INTRODUCTION

The endothelium plays a vital role on the control of vascular functions. Clinically revealed, non-uniform distribution of peripheral vascular diseases throughout the arterial tree suggests that localized factors such as hemodynamic forces can modulate the endothelial dysfunction. The Doppler blood flow measurement in the lower extremities has become a routine procedure, however, there is limited knowledge concerning bilateral differences of blood flow pattern.

OBJECTIVES

The purpose of this study was to examine blood flow pattern of deep (DFA) and superficial (SFA) femoral arteries in paired legs.

METHODS

Young, physically inactive, healthy volunteers (10 females, 5 males; age 21.2 ± 2.6 years) participated in this study. During rest conditions beat-per-beat arterial pressure (MAP), heart rate (HR), blood velocity (TAM), and artery diameter (D) were registered from SFA and DFA in the left and right leg with ultrasound Doppler (fig.1). During experiment B-mode and Doppler mode were switched intermitently, 3 seconds and 10 seconds respectively. All ultrasound video output were captured (25 fps; 640x480) with DVI grabber (DVI2USB Epiphan Systems Inc.) connected to PC, on-fly compressed and stored to AVI file, (VirtualDub, Free Software Foundation, Inc. & MFX4 encoder, Microsoft) for further off-line analyses.

MEASUREMENT PROCEDURE

Heart rate (HR) and mean arterial pressure were recorded with Finameter Midi; Blood velocity and artery diameter with Sonosite Titan.

DATA ANALYSES

The mean blood flow (Q), antegrade mean blood velocities (TAMa), retrograde mean blood velocities (TAMr), antegrade shear rate, retrograde shear rate and oscillatory shear indexes rates were computed for SFA and DFA in left and right leg with custom developed ultrasound video processing software(fig. 2,3).

RESULTS

During entire recording systemic hemodynamic parameters were similar for all subjects (MAP: 92.1 ± 5.2 mmHg, HR: 65.3 ± 5.2 bpm). However there was a significant bilateral asymmetry for flow parameters in DFA: D=10.1%, Q=30.4%, TAM=24.2%, TAMr=30.3%. TAM=14.5%; SFA:D=3.3%, Q=20.1%, TAM=23.3%, TAMr=21.1%, TAMr=10.2% (fig 4). For some subjects we observed correlation between flow differences in SFA and DFA for paired leg.

CONCLUSIONS

The asymmetrical values of hemodynamic parameters between the femoral arteries in paired legs are observed in even healthy, young individuals who perform low level daily physical activity. Possibly, hydrodynamic factors which influence the endothelium are asymmetrical.

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REFERENCES


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Bilateral difference in superficial and deep femoral artery blood flow

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Figure 1. Experiment setup, and equipment. Heart rate and mean arterial pressure were recorded with Finameter Midi; Blood velocity and artery diameter with Sonosite Titan.

Figure 2. Calculation of hemodynamic parameters

Figure 3. Screenshot of custom developed ultrasound video processing software.

Figure 4. Typical values of hemodynamic parameters from six subjects; mean ± std