Purpose:

To characterize the dosimetric properties of a new cervical applicator designed for the Xoft 50 kVp X-ray Electronic Brachytherapy (eBx) system.

Methods:

The Axxent Cervical Applicator was developed to treat invasive cancer of the cervix using the existing Xoft Axxent Controller and X-ray source. This applicator is a Henschke-type design, consisting of a central tandem with ovoids mounted on the distal end of colpostats on either side. Filtration through the thin-walled titanium tandems and colpostats allows for improved dose penetration, lowering the surface dose and reducing the dose to non-target tissues. Dose profiles in a plane parallel to the straight, 15 degree, 30 degree, and 45 degree curved tandems were measured using GAFChromic EBT2 film. The tandem depth dose was calculated and the dose profile was compared to the distribution calculated using Varian BrachyVision treatment planning software.

Results:

The dose measured within 1.5 mm of the surface of the tandem was 6.4 +/- 0.4 times the dose at 2.0 cm for all curvature tandems measured. The maximum dose near the surface was 6.8 times the 2.0 cm dose. The dose rate in water for a nominal strength source at 2.0 cm from the centerline of the tandem was 24 +/- 3 Gy/hr. The ovoids produced 35 +/- 1 Gy/hr at a distance of 2.0 from the colpostat centerline. Dose profiles agree with expectations to within 10% over the majority of the treatment volume out to 2 cm.

Conclusions:

The Axxent Cervical Applicator can be used to treat cervical cancer using eBx with the Xoft X-ray Source. Dose profiles measured for each tandem compare well with the profiles expected from the treatment planning software. Titanium filtering produces improved dose penetration resulting in a lower surface - Point A dose ratio comparable to that of Ir-192 and Cs-137.

Funding Support, Disclosures, and Conflict of Interest:

Research supported by Xoft - a subsidiary of iCAD