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The Effects of Chronological Age on the Cellular Mechanics of Human Dermal Fibroblasts Z. PAN, V. HUNG, S. KAMBHAMPATI, S.R. GE, M. RAFAILOVICH, Mat Sci & Eng Dept,SUNY Stony Brook, K. GHOSH, R. CLARK, BME Dept, SUNY Stony Brook, Y.J. LIU, T. NAKAMURA, Mech Eng Dept, SUNY Stony Brook, X.Z. SHU, G. PRESTWICH, Med Chem Dept, Univ. Utah — It is often observed that older people display diminished wound healing abilities. Understanding of this phenomenon is important for many in vivo applications of tissue engineering. In this study, the cell mechanics of dermal fibroblasts from 25, 40 and 84 years old female subjects were compared. These cells were cultured on functionalized hyaluronic acid hydrogel substrates which emulated physiological conditions in dermal tissue. The deformation of the substrate caused by cellular traction forces was detected by tracing the displacement of fluorescent beads embedded in the substrate using Digital Image Speckle Correlation. Then cellular traction forces were quantitatively determined by Finite Element Method in a linear elastic model with a high spatial resolution. These results were correlated with auxiliary measurements of substrate modulus, cell modulus and migration. We found that with increasing age, the magnitude of the cellular traction forces diminished. Similarly, the ability of the cells to adapt to changes in the mechanical properties of their environment and migrate was also impaired. The interrelationship between these factors and wound healing will be discussed. This work is supported by NSF-MRSEC program.

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