Film Based Treatment Plan Validation for a New Vaginal Applicator Using the Xoft Axxent® 50 kVp Miniature X-ray Source

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INTRODUCTION

Purpose

30 mm Applicator

Visual comparison of isodose contours

Materials that have poor transmission characteristics for low energy x-rays such as those emitted by the Axxent (Xoft, Inc., Sunnyvale, CA).

RESULTS

Introduction

A plot of dose from a simulation plan evaluated using the Xoft Axxent® 50 kVp Miniature X-ray Source (Xoft, Inc., Sunnyvale, CA) is shown in Figure 1. The isodose lines and mask were created from the Xoft BrachyVision software plan. The isodose mask was superimposed on the calibrated film image from treatment with a 35 mm applicator. False color scale is at upper right.

Background: Axxent® System

The Axxent® Brachytherapy System was designed as a new method of delivering local radiation therapy for women undergoing radiation therapy for early stage breast cancer. Unique attributes of the Axxent® System:

• Radiation is emitted only during treatment when the X-ray source is turned on.
• No radioactive materials handling and safety issues
• No ionization chamber or EBT film precision issues

The Axxent® X-ray Source delivers high-dose rate, low energy radiation treatment without the use of radioactive isotopes. The Axxent® Irradiation (APBI) using an inflated balloon placed into the patient’s vagina enables the procedure to be done in a minimally shielded setting under the supervision of a radiation oncologist.

METHODS

Analysis

A plot of dose from a simulation plan evaluated using the Xoft Axxent® 50 kVp Miniature X-ray Source (Xoft, Inc., Sunnyvale, CA) is shown in Figure 1. The isodose lines and mask were created from the Xoft BrachyVision software plan. The isodose mask was superimposed on the calibrated film image from treatment with a 35 mm applicator. False color scale is at upper right.

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Ionization Chamber Data

Table 1. Ionization Chamber Data

<table>
<thead>
<tr>
<th>Applicator Diameter</th>
<th>2 Gy</th>
<th>5 Gy</th>
<th>7.5 Gy</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>0.001 ±0.005</td>
<td>0.001 ±0.005</td>
<td>0.002 ±0.005</td>
</tr>
<tr>
<td>25 mm</td>
<td>0.001 ±0.005</td>
<td>0.001 ±0.005</td>
<td>0.002 ±0.005</td>
</tr>
<tr>
<td>30 mm</td>
<td>0.001 ±0.005</td>
<td>0.001 ±0.005</td>
<td>0.002 ±0.005</td>
</tr>
<tr>
<td>35 mm</td>
<td>0.001 ±0.005</td>
<td>0.001 ±0.005</td>
<td>0.002 ±0.005</td>
</tr>
</tbody>
</table>

CONCLUSION

The Axxent® Brachytherapy System for the new approach can provide vaginal applicators that are simple to use with minimal radiation exposure. These applicators are designed to fit inside the vagina and apply radiation directly to the tumor bed. The Axxent® X-ray Source delivers high-dose rate, low energy radiation treatment without the use of radioactive isotopes. The Axxent® Irradiation (APBI) using an inflated balloon placed into the patient’s vagina enables the procedure to be done in a minimally shielded setting under the supervision of a radiation oncologist.