Washington University in St. Louis
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APPLICATOR DEVICE FOR REDUCING ARTIFACTS IN MR-GUIDED GYNECOLOGICAL BRACHYTHERAPY

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Technology Description

Radiation oncologists at Washington University in St. Louis have developed a patented plastic sheath applicator device to improve treatment planning and tumor targeting in image-guided brachytherapy (IGBT) for uterine and cervical cancer. Currently, high-dose rate brachytherapy is delivered to patients using intrauterine tandem and ovoid applicators which are precisely placed through image guidance (either CT or MRI). While magnetic resonance (MR) guidance is safer for patients, accurate treatment delivery with MR-compatible applicators can be limited because plastic applicators bend and deform with the patient while the metal applicators cause MR artifacts which make visualization difficult. This invention minimizes those artifacts using a plastic sheath to cover the metal tandem applicator. By reducing distortion and improving the image, the device can help clinicians visualize the exact position of the tandem applicator to optimally target radiotherapy to the tumor tissue and reduce side effects on nearby healthy cells.

Stage of Research

The inventors designed and tested a plastic sheath for a titanium cervical tandem applicator using a phantom and demonstrated that it can reduce metal artifacts. The addition of the sheath for MR images decreased the mean differences in foot-head coordinate from 0.20 cm to 0.02 cm and in diameter from 0.11 – 0.17 cm to 0.01 – 0.02 cm.

Applications

- **Image-guided gynecological brachytherapy –** for treatment planning and checking placement

Key Advantages

- **Improved tumor targeting –** plastic sheath reduces distortion artifacts in MRI which could enable more precise placement of brachytherapy placement to better target radiotherapy to tumor tissue
- **Stable placement –** unlike fully plastic applicators, the metal applicator with a plastic sheath does not bend, deform or move with patient, allowing consistent, targeted delivery of brachytherapy
- **Advantage of MRI guidance for treatment planning:**
  - using MRI guidance is safer than CT scans because it eliminates additional exposure to ionizing radiation
  - allows clinician to deliver adaptive brachytherapy based on macroscopic tumor volume and tumor regression

Patents

- Gynecological brachytherapy applicator for use in MR-guided intracavitary brachytherapy (U.S. Patent No. 9,248,310)