Dilated Cardiomyopathy: Physiotherapy Challenges, Treatment and Recommendations; A Tertiary Care Center Experience

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Abstract

Interdiction: Cardiomyopathy (DCM) is a disease of the heart muscle that makes it harder for the heart to pump blood to the rest of the body. DCM is characterized by cardiac enlargement and impaired systolic function of one or both ventricles with normal left ventricular wall thickness.

Case presentation:
A case of a 19-year-old male with DCM and Ejection fraction (EF): <10%. He had been hospitalized for >200 days and had been constantly on inotropic support for more than 2 months and was on the transplant waiting list. Due to rapid deterioration and loss of weight, reduced muscle mass he developed cachexia and hypo-perfusion of several organ systems. This patient was supported by extracorporeal membrane oxygenation (ECMO), a month later a heart transplantation surgery was done. Strengthening, function and balance exercises were needed to be initiated prior to Aerobic Exercise (A/E) in cachexic patients.

Result and Discussion
The current report showed significant improvement in patient condition post the Cardiac rehabilitation (CR) program (P<0.05). It has been proven that aerobic and resisted exercises are the most effective type of treatment protocols for patient with DCM. However, the challenges in the current case found to be with post ECMO complication, cachexia (patient weight was 37 Kg, BMI was 15.9kg/m2) and high level of depression and lack psychosocial support among the Saudi population diagnosed with DCM and under gone heart transplantation surgery. Special consecrations must be taken in developing exercise prescription program for those patients.

Conclusion
The CR program of DCM patient who had ECMO and under-went heart transplantation need gradual progressive in applying the exercise. Aerobic and strengthening exercises including leg press machine as an essential part of the CR program that facilitate general muscle core of those patients. A high level of psychosocial and nutrition support is needed to over-come the anxiety and depression level which consequently improved well-being and quality of life.

Keywords: Heart Failure, DCM, CR, ECMO, Physical Therapy Role, Aerobic Exercise

Background

Introduction
Dilated cardiomyopathy (DCM) is characterized by cardiac enlargement and impaired systolic function of one or both ventricles with normal left ventricular wall thickness [1]. It is characterized by cardiac enlargement and impaired systolic function of one or both ventricles with normal left ventricular wall thickness [2]. It is reported that DCM is the most common form of cardiomyopathy and cause of cardiac transplantation in children and young adult, however, the epidemiology, detailed echocardiographic criteria of risk and clinical course of DCM in children as well as in adults are not well established [3].
Prevalence and clinical presentation of DCM in KSA

The prevalence of DCM in the Kingdom of Saudi Arabia is unknown [4]. This has been reported previously with the first epidemiological study that has been conducted by Al-Nozha et al [5]. However, it has been reported by Al-Azkawi and Al-Mutair [6] that DCM in Saudi Arabia has an estimated incidence of 1.13 cases per 100,000 children and the primary etiology occurs in fewer than half of these children but significantly improves their outcome. Most patients present between the ages of 20–50, but the disease may also affect the children and elderly. Symptoms usually develop gradually and patients may remain asymptomatic with LV dysfunction for months or even years [7].

Case presentation

This is a 19-year-old male with dilated cardiomyopathy and relatively very short prior history, Ejection fraction, <10%, height was 171 cm, weight 37 kg. He had been in the KFSH&RC hospital for over 200 days and he had been constantly on inotropic support for more than 2 months and was on the transplant waiting list. However, due to rapid deterioration patients developed cachexia, reduced muscle mass and hypo-perfusion of several organ systems. Therefore, the Medical team decided to put him on Extracorporeal Membrane Oxygenation (ECMO). Post ECMO patient have had several complications including liver failure, respiratory failure and gastrointestinal bleeding.

After 3-4 weeks from ECMO implantation patient started recover gradually, and at that time patient referred to Physiotherapy for cardiac rehabilitation. One of the major complication in addition to the previously mentioned he had remarkable weight loss and muscle loss, his weight was 37 Kg and body mass index (BMI) of 16 kg/m^2. 39 days’ post ECMO and daily exercise which mainly was active assisted range of motion (ROM) exercise, the patient underwent heart transplantation surgery on 18 March (see timeline Table 1). Post heart transplantation, patient condition was stable but the main complication was that the patient was having severe depression, and a massive reduction in his muscle mass, nasogastric tube (NGT) feeding, tracheostomy, and a remarkable sacral wound as a result of prolonged bed redden. However, the post heart Transplantation cardiac rehabilitation (CR) protocol was started 2nd post-operative day, the challenge in dealing with this patient was severe depression and un desire to participate in the CR program with the absence of the Psychosocial support and clinical Psychologist in the hospital, in addition to the remarkable decrease in the BMI due to poor appetite. Nevertheless, with tremendous, family member support, Nutritionist and the proper CR intervention plan, “see the Consensus Exercise Reporting Template (CERT) Slade et al [8] at Table 2”. After a 6 month of gradual and comprehensive CR intervention program and multidisciplinary team work patient showed tremendous recovery and good quality of life. The outcome measures and results of the intervention programme were discussed below:

Assessment through Time Line

The time line of the presented case study from the day of admission till the day of discharge is displayed in the time line Table below:

<table>
<thead>
<tr>
<th>Date</th>
<th>History, clinical situations and interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 December</td>
<td>Patient admitted to Cardiac surgical intensive care unit (CSICU) of King Faisal Specialist Hospital and research Center through emergency and diagnosed with idiopathic dilated cardiomyopathy. Status and complication were: Ejection fraction, &lt;10%, NYHA class IV.</td>
</tr>
<tr>
<td>06 February</td>
<td>Patient still in CSICU. Medical team decided to do ECMO insertion post condition deterioration, complication was: intubation for a week, then tracheostomy, liver Failure, respiratory failure, Gastro Intestine (GI) bleeding, Sacral wound, nasal-gastric tube feeding (NGT) and patient was very cachectic. Cardiac rehabilitation started 4 weeks post ECMO.</td>
</tr>
<tr>
<td>18 March</td>
<td>Still in CSICU. Patient under-went heart transplantation surgery, and was still having some complications: liver Failure, respiratory failure, Gastro Intestine (GI) bleeding, Sacral wound and patient was still very skinny. Cardiac rehabilitation resumed 2nd post-operative day</td>
</tr>
<tr>
<td>13 May</td>
<td>Trachea and NGT removed. Patient is feeding orally. Improving physically, started to walk in the room with walker and very closed supervision.</td>
</tr>
<tr>
<td>20 June</td>
<td>Patient status improved and has been transferred to the cardiovascular step down (CVSD) unit which between the CSICU and the Cardiovascular Telemetry Unit (CVT). Patients continued</td>
</tr>
<tr>
<td>27 July</td>
<td>Patient improved a lot. Patient discharged home walking using walking aids (Cane). Almost independent in bed mobility and need minimal assistance in out of bed mobility. The Six mints walk test (6MWT) = 198 m. See Table 2 and 2</td>
</tr>
<tr>
<td>13 Sept</td>
<td>Complete the outpatient cardiac rehabilitation program, independent in ADL. The 6MWT= 330 m. See Table 2. Patient D/C from the hospital completely independent able to do 20 min cycling, 15 - 20 min Tread mill and can go upstairs; 2 levels of 10 steps.</td>
</tr>
<tr>
<td>20 Sept</td>
<td>Patient completely recovered, back to school and normal life</td>
</tr>
</tbody>
</table>

Table- 1: Timeline of clinical situations and interventions.
Functional and bed mobility’s

Patient at baseline (2 weeks post ECMO) was unable to do any of the bed mobility’s, however prior to the hospital discharge (post 6 months of CR program) he was independent in rolling from side to side, need minimum assistance for sitting at edge of the bed and his sitting and standing balance was fair. But post the 8 weeks of the patient was able to be independent in all the activities of daily living.

Out of bed mobility’s assessment

Patient was completely dependent in bed mobility at baseline, but prior to hospital discharge (post 6 months of CR) patient was able to Able to transfer with minimum supervision due to fair balance, Able to walk with very close supervision using cane and Able to claim the stairs (5 steps) with very moderate assistance. However, Post CR program (8 weeks of CR), patient was independent in transfer, Able to walk with cane only for 30-50m, Able to claim the stairs (10 steps) independently. Post one year follow up patient was completely independent in all activities of daily living.

Methods

Intervention through time line

The treatment program includes three-time frames: Two-week post ECHO (In-patient), Post heart transplantation (Inpatient), 6 months and post D/C from CR (1 year, Unsupervised). The intervention programme of the current study was displayed in the Consensus Exercise Reporting Template (CERT) format as supported by Slade et al [8] see Table 2.

Outcome measures

A high reliable and valid tool (The Arabic version SF-36 questioners) was used to measure the quality of life [9]. The Six minutes’ walk test was also used to measure exercise [10]. All outcome measures were taken three times.

<table>
<thead>
<tr>
<th>Intervention parameters</th>
<th>Intervention</th>
<th>Outcome patient CR (8 weeks)</th>
<th>POST D/C From CR (1 year Unsupervised)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Daily 1-2/day</td>
<td>3 time/week</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>Light, RPE 10 - 12, 40 - 60% HR max, Borg scale &lt; 15</td>
<td>Moderate 11 - 15, Gradually increased to 60 - 75% Borg scale &gt; 1.5</td>
<td>Patient advised to walk 5x/week with moderate — max intensity which was advised to be 60 - 75% of his Max HR &amp; (11 - 15) Borg S-scale</td>
</tr>
<tr>
<td>Type</td>
<td>AAROM exercises for both upper and lower extremities.</td>
<td>Leg press, Stepping UBE, Bike T. mill</td>
<td>Community Gymnasium.</td>
</tr>
<tr>
<td>Time</td>
<td>Each exercise had been repeated 10 - 15 times (15 - 20 min)</td>
<td>Each exercise has been repeated for 1.5 times (20 - 30min)</td>
<td>30 - 45 min</td>
</tr>
<tr>
<td>Setting</td>
<td>King Faisal Heart Institute Cardiac Center, KSA, Riyadh.</td>
<td>King Faisal Heart Institute, Cardiac Centre, KSA, Riyadh.</td>
<td>Pts. rim self</td>
</tr>
<tr>
<td>Who</td>
<td>Physiotherapist</td>
<td>Physiotherapist</td>
<td>Phone calls &amp; self-motivation.</td>
</tr>
<tr>
<td>Adherence</td>
<td>91.67%</td>
<td>$7.5%$</td>
<td>Yes</td>
</tr>
<tr>
<td>Motivation</td>
<td>Yes through all medical team</td>
<td>No apart from home exercise program.</td>
<td></td>
</tr>
<tr>
<td>Home Programs</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2: Intervention plan according to CERT format Slade et al [8].
Results

The study showed statistically and clinically significant improvement in the physical fitness (6MWT) and quality of life (SF-36), p < 0.05. The 6MWT increase from 297 meters post hospital discharges to 429 meters post the 8 weeks outpatient CR program. Finally, after one year follow up the physical fitness showed significant increase, the 6MWT increased up to 462 meters (see Figure 1). In addition, the result also showed significant improvement in the eight domains of the SF-36, P< 0.05 which represent the quality of life at the three timelines (see Figure 2).

Discussion

Patients with DCM are known to have a poor clinical status and impaired exercise capacity due to both to cardiac limitations and to peripheral maladapted of the skeletal musculature [11]. It has been proven that aerobic and resisted exercises are the most effective type of treatment protocols for patient with DCM [12]. However, the challenges in the current case found to be post ECMO complication, such as cachexia (patient weight was 37 Kg, BMI was 15.9kg/m2), high level of depression and lack psychosocial support among the Saudi population diagnosed with DCM and under gone heart transplantation surgery. Since muscle atrophy has been verified to be a hallmark of HF, the main principle of our exercise program with such conditions is to train the peripheral muscles effectively without producing great cardiovascular stress. However, studies stated that in order to increase muscle mass and strength in patients with HF there is a need for implementing resistance exercises in the exercise training programs [13, 14, 15]. One of the preferable equipment for these patients along with aerobic exercises was the “Leg press machine” where they become lying down on their back and train the peripheral muscles without heart stress. Based on recent scientific evidence, the application of specific resistance exercise programmes is safe and induces significant metabolic and functional adaptations in skeletal muscles, contributing to the treatment of muscle weakness and specific myopathy occurring in the majority of CHF patients [16, 17, 18]. It is important to differentiate cachexia from under nutrition or anorexia, which are reversible conditions with adequate food intake, which hardly occurs in cachexia. The cardiac cachexia is characterized by the predominance of lean body mass loss, being caused by many factors [19]. Thus, nutrition DCM patients is very essential, thus in the presented case the proper nutrition contributed in remarkable improvement in body weight (53 kg BMI was 20.9). It is believed that psychological distresses have direct impact on the physiological stress response system and it is also associated with poor lifestyle behaviours that contribute to coronary artery disease (CAD), therefore, a massive support from the medical team, physiotherapist and family members was essential and also meeting other patient that have been through similar procedure was of a great help to sustained psychological well-being and played essential roll along with the cardiac rehabilitation program to improve the patient physical fitness (6MWT) and quality of life (SF-36).

Conclusion

The CR program of DCM patient who had prolonged bed redden period before ECMO and under-went heart transplantation may need gradual progressive in applying the exercise program. The main aspect of the protocol should include combination of Aerobic exercises with strengthening (resisted) exercise of the peripheral aspects of the body using leg press machine as an essential part of the CR program that facilitate general muscle core of those patients. In addition,
high level of psychosocial and nutrition support is needed to over-come the anxiety and depression level which consequently improved well-being and quality of life.

References


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