Stretching exercise improves vascular endothelial function and peripheral circulation in patients with ischemic heart disease

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Purpose:

Recently, many studies have revealed that physical force generated by a stretch of the vascular endothelium results in an induction of endothelial derived relaxing factors such as nitric oxide. The aim of this study was to clarify the effects of stretching exercise on vascular endothelial function and peripheral circulation in patients with ischemic heart disease.

Methods:

Sixteen patients aged 65±6 years who received a phase I cardiac rehabilitation because of acute myocardial infarction (AMI) were enrolled for the present study. Stretching exercise was performed on a mat spread on the floor under the close supervision of a physical therapist. Stretching exercise consisted of five manners: wrist dorsiflexion, trunk flexion in close-legged, trunk lateral bending, trunk flexion in open-legged and trunk flexion in cross-legged. In each manner, 30-second stretching followed by 30-second relaxation was performed and repeated twice by turns. Systolic (SBP) and diastolic (DBP) blood pressure, heart rate (HR), cardio-ankle vascular index (CAVI), ankle brachial index (ABI), augmentation index (AI) and transcutaneous oxygen pressure (tcPO2) were measured before and immediately after the stretching exercise. After the power spectra of low- and high-frequency components (LF: 0.04-0.15 Hz, HF: 0.15-0.40 Hz) were analyzed in heart rate variability throughout the stretching exercise, HF and LF/HF were used as indices of parasympathetic and sympathetic nervous activities, respectively. The reactive hyperemia index (RHI) was measured twice before and after the stretching exercise, which was calculated as the ratio of the pulse volume amplitude of the fingertip measured after an upper arm compression to that before the compression and indicated the vascular endothelial function. The paired t-test was used to assess the statistical significances in vascular endothelial function and cardiovascular responses between the parameters measured before and after the stretching exercise.

Results:

There were no significant differences between SBP, DBP, HR, CAVI, ABI or LF/HF measured before and after the stretching exercise. The AI measured after the stretching exercise was significantly lower than that before the exercise ($P<0.05$). The tcPO2, HF and RHI measured after the stretching exercise were significantly higher than those before the exercise ($P<0.01$, $P<0.05$, and $P<0.01$, respectively).

Conclusions:

The present study demonstrated that the stretching exercise improved vascular endothelial function and peripheral circulation in patients with AMI.