CASE REPORT

Cardiac Rehabilitation in a Young Patient with Severe Left Ventricular Dysfunction and Stroke: A Case Study

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ABSTRACT. This is a case report of a 36 years old Puerto Rican female with dual disabilities: severe left ventricular dysfunction secondary to an extensive myocardial infarction and two stroke episodes, complicated with congestive heart failure, who underwent a comprehensive cardiac rehabilitation program which resulted in improvement. Strategies included a long term exercise program, with low increments, slow progression and close supervision; educational, nutritional and medical interventions, in addition to an orthotic device. This report discusses the health-related fitness and overall benefits that the patient obtained from this multifactorial program.

A cerebrovascular accident is a complication that greatly increases the mortality and morbidity of myocardial infarct (MI)(1). The literature available presents some information about rehabilitation programs for patients with stroke, cardiomyopathies, coronary artery diseases, and myocardial infarction (1-6). However, in the available literature there is a lack of specific guidelines for the rehabilitation of complicated patients with double disability such as MI and stroke. It is necessary to develop guidelines that might help in prescribing and designing an effective cardiac rehabilitation program, which will be crucial for those patients who survive MI and stroke. The purpose of this case report is to analyze a phase II cardiac rehabilitation program in a young, female patient with dual disability, severe left ventricular dysfunction, stroke and complicated with congestive heart failure, which resulted in significant functional improvement.

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Case Report

The patient is a Puerto Rican female, 36 years old, obese, without history of previous systemic illness. She was allergic to penicillin, with no history of toxic habits (ethanol, drugs or cigarette smoking), without family history of coronary artery disease, G3 P2 A1, who used oral contraceptives for 7 years prior to her MI. The patient was admitted to the hospital due to a newly diagnosed uncontrolled arterial hypertension. Two weeks after hospitalizations the patient developed a massive (anterolateral, septal and inferior) myocardial infarction. Cardiac catheterization revealed no coronary artery disease but had an ejection fraction of 18%. The day after had the procedure the patient developed an acute ischemic brain infarct in the right temporal lobe, diagnosed by a brain CT scan with a resultant left hemiplegia. A hypercoagulable state was considered as the etiology for MI and stroke, probably related to the use of oral contraceptives and thrombocytosis (platelet level was 512 K/uL). Lupus anticoagulant antibodies, anticardiolipid antibodies, protein S and C, antithrombin III and FANA test were reported negative. During the hospitalization the patient was unable to tolerate a physical therapy program due to frequent fainting and dizziness episodes. The patient was discharged home with an extremely poor functional capacity, limited walking tolerance, requiring assistance in activities of daily living (ADL), using a

wheelchair for mobility. The patient remained bed confined at home and two months later (June 1995) developed sudden, severe respiratory difficulty. She was admitted to the intensive care unit with the diagnosis of acute pulmonary edema and partially compensated congestive heart failure. At that moment the patient was on enalapril 10 mg p.o. bid, warfarin 7.5 mg p.o. daily, lanoxin 0.25 mg p.o. daily and potassium supplement. The patient was referred to the Cardiac Rehabilitation Program Phase II in August '95. The initial evaluation revealed the following: body weight of 199 lb.; HR 88 bpm, BP 90/70 mm Hg, high percentage of body fat (36%, as determined by 3 site skin fold measurements) low level of low back and hamstring flexibility (8 in.) as determined by the modified sit and reach test (7). Low level of vital capacity (2,570 ml) as determined by spirometry; elevated total serum cholesterol (246 mg/dl) and LDL fraction of 148 mg/dl. Triglycerides were also elevated (307 mg/dl) and the HDL fraction was low (37 mg/dl). No exercise testing was performed before entering the program due to the recent pulmonary edema. She was considered high risk patient according to the stratification criteria established by the American Association of Cardiovascular and Pulmonary Rehabilitation (AACPR) (8), the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) (9), she was considered a high risk patient. She was placed on a multifactorial program that involved exercise, diet modification and education to promote adequate lifestyle behavior. An exercise prescription was performed, based on the Bouchard Three-Day Physical Activity Record (11). The activity record was filled out by the patient during the next week after the initial evaluation. The Three-Day Physical Activity Record used has been validated, with a high reliability (11). In addition to the instructions described in the physical activity record, the patient was also asked to report any symptoms felt while performing a specific activity (Table 1). The goal of the exercise program was to reach 5 metabolic equivalents (METs) of relative exercise intensity and 30 min of duration, in an expected period of 6 months. The designed program was explained to the patient and her cardiologist. The exercise sessions consisted of a 5 min warm up, stretching exercises (5 min), aerobic conditioning period (15 min), cool down (5 min) and a final stretching period (5 min). The rating of perceived exertion (RPE), dyspnea scale, chest pain scale, pulse oxymetry, ECG by telemetry, finger tip blood glucose and symptoms were used to monitor the patient (7-8). Table 2 presents the relative and absolute intensity, duration, exercise modality and frequency of the exercise prescription. After reaching the goal of 5 METs, the health related fitness test battery and the Bouchard Three-Day Physical Activity Record were performed again.

Table 3 presents the results of the initial and final evaluation of the patient. The results of this activity record demonstrated that the mean initial daily activity energy expenditure of the patient was close to 1.4 METs. The activities of higher intensity performed by the patient were related to light ADL (< 2.5 METs) for short periods of time and no symptoms were reported by the patient. The exercise target heart rate was determined to be the resting heart rate plus 20 beats 8. The patient started in hall walking with an absolute intensity of 1.6 mph, and 0% of grade elevation (2.0 METs) for 15 min (with resting intervals of 2 min), 2 times per week. The progression of the exercise program was done following the responses of the patient at each exercise session. The increments were low (increasing 0.25 METs-every 4-6 exercise sessions; increasing 5 min of duration-every 6-8 sessions, approximately), resulting in a slow exercise progression. A plastic molded ankle foot orthosis was prescribed to help decrease energy consumption while walking (12).

During the exercise program the patient required medical interventionsdue to events such as hypoglycemia, hypotension and depression. The patient had a second cerebrovascular accident at home (March '96) and a brain CT scan showed a hemorrhagic infarct in the right occipital lobe. She developed increased weakness on the left hand and involuntary movements on the left upper and lower extremities. The patient was withdrawn from the program for 2 weeks. After this event the exercise program progressed with higher and faster increments than the initial period. A total of 9 increments were done in the exercise progression. It was changed from hall walking to cycleergometer (20 min with 2 min resting intervals) with good tolerance. After 50 sessions the patient reached 5 METs with an absolute intensity of 100 watts. The patient attained 8 sessions at 5 METs of intensity and 30 min of duration. After the discharge of the program, she was strongly suggested to continue an exercise home program. The home program prescribed provided an on-going plan in which the patient can exercise indefinitely. At the moment of discharge the patient was able to tolerate ADL with minimal symptoms.

Discussion

The results shown in Table 3, demonstrate that the patient had a decrease in cholesterol level, increased low back and hamstring flexibility, vital capacity and daily energy expenditure related to low and moderate intensity daily activities. Although statistical significant testing was not performed, the percentage of difference between the

Table 1. Evaluation of the Patient at CRP phase II.

Variables	Initial	Second	% of difference
Cardiovascular function			
Resting heart rate (b/min)	88	92	2.2
Resting blood pressure (mmHg)	90/70	90/70	0
Double product (mmHg x b/min)	7,920	8,280	2.2
Ejection fraction (%) by cardiac catheterization	18		30.8
Ejection fraction (%) by echocardiogram		34	
ECG	NSR, Q wave (V1-5), inverted T (I, AVL, V4-6)		
Coronary arteries by angiography	Normal		
Lipid profile			
Cholesterol (mg/dl)	246	184	14
Low density lipoprotein (mg/dl)	148		
High density lipoprotein (mg/d.)	37		
Triglycerides (mg/dl)	307	284	3.9
Blood glucose (mg/dl)	104	86	9.5
Other laboratories	Normal		
Physical fitness			
Vital capacity (ml)	2,570	2,576	.12
Flexibility Modified sit & reach (in)	8	10	11
Anthropometry			
Weight (lbs)			
Skinfolds	199	191	2.1
Total (mm)			
Central (mm)	100	95.3	4.5
Superior (mm)	40.3	36	5.6
Inferior (mm)	27.7	30.3	2.4
Body composition	32	29	4.9
Percent body fat (%)	36.2	35	1.7
Body mass index (kg/m^2)	30.2	29.3	1.5
Daily activities energy expenditure			
Estimated basal metabolic rate kcal/kg/day	10.9	6.9	22.5
related MET	1	1	
time expended (hr)	10.5	6.7	
Estimated low intensity activities kcal/kg/day	23	31.2	15.1
related MET	1.7	1.8	
time expended (hr)	13.5	17.2	
Estimated moderate int. activities kcal/kg/day	0	.56	100
related MET		3.3	
time expended (hr)		.12	
Total kcal/kg/day	33.9	38.7	6.6
related MET	1.4	1.6	

final and initial evaluation were higher than 5% in these parameters. The activity record showed that the patient was able to perform household activities of an intensity greater than 3.5 METs. Also, she was able to engage in activities of low intensity for a longer period of time than before the cardiac rehabilitation period. As the exercise sessions were progressing, one of the most important changes was the reduction of symptoms related to heart failure and presence of ventricular arrhythmias. Also, there was a trend to reduce body mass index, body weight and body fat percent. These parameters are important components of health- related fitness. As mentioned before, the patient presented at the rehabilitation program with a low level of health-related fitness, which affected her capacity to perform daily activities. Her poor fitness and low functional capacity prevented her from receiving

Table 2. Exercise Prescription

Type of exercise	Aerobic exercise program
Intensity	
Target heart rate (b/min)	115-120
METs	2
Exercise modality	
Hall walking	1.5 mph, flat surface
Cycle-ergometry	25 watts, 50 rpm, .5 kp
Duration	15 min intermitent: 5 min exercise, 2 min resting 5 min exercise, 2 min resting 5 min exercise, cooldown
Frequency	2 times per week
Warm up	5 min of low speed walking
Stretching exercise	shoulders, arms, neck trunk, legs, and ankles
Cool down	5 min of low speed walking
Monitoring methods	
Telemetry	monitoring arrhythmias, dysrrhythmias and S-T changes
Glucose levels	70-250 mg/dl
Blood pressure	<200 mmHg systolic, <100 mm Hg diastolic
Rating of perceived exertion	10-11
Dyspnea scale	4-5
O^2 saturation (pulse oxymetry)	>95%
Angina scale	1-2

the benefits of an in-patient physical and occupational therapy program. Probably, her symptoms related to the congestive heart failure and the low mobility due to the stroke were the major causes in the deterioration of her fitness level and capacity to perform activities of daily living. At the beginning of the exercise program the patient was performing the exercise sessions with an intermittent duration, having various rest periods based on her exercise tolerance. As the exercise sessions progressed, the resting periods during exercise decreased. Also, at the beginning the patient was unable to walk from the parking lot to the facility, requiring a wheelchair. Later, she was able to walk the same distance without rest.

Table 3. Values of the Initial and Final Evaluation

Varialbles	pre	post
Resting heart rate (b/min)	88	80
Resting blood pressure (mm Hg)	90/70	80/60
Cholesterol (mg/dl)	246	157
Low density lipoprotein (mg/dl)	148	85
High density lipoprotein (mg/dl)	37	34
Triglycerides (mg/dl)	307	197
Blood glucose (mg/dl)	109	91
Vital capacity (ml)	2,570	2,700
Flexibility-modified sit & reach (in)	8	8.5
Weight (lbs)	199	201
Total skinfold (mm)	100	110.5
Percent body fat (%)	36.2	38.8
Total energy expenditure	33.99	38.28
Intensity of functional capacity (%)	30	75
METs	2.0	5.0
Duration (min)	15	30

Another relevant point of this experience, was the challenge of prescribing the exercise program for such a delicate case without a previous stress test and detailed guidelines. The acute pulmonary edema episode is considered to be an absolute contraindication for exercise stress testing. The common guidelines for exercise prescription were not applicable for this case. A different approach was necessary to safely exercise this patient. The Bouchard Three-Day Physical Activity Record was a very significant tool for the exercise prescription. This record gave a complete information of the patient's estimated daily energy expenditure and the intensity and type of physical activities that she was able to perform and the symptoms related to those activities. This tool was a safe approach in prescribing the patient exercise program. Besides the Bouchard Three-Day Activity Record, other instruments such as the RPE scale, dyspnea

scale, chest pain level scale, pulse oximeter and close monitoring of the patient symptoms were important methods for the execution of the exercise program.

In the past years the role of exercise in the rehabilitation with cardiomegaly, decreased ejection fraction, and congestive heart failure was considered to be a relative or an absolute contraindication (7,8). Guidelines for the rehabilitation of these patients are lacking. In our experience it has been shown that, with close monitoring and adequate medical intervention, this type of patients can be rehabilitated safely in a multifactorial setting. An exercise program with low increments, slow progression, and close supervision; and a strong educational counseling are fundamental in the rehabilitation program of a patient with dual disability such as MI and stroke.

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