Abstract

Indentation Technique for the Examination of Nanomechanical Properties of Human Tissues

The detection techniques used for cancer management range from molecular assays to radiodiagnosis. Although these methods provide clinical information on the presence of cancer, limited information on the metastatic potential of the cancer cells are usually available before commencement of therapy.

In this study, normal and cancer resected human breast and colorectal tissues were selected due to their increased incidences in the society. Each tissue was cut and attached to a coverslip, which is then adhered to a metal disc using a double-sided tape. The assembly was then placed on an atomic force microscope (AFM) stage. About 50 µl of phosphate buffer saline was added to the surface of the tissue specimen while 20 µl was added to the AFM probe. After creation of water column between the sample and AFM probe, the specimen was then indented for nanomechanical characterization.

Initial results from indentation curves shows that the samples are not elastic in nature as there is lag between the approach and retract curves. This indicates the general Hertz's law will not be applicable for the specimens under consideration. An average Young's modulus (which represents stiffness) of 2.12±0.22 MPa was obtained for normal colorectal tissues while a values of 44.186±20.65 kPa was obtained for the colorectal cancer tissue specimen. However, results from the breast tissues indicate Young's moduli of 2.17±0.42 and 207±16.01 kPa for the normal and cancer tissues respectively.

The results obtained show that the normal tissues are more rigid that cancer specimens at the nanoscale level.

Further measurements are ongoing to acquire the topography of the tissues in liquid while additional force curves are being acquired to help improve the statistical significance of the Young's modulus data.