CHAPTER 5 CONCLUSION AND SUGGESTION

5.1 Conclusion

Based on the results of this study, which compared dose distributions for glioblastoma patients using PRIMO software and the Eclipse Treatment Planning System (TPS), the following conclusions are drawn:

1. The Homogeneity Index (HI) values between PRIMO Monte Carlo simulation and Eclipse TPS (AAA) calculation showed relatively comparable results across all five glioblastoma patients, indicating that the dose homogeneity within the planning target volume (PTV) predicted by the AAA algorithm does not differ significantly from the Monte Carlo simulation results.
2. The Conformity Index (CI) values obtained from PRIMO Monte Carlo simulation were consistently lower compared to those calculated by Eclipse TPS (AAA). This discrepancy was primarily attributed to two contributing factors: the inherent limitation of AAA in accurately modeling lateral electron transport in the penumbra region and at tissue interfaces, which may result in an overestimation of conformity, and the difference in field aperture geometry arising from the substitution of MLC80 with MLC120 during the replanning process in PRIMO.
3. Monte Carlo simulation in PRIMO identified OAR dose values approaching or exceeding QUANTEC tolerance limits in certain patients, particularly for the brainstem and optic nerves, which were not as clearly apparent from TPS calculations alone. This underscores the clinical value of Monte Carlo-based independent dose verification as a supplementary quality assurance tool in glioblastoma radiotherapy treatment planning.

5.2 Suggestion

Based on the results of this study, the following recommendations are suggested:

1. Future studies should perform dose distribution comparisons using the same MLC type between PRIMO Monte Carlo and the TPS, in order to eliminate the geometric uncertainty introduced by MLC substitution and to more accurately isolate the dosimetric differences attributable solely to the difference in calculation methods.
2. A larger number of patient datasets and different cancer cases should be included to improve the generalizability of the findings and to evaluate whether the observed dosimetric differences between AAA and Monte Carlo are consistent across different treatment sites and tumor geometries.
3. Dose distribution comparisons should be performed using different beam energy levels to evaluate whether the dosimetric differences between AAA and Monte Carlo simulation observed in this study are energy dependent, which would provide a more comprehensive understanding of the accuracy of the AAA algorithm under various clinical conditions.