VALIDATION MEASUREMENTS OF DOSE DELIVERED FROM A NOVEL ELECTRONIC BRACHYTHERAPY X-RAY SOURCE
Steve Axelrod, Ph.D., Earl E. Dozier and Thomas W. Rusch, Ph.D., Research & Development, Xoft, Inc., Fremont, CA

ABSTRACT

Objective: To measure the absolute dose delivered and dose distribution from the Xoft Axxent™ electronic brachytherapy source during simulated treatment to a water phantom using two and four applicators and examine the necessity to validate the brachytherapy treatment plans.

RESULTS

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METHODS

Dosimetry-Based Measurements

Matching of Shape of Isodose Contours to Data

RESULTS

SUMMARY

The Xoft Axxent™ electronic brachytherapy system, consisting of the Xoft Source, the Balloon Applicator and the Controller, was designed to perform electronic brachytherapy treatments replacing fiducial methods, which are a traditional means of delivering precision radiation therapy. The Xoft Axxent™ Balloon System consists of a novel miniature x-ray source operating at 40, 45 or 50 kVp and a balloon applicator which is surgically placed within the breast. During treatment, the source is retracted under computer control through the balloon applicator, delivering a high dose rate of x-radiation to the innermost contours of the tumor bed.

The Xoft Axxent™ Balloon System was used to deliver brachytherapy treatments to the inner surface of a body cavity such as an excised milk goat (Capra hircus) using the treatment planning system (TPS) of Xoft. The treatment planning system (TPS) sets nominal dwell times based on the nominal TG-43 parameters, and the controller adjusts these times based on the source strength as measured in a well chamber just prior to use. Dose rate constants were measured at 40 and 50 kVp with uncertainty in physical positioning in the fixture and that in the balloon position of approximately 1 mm.

The treatment planning system (TPS) was produced using the same x-ray balloon prescription measured on Nubian milk goats as the TPS input as shown in Figure 1. The Balloon Applicator consists of a balloon catheter and an external balloon controller. The balloon is inflated with a radio opaque material and filled with saline until the balloon reaches a fixed degree of inflation. The upper catheter guide enters the balloon through the guide catheter while the controller provides a water seal to maintain the balloon inflated during treatment.

The treatment planning system (TPS) was used to produce treatment planning systems (TPS) with the Axxent™ Balloon System. The treatment planning system (TPS) was tested using a water phantom and a water-filled balloon. The treatment planning system (TPS) was used to produce treatment planning systems for treatment with the Axxent™ Balloon System.

The treatment planning system (TPS) with the Axxent™ Balloon System was used to deliver brachytherapy treatments to the inner surface of a water-filled balloon. The treatment planning system (TPS) was used to produce treatment planning systems for treatment with the Axxent™ Balloon System.

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