Journal of Clinical Gerontology & Geriatrics
www.e-jcgg.com

Case Report

Pronounced improvement following progressive physical therapy in an LVAD recipient

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ABSTRACT

This paper refers to a 67-year-old male dilated cardiomyopathy (DCM) patient who received the left-ventricular assist device (LVAD) implant. However, having been affected by heart failure for many years, the patient had sustained long-term fatigue and weakness, and hence was in a depressed mood. The patient also experienced decreased muscle strength and muscle mass due to aging, which also led to a lack of endurance after the surgery. During the post-surgery recovery phase, the author worked with the patient, his family, physical therapists and heart-failure case-managers to implement an individually tailored recovery regime. As a result, the patient achieved an activity level of 1.0–3.0 metabolic equivalents (METs) in the cardiac care unit after surgery, which effectively improved his lack of endurance for activities. In addition, the patient performed daily living activities independently and regained his confidence. This case demonstrates the importance of cardiac rehabilitation and timing of cardiac rehabilitation.

INTRODUCTION

In Taiwan, heart disease is number two on the list of the ten most common causes of death accounting for 11.7% of the total annual deaths in the country.[1] The morbidity of heart failure in Taiwan sits at around 50%, and with transplant being the only effective option in many cases, the need for donor-hearts far exceeds their availability. Indeed, many patients expire before receiving one.[2] This leads to feelings of powerlessness on the part of the medical team, the patient and their families.

In 1975, the technique of using a left-ventricular assist device (LVAD) as a bridge for patients waiting for a heart transplant was pioneered. Although intended as a temporary measure, in many cases the LVAD has itself become a solution with many patients using it indefinitely.[3] LVAD is 7 cm long with a diameter of 3.5 cm and weighs approximately 280 g. It is composed of an inflow pump catheter, which collects blood from the apex of the left ventricle, and an outflow pump, which returns blood to the ascending aorta. A controller provides electricity to keep the device in operation, which delivers blood from the left ventricle to different parts of the body, increases blood perfusion to peripheral tissues and organs, and alleviate the symptoms of heart failure.[4,5] Currently, the post-implant survival-rate for the LVAD in the first year is 78%,71% by the end of the second year, with the longest recorded survival-time being as long as 8 years post-implant.[5,6] Patients who show symptoms of heart failure for many years require repeated, even long-term hospitalizations, and the use of inotropic agents, which implies that they are unable

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Received 10 July 2017
Accepted 9 September 2017
DOI: 10.24816/jcgg.2018.v9i1.07

Keywords
heart failure
Left-Ventricular Assist System
cardiac rehabilitation

to return home. For these patients, returning home and maintaining their original lifestyle and habits after surgery will enable them to achieve physical and emotional comfort, thereby increasing the patient's quality of life.[7,8] Owing to its value and importance, currently in Taiwan, the LVAD has become a commonly chosen option among heart failure patients.

CASE PRESENTATION

In the three months prior to receiving the HeartMate II Left-Ventricular Assist System™ implant, this patient experienced nausea and vomiting, shortness of breath during physical activity and a worsening of symptoms related to heart failure. After being diagnosed with DCM, he was found to have level four heart failure (NYHA) and was subsequently treated with Dopamine (5 μg/kg/min) and Dobutamine (3 μg/kg/min). The patient's echocardiogram revealed a left ventricular ejection fraction (LVEF) of 23%, a right ventricular ejection fraction (RVEF) of 38%, and severe regurgitation of the mitral and tricuspid valves. Due to the persistence of the symptoms of low cardiac output the patient was transferred directly into cardiac care unit where his condition continued to deteriorate. The patient received the LVAD on Jan. 04 2016. On the first day after surgery, the patient had his endotracheal tube removed. However, due to an extended period of inactivity, the patient's muscular strength was very low (Medical Research Council Scale for Muscle Strength, level 3), so the patient was trained using techniques of controlled deep breathing and coughing, and prone exercises focusing on joint-articulation. At four days after the surgery, the patient's muscular strength had improved to level 5 (MRC scale) and, with assistance, the patient was able to translocation on the side of his bed, and also to stand for limited periods while engaging in joint-articulation exercises. The LVAD pump speed was 8800-9200 rpm, flow 4.1-4.5 l/min. During activity, the mean blood pressure was approximately 80-89 mmHg. While in cardiac care unit the patient's activity level was 1.0-3.0 METs, and his heart failure level improved to level 2 (NYHA). The patient transferred out of cardiac care unit and to cardiac ward on Jan. 22 2016.

DISCUSSION

At the stage in life where individuals are meant to be enjoying their old age and consolidating their self-values, these patients were affected by heart failure for many years, which led to the deterioration in their heart and lung functions. Together with issues such as fatigue, weakness, and shortness of breath, the patient was ultimately confined to long-term bed rest and refrained from performing activities. This in turn led to the decrease in muscle strength and lack of endurance in activities, which resulted in a low mood. LVAD implantation is a treatment option for heart failure. It can effectively improve the symptoms and discomfort of the disease, but the patient's muscle strength and performance in physical activities cannot recover immediately. The impact on daily activities and self-care abilities made the patient feel powerless and hopeless, which was sufficient to affect his quality of life.

The patient presented in this paper is a 67-year-old man with heart failure. His chief complaint before surgery was that, "I used to have a poor heart, but I could manage daily activities. Every day, I went for a brisk or slow walk, or cycled. However, since November last year, I felt breathless and strenuous every time I moved, so I mostly stayed at home and rested in bed." As chronic heart failure leads to long-term fatigue and weakness, and decreased activity level, it can cause a loss of muscle strength. After the implantation of LVAD, the patient complained that "I still feel a bit tired, and have no energy. I cannot stop my hands and feet from shaking. I cannot even eat on my own." The patient clearly had an issue with lack of endurance.

The literature indicates that after 30 years of age, an individual's muscle mass decreases by 1% per year. From 40 years of age, their muscle mass will decrease by an average of 10–15% per decade with increasing age. Muscle mass and muscle strength will decrease linearly, which speeds up after 70 years old at a rate of 25–40% per decade and as much as 50% at 80 years old.[9,10] This could potentially lead to poor prognosis, including falls, fractures, and deaths, as well as loss of independence.[11] For the 67-year-old male patient in this paper, the disease caused a decrease in muscle mass, which then affected his functional activities, and limited his ability to perform daily activities. Therefore, first-stage cardiac rehabilitation was implemented when the patient was in postoperative intensive care. The main objective of the rehabilitation was to remove the endotracheal tube as early as possible and to prevent postoperative respiratory or inactivity-related complications. Moreover, a cardiac rehabilitation plan tailored to the needs of this patient was developed. Due to pre-operative weariness, and post-operative muscle wasting and intolerance to activity, the author suggests that the first stage of care should start immediately after surgery and focus on physical therapy as its primary objective to mitigate the potential for respiratory complications, and to minimize the adverse effects of prolonged inactivity. Specifically, the author suggests that the endotracheal tube is removed as soon as possible and that the patient in engaged with a physical therapy regime consisting of 30-60 minutes of exercise (including a 3-5 minute warm-up, and a 3-5 minute cool-down) 3-5 times per week. Within this, the author recommends that the patient engage in 20-40 minutes of predetermined intensity exercise per session. The author recommends that the patient is assisted to the desired level of activity progressively, in small increments and that isometric exercise and the Valsalva maneuver are avoided.[2] The patient in this study, while in cardiac care unit, completed 1.0-3.0 METs[12], improved his intolerance to activity, became able to engage in daily activity independently.[13] This study shows just how important post-operative physical therapy is to a patient's recovery.

CONFLICTS OF INTEREST STATEMENT

There are no conflicts of interests including financial,

consultant, institutional and other relationships that might lead to bias.

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