**Purpose/Objective(s)**

Weekly offline adaptive inverse planning optimization needs to be performed during the H&N cancer adaptive radiotherapy. To reduced clinical load, as well as improving planning reliability, we developed an automatic adaptive inverse planning method, and evaluated this method retrospectively by comparing it to the manual adaptive inverse planning.

**Materials/Methods**

An iterative method was developed for the adaptive inverse planning automation. The expected treatment dose in organs of interest constructed using the previous and on going treatment plans, and daily CBCT images was utilized to setup an initial criteria for each organ in the objective function. Following the initial inverse planning optimization, the achieved objective value was used to modify the previous criteria in the objective with respect to a predetermined formulation, and then a new inverse planning optimization was repeated accordingly. The iteration was stopped if there was no clear improvement in the objective. Figure 1 shows the flow chart for the automatic plan algorithm.

The automatic planning method was evaluated using the pre-treatment planning CT and daily CBCT images obtained during the entire treatment course of 10 H&N cancer patients. The evaluation was performed by comparing the total expected treatment dose in all organs of interest constructed using the automatic plan and a manual plan respectively. The manual adaptive inverse planning was performed by a single planer following a fixed rule of selecting objective criteria. The rule was try to reduce a 5% from the currently achievable organ dose-volume parameter obtained from the expected treatment dose.

**Results**

The adaptive planning was automatically completed for 30% of cases with the average 8 iterations per case. Figure 2 shows the variation of the DVH index of all organs of interest during the iterative progress for each patient. Minor manual adjustment on the target coverage was needed for the other 70% planning.

**Conclusions**

Our study demonstrated adaptive inverse planning can most likely be performed automatically in clinical implementation. The quality of the automatic planning is commonly superior to the manual planning if “try-n-error” is not applied in the manual planning process.

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