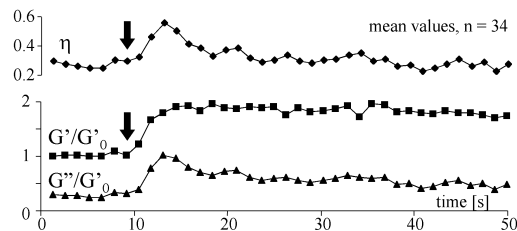


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**CONTRACTILE RESPONSE OF HUMAN AIRWAY SMOOTH MUSCLE
CELLS IN CULTURE**

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We have extended magnetic twisting cytometry (Science, 260:1124-7, 1993) with an optical detection method to probe the contractile response of individual human airway smooth muscle cells in culture. Ferromagnetic beads (4.5 μm) coated with Arg-Gly-Asp (RGD) peptide were bound to $\beta 1\alpha 5$ integrins on the cells. The beads were magnetically twisted with a sinusoidal field of 25 Gauss at a frequency f of 0.75 Hz. The resulting oscillatory bead displacement was recorded with an accuracy of 5 nm (rms) using a phase-locked video camera. Storage modulus (G'), loss modulus (G'') and hysteresivity (η) could be determined with a time resolution of 1.3 s. With addition of histamine (10 μM) at $t=60\text{s}$ (see arrows), G' doubled within 3 seconds; G'' increased transiently up to 4-fold within 3 seconds and returned to an increased plateau level within 15 seconds. η (the ratio G''/G') increased transiently from 0.25 to 0.5 and returned to baseline within 15 seconds. The increase of G' and G'' after activation seems too fast to reflect cytoskeletal reorganization, and more likely reflects acto-myosin crossbridge formation.



Further, the transient increase in η is consistent with a transient increase in crossbridge cycling rate before the muscle reaches a latch state. These findings in a cell culture system express the essential mechanical features that are characteristic of the contractile response at a tissue level.

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