

3D-PRINTED PATIENT-SPECIFIC APPLICATOR FOR INTENSITY MODULATED HIGH-DOSE-RATE BRACHYTHERAPY

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T-017203

Technology Description

Inventors in Washington University's Department of Radiation Oncology have developed a method and 3D-printed applicator for intensity modulated high-dose-rate brachytherapy that surpasses conventional brachytherapy efficiency. This device is tailored to the patient's anatomy to minimize the radiation dose to healthy organs while delivering the maximum dose to the tumor. Conventional brachytherapy applicators undertreat ~40% of tumors because the radiation is delivered isotropically (equally in all directions) and clinicians must use lower doses to prevent high radiation exposure to healthy organs. This new applicator shields healthy organs from radiation and allows clinicians to use higher doses to improve clinical target volume (CTV) coverage of the tumor. Combined with patient-specific treatment planning software and quick 3D-printing, this applicator makes intensity modulated high-dose-rate brachytherapy an efficient, automated, and individualized process.



Calculated dose distributions between conventional brachytherapy and the personalized applicator. The personalized applicator has both higher and directed doses, allowing some regions to be shielded from radiation.

Stage of Research

- >99% CTV coverage of cervical cancer tumors in prototype phantom and patient studies.
 - Phantom: 99.18% (Conventional: 58.32%; 70% improvement)
 - Patient: 99.92% (Conventional: 56.21%; 78% improvement)
- Higher and directed doses compared to conventional applicators

Applications

- **Brachytherapy** to treat cervical, skin, prostate, rectal, and breast cancers, particularly intensity modulated high-dose-rate brachytherapy.

Key Advantages

- **>70% improvement in CTV coverage for potentially more efficient treatment**
 - Shields healthy organs from radiation while maximizing the dose to the tumor
 - Allows continuous radiation doses to extended and asymmetric tumors
- **Fast, automated, individualized treatment plan** easily implemented in a clinical workflow:

- Treatment planning software tailors applicator design to patient anatomy, tumor location, and prescribed dose
- Can be constructed and 3D printed in 10 hours

Patents

- US Patent Application Pending

Website

- [Justin Park Profile](#)
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