

X-ray diffraction studies on the effect of reduction of stretch velocity in tetanized frog skeletal muscle by a CCD-X ray detector

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Introduction

When moderate stretch velocity is suddenly reduced during stretch in tetanized skeletal muscle, tension rises during the first part of stretch, and then starts to decay. To investigate molecular mechanism under-lying the stretch velocity sensitive force response to stretch, we measured the intensity changes of the meridional reflections of the X-ray diffraction with 15ms time resolution, which give information about behavior of actin-myosin linkages.

Materials and methods

The sartorius muscle fiber was mounted isometrically at in length and set to monochromatized X-ray beam path of wavelength 0.155nm from beam line 15A of synchrotron radiation. The muscle fiber was tetanized at 20Hz and then the muscle was stretched with moderate fast velocity (1.5%Lo, 0.15Lo/s) followed by slow (1.5%Lo, 0.015Lo/s) or opposite sequence during steady state of tension by the vibrator. The intensity of the meridional reflections was recorded by the CCD-Xray detector with tension. All experiments were made at 12°C.

Results

The intensity changes of 143 and 215 meridional reflection (I_{143} , I_{215}) with fast stretch followed by slow and opposite sequence are shown Fig.1A and 1B. The I_{143} suddenly decrease during early phase of isometric tetanus and then recovered to lower level during steady state of isometric tetanus. The I_{143} further decreased during fast stretch and then slightly decreased during followed slow stretch (Fig. 1A). In contrast, the I_{143} slightly increased during slow stretch and then suddenly largely decreased during followed fast stretch (Fig. 1B). After completion of stretch the I_{143} recovered slowly to isometric tetanus level. The I_{215} decreased monotonically during rising phase of isometric tetanus and then no remarkable changed.

References

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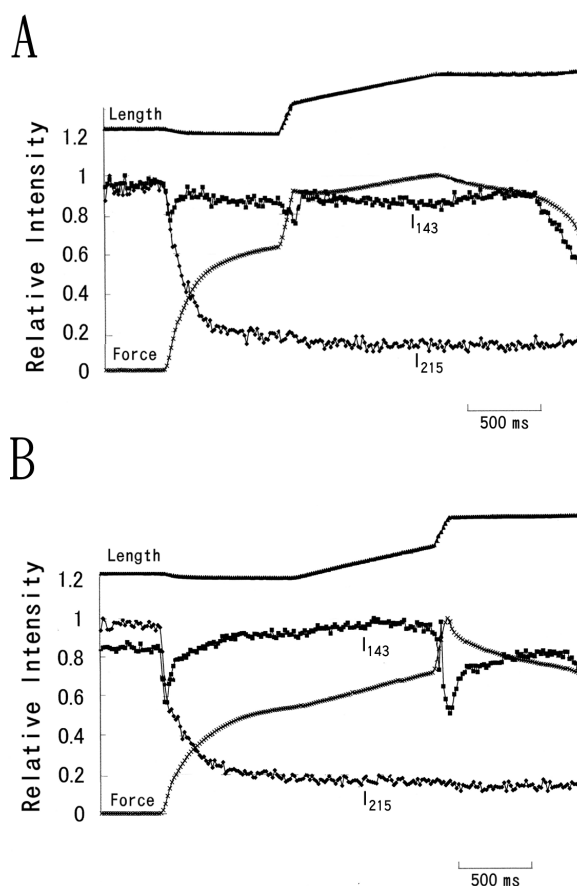


Figure 1. Length, force and intensity changes of 143 and 215 meridional reflection (I_{143} , I_{215}) during fast stretch followed by slow stretch (A) and opposite sequence (B).

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