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CASE REPORT

CARDIAC REHABILITATION IN 32-YEAR-OLD WOMAN WITH SYSTEMIC LUPUS ERYTHEMATOSUS COMPLICATED BY CONSTRICTIVE PERICARDITIS

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Abstract. Background: *The cardiovascular system is severely impacted by systemic lupus erythematosus (SLE), which can cause fibrosis of the pericardium known as constrictive pericarditis (CP). Comprehensive cardiac rehabilitation (CR) has a proven track record of lowering cardiovascular death and morbidity while also enhancing functional ability, well-being, and quality of life (QoL).* ***Clinical Case Description:*** *A 32-year-old woman presented with symptoms of difficulty and shortness of breath while doing physical activity. She had a history of SLE complicated by CP and pulmonary hypertension. She was referred to undergo CR. Before the program was carried out, she did a 6-minutes walking test (6MWT) with a result of 187 meters and the patient's Depression, Anxiety and Stress Scale-21 Items (DASS-21) was Moderate-Severe-Severe. After one month of the program, the patient reported that her breathing has improved and she can perform somewhat more strenuous tasks without experiencing dyspnea, DASS-21 become Moderate-Moderate-Moderate and the 6MWT is 340 m.* ***Conclusion:*** *The result from the program instance highlights the importance of CR for individuals with SLE who have CP. This is crucial as it can improve the patient's physical activity level, enhancing functional ability, reducing symptoms, lowering risk factors, enhancing emotional and self- stability, and eventually improving QoL.*

Key words: *systemic lupus erythematosus, constrictive pericarditis, cardiac rehabilitation, pulmonary hypertension*

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INTRODUCTION

Systemic lupus erythematosus (SLE) is a chronic autoimmune illness that is typified by the development of immune complexes and antibodies that can impact the body's organs, including the heart [1]. Typically, pericarditis, myocarditis, endocarditis, valvular heart disease, or arrhythmias are the symptoms of cardiac involvement in SLE. Constrictive pericarditis (CP) and cardiac tamponade are quite uncommon [2]. But it usually occurs during acute SLE flare-ups, when the immune system sets off a series of events that assault many organs, including the heart [1]. The condition is characterized by a fast heartbeat, low blood pressure, dyspnea, and chest pain. It can cause cardiogenic shock and eventually death if left untreated [3].

It has been demonstrated that cardiac rehabilitation (CR) is helpful in the treatment of several illnesses [4]. Comprehensive CR has a proven track record of lowering cardiovascular death and morbidity while also enhancing functional ability, well-being, and quality of life (QoL) [5]. A case of SLE with CP as a complication that underwent cardiac rehabilitation is detailed in this paper.

CLINICAL CASE DESCRIPTION

A 32-year-old woman presented to the outpatient department with symptoms of difficulty and shortness of breath while doing physical activity. She had a history of SLE complicated by CP and pulmonary hypertension. She was referred from another medical center to undergo cardiac rehabilitation. Her medications included methylprednisolone (Lameson), azathioprine (Imuran), hydroxychloroquine, nebivolol (Nebilet), furosemide (Lasix), edoxaban (Lixiana), sildenafil (Revatio), colchicine (Recolfar), vitamin D3 (Cavit D3), and calcium (Calsifar plus). Upon arrival, her blood pressure was 110/72 mmHg with heartbeat of 64 beats per minute, respiratory rate was 20 breaths per minute, and the body temperature was normal. Her body weight is 80 kg with the height of 163 cm (body mass index (BMI): 30.1 kg/m^2 – obese) and a waist circumference of 95 cm. Nothing abnormal was found in the physical examination. Her laboratory findings were significant for elevated erythrocyte sedimentation rate, SGPT, uric acid, and high sensitivity C-reactive protein (hs-CRP), as shown in Table 1.

Urinalysis showed the presence of white blood cells (70 cells/μL and 3-6 cells per HPF) and + (few) bacteria. Electrocardiogram on admission showed normal sinus rhythm of 64 beats per minute with normal axis and non-specific T wave inversion at V1-V2 as shown in Figure 1.

She also brought past CMR result with the conclusion of constrictive pericarditis feature as demonstrated in Fig. 2 and echocardiography result, which states normal dimension with normal systolic function (EF 65%), normal diastolic function, normokinetic wall, mild tricuspid regurgitation – mild PHT, with estimated PASP 35-40 mm Hg and mild thickening of the pericardium with slight ventricular septal diastolic flattening.

Before a cardiac rehabilitation program was carried out, she did a 6-minutes walking test (6MWT) with a distance result of 187 meters. We also did the Depression, Anxiety and Stress Scale-21 Items (DASS-21) questionnaire for the patient with the results of moderate depression (14 points), severe anxiety (18 points), and severe stress (26 points). Based on the

Table 1. Laboratory findings of the patient

Laboratory Parameters	Results	Reference range
White blood cell	5.960 /μL	4.000-11.500 /μL
Red blood cell	4.23 M/μL	3.70-5.30 M/μL
Hemoglobin	13.7 g/dL	11.5-15.0 g/dL
Platelet	233 K/μL	140-400 K/μL
Erythrocyte sedimentation rate	60 mm/hour	0-20 mm/hour
hs-CRP	3.30 mg/L	Cardiovascular risk : < 1.0 = Low risk 1.0-3.0 = Average risk 3-10 = High risk
SGPT	44 U/L	0-31 U/L
Albumin	4.7 g/dL	3.5-5.0 g/dL
Creatinine	0.75 mg/dL	0.40-1.10 mg/dL
Uric acid	6.80 mg/dL	2.40-5.70 mg/dL
Sodium	139 mmol/L	135-146 mmol/L
Potassium	3.5 mmol/L	3.5-5.0 mmol/L
D-dimer	204.73 ng/mL	0.00-500 ng/mL

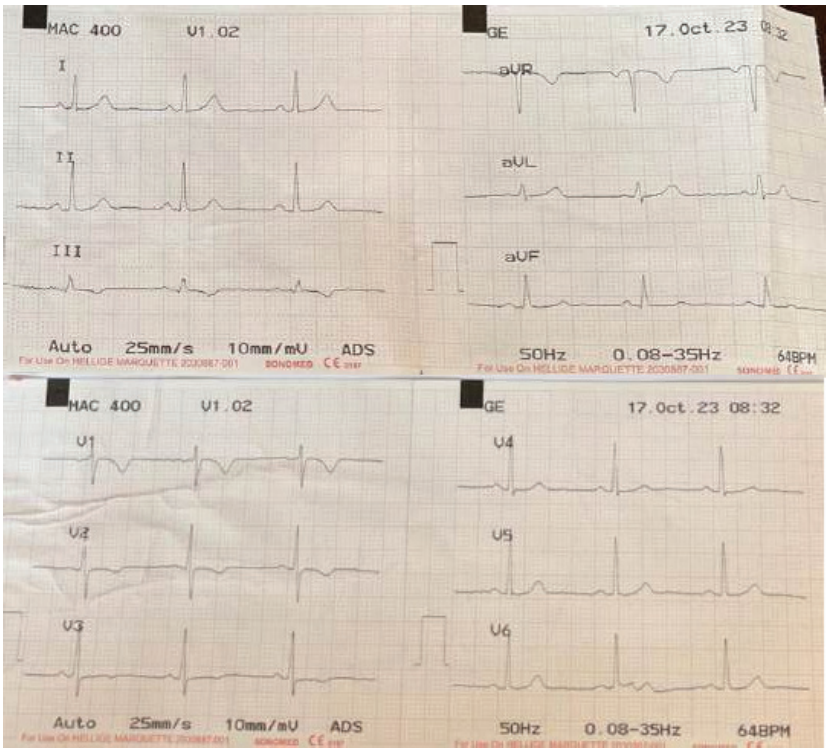

Fig. 1. ECG on admission

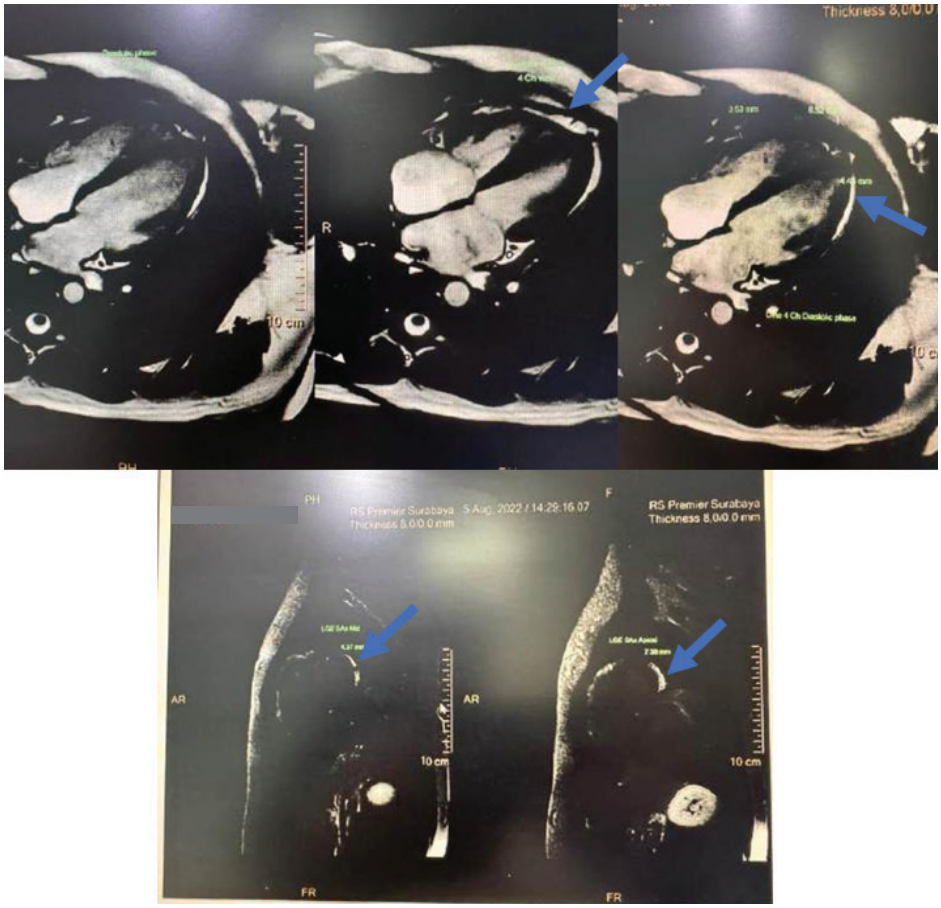

Fig. 2. Patient's CMR result. There is a pericardial thickening (showed by blue arrow) with various diameter in between 4.8 to 7.5 mm, interventricular septal bouncing in early diastolic phase. Late gadolinium enhancement shows contrast absorption in pericardium with non-globular type

6MWT result, we prescribed cardiac rehabilitation exercise for one month, 3x each week, 30-45 minutes per session, aerobic exercise (flat walking for two intervals each 15 minutes and a stationary bike for 10 minutes), with a warm-up and cool-down for 30-45 minutes. When exercising, we aim for a BORG scale of 11-13, the target heart rate being the resting heart rate + 20. As for progressivity, we increase the distance of flat walking by 50 m each session. The patient's training progress during exercise was monitored, and as time went by, in the end of program, the patient's 6MWT increased to 340 m. DASS-21 in the end of program become moderate depression (16 points), moderate anxiety (10 points), and moderate stress (22 points). The patient program exercise data can be seen in Table 2.

Table 2. Patient's exercise data performance

Visit	Exercise	Heart rate	Blood pressure	Symptoms
1	Pre Exercise 6MWT: 187 meter Post 6MWT Stationary bike: 10 watt – 5 mins Cooling down	69 bpm 90 bpm 71 bpm 79 bpm 73 bpm	115/70 mmHg 98/72 mmHg 134/74 mmHg 100/87 mmHg 111/73 mmHg	During the stationary bike, stopped in 5 minutes due to shortness of breath
2	Warming up Flat walking: 280 meter Stationary bike: 15 watt – 7 mins Cooling down	89 bpm 88 bpm 96 bpm 89 bpm	100/70 mmHg 100/70 mmHg 100/70 mmHg 100/70 mmHg	During the stationary bike, stopped in 7 minutes due to shortness of breath
3	Warming up Flat walking: 280 meter Stationary bike: 10 watt – 7 mins Cooling down	82 bpm 83 bpm 96 bpm 83 bpm	95/70 mmHg 110/70 mmHg 110/70 mmHg 100/70 mmHg	During the stationary bike, stopped in 7 minutes due to shortness of breath
4	Warming up Flat walking: 330 meter Stationary bike: 15 watt – 9 mins Cooling down	80 bpm 88 bpm 103 bpm 83 bpm	100/70 mmHg 110/70 mmHg 130/80 mmHg 120/80 mmHg	During the stationary bike, stopped in 9 minutes due to being tired
5	Warming up Flat walking: 380 meter Stationary bike: 15 watt – 10 mins Cooling down	87 bpm 92 bpm 100 bpm 98 bpm	100/70 mmHg 110/70 mmHg 110/80 mmHg 110/70 mmHg	-
6	Warming up Flat walking: 430 meter Stationary bike: 15 watt – 10 mins Cooling down	80 bpm 87 bpm 100 bpm 91 bpm	100/70 mmHg 110/80 mmHg 140/90 mmHg 120/70 mmHg	-
7	Warming up Flat walking: 480 meter Stationary bike: 15 watt – 10 mins Cooling down	83 bpm 99 bpm 95 bpm 91 bpm	110/70 mmHg 120/80 mmHg 125/80 mmHg 110/70 mmHg	-
8	Warming up Flat walking: 530 meter Stationary bike: 15 watt – 10 mins Cooling down	78 bpm 91 bpm 95 bpm 78 bpm	120/70 mmHg 120/80 mmHg 120/70 mmHg 120/70 mmHg	-
9	Warming up Flat walking: 580 meter Stationary bike: 15 watt – 10 mins Cooling down	80 bpm 91 bpm 89 bpm 90 bpm	120/70 mmHg 110/70 mmHg 110/70 mmHg 120/70 mmHg	-
10	Warming up Flat walking: 630 meter Stationary bike: 15 watt – 10 mins Cooling down	82 bpm 106 bpm 78 bpm 93 bpm	110/70 mmHg 120/70 mmHg 120/70 mmHg 110/70 mmHg	-
11	Warming up Flat walking: 630 meter Stationary bike: 15 watt – 10 mins Cooling down	75 bpm 86 bpm 105 bpm 89 bpm	120/70 mmHg 110/70 mmHg 110/70 mmHg 110/70 mmHg	-
12	Pre Exercise 6MWT: 340 meter Post 6MWT Stationary bike: 15 watt – 10 mins Cooling down	93 bpm 120 bpm 106 bpm 120 bpm 106 bpm	119/90 mmHg 119/90 mmHg 141/88 mmHg 110/74 mmHg 116/88 mmHg	-

DISCUSSION

Skin, joints, and the heart are just a few of the organs that can be impacted by SLE, a connective tissue condition marked by the generation of autoantibodies. Approximately 50% of SLE patients have cardiac problems [6]. In SLE, infections can occur in the pericardium, myocardium, and endocardium; nevertheless, pericarditis is the most commonly reported cardiac complaint [2].

Clinical pericarditis affects 25% of SLE patients at some point in their lives, and up to 50% of cases are asymptomatic [7]. Effusive or fibrinous alterations are indicative of acute pericardial involvement, and if the insult is sustained and recurring, it might lead to scarring and the development of CP. When diastole occurs, the scarred and rigid pericardium becomes less elastic and is unable to expand with the right ventricle's distension. Ventricular interdependence results from this, which causes abnormal right ventricular filling and the interventricular septum to protrude into the left ventricle [2]. While tuberculosis is the main cause in developing nations, idiopathic or viral etiology is the most frequent cause in wealthy nations [8]. Additional causes of the condition include medications, pyogenic pericarditis, cardiac surgery, radiation, cancer, connective tissue disorders, and chronic renal disease [2]. Procainamide and hydralazine have also been linked to CP secondary to drug-induced lupus [9]. It is incredibly uncommon for CP to be the first sign of SLE.

Through the integration of respiratory, musculoskeletal, and circulatory processes, cardiac rehabilitation enhances cardiorespiratory fitness [10]. Increased lung expansion capacity, increased pulmonary capillary and respiratory muscle endurance for improved oxygen uptake, and increased alveolar surface area for enhanced gas exchange are all effects of aerobic exercise on the respiratory system's physiological adaptability. During physical exertion, exercises that improve ankle pumping and range of motion can help boost ventilation [11].

Our patient is a 32-year-old female who presented to the cardiac rehabilitation department due to SLE complicated by CP. CP is diagnosed based on CMR and echocardiogram results, as well as the clinical presentation of the patient. The patient then underwent rehabilitation sessions for one month. For measuring patient's effort and exertion, we use The BORG Rating of Perceived Exertion scale. The scale is a simple list of numbers, from 6 ("No exertion at all") to 20 ("Maximal exertion"). In each session we aim for a BORG scale of 11 (Light) – 13 (Somewhat hard), which is a good level for common exercise. Light (scale 11) means that the patient feel comfortable with the exercise pace and still can easily talk. Meanwhile Somewhat hard (scale 13) means that the patient's having fairly strenuous and breathless, not so easy to talk exercise [12].

After one month of undergoing the cardiac rehabilitation program, the patient reports that her breathing has improved, she can perform slightly more strenuous tasks like making the bed without experiencing dyspnea and she can walk farther, which is from 187 m at the start of the program to 340 m at the end of the program.

To evaluate stress, anxiety, and depression of the patient, three self-report measures make up the Depression, Anxiety, and Stress Scale-21 Items (DASS-21) [13]. In the beginning of the program, the patient's depression score was 14 points (moderate depression), the anxiety score was 18 points (severe anxiety), and the stress score was 26 points (severe stress). After one month of CR, we reassessed the DASS-21 with the results of 16 depression points (moderate depression), 10 anxiety points (moderate anxiety), and 22 stress points (moderate stress). This showed that after the CR program, the patient is less anxious and less stressed about her symptoms than before CR.

In the end of the CR program in our hospital, we gave the patient a recommendation to do the physical exercise at home. Based on the 6MWT test done on the final program, the patient was able to walk for 340 meters. Exercise prescription to be done at home consists of 60% from the 6MWT completed distance (204 meters) with a medium intensity followed by targeted heart rate during exercise: resting heart rate + 20 x/minutes. The types of exercises to be done includes aerobic and walking with a rate of perceived exertion/RPE (BORG scale) 11-13 (until somewhat hard). Exercise should be started with 5 minutes of warm up then main exercise for 20-30 minutes and, finally, cooling down 5 minutes. The patient was advised to repeat 6MWT in another 3 months for fitness evaluation in terms of aerobic as well as to adjust the next recommended physical activity.

CONCLUSIONS

A rare but potentially fatal SLE complication, CP is usually caused by recurring episodes of acute pericarditis. The pericardial inflammatory process that leads to pericarditis is mediated by immune complexes and complement system activation. Patients with SLE who have CP should begin systemic corticosteroid therapy as soon as infections have been ruled out. Enhancing functional ability, reducing symptoms, lowering risk

factors, enhancing emotional and self-stability, and eventually improving quality of life are the objectives of cardiac rehabilitation. Cardiologists, medical rehabilitation specialists, physiotherapists, the patients and their families must work together to create a comprehensive rehabilitation program. Our example demonstrates how CR can help the patient become more functional and experience less problems.

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Ethical statement: *This study has been performed in accordance with the ethical standards as laid down in the Declaration of Helsinki.*

Informed Consent for a Clinical Case: *Written informed consent was obtained from the patient for the publication of this case report, including any accompanying images.*

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