

AbstractID: 11766 Title: Dosimetric Comparison of Superficial X-Rays and a Custom HDR Surface Applicator for the Treatment of Superficial Cancers.

**Purpose:** The purpose of this study was to design and characterize a custom HDR applicator for the treatment of cancers in the region 0-5 mm, comparing it to the dosimetric properties of the Maxima R-100 superficial x-ray unit. Accelerator produced electrons of energy 4-6 MeV with the addition of a buildup bolus are in competition with superficial X-rays and are very well suited for the treatment of shallow lesions as the maximum dose,  $D_{\max}$ , is brought to the surface. With this applicator, HDR may be a modality suited for treatment of Basal and squamous cell carcinomas, Kaposi's sarcoma, and Merkel cell carcinomas.

**Method and Materials:** The superficial machine was characterized in terms of percent depth dose, beam profiles, and dose rate. Similar measurements were taken from a Varian Varisource HDR unit applying a newly designed copper HDR applicator. Both data sets were compared in terms of dosimetric properties and clinical efficacy.

**Results:** The applicator alone had an unacceptably large dose inhomogeneity across the the HDR beam so a primary filter, modified filter, and secondary lead collimator were designed and manufactured to help shape the dose into a profile similar to the superficial applicator. Beam flatness and width were nearly replicated but beam divergence was more pronounced for the HDR applicators.

**Conclusions:** Percent depth dose measurements for the HDR applicator showed a dose fall-off nearly identical to superficial x-rays rather than the assumed inverse square dose fall-off. Flattenning the HDR beam through this filtered applicator provides means to deliver uniform dose to surface lesions with superior treatment delivery while implementing the HDR billing codes.