

PhD Seminar Talk – I

Design, Development, and Clinical Validation of a Multispectral Transvaginal Imaging Probe for Early Detection of Premalignant Cervical Lesions – Part I

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ABSTRACT

Cervical cancer is one of the most common cancers in the female population, especially in middle and low-income countries, where the regular screening of the cervix is limited and has limited diagnostic infrastructure. Cervical cancer is primarily caused by persistent infection with high-risk strains of the human papillomavirus (HPV). Other factors that may increase the risk include smoking, a weakened immune system, long-term use of birth control pills, and a family history of cervical cancer. Cervical cancer is preventable and manageable if it is diagnosed in the early stage. There are a few conventional diagnostic methods available for cervical cancer diagnosis, which include a Pap smear test, visual inspection of the cervix by the application of acetic acid and lugol's iodine using colposcopy, HPV testing, and biopsy, etc. These diagnostic techniques are subjective and rely on experienced personnel. Thus, developments in optical imaging technologies, such as Raman spectroscopy, diffuse reflectance imaging, fluorescence imaging, optical coherence tomography, multispectral imaging, and hyperspectral imaging, particularly in environments with limited resources, create new opportunities for non-invasive, real-time, accurate, and reliable cervical cancer diagnosis. In this pilot study, a novel imaging system and analysis method for assessing the transformation zone (TZ) are proposed. The assessment of the transformation zone is a critical step toward the diagnosis of cervical cancer. The portable, battery-powered, handheld multispectral transvaginal imaging probe, GynoSight v1.0, was indigenously designed and developed to acquire multispectral images of the cervix. The suspicious region was assessed using the spectral contrast ratio, and the TZ was assessed based on the new and old squamous columnar junction (SCJ) using the ratios $R_{610/545}$ and $R_{610/450}$.