Heart Rate

Heart rate: a key determinant of myocardial ischemia
It is well known that heart rate is a key determinant of ischemia.\(^1\) Elevated resting heart rate and increase in heart rate due to any triggering factor like stress, in patients with diminished blood flow to the heart as a result of arteriosclerosis, deprives the heart muscle of oxygen. Depending on the severity of atherosclerosis it can manifest clinically as angina or heart attack (myocardial infarction). This could lead to insufficient heart muscle function, or even total death of heart muscle, resulting in congestive heart failure. Slowing the heart rate reduces the heart’s need for oxygen. Simultaneously, slowing the heart rate also increases the diastolic time, and thus increases the oxygen supply, as the myocardium is perfused during diastole.

Heart rate: a predictor of cardiovascular events
Recently, a large number of epidemiological studies have shown that heart rate is also a strong and independent predictor of cardiovascular events in a wide range of patients, including those with CAD and postmyocardial infarction.\(^2\)-\(^4\) Patients with a higher baseline heart rate have a higher risk of cardiovascular events and vice versa. This risk seems to become particularly evident with heart rate above 70 bpm.\(^4\) Reducing the heart rate could reduce the risk of cardiovascular events.\(^5\)

Need for pure heart rate reduction
β-Blockers are among the current treatment options to lower heart rate, improve cardiac function, and reduce cardiovascular events in postmyocardial infarction patients and in heart failure patients.\(^5\)-\(^8\) Heart rate reduction seems to be the principal mechanism of action of β-blockers and reversal of β-blocker–induced reduction in heart rate has deleterious effects even on ventricular function.\(^9\)
However, despite the availability of β-blockers and all advances in the field of cardiovascular medicine, coronary artery disease remains the leading cause of death.10 The presence of left ventricular dysfunction has a further dramatic negative influence on mortality.11 Furthermore, not all patients can take beta-blockers due to their side effects,12-14 and resting heart rate may not be sufficiently controlled in all CAD patients on β-blockers.15 Epidemiological studies suggest that 50% of patients, despite receiving β-blockers, have a heart rate ≥70 bpm4.

References