

ความสามารถในการทำกิจกรรมในผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียมที่มี และไม่มีกลุ่มอาการขาอยู่ไม่สุข

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บทคัดย่อ

ที่มา กลุ่มอาการขาอยู่ไม่สุข (Restless legs syndrome; RLS) มักพบได้ในผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม ซึ่งผู้ป่วยกลุ่มนี้มีความสามารถในการใช้ออกซิเจนต่ำกว่าคนปกติสุขภาพดี ซึ่งอาจส่งผลให้ผู้ป่วยมีกิจกรรมลดลง **วัตถุประสงค์** เพื่อเปรียบเทียบระดับความสามารถในการทำกิจกรรมระหว่างผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียมที่มีและไม่มีกลุ่มอาการขาอยู่ไม่สุขร่วมกับ **วิธีการ** อาสาสมัครเป็นผู้ป่วยโรคไตเรื้อรังที่ได้รับการรักษาโดยการฟอกเลือดด้วยเครื่องไตเทียม จำนวน 28 คน แบ่งออกเป็น 2 กลุ่ม คือ ผู้ป่วยที่มีกลุ่มอาการขาอยู่ไม่สุข ($n = 14$) และผู้ป่วยที่ไม่มีกลุ่มอาการขาอยู่ไม่สุข ($n = 14$) อาสาสมัครทั้งหมดได้รับการทดสอบความสามารถในการทำกิจกรรม โดยใช้การจับเวลาในการลุกยืน 10 ครั้ง (sit-to-stand-to-sit test for 10 repetitions; STS10) เพื่อประเมินความแข็งแรงของกล้ามเนื้อขา การทดสอบจำนวนครั้งในการลุกขึ้นยืนภายในเวลา 60 วินาที (sit-to-stand-to-sit test for 60 seconds; STS60) เพื่อประเมินความทนทานของกล้ามเนื้อขา และการทดสอบระยะทางเดินในเวลา 6 นาที (6-minute walk test; 6MWT) เพื่อประเมินสมรรถภาพของระบบหัวใจและไหลเวียนโลหิต **ผลการศึกษา** ผู้ป่วยที่มีกลุ่มอาการขาอยู่ไม่สุขมีจำนวนครั้งในการลุกขึ้นยืนภายในเวลา 60 วินาที และระยะทางเดินในเวลา 6 นาที น้อยกว่าผู้ป่วยที่ไม่มีกลุ่มอาการขาอยู่ไม่สุข ($P = 0.02$ และ $P = 0.01$ ตามลำดับ) แต่ไม่มีความแตกต่างของระยะเวลาในการลุกยืน 10 ครั้ง ($P = 0.24$) **สรุปผลการศึกษา** ผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียมที่มีกลุ่มอาการขาอยู่ไม่สุขมีความทนทานของกล้ามเนื้อขาและสมรรถภาพของระบบหัวใจและไหลเวียนโลหิตต่ำกว่าผู้ป่วยที่ไม่มีกลุ่มอาการขาอยู่ไม่สุข อย่างไรก็ตาม ไม่พบความแตกต่างของความแข็งแรงของกล้ามเนื้อขาในทั้งสองกลุ่ม ดังนั้น ควรแนะนำโปรแกรมการออกกำลังกายที่เพิ่มความทนทานของกล้ามเนื้อขาและสมรรถภาพของระบบหัวใจและไหลเวียนโลหิตในผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียมที่มีกลุ่มอาการขาอยู่ไม่สุข

คำสำคัญ : ผู้ป่วยที่ได้รับการฟอกเลือดด้วยเครื่องไตเทียม, กลุ่มอาการขาอยู่ไม่สุข, ความสามารถในการทำกิจกรรม

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Functional ability in hemodialysis patients with and without restless leg syndrome

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ABSTRACT

Background: Restless legs syndrome (RLS) is commonly found among patients who receive hemodialysis therapy, and they likely reduce maximal oxygen uptake as compared with healthy subjects. Consequently, low oxygen uptake might have an effect on functional ability in hemodialysis patients with RLS. **Objective:** The purpose of this study was to compare the functional ability between hemodialysis patients with and without RLS. **Method:** Twenty eight hemodialysis patients voluntarily participated and were divided into two groups: an RLS group (n = 14) and a non-RLS group (n = 14). Functional ability tests included a sit-to-stand-to-sit test for 10 repetitions (STS10) to measure muscle strength in the lower extremities, a sit-to-stand-to-sit test for 60 seconds (STS60) to measure muscle endurance in the lower extremities and a 6-minute walk test (6MWT) to measure cardiovascular fitness. **Results:** The results showed that the RLS group had a lower number of repetitions in STS60 and a shorter 6-minute walk distance (6MWD) than the non-RLS group ($P = 0.02$ and $P = 0.01$, respectively), whereas there was no difference in STS10 between groups ($P = 0.24$). **Conclusion:** Hemodialysis patients with RLS had lower muscle endurance in the lower extremities and lower cardiopulmonary fitness than hemodialysis patients without RLS, whereas there was no difference in lower extremity muscle strength between hemodialysis patients with and without RLS. A program to help increase muscle endurance and cardiopulmonary fitness is recommended for hemodialysis patients with RLS.

Keywords : Hemodialysis, Restless legs syndrome, Functional ability

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Introduction

Restless legs syndrome (RLS) is a common neurological disorder among patients who receive hemodialysis therapy, a condition known as uremic RLS, that is characterized by sensorimotor symptoms such as paraesthesia and restlessness, which mainly affect the lower limbs and become worse during inactivity.⁽¹⁾ These unpleasant sensations occur during rest in the evening or at night and are partially relieved by movement.⁽¹⁾ The prevalence of RLS is higher in dialysis patients (12% to 62%) when compared to the general population (5% to 15%).⁽²⁾ Decreased functional activity and an increasingly dependent lifestyle in RLS patients were causes of a low quality of life.⁽¹⁻³⁾ Moreover, these causes increased mortality and morbidity in this patient group.^(3, 4)

Hemodialysis treatment has been associated with decreased muscle size in hemodialysis patients, leading to avoidance and lack of exercise that may affect physical performance.⁽⁵⁾ The effects of both uremia⁽⁶⁾ and sleep disturbance in hemodialysis patients with RLS were associated with reductions in circulating anabolic hormones.^(7, 8) Therefore, RLS affects muscle metabolism. A previous study showed that decreases in daily physical activity in hemodialysis patients were associated with low cardiorespiratory capacity.⁽⁹⁾ Schlesinger et al.⁽¹⁰⁾ found that RLS patients had a lower level of physical fitness and higher cardiovascular risk factor than non-RLS patients. The hypothesis of this study is that hemodialysis patients with RLS will experience greater effects from uremia and more negative effects on functional ability than do hemodialysis patients without RLS. Larsson et al.⁽¹¹⁾ reported a muscle morphology change in RLS patients but did not study the changes in functional ability in hemodialysis patients with RLS. Giannaki et al.⁽¹²⁾ showed changes in muscle morphology in hemodialysis patients with RLS but did not find changes in functional ability. The effects on functional ability caused by hemodialysis

with RLS are unclear and thus should be studied. Therefore, this study aimed to compare functional ability in chronic kidney disease patients who received hemodialysis treatment with RLS with those who did not have RLS.

Methods

Twenty eight hemodialysis patients at the Chiang Mai Kidney Clinic, Thailand, voluntarily participated in this study. The patients were divided into two groups according to RLS status that was diagnosed by a nephrologist using the International Restless Legs Syndrome Study Group criteria,⁽¹²⁾ namely, an RLS group (n = 14) and a non-RLS group (n = 14). The study was approved by the Ethics Committee of the Faculty of Medicine, Chiang Mai University [code 484]. All patients provided written informed consent prior to enrolling in the study. Patients who had hemodialysis treatment 3 times/week for at least 3 months had a stable medical condition, $Kt/V_{urca} \geq 1.2$, and were able to walk independently without assistive devices were included in the study. Patients who had cardiopulmonary disease, musculoskeletal disorder, or neurological conditions that affected the tests, diabetic mellitus, an inability to understand verbal communication based on the cutoff point of the Mini-Mental Stable Examination Thai 2002⁽¹³⁾ of more than 24 points based on education level, uncorrected vision or hearing impairment, or a current prescription of any medication that might affect testing were excluded. Functional ability tests, including a sit-to-stand-to-sit test for 10 repetitions (STS10), a sit-to-stand-to-sit test for 60 seconds (STS60), and a 6-minute walk test (6MWT), were performed as described below.

Sit-to-stand-to-sit test for 10 repetitions (STS10)

STS10 was used to measure lower extremity muscle strength.⁽¹⁴⁻¹⁷⁾ This test was performed with a standing wooden chair that was 44.5 cm high, 3.8 cm

deep, and resting against a wall. Patients were asked to perform 10 chair rise cycles as fast and safely as possible.⁽¹⁶⁾ Patients had to fully extend their bodies in the standing position with their arms folded across their chests.⁽¹⁶⁾ Time was recorded in seconds. Patients performed the test three times; the best result was used for data analysis.

Sit-to-stand-to-sit test for 60 seconds (STS60)

STS60 was used to measure lower extremity muscle endurance.⁽¹⁶⁾ This test was performed on a standing wooden chair that was 44.5 cm high, 3.8 cm deep, and resting against a wall. Patients were asked to perform chair rise cycles as fast and safety as possible over a duration of 60 seconds.⁽¹⁶⁾ Patients fully extended their bodies in the standing position with their arms folded across their chests.⁽¹⁶⁾ The number of repetitions achieved in 60 s was recorded. Patients performed the test three times; the maximal number of repetitions was used for data analysis.

6-minute walk test (6MWT)

6MWT was used to measure cardiopulmonary fitness.^(18, 19) Patients were asked to walk along a 20-m walkway as fast as possible without shoes. The patients were instructed to walk from end to end, turning at a cone mark without stopping, and covering as much distance as possible in 6 min without running or jogging, but they were allowed to slow down or stop as necessary. The patients received instruction and encouragement according to the standard procedures of the American Thoracic Society for the measurement of the 6MWT.⁽¹⁸⁾ The 6-minute walk distance (6MWD) was recorded in meters.

Statistical analysis

Descriptive statistical analyses were used for reporting demographic data. An independent *t*-test for the parametric distribution was used to compare the differences in functional ability parameters between hemodialysis patients with RLS and without RLS. All statistical tests were undertaken using the Statistical Package for the Social Sciences version 11.5 (SN 5068035). The statistically significant difference level was set at $P < 0.05$.

Results

The demographic data of the subjects are shown in **Table 1**. There were no statistically significant differences in age, weight, height, BMI, period of hemodialysis, Kt/V_{urea} , hemoglobin, and hematocrit between groups. The functional ability of the subjects is shown in **Table 2**. The RLS group had a lower number of repetitions in the STS60 and a shorter 6MWD than the non-RLS group ($P = 0.02$ and $P = 0.01$, respectively), whereas there was no difference in STS10 between groups ($P = 0.24$). Therefore, the RLS group had lower muscle endurance of the lower extremities and lower cardiopulmonary fitness than the non-RLS group. However, there was no difference in lower extremity muscle strength between the RLS and non-RLS groups.

Table 1 Demographic data of subjects. The data are presented as mean \pm SD.

Variable	Groups		P - value
	HD with RLS group [n = 14; F = 7, M = 7]	HD without RLS group [n = 14; F = 7, M = 7]	
Age (yr)	55.07 \pm 10.75	55.14 \pm 10.84	0.98
Weight (kg)	52.38 \pm 4.73	56.40 \pm 8.55	0.13
Height (cm)	158.42 \pm 8.75	160.64 \pm 10.63	0.68
BMI (kg/m ²)	21.00 \pm 2.32	22.83 \pm 2.36	0.25
Period of HD (months)	67.57 \pm 49.12 (12-146)	66.64 \pm 44.32 (12-145)	0.13
Kt/V	2.09 \pm 0.42	2.09 \pm 0.41	0.22
Hemoglobin (g/dL)	11.90 \pm 1.71	11.22 \pm 1.21	0.23
Hematocrit (%)	32.70 \pm 5.34	33.25 \pm 4.64	0.77
Co-morbidity			
Hypertension	11	7	NA

Note: Data were analyzed by using the independent t-test. *: significant difference between groups at $P < 0.05$. Abbreviations: HD = hemodialysis, RLS = restless legs syndrome, F = female, M = male, Kt/V = index of dialysis adequacy, NA = not analyzed

Table 2 Functional ability. The data are presented as mean \pm SD.

Variable	Groups		P - value
	HD with RLS group [n = 14; F = 7, M = 7]	HD without RLS group [n = 14; F = 7, M = 7]	
STS10 (s)	28.39 \pm 11.19	24.42 \pm 4.68	0.24
STS60 (reps)	19.64 \pm 7.65	25.42 \pm 4.55	0.02*
6MWD (m)	274.18 \pm 91.38	375.18 \pm 67.81	< 0.01*

Note: Data were analyzed by using an independent t-test, *: significant difference between groups at $P < 0.05$. Abbreviations: HD = hemodialysis, RLS = restless legs syndrome, STS10 = sit-to-stand-to-sit 10 repetitions, STS60 = sit-to-stand-to-sit 60 s, 6MWD = 6-minute walk distance.

Discussion

The purpose of this study was to compare functional ability between hemodialysis patients with and without RLS. The main findings of this study are that the RLS group had lower muscle endurance in the lower extremities and lower cardiopulmonary fitness than the non-RLS group. However, there was no difference in lower extremity muscle strength between the RLS and non-RLS groups.

STS60 is used to measure lower extremity muscle endurance.⁽¹⁶⁾ This test has a high test–retest reliability (ICC = 0.97).⁽¹⁶⁾ The hemodialysis patients in this study performed the STS60 for approximately 19–25 repetitions (Table 2). A previous study on hemodialysis patients with RLS reported a value near 22 repetitions for the STS60.⁽¹⁶⁾ Hemodialysis patients with RLS in this study had lower muscle endurance of the lower extremities than in non-RLS patients. In contrast to the results of this study, Giannaki et al.⁽¹²⁾ did not find differences in functional ability in STS60. Moreover, Larsson et al.⁽¹¹⁾ studied the muscle morphology of RLS patients and found that they had a lower proportion of type I muscle fibers than in healthy subjects, although there was no statistically significant difference. The endurance of the muscle decreased as the proportion of slow type I fibers decreased. However, the present study did not measure muscle morphology; therefore, this study cannot confirm a decrease in muscle endurance in the RLS group resulting from changes in muscle morphology. STS10 was used to measure lower extremity muscle strength.⁽¹⁶⁾ This test is high test–retest reliability (ICC = 0.88).⁽¹⁶⁾ The hemodialysis patients in this study performed the STS10 for approximately 24–28 s (Table 2). A previous study on hemodialysis patients with RLS reported a range of 21–29 s for the STS10.⁽¹²⁾ Hemodialysis patients with and without RLS in this study did not exhibit differences in muscle strength of the lower extremities. Similar to the results of this

study, Giannaki et al.⁽¹²⁾ did not find differences in functional activity in STS5.

The 6MWT is considered to be a test of the ability to perform activities of daily living, such as walking.⁽¹⁶⁾ This test has a high test–retest reliability (ICC = 0.94).⁽¹⁶⁾ The patients in this study walked approximately 274 to 375 m in 6 min (Table 2). A previous study on hemodialysis patients reported that the 6MWT results ranged from 347 to 522 m.⁽⁹⁾ However, hemodialysis patients with RLS in the present study exhibited a shorter walking distance than hemodialysis patients without RLS. The results of the present study showed that hemodialysis patients with RLS had lower cardiopulmonary fitness than non-RLS patients. Endo et al.⁽⁹⁾ studied the cardiopulmonary fitness of hemodialysis patients and found that hemodialysis patients had lower cardiopulmonary fitness compared to healthy subjects. They found that decreases in daily physical activity in hemodialysis patients were associated with lower cardiopulmonary capacity.⁽⁹⁾ However, the present study did not measure the physical activity levels of the subjects.

Limitations of this study were that we did not measure daily physical activity levels, the muscle size of the lower extremities, and the duration of having RLS, which would have allowed us to confirm the cause of the loss in functional ability in the patients. For a future study, physical activity levels, muscle size, and the duration of having RLS should be investigated to study the causes of reduced functional ability in hemodialysis patients with RLS.

Conclusion

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

may consider adding interventions to a hemodialysis program, particularly a specific exercise program that could increase lower extremity muscle strength and cardiopulmonary fitness in hemodialysis patients with RLS.

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