

# The Importance of Heart Rate in Coronary Artery Disease

## – Background –

### **Heart rate: a key determinant of myocardial ischemia**

It is well known that heart rate is a key determinant of ischemia.<sup>1</sup> 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 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 heart's oxygen supply.

### **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 Coronary Artery Disease (CAD) and postmyocardial infarction.<sup>2-4</sup> 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.<sup>4,5</sup> Patients with a baseline heart rate above 70 have a significantly higher risk of all cardiovascular events as compared to those with heart rate below 70 bpm.<sup>6</sup> Pure heart rate reduction reduces the risk of coronary events in CAD patients with heart rate above 70 bpm.<sup>5</sup>

### **Need for pure heart rate reduction**

Beta 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.<sup>7-9</sup> Heart rate reduction seems to be the principal mechanism of action of beta blockers and reversal of beta blocker induced reduction in heart rate has deleterious effects even on ventricular function.<sup>10</sup>

However, despite the availability of beta blockers and all advances in the field of cardiovascular medicine, CAD remains the leading cause of death.<sup>11</sup> The presence of left ventricular dysfunction has a further dramatic negative influence on mortality.<sup>12</sup> Furthermore, not all patients can take beta blockers due to their side effects,<sup>13-15</sup> and resting heart rate may not be sufficiently controlled in all CAD patients on beta blockers.<sup>16</sup> Epidemiological studies suggest that 50% of patients, despite receiving beta blockers, have a heart rate  $\geq 70$  bpm.<sup>4</sup>

## References

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