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The Effect of Inhomogeneity Correction Algorithm in the Radiotherapy Treatment Planning of Lung Cancer

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Purpose: The selection of inhomogeneity correction algorithm gives direct influence on the result of treatment plan in planning of radiation therapy of lung cancer. Therefore, the change in dose with or without inhomogeneity correction algorithm was compared and analyzed and the actual measurements were compared with use of ionization chamber and films to assess the optimum inhomogeneity correction algorithm. Materials and Methods: To assess inhomogeneity correction algorithm, inhomogeneity correction phantom was self-manufactured with use of acryl and cork. The outside(30×30×30 cm3) of the phantom was made of acryl(PMMA) and the inside(29×29×1 cm3, 30 sheets) was made to imitate lung part with use of cork that had similar density with that of lung. CT images were obtained at 5 mm intervals in 120 kV, 200 mA condition with use of CT(SOMATOM PLUS4, SIEMENS, Germany). To compare and analyze the result of treatment with or without inhomogeneity correction algorithm, radiotherapy treatment planning system(RTPs, PROWESS 3DTM, PROWESS, USA) was used and the fast photon algorithm and scatter photon algorithm, which are adopted by RTPs, were applied. The change in doses with or without inhomogeneity correction algorithm was compared and analyzed and the actual measurements were compared with use of ionization chamber and films to assess the optimum inhomogeneity correction algorithm. The assessment of radiotherapy was performed with use of dose-volume histogram (DVH), isodose curve, and dose statistics. Results: The effective measurement depth with fast photon algorithm was 6.65 cm in inhomogeneity correction algorithm with one port radiotherapy plan and was 7.30 cm with scatter photon algorithm. The maximum differences in the doses with inhomogeneity correction algorithm were 35.87% and 34.24% in case of two-port radiotherapy plan. It was also found that the difference in actual doses which was actually measured with use of ionization chamber and films according to the treatment plan by algorithm was within ±5%. Conclusion: The optimum inhomogeneity correction algorithm could be assessed by comparing and analyzing the change in doses with or without inhomogeneity correction algorithm with use of self-manufactured inhomogeneity correction phantom and by comparing the actual measurements with use of ionization chamber and films.

Keywords : Inhomogeneity Correction Algorithm, Radiation Treatment Planning, Inhomogeneity Correction Phantom