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The Objective Evidence of Hemodynamic Safety of Early Cardiac Rehabilitation in Intensive Care Unit

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Objective

Cardiac patients after surgical treatment are often admitted in intensive care units (ICU) for hemodynamic monitoring and intensive treatment. Cardiac rehabilitation can help patients minimize complications and shorter recovery periods and lengths of stay in a hospital. As safety should be a priority in the acute phase, close monitoring of hemodynamic response and patient symptoms is important. In this study, we monitored and recorded real-time vital signs during exercise continuously by arterial pressure, to ensure safety and feasibility of early cardiac rehabilitation in ICU.

Method

Ten patients who had coronary artery bypass graft surgery in ICU were enrolled. After extubation, hemodynamic stability and proper awareness to cooperate had been checked. All the patients underwent a low intensity resistance exercise at postoperative day 3, consisting of 3 sets of isotonic knee extension, 10 times per each set, with 2-Kg sandbag at their ankle (Figure 1).

Vital signs including systolic, diastolic blood pressure, mean arterial pressure, heart rate, and oxygen saturation were monitored before, during and after exercise. We used the software named Datex-Ohmeda S/5 Collect (GE healthcare Inc., Little Chalfont, Buckinghamshire, UK) to collect records of vital signs from B650 monitoring system (GE healthcare Inc., Little Chalfont, Buckinghamshire, UK) (Figure 2). Paired t-test was conducted for all variables to assess the effect of the exercise.

Fig 1. Low intensity resistance exercise in ICU

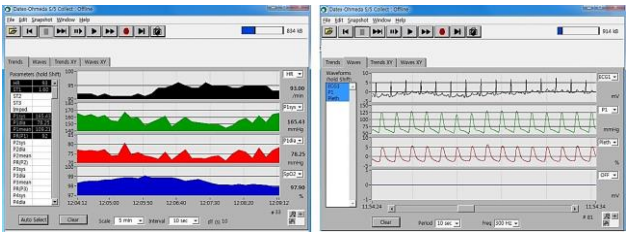

Fig 2. Datex-Ohmeda S/5 Collect software

Result

In Figure 3, the mean with 95% confidence intervals of each vital sign was plotted by setting its initial value of each patient as 0. Heart rate showed statistically significant increase in response to exercise, reached a peak and then recovered during the resting phase. Among ten patients, the mean maximal heart rate increase from initial value was 6.200 BPM at 20 seconds after finishing the third set of exercise (p=0.024). In addition, the upper limit of maximal heart rate increase was 11.154 BPM at the same time. On the other hand, changes in systolic, diastolic blood pressure, mean arterial pressure and oxygen saturation values were insignificant during the exercise. All the patients did not complain of chest pain, dyspnea, excessive fatigue, and other symptoms in the entire study.

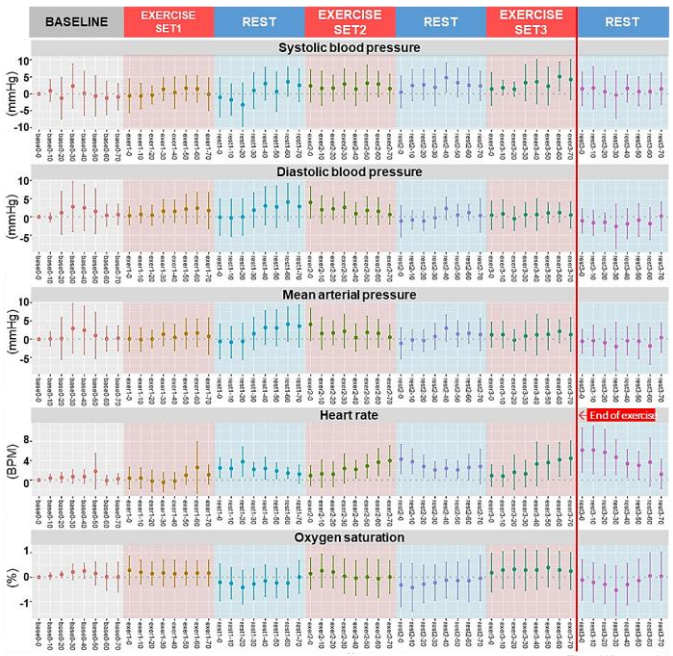

Fig 3. Mean with 95% confidence intervals of each vital sign

Conclusion

In this study, low intensity resistance exercises were done by postoperative cardiac patients with real-time monitoring in ICU. We acquired the objective and detailed evidence of hemodynamic safety in early cardiac rehabilitation. Using this method, further work can be done to verify the safety of various exercise protocols and to suggest proper exercise prescription guidelines.