



2022 MCC Community Outreach and Engagement Pilot Project Award

An Interdisciplinary Approach to Quantifying Radiation Induced Vaginal Steno Cancers for the Development of a Patient-focused Biomechanical Therapeutic Device

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Scientific Abstract:

The standard curative treatment for cervical cancer is radiation therapy (RT) which also induces significant vaginal narrowing, termed vaginal stenosis (VS), in roughly 257,000 out of 291,000 current survivors in the US. This syndrome often causes pain and heavy scarring which adversely impacts clinical examinations, sexual health, psychological well-being, and over-all quality of life (QoL). This interdisciplinary research project will design, build, and clinically validate a comfortable, effective, and automated inflatable balloon VS treatment device. The working hypothesis is *“Computer simulations of inflatable balloon driven VS dilation will correspond with the progression of vaginal phantom expansion generated by an automated inflatable system”*. **Aim 1** will quantify vaginal stenosis via clinical measurements and CT imaging. We will collect patient dilator compliance preferences via a sexual health questionnaire. These data will guide computer simulations and the design of an inflatable balloon dilator system and associated treatment regimen. **Aim 2** will optimize dilator and compare simulation with benchtop results by comparing computer projections of personalized balloon driven vaginal diameter enlargement over specific time periods. Phantoms will be used to quantitatively evaluate dilator behavior before future proposed human testing, and a pelvic simulator at the UCSD SOM will be utilized by our interdisciplinary team of engineers and clinicians to qualitatively evaluate device ergonomics, safety, and feasibility. The proposed experiments integrate novel methods and instruments in the context of VS research, and will establish a suitable groundwork for future translational studies to systematically investigate automated, personalized serial balloon dilation as an effective treatment for VS.

Lay Abstract:

Radiotherapy induced vaginal stenosis (VS) is a common side effect affecting up to 88% of cervical cancer survivors causing pain and scarring, which adversely impacts clinical examinations, sexual health, and over-all quality of life (QoL). Efficacy of present dilation therapy for VS is limited by a lack of quantifiable metrics determining severity, an absence of standardized treatment practices, and poor patient adherence to non-personalized dilation device therapy. This research proposal plans to address the impact of VS by developing reproducible, quantifiable metrics, obtaining patient input for treatment applications, and correlating these data for engineering and validating a patient-focused treatment device to improve tolerability and efficacy. We plan to use a multidisciplinary team of physicians, mechanical and biomedical engineers to better understand and solve radiation induced vaginal scarring for cervical cancer survivors.

