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In-situ AFM measurement of single fibrin fiber stiffness before and after addition of Factor XIII JOHN HOUSER, E. TIMOTHY O'BRIEN, Department of Physics and Astronomy, University of North Carolina at Chapel Hill, SUSAN T. LORD, Department of Pathology and Laboratory Medicine, University of North Carolina at Chapel Hil, RICHARD SUPERFINE, MICHAEL R. FALVO, Department of Physics and Astronomy, University of North Carolina at Chapel Hill
— Fibrin fibers are the main structural component of blood clots. Ligation of fibrin by native Factor XIII (FXIII) serves to fine tune the mechanical properties of the clot. Mechanical alteration is important because a clot must be stiff enough to resist forces from blood flow but compliant enough to prevent embolism (fracture). Cone and Plate measurements of fibrin gels, which represent the vast majority of mechanical measurements on fibrin, show that FXIII increases clot stiffness. More recently, measurements on individual fibrin fibers show that they exhibit remarkable extensibility, breaking at strains up to 300%. As of yet, the origin of this extensibility is not fully understood. The different responses of ligated and unligated fibrin fibers can give us clues as to it's mechanism of extension. We use a combined fluorescence/atomic force microscope to stretch individual, isolated, fibrin fibers and then compare force extension curves of the same fiber before and after addition of FXIII. We found up to a 3.5-fold increase in fiber stiffness after addition of FXIII. We also show stiffening of individual fibrin fibers after crosslinking by gluteraldehyde.

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