A Novel Method of Early Detection of Arteriosclerosis: Analyzing the Effect of Arterial Stiffness and Arterial Clogging on Blood Pressure during Systolic-Diastolic Cardiac Cycle

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Arteriosclerosis, which is the stiffening and thickening of an artery, is the leading cause of death globally. By the time symptoms of this disease appear, the condition has already reached a life-threatening stage. It is important that Arteriosclerosis is diagnosed early on, in order to prevent future severe conditions. The test setup consisted of an Arduino UNO controller, power supply circuit, RLC tree circuit, and voltage sensing circuit, and was operated using the Arduino code. Analogous to a blood pressure cycle from systolic of 120[mmHg] to diastolic of 80[mmHg], a transient power supply circuit was designed to deliver 12V to 8V and a cycle time of 800[ms], with 250[ms] systolic cycle and 550[ms] diastolic cycle. I analyzed the effects of arterial stiffness and arterial clogging on blood pressure during the systolic-diastolic cardiac cycle, using a RLC tree to model an artery tree. Test results showed: • Dip in Systolic Pressure ratio is inversely proportional to Arterial Stiffness, thus formulating a Normalized Early Detection Curve for Arterial Stiffness. • Reduction in Diastolic Pressure ratio is inversely proportional to Arterial Clogging, thus formulating a Normalized Early Detection Curve for Arterial Clogging. Once the systolic and diastolic pressure ratios are measured for a patient, and are normalized to typical healthy values, the early detection curves can be used to identify the % of arterial stiffness and arterial clogging present. Both of these early detection curves, alone or in combination, will offer a significant improvement over conventional methods that are limited to diagnosis at higher levels.

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