AbstractID: 8982 Title: Characteristics of thermal elastic shear wave (TESW) propagation in dermis for the diagnosis of the superficial tissue damage in radiation therapy

Measurement of tissue radiation damage quantitatively in radiation therapy is very important to optimize the therapeutic treatment. Ionized radiation induces homogenization of the extracellular matrix that is synthesized by fibroblast and the randomization of the orientation of the collagen fibers in dermis. If the dermis is exposed by ionized radiation, a thermal elastic shear wave (TESW) which propagates in dermis becomes harmonic wave. Otherwise, an inharmonic wave is expected because of inhomogeneous and the anisotropic properties which include rigid modulus and density of dermis. A polarized optical heterodyne Michelson interferometer(Fig.1) was setup in order to measure the transverse displacement of TESW and analyze the propagation mode of the shear wave in dermis(Fig.2). The detection sensitivity of the displacement is 1 nm and the dynamic range is 150 nm in this arrangement. The lowest dose that can be detected by the exposure of using ^{60}Co radiation on porcine dermis is 1 cGy. A linear relation ship of absorbed dose versus wave number in a range of 1 cGy to 500 cGy is obtained in the experiment(Fig.3). The results in a novel method of quantitative determine absorbed dose in terms of mechanical properties of porcine dermis by optical means. In addition, the linear range of absolute dose by this method in able to provide the preferential data in clinical radiation therapy and verify dermis to be the useful biological dosimeter.

Keyword: Thermal Elastic Shear Wave (TESW), Dermis damage, Biological dosimeter, Polarized Michelson interferometer