGy (3.44 vs 3.42) $p = 0.46$. pengaturan tanpa NTO menghasilkan conformity index yang buruk. Perbandingan antara automatic dan manual NTO adalah : CI (0.92 vs. 0.96) $p = 0.035$, GI (5.25 vs. 4.69) $p = 0.253$, mGI (4.46 vs 3.95) $p = 0.001$, HI (1.09 vs 1.10) $p = 0.004$, MU/cGy (3.31 vs 3.42) $p = 0.041$. Berdasarkan hasil tersebut diperoleh bahwa manual NTO dengan priority 100, jarak NTO terhadap target sebesar 1 mm dan dose fall off $\geq 0.5 \text{ mm}^{-1}$ menunjukkan hasil yang paling optimal.

Kata kunci : *Normal Tissue Objective (NTO), priority, fall off, external beam radiation therapy, IMRT*

Determination Of Normal Tissue Objective (NTO) for Brain Tumor Cases

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Abstract

One of the objectives in the IMRT technique is the normal tissue objective (NTO). NTO has several parameters that must be combined to obtain optimal planning results. Therefore, the aim of this study was to determine the most optimal NTO setting based on the dose distribution of brain tumor planning. The plan is divided into three NTO settings: without NTO, automatic NTO and manual NTO. 15 patients of brain tumor were re-planned using NTO priorities of 1, 50, 100, 150, 200, and 500, combination of fall off: 0.05, 0.1, 0.2, 0.3, 0.5, 1 and 5 mm^{-1} and the distance of NTO : 0, 1, 3, 5, and 10 mm. In addition, the fixed parameters are: initial dose of 105%, and final dose of 60%. Planning was evaluated using several indices: conformity index (CI), homogeneity index (HI), gradient index (GI), modified gradient index (mGI), comprehensive quality index (CQI), and monitor unit (MU). Differences among automatic NTO, manual NTO and without NTO were evaluated using the Wilcoxon signed rank test. Comparisons obtained without and with manual NTO were: CI of 0.77 vs 0.96 ($p = 0.002$), GI of 4.52 vs 4.69 ($p = 0.233$), mGI of 4.93 vs 3.95 ($p = 0.001$), HI of 1.10 vs 1.10 ($p = 0.330$), and MU/cGy of 3.44 vs 3.42 ($p = 0.460$). Without NTO produced a

poor conformity index. Comparisons of automatic and manual NTOs were: CI of 0.92 vs. 0.96 (**p = 0.035**), GI of 5.25 vs. 4.69 (**p = 0.253**), mGI of 4.46 vs 3.95 (**p = 0.001**), HI of 1.09 vs 1.10 (**p = 0.004**), MU/cGy of 3.31 vs 3.42 (**p = 0.041**). Based on these results, manual NTO with a priority of 100, distance between NTO and target of 1 mm and dose fall off $\geq 0.5 \text{ mm}^{-1}$ showed the optimal results.

Keywords: Normal Tissue Objective (NTO), priority, fall off, external beam radiation therapy, IMRT

Pembimbing Akademik

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