Laser induced breakdown spectroscopy (LIBS) in cervical cancer screening: A proposed tool

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Cervical cancer, one of the few highly preventable cancers through successful screening, is the most common cause of death from cancer in women in the developing world. Successfulness of any screening program depends on the screening modality being used. The present screening modalities used in the screening for cervical cancer such as, cytology; VIA; HPV DNA screening and optical spectrometry, failed in decreasing the toll of disease in developing world owing to lack of their adequate sensitivity, specificity, reproducibility, affordability, complicated, and the most important is non-real time to ensure wide coverage through screen and treat and curtail loss to follow up. This brief hypothesis postulates a screening tool aimed to have a real time screening of cervical cancer using LIBS modality. Laser Induced Breakdown Spectroscopy (LIBS) is a spectrochemical method for determining the elemental composition of various samples present in any phase, by simultaneously vaporizing and exciting the sample and thus it improves the spectrochemical techniques by eliminating the requirement of sample pre-treatment. LIBS system focuses a high peak power laser pulse onto a targeted material to produce a laser spark or microplasma. Elemental line spectra is created, collected and analyzed by a fiber spectrophotometer since nano- to micro-grams of material are ablated in femto- to nano-seconds (depending on the laser pulse duration), the whole process can be considered as minimally destructive and real time.The postulated hypothesis is aimed to use laser induced breakdown spectroscopy (LIBS) in the screening of cervical cancer as trace mineral elements acts as biological signature in tissues like bones, teeth, hair, blood, etc., from the living phase and store information regarding habitat, nutrition, and other environmental conditions. Previous researches have shown significant differences in concentrations of trace elements between normal and cancerous tissue cells, so modulation of trace elements level in both benign and malignant tissues may be of potential to be used as diagnostic marker of the disease process and its possible relationship etiologically. This will be achieved by focusing a high peak power laser pulse onto the cervical transformation zone under full visualization, as it is the location where cervical dysplasia most often occurs and used for cervical cytology scrapings and VIA and recording and analyzing the emission wavelength. The technique is exemplified by suggested use of LIBS in studying biological samples such as tissues, gall stones, biological aerosols and in vivo cancer detection. Finally, the hypothesized concept can also be used in other fields like forensic medicine in determining the time of death of an individual by assessing the change in the trace element concentration in different body parts with time and in suspected snake bite cases, to whom we just keep under observation, by determining the change in serum carbon and nitrogen which is the main component of snake venoms as like any other protein to just rule out envenomation in real time.