Evaluation of the Effects of Filtration on the Xoft Axxent® Source

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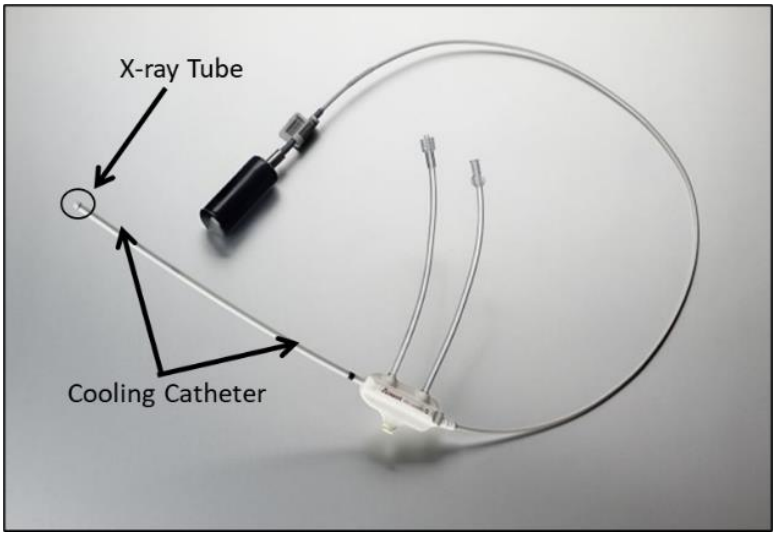
The Xoft Axxent® electronic brachytherapy source is a miniature, low energy and high dose rate x-ray tube that operates at tube potentials ranging from 40 to 50 kVp. Previous works have characterized the older, water cooled S7500 Axxent® sources, which were water cooled. A newer S7600 source has recently been introduced which used a Galden® coolant with a density of 1.72 g/cc. The introduction of this coolant can result in further filtration of the source spectrum and can influence the dose delivered from these sources compared to the S7500 sources.

The Axxent® sources can be used to treat a variety of cancers including breast cancer, skin cancer, and gynecological cancer. The treatment of gynecological cancers requires the use of a titanium cervical applicator. The use of this applicator causes further filtration of the source, resulting in a reduced dose rate of the source, a more monoenergetic spectrum, and a larger average energy. These modifications to the source output can influence the dose delivered from the source as well as influence the biological effects of the source. Thus, the purpose of this work is to dosimetrically and biologically characterize the newest Axxent® source model with and without the titanium cervical applicator present.

Measurements made with the Attix Free Air Chamber, TLD 100 microcubes, an A26 microionoization chamber, and EBT3 film were used to characterize these sources and benchmark Monte Carlo models in both TOPAS and EGSnrc for determining modified TG43 dosimetry parameters Additionally, clonogenic survival assays, comet assays, and chromosomal instability assays were performed using HeLa cells to determine the biological effects of these sources.



The Xoft Axxent® source