MSE SEMINAR

March 31, 2017
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

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“Effects of Repeated Biaxial Loads on the Creep Properties of Cardinal Ligaments”

Abstract

The cardinal ligament (CL) is one of the major pelvic ligaments providing structural support to the vagina/ cervix/uterus complex. This ligament has been studied mainly with regards to its important function in the treatment of different diseases such as surgical repair for pelvic organ prolapse and radical hysterectomy for cervical cancer. However, the mechanical properties of the CL have not been fully determined, despite the important in vivo supportive role of this ligament within the pelvic floor. To advance our limited knowledge about the elastic and viscoelastic properties of the CL, we conducted three consecutive planar equi-biaxial tests on CL specimens isolated from swine. Specifically, the CL specimens were divided into three groups and loaded to 3 different equi- biaxial loads that kept constant for 1200 s three times. The two axial loading directions were selected to be the main in-vivo loading direction of the CL and the direction that is perpendicular to it. Using digital image correlation (DIC) methods, the in-plane Lagrangian strains in these two loading directions were measured throughout the tests. The results showed that CL was elastically anisotropic, as statistical differences were found between the mean strains along the two axial loading directions for specimens in all 3 groups The greatest mean normalized strain (or, equivalently, the largest increase in strain over time) was measured at the end of the 1st creep test (t = 1200 s), regardless of the equi-biaxial load magnitude or loading direction. Mean normalized strains during the 2nd and 3rd creep tests (t = 100, 600, and 1200 s), along each loading direction, were not statistically different. Isochronal data collected at different equi-biaxial loads indicated that the CL may be a nonlinear viscoelastic material. Overall, this experimental study offers new knowledge of the mechanical properties of the CL that can guide the development of better treatment methods such as surgical reconstruction for pelvic organ prolapse and radical hysterectomy for cervical cancer.

Biosketch

Adwoa Baah-Dwomoh is currently pursuing a PhD in Materials Science and Engineering. She received her bachelor’s degree in Materials Science and Engineering from Virginia Tech in 2010 and a master’s degree in Materials Science and Engineering from the University of Florida in 2012. Her research interests are biomaterials for biomedical applications and biomechanics. Adwoa is co-advised by Dr. Raffaella De Vita and Dr. Rafael Davalos.