

LETTER to the EDITOR

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Cervical Cancer Screening Revolution: Advancements with Confocal Endomicroscopy

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Dear Editor

I am writing this letter for deep concern about the methods used for prevention of cervical cancer. Cervical cancer is the most common cancer in women worldwide and fourth in cancer-related deaths. In 2020, there were an estimated 604,000 diagnosed new cases of cervical cancer and 342,000 deaths worldwide [1]. Every woman is at risk for cervical cancer over age of 30 because of sexual transmission of high risk human papillomaviruses. Cervical cancer is preventable, treatable, and curable if diagnosed early with long term quality life. Because of slow progression, it gives a window of about ten years for recognition and treatment of precancerous lesion.

The current challenges for cervical cancer diagnosis are interobserver variation in clinicians' interpretation of visual inspection with acetic acid or Lugol's iodine, cost and less sensitive cytology-based screening, also lack of skilled cytologists and clinicians. HPV vaccine is effective at teenage only, further it is not cost effective for everyone. The optical modalities can assist in qualitatively and quantitatively analysing the tissue to differentiate between cancerous and surrounding normal tissues in screening as well as during follow up of surgery to detect minimal residual disease (MRD) [2]. Confocal endomicroscopy is an advanced real time instrument which can be operated by clinicians in vivo with precise and non-invasive manner unlike confocal laser scanning microscope (operated by specialized technicians) [3,4]. This newly developed technology has enabled endoscopists to collect real-time in vivo histological images or "virtual biopsies" of the various medical branches like Head and Neck squamous cell carcinoma, colorectal cancer, allergic rhinitis for observing real-time mucosal changes, gastrointestinal mucosa during endoscopy, detection of tumour boundaries for complete tumour resection in endometrial lesions. and has stimulated significant interest in the application of this technique in clinical gastroenterology [5,6,7,8,9].

Studies showed that images correlate well with the histopathological features established through histology. The sensitivity for detection of CIN was 97%. The specificity for predicting the grade of abnormality was 80% for normal-CIN1 and 93% for CIN2-CIN3 [10]. For the diagnosis of Gastrointestinal neoplasia, the sensitivity, specificity found were 81%, and 98%. Optical sections instead of physical sectioning can give in depth analysis of the cervical tissue by reducing the number of biopsies and pain of the patients. Large studies will determine the reliability of the real-time diagnosis and its potential use in

the assessment and treatment of cervical lesions [10]. Cost for the portable models of cervical endomicroscopy is less than the original confocal microscope to be implemented for low resource income countries. Automation in image analysis make it easier to handle for clinicians. Portable models can be operated by clinicians without any technical help like coloscopy.

So, in conclusion digital image analysis identifies and focuses on the abnormal areas with high sensitivity. Suspicious regions can be further confirmed using high resolution techniques. Confocal imaging is proving to be a rapid, non-invasive technique with great sensitivity and specificity compared to colposcopy. It is advantageous both for screening and diagnosis of cervical dysplastic lesions [11]. Quantitative analysis of confocal fluorescence images discriminates advanced grade cervical lesions versus low-grade cervical neoplastic lesions and normal healthy tissues, at various depths of optical imaging. This approach is useful to help clinicians in identifying high-grade cervical lesions in clinical settings. Now a days, newer imaging models are in clinical trial phase and not yet implemented for routine cervical cancer screening and diagnostics [12]. Some instruments are being used by clinicians in a real-time manner [13]. More work is essential on a large scale for the true value of this technique in clinical settings. Portable models of confocal imaging will be of great use in low-income countries.

Most importantly, early detection of cervical abnormalities through confocal endomicroscopy can lead to timely intervention and treatment, potentially improving patient outcomes and survival rates. We all should aim to decrease the healthcare burden of various types of cancers as one health mission.

Keywords: Optical imaging, cervical cancer screening, PAP test, confocal endomicroscopy, HPV vaccine, confocal laser scanning microscopy.

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