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

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Introduction

- The severity of vascular endothelial dysfunction is one of prognostic factors for the long term outcome in patients with ischemic heart disease (IHD).
- Physical force generated by a stretch of the vascular endothelium results in an induction of endothelial derived relaxing factors such as nitric oxide.¹
- Although stretching exercise is generally performed before starting aerobic exercise as an integral part of warm-up routines, little is known about the effects of stretching exercise on endothelial function and peripheral circulation.
- The aim of this study was to clarify the effects of stretching exercise on vascular endothelial function and peripheral circulation in patients with IHD.

Methods

Patients: Twenty patients who were admitted to the Cardiovascular Center of Kitasato University Hospital due to acute myocardial infarction (AMI) and underwent a phase I cardiac rehabilitation who were identified. Patients were instructed to stretch and relax their muscles by turns during the exercise while they felt a muscle tension without pain and thoroughly relax, respectively. They counted from 1 to 30 during the 30-second stretch to avoid holding their breath during the stretching.

Measurement

Cardiovascular responses: Systolic and diastolic blood pressures (SBP and DBP) were measured using a finger sphygmomanometer (Finometer, Finapres Medical System BV, Amsterdam, The Netherlands). Heart rate (HR) was recorded using a digitized Holter electrocardiogram (FM-120, Fukuda Denshi, Tokyo, Japan).

Arterial stiffness: The cardio-ankle vascular index (CAVI) and ankle brachial index (ABI) were measured using a VaSerA CAVI instrument (VS-1500, Fukuda Denshi, Tokyo, Japan).

Heart rate variability (HRV): The power spectrum of the low frequency (LF; 0.04 - 0.15 Hz) and high frequency (HF; 0.15 - 0.4 Hz) components were analyzed from a Holter electrocardiogram. The power spectrum of the HF component is known to reflect cardiac parasympathetic nervous activity, and the ratio of LF to HF (LF/HF) indicates the predominance of cardiac sympathetic nervous activity.²

Vascular Endothelial Function: Reactive hyperemia peripheral arterial tonometry (RH-PAT) and augmentation index (AI) were monitored using Endo-PAT500 (Itamar Medical, Caesarea, Israel). The principle of RH-PAT has been described previously.³ The RH-PAT index is known to reflect the extent of reactive hyperemia.

Peripheral circulation: Transcutaneous oxygen pressure (tcPO₂) was measured using tcPO₂ device (PO-850, Sumitomo Electric Hightechs, Tokyo, Japan), for which the probe was affixed to the dorsum of the right foot in the first intermetatarsal space.

Conclusion

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

References