

Comparative Investigation of Foot Blood Flow Dynamics: A Study of the Anterior and Posterior Tibial Arteries in the Sitting vs. Standing Positions

CHASE TOMLINSON, MEL HARSH, CAMILLE L. NGUYEN, LEE J HINKLE, KALISSA COX, PAT VEHR'S FACSM, & A. WAYNE JOHNSON

Foot and Ankle Research Group; Exercise Science; Brigham Young University; Provo, UT

Category: Undergraduate

Advisor / Mentor: Johnson, Wayne (wayne_johnson@byu.edu)

ABSTRACT

Optimal blood circulation is crucial to perform activities of daily living and for living a healthy life. For example, insufficient blood flow to the foot contributes to the development of foot pathology such as plantar fasciopathy. An unshod simulation of tight and narrow shoes showed decrease blood flow to the foot. **PURPOSE:** This study investigated if there was a significant decrease in blood flow to the foot via the anterior and posterior tibial arteries when an unshod person transitions from sitting to standing. **METHODS:** Nine individuals participated in this pilot study (age=24.7±4.4, weight=72.7kg±8.8, height=1.8m±0.07). For the sitting position, participants sat on a platform while blood flow volume measurements were taken simultaneously of the anterior and posterior tibial arteries using ultrasound pulse wave. For the standing measurements, the participants stood on the platform and the same measurements were taken. A period of three minutes after standing was implemented before standing measurements were taken to ensure that blood flow adjusted to the new position. A paired t-test was used to compare sitting to standing differences within the participants. **RESULTS:** In the anterior tibial artery, average volume flow changed from 4.88 ml/min (sitting) to 2.76 ml/min (standing), a 43.4% drop in blood flow (p<0.01). In the posterior tibial artery, volume flow decreased from an average of 5.01 ml/min to 3.69 ml/min, a decrease of 26.3% (p<0.05). Total reduced blood flow between the two arteries decreased from 9.89 ml/min to 4.88 ml/min, a 50.6% drop (p<0.01). **CONCLUSION:** This study demonstrates a simple change in position significantly impacts blood flow to the foot. This suggests further research is needed to determine if there is an additive effect of footwear on this observed decrease in blood flow that may contribute to an increase incidence rate of plantar fasciopathy. This finding additionally provides rationale to investigate what mechanism the body uses to overcome positional-related decreases in blood flow.