

## CHAPTER V

### DISCUSSION AND CONCLUSION

Cardiac rehabilitation program is an essential component of the long-term comprehensive management strategy for CAD patients. It reduced the risk factor of disease, improved quality of life and reduced the incident of recurrent disease.

This study demonstrates the influence of exercise in rehabilitation program on fibrinolysis in CAD patients. The effect of exercise at light – moderate intensity for 8 weeks on fibrinolytic system was determined by plasma t-PA activity, t-PA antigen, PAI-1 activity, and PAI-1 antigen in CAD patients who did not have 6 months preceding myocardial infarction.

Thirty-three subjects who were participated in this study were CAD patients in Thammasat University Hospital and King Chulalongkorn Memorial Hospital.

They were underwent the cardiac rehabilitation program for 8 weeks long, 4 days per week, 30 minutes per day, 10 minutes warming up and 10 minutes cooling down before and after exercise respectively. During exercise session heart rate and blood pressure were monitored. After eight weeks of training, the physical fitness was improved in terms of  $VO_{2\ peak}$ , decreased resting heart rate, and decreased serum triglyceride. (Figure 4.1 and Figure 4.2).

#### Demographic study

Increased of  $VO_{2\ peak}$  in experimental group and decreased in control group were observed when compared before and after 8 weeks. The data suggested the exercise effects on enhancement of functional capacity of

cardiovascular system in CAD patients. This result was consistent with the previous reports by others.

Savage et al. (2003) found 21.2% improvement of  $VO_{2\text{ peak}}$  in CAD patients after 4 months of cardiac rehabilitation program. Milani and Lavie (1998) also showed an increase in  $VO_{2\text{ peak}}$  by 12% after three months of cardiac rehabilitation program.

Level of serum triglyceride in experimental group was decreased by 20.11% ( $p < 0.02$ ) after 8 weeks of training without the dose changes in dosage of lipid lowering drugs during participation in the program.

Our study showed earlier improvement of serum triglyceride from participating in the cardiac rehabilitation program when compared with the study of Paramo et al. (1998). They showed the reduction of serum triglyceride in acute myocardial infarction patients who enrolled in 3 months program.

The results demonstrated that exercise adherence in CAD patients would help decrease the dosage of lipid lowering drugs.

**Table 5.1** Effects of cardiac rehabilitation program on fibrinolytic parameters

Parameter	Acute effect		Chronic effect	
	Control	Experimental	Control	Experimental
t-PA activity	-	Increase	No change	No change
t-PA antigen	-	Increase	No change	No change
PAI-1 activity	-	Decrease	No change	No change
PAI-1 antigen	-	No change	No change	No change

The fibrinolytic parameters including t-PA activity, t-PA antigen, PAI-1 activity, and PAI-1 antigen as shown in Table 5.1 concluded our study on fibrinolysis. Eight weeks exercise trains at light-moderate exercise intensity

didn't change the level of t-PA activity, t-PA antigen, PAI-1 activity, and PAI-1 antigen in the CAD patients.

Many factors influenced of changes in fibrinolysis including intensity, duration and frequency of exercise were important factors of hemostasis balance. Since the fibrinolysis is part of the hemostasis balance, the reference values in healthy individuals and patients should be reports. However, we found a range of variation of these parameters in different studies as follows.

Weiss et al. 1998, showed activation of coagulation and fibrinolysis after cardiac rehabilitation in patients with CAD presented t-PA antigen levels ranged between 5.0 and 22.6 ng/ml and PAI-1 antigen levels ranged between 5.7 and 6.2 ng/ml.

Paramo et al. 1998, studied the influence of cardiac rehabilitation program in acute myocardial infarction reported the t-PA antigen level ranged between 8.6 and 9.1 ng/ml, PAI-1 activity level ranged between 13.1 and 19.6 AU/ml and PAI-1 antigen level ranged between 36.9 and 43.1 ng/ml.

The similar variation was also seen in the acute effect of exercise on fibrinolytic parameters as follows.

Womack et al. 2000, demonstrated fibrinolytic response to acute exercise in patients with peripheral arterial disease as t-PA activity increased by 180% ( $0.5 \pm 0.16$  IU/ml at baseline to  $1.4 \pm 1.2$  IU/ml at immediately post exercise) and remained significantly elevated 30 min ( $0.9 \pm 0.4$  IU/ml) and 60 min ( $0.9 \pm 0.3$  IU/ml) after exercise. There was a trend for decrease in PAI-1 antigen after exercise ( $33.4 \pm 33.3$  ng/ml at baseline to  $26.8 \pm 26.2$  ng/ml after exercise). Plasma PAI-1 activity decreased by 43% ( $2.0.6 \pm 5.5$  AU/ml baseline to  $11.8 \pm 6.2$  AU/ml after exercise), and remained decreased by 36% ( $13.1 \pm 2.2$  AU/ml) 30 min. after exercise and 49% ( $10.6 \pm 5.2$  AU/ml) 60 min. after exercise

Lin et al. 1998, reported activation and disturbance of blood hemostasis followed strenuous physical exercise in healthy man. The results showed that t-PA activity level exhibited a significant increase in response to exercise (ranged between 0.71 and 7.24 IU/ml). Comparable changes in t-PA antigen were also observed (ranged between 7.45 and 70.09 ng/ml). The values of t-PA activity and antigen had returned to pre-exercise levels 2 hours after exercise and remained at baseline value over the following 24 hours. A significant decrease in PAI-1 activity was observed immediately after exercise in all subjects (ranged between 4.11 and 19.64 AU/ml).

### Conclusion

1. Acute exercise activated the function of blood fibrinolysis system.
2. The exercise at light to moderate intensity for 8 weeks could not alter the studied fibrinolysis parameters but augmented the physical fitness and decrease serum triglyceride levels.
3. The variation of training program such as intensity, duration, frequency, and studied population were the factors related to the fibrinolysis level.
4. Cardiac rehabilitation program should be included in the patient education in order to help improvement of physical fitness and functional capacity, patients with CAD must continue doing exercise because its benefits to physical health.
5. Comparative study on effect after bout of exercise in control group as well as experimental group should also be conducted to demonstrate training effect on prevent induction of event of heart attack in CAD patients after the acute bout of exercise.
6. In addition, the baseline data of each parameter in fibrinolysis system should be normalized to be the reference data. There were much more variations in several studies as mentioned above.