

## **Effects of Heart Rate on Coronary Artery Flow: Insights into the Mechanisms of Tachycardiomyopathy**

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### **Background:**

Tachycardiomyopathy is the most frequently unrecognized cause of heart failure heart and is associated with tachyarrhythmia which resolves completely or at least partially after resolution of the tachyarrhythmia. Tachycardia on one hand increases myocardial oxygen demand and on the other hand decreases the diastolic interval which may reduce coronary artery flow.

### **Aim:**

Evaluate coronary artery blood flow and its relation to myocardial oxygen demand during increase in heart rate.

### **Methods:**

Twenty six patients with sick sinus syndrome and preserved atrio-ventricular conduction were evaluated. All had complete baseline transthoracic Doppler echocardiographic studies. Atrial pacing rate was increased by 10bpm from 70bpm to 110bpm. AT each stage, sampling of blood velocity of the left anterior descending coronary artery (LAD) was performed. In addition, ventricular outflow and inflow velocities as well as well as tissue Doppler imaging were performed.

### **Results:**

Increase in atrial pacing rate was associated with significant increase in LAD peak diastolic velocities however diastolic time velocity integral decreased. The product of heart rate and diastolic LAD blood velocity integral increased significantly during increase in atrial pacing rate. Coronary blood supply/myocardial oxygen demand ratio index evaluated as the ratio of LAD blood velocity integral to the product of heart rate and arterial systolic blood pressure decreased significantly with increasing atrial pacing rate.

### **Conclusions:**

Increase in heart rate is associated with increase in diastolic coronary velocity and flow, however coronary flow to myocardial oxygen demand ratio decreases which may contribute to the development of tachycardiomyopathy.