

# Artificial Intelligence Planning: A New Approach to Reinventing the Quality and Efficiency of Multicancer Radiotherapy Planning

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## Abstract

**Introduction** To analyze the dosimetry differences and advantages of Auto-Planning (AP) and manual planning (MP) for right breast cancer, esophageal cancer and rectal cancer. **Methods** A retrospective study of three groups of patients (33 cases of simultaneous integrated radiotherapy for esophageal cancer, 31 cases of breast conservation of right breast cancer, and 30 cases of rectal cancer) receiving radiotherapy. We used the Auto-Planning module and manual planning method of Pinnacle 16.2 planning system to design VMAT radiotherapy plans for patients, respectively. Blind review evaluation of doctors was introduced to evaluate plans. We compared the differences between the two methods in terms of PTV dose parameters, OAR dose constraints, dose gradient, machine units (MU), effective optimization time of the plan, passing rates of quality assurance (QA) plans and planning generation and optimization process. The paired t-test analysis was performed using SPSS software, and the data were expressed as mean  $\pm$  standard deviation.  $P < 0.05$  indicated that the difference was statistically significant. **Results** Both planning methods met the clinical requirements. No significant differences were observed in the targets evaluation of three groups, and only the CI of rectal cancer targets increased by 6%. In the AP of right-sided breast cancer, the mean dose of the healthy lung, affected lung, whole lung, heart and cord in the observation group was lower than the control group, and the difference was statistically significant ( $P < 0.05$ ). In the AP of esophageal cancer, the dose evaluation parameters of lung, heart and cord were better than MP. In the AP of rectal cancer, V40 of the left femoral head, V40 of the bladder, the average dose, the V30 of the small intestine, and the maximum dose of AP were all less than MP except the left femoral head. The AP for three groups of planning manual debugging times, MU values, and total planning debugging times are all better than MP. The volume of 20%, 40%, 60%, and 80% of the prescribed dose, and the AP was less than the MP. The probability of doctors blindly selecting AP is more than 90%. The passing rates of QA plans for the two methods were not significantly different. **Conclusions** AP can provide plan quality that same to or better than MP under the condition of ensuring target coverage. AP simplifies the planning process, shortens planning time, and improves work efficiency. We suggest that medical units with Auto-Planning module configuration can prefer AP as the design of radiation therapy planning for esophageal cancer, right breast cancer, and rectal cancer.

## **Keywords**

Automatic Planning, Esophageal Cancer, Breast Cancer, Rectal Cancer, Radiation Therapy