CHAPTER 5

Discussion

The purpose of this study was to compare the physical performance between hemodialysis patients with and without RLS. A majority of this study found that there were significant differences of lower extremity muscle endurance by using the STS60 test and 6MWD by using the 6MWT between hemodialysis patients with and without RLS, whereas lower extremity muscle strength measured by using the STS10 test did not show any significant difference. The results indicate that physical performance which is lower extremity muscle endurance and cardiopulmonary fitness by using the STS60 test and 6MWT were decrease in hemodialysis patients with RLS. All details are described as follows:

5.1 Muscle performance

The STS is a basic skill movement that indicates the functional level of a person in activities daily living (ADL) (82). This test is used to measure lower extremity muscle performance by measuring the force-generating capacity of a muscle (82). This test is simple and is used to determine changes in physical function in patients with renal disease patients (82). This study was used STS10 and STS60 to determine strength and endurance in hemodialysis patients, respectively. The hemodialysis patients in this study performed the STS10 and STS60 for approximately 24-28 sec and 19-25 repetitions, respectively.

Hemodialysis patients with RLS had reduced lower extremity muscle endurance compared to hemodialysis patients without RLS. In contrast to the previous study, Giannaki et al. (14) studied the muscle endurance of hemodialysis patients with RLS by using an STS60 test and found that there was no significant difference in muscle endurance between hemodialysis patients with and without RLS. However, they found

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reductions of the thigh muscle total area, muscle cross sectional area (CSA), and the level of muscle fat infiltration by using a CT scan in hemodialysis patients with RLS compared to hemodialysis without RLS (14). Larsson et al. (13) studied aerobic performance by using a submaximal cycle ergometer test and muscle biopsies taken from the tibialis anterior muscle in RLS patients compared to the control group. The result showed that the RLS group had lower predicted maximal oxygen uptake in the tibialis anterior muscle and had a predominant proportion of slow type I fibers, a higher percentage of fast type IIX and IIA/IIX, and higher LC/PF index (tortuosity) and decrease muscle fiber type I in the RLS group (67.5± 8.9%), however, the result was not show the significant difference (13). The endurance of the muscle decreased as the proportion of slow type I fibers decreased. The endurance of hemodialysis patients with RLS decreased more than that of hemodialysis patients without RLS. This study did not find a difference in lower extremity muscle strength between hemodialysis patients with and without RLS. Similarly, in the study of Giannaki et al. (14), a difference in muscle strength was not found in the results of the STS5 test.

Therefore, this study found that hemodialysis patients with RLS had lower muscle endurance in the lower extremity than hemodialysis patients without RLS. However, there was no difference in lower extremity muscle strength between hemodialysis patients with and without RLS.

5.2 Cardiopulmonary fitness

The 6MWT was utilized to assess the functional capacity or the ability to perform daily activities such as walking (85-87). In this study, 6MWT was used to measure cardiopulmonary fitness (85). The result showed a significant difference in distance, which the hemodialysis patients with RLS had lower walking distance than hemodialysis patients without RLS. The patients in this study walked approximately 274–375 m in 6 min. Data from a previous study (82) showed that hemodialysis patients had a walk distance range from 347 to 522 m. This study showed hemodialysis with RLS group had shorter walking distance than hemodialysis without RLS. Endo et al. (90) studied cardiopulmonary fitness after daily walking exercise on chronic

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hemodialysis outpatients by using the 6MWT. They showed that decreases in daily physical activity in hemodialysis patients were associated with low cardiopulmonary fitness (90). The 6MWT is correlated with the maximal oxygen consumption test (85). Previous study reported that hemodialysis patients had reduced physical performance, high levels of weakness, and low exercise tolerance (91). Moreover, Larsson et al. (13) found that hemodialysis patients with RLS had lower predicted maximal oxygen uptake than healthy subjects. Their study speculates that the low 6MWD in hemodialysis patients with RLS might be caused by low oxygen consumption. The effects of iron insufficiency are decrease fitness, aerobic work capacity, oxygen transport and increase fatigue (92). There was no significant difference of mean of serum iron and ferritin levels in both patient groups in this study. This study found one patient had a low level of serum ferritin level, and two patients had a low serum iron levels in hemodialysis patients with RLS, and two patients without RLS had low serum iron levels. Previous studies (40, 93) found that cerebrospinal fluid (CSF) iron and ferritin were low level in RLS patients but their studies did not find a difference in serum iron and ferritin between RLS and non-RLS patients. However, the present study did not measure the level of iron and ferritin in CSF.

There was no significant difference in cardiopulmonary parameters, including HR, SpO_2, SBP, DBP, and RR, between hemodialysis patients with and without RLS after immediately performing the 6MWT. However, the patients had normal cardiovascular response to the 6MWT in the terms of increase HR, SpO_2, SBP and RPE after immediately performing the 6MWT in both groups. In fact, during exercise is increasing oxygen delivery to active muscle tissue that increased cardiac output (94). Therefore, hemodialysis patients with and without RLS in this study had normal responses to the exercise tests.

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5.3 Conclusion

Hemodialysis patients with RLS had reduced lower extremity muscle endurance and cardiopulmonary fitness than in hemodialysis patients without RLS. However, there was no difference in the lower extremity muscle strength between hemodialysis patients with and without RLS.

5.4 Clinical application and future study

The results of this study can be used as preliminary information regarding physical performance in this patient group. Moreover, the results would apply to the design of appropriate exercise programs for this patient group. Therefore, health professionals need to pay careful attention regarding RLS in the treatment of hemodialysis. Moreover, health professionals may consider adding interventions to hemodialysis treatment especially, a specific exercise program which could maintain or increase physical performance of hemodialysis with RLS. Aerobic exercise such as cycling, walking, and brisk walking will recommend for increase cardiopulmonary fitness. Moreover, resistance exercise such as low weight training will recommend for improve muscle endurance of lower extremity.

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5.5 Limitations and suggestions

Although this study found significantly decrease in muscle endurance and cardiopulmonary fitness in hemodialysis with RLS, there was no significant difference in muscle strength. There were some limitations in this study. Firstly, the level of physical activity was not assessed in this study. In a future study, physical activity levels should be measure to investigate the relationship between physical activity level and physical capacity. Secondly, this study did not measure muscle size to confirm changes in the structure of muscle that might affect on muscle performance, a measurement of muscle size is recommended in a future study. Thirdly, this study did not evaluate the level of CSF iron and ferritin, and iron and ferritin in the brain that might confirm RLS. Lastly, the sample size may be limited our potential to find significant differences in lower extremity muscle strength between groups. Based on our results, to detect differences in muscle strength between groups with 80% power would be required of 123 per group.

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