OPTIMIZATION OF POSITION AND EXPOSURE TIME OF RADIOACTIVE SOURCE IN HIGH-DOSE-RATE AFTERLOADING BRACHYTHERAPY

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In the high-dose-rate afterloading brachytherapy unit, the 3.5 mm in length and 1.1 mm in diameter Ir-192 single source is remotely and programmably moved into the preset positions which can be 2.5 or 5.0 mm apart for a certain period of time. Theoretically, there are infinite arrangements of position and exposure time of the radioactive source for a given treatment. In order to produce satisfactory isodose curves, the best number and allocation of the source position and exposure time must be predetermined. Optimization of number, location and exposure time of the source can be calculated involving linear equations. Unfortunately, by direct calculation the exposure time can be negative for some positions. In this study, a mathematical method is developed to calculate the number and proper positions of the source and the exposure time in each position, the dose distribution can be plotted out by a plotter of CMS treatment planning system, By this algorithm we match the dose requirement as clinically needed. For practical consideration, a table of source dwelling-time for cylindrical dose contour is constructed. The dose distributions were found to corresponding within 4% as initially requested. Furthermore, using the multiple linear equation one can determine the position and exposure time for up to three needles on single plane brachytherapy. This principles can be applied to more complicated treatment plannings. [Therapeut Radiol Oncol 1995; 2: 41-45]

Key words: Afterloading high-dose-rate brachytherapy, Treatment planning, Optimization.

INTRODUCTION

The accurate determination of source-position and dwell times needed to obtain a required dose distribution is of prime importance in intracavitary radiotherapy using a single source, remote afterloading system such as the MicroSelectron. During treatment

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