Rehabilitating Patients with Multiple Comorbidities

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KIM: ***Rehabilitating Patients with Multiple Comorbidities.*** *The cardiac rehabilitation (CR) is actively being operated at hospitals throughout the world and the individualized tailored program is necessary to get the greatest result by the safest way in each patient. However, there are many non-cardiovascular limitations to hinder the participation of CR program. Diabetes mellitus, end-stage renal disease (ESRD), severe chronic obstructive pulmonary disease (COPD), and elderly itself are common medical problems. Moreover, physical problems such as lower limb amputation, stroke hemiplegia, paraplegia, and musculoskeletal pain disturb in active involvement of CR program. In case of multiple comorbidities, CR program might be rejected by the medical staff partly due to its safety and complexity or by the patient's self-giving up. But the need and benefit of CR are applied to those kinds of patients also. To get the successful result in patients with multiple comorbidities, CR staff should know the patient's overall physical conditions and must develop the best strategy to conduct safe and efficient exercise program. The risk factor modification programs and the exercise training can be adapted and modified for them with the same training principles. So, this is an area where physiatrist (a physician specializing in physical medicine and rehabilitation) can take a leadership role, as most existing programs are limited in the ability to compensate for them. As a matter of fact, CR program is more desperately needed for those kinds of patients and comprehensive and multidisciplinary approaches should be taken to provide it successfully. (J HK Coll Cardiol 2006;14(Suppl 2):B39-B42)*

Cardiac rehabilitation, comprehensive approaches, multiple comorbidities

摘要

心臟病的復康治療在全世界各個醫院都在積極地開展中，個體化的治療方案是很有必要的，它能夠採用安全的方式使患者得到最好的結果。然而，有許多非心臟疾患因素阻礙了心臟病復康計劃的實施。糖尿病、終末期腎病、嚴重的慢性阻塞性肺病、和高齡本身均是常見的醫療問題。不僅如此，機體的問題如下肢的截肢、中風後半身不遂、截癱和肌肉骨骼疼痛，困擾著心臟病復康治療的積極開展。一旦出現合併多種疾患，心臟病復康治療可能部分因治療的安全性和複雜性，被醫務工作人員拒絕，或被患者本人放棄。然而，心臟病康復治療對於此類患者也是需要、並有益處的。爲了使合併多種疾患的病人治療獲得成功，心臟病復康人員必須知曉病人總體的身體狀況，採用最佳方案，開展安全有效的訓練計劃。依據相同的訓練原則，對於這類患者應採用危險因素修正的計劃，並在訓練中不斷地調整和改進。因此，在訓練場所內物理治療醫師（精通內科學和復康學的醫生）具有領導核心地位，而現行的治療計劃對於機體的康復能力十分有限。事實上，心臟病康復治療對於患者是非常需要的，採用綜合方法和多學科的介入是成功的保障。

關鍵詞：心臟病復康　綜合方法　合併多種疾病

Introduction

Because of many positive research results on the benefit of cardiac rehabilitation (CR) in the last fifty years, there is no one who can ignore the need of the CR. Though it is still centered on developed nations, the CR is actively being operated at hospitals throughout the world and the individualized tailored program for each patient is necessary. Needless to say, the reason why CR should be run on tailored program is to get the greatest result by the safest way in each patient.

We all know the importance of the CR program for the recovery of physical function and the secondary prevention of atherosclerotic ischemic heart disease

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(IHD), and so called 'good candidate' can get these goals easily and safely. Of course, in case of well known contraindication to exercise including unstable angina, resting ST depression over 2 mm, uncontrolled dysrhythmias, severe aortic stenosis, resting systolic blood pressure (BP) over 200 mmHg or diastolic BP over 110 mmHg, uncompensated CHF, symptomatic orthostatic systolic BP drop 10-20 mmHg, further medical managements are necessary prior to starting CR program. But other comorbidities besides those cardiovascular reasons of contraindication also hinder the participation of CR program. Especially with multiple comorbidities, the participation of CR program may be rejected by the medical staff possibly due to safety and its complexity or the self-giving up of the patient.

But the need and benefit of CR, which have been mentioned earlier, are also applied to the patients with multiple comorbidities, so the CR staff must prepare and develop the best way for them to participate in CR program. The risk factor modification programs and the exercise training can be adapted and modified for patient with multiple comorbidities with the same training principles. So, this is an area where physiatrist (a physician specializing in physical medicine and rehabilitation) can take a leadership role, as most existing programs are limited in the ability to compensate for them. As a matter of fact, CR program is more desperately needed for those kinds of patients and comprehensive and multidisciplinary approaches should be taken to provide it successfully.

Comorbidities to Disturb Participating Cardiac Rehabilitation Program

There might be two kinds of comorbidities to disturb CR, medical and physical comorbidities, as shown in Table 1.

Table 1. Comorbidities to Disturb Cardiac Rehabilitation

Medical comorbidities	Physical comorbidities
Diabetes mellitus	Low limb amputation
End-stage renal disease	Hemiplegia
Severe COPD	Paraplegia
Geriatric patient	Musculoskeletal pain

COPD, chronic obstructive pulmonary disease

Medical Comorbidities

In diabetes mellitus, there are several factors to be considered in cardiac rehabilitation. Blood sugar is tested before and after exercise, and during training if hypoglycemia is suspected. Significant hypoglycemia while exercising is frequent in patients with insulin dependent diabetes, but is most common several hours after completion of exercise.[1] A patient having diabetes who has a blood sugar <100 mg/dL before exercise should eat a carbohydrate snack and monitor blood sugar during the exercise session. If blood sugar is >350 mg/dL, exercise is postponed.[2,3] Exercise training in patients with autonomic neuropathy should be conducted to minimize the adverse consequences of orthostatic hypotension, silent ischemia, and arrhythmia. Patients should be adequately hydrated before exercise and should avoid exercise after a meal or during the morning. They should also adjust their antihypertensive medication and the environmental temperature. They should use compressive stockings, and the exercise should be done in a supervised environment. The target for exercise should be predicted on perceived exertion rather than HR.[4] Somatic neuropathy puts the patient at a higher risk for injury because of decreased sensation. The patient should be taught about proper foot care and proper fitting of shoes. Non-weight-bearing exercise, such as swimming, bicycling, rowing, or armchair calisthenics, may be appropriate for patients with a concomitant lower-extremity disorder.

The effects of exercise in patients with end-stage renal disease (ESRD) have been studied for patients both with and without concomitant CAD.[5] The safety of CR in patients with ESRD and with a recent acute coronary event has not been established. In a 1-month multicenter study of chronic hemodialysis patients, 76% manifested ventricular arrhythmia, 69% demonstrated supraventricular arrhythmia on 48-hour ambulatory monitoring, and 39% manifested multiple episodes of complex ventricular ectopy.[6] The frequency of ventricular arrhythmia increased significantly during the second hour of dialysis and lasted up to 5 hours after

dialysis. There is both a higher incidence of ischemia during exercise training and a higher incidence of silent ischemia in a patient with ESRD. So, a supervised and monitored exercise program is prudent for these patients. The exercise target rate of 50% to 70% of that achieved on a screening maximum exercise test showed improvement in exercise capacity and symptoms.

In case of cardiac patient with severe chronic obstructive pulmonary disease (COPD), they need to have exercise testing performed with oxygen and need a monitored supervised program because they are in a high-risk group. Pulse oximetry is often used to monitor peripheral tissue oxygenation during the exercise program. These patients will often show less improvement in their peak VO_2 with CR compared with non-COPD cardiac patients.[7]

In the elderly, ischemia often cannot be reliably detected because of the frequent absence of chest pain and dyspnea may be related to an underlying pulmonary disorder rather than an angina equivalent. There is an increased potential for exercise related myocardial ischemia and arrhythmia in this age group and an overall increased risk for adverse events.[5] So, exercise prescription for the elderly need to be modified with respect to intensity, frequency, duration, and mode of exercise compared with younger individuals. In addition, the elderly generally have musculoskeletal limitations, particularly as a result of arthritis and de-conditioning of specific muscle groups. It is important to recommend activities that require low levels of energy expenditure (around 40% to 50% of VO_{2max}), particularly during the first weeks of a program. It is often best to prescribe mild increases at the time of program progression. In general, the elderly are encouraged to increase the frequency of exercise but maintain a short duration. Because of reduced cardiac reserve and decreased ability to sweat efficiently, there is a need for a rest period during physical activity. Some elderly patients also have a pacemaker and/or ICD (implantable cardioverter-defibrillator). The exercise target rate ranges for the patient with an ICD should be set at 20 to 30 beats per minute below the threshold rate of the device.

Physical Comorbidities

Because many of the patients also have concomitant physical comorbidities including lower limb amputation, hemiplegia, paraplegia, and musculoskeletal pain such as arthritis and lumbago due to various reasons. These patients can be quite challenging. It may not always be feasible to conduct a peak or symptom-limited exercise test in this group of patients. Alternatively, a symptom-related rating scale including the perceived exertion scale of Borg and a scale for angina, dyspnea, or claudication could be used. A dipyridamole thallium stress test could be helpful in some subjects before the beginning of a CR program.[8] One can also use the RPP (HR x systolic blood pressure) or simply check the HR_{rest} and not allow it to go beyond 20 beats from the baseline with exercise.

The two most common physical disabilities associated with IHD are lower limb amputation and stroke. Patients with these conditions are often quite anxious at the start of a program. This tends to adversely affect their cardiac capacity. Furthermore, some patients who appear medically stable may decompensate when they perform a high level of physical activity. Monitoring the patient's initial performance by ECG telemetry may be very useful in guiding therapy.

In cardiac amputee patients, prosthetic ambulation even in a trained individual is a high-energy-cost physical activity. Compared with the average energy cost of normal ambulation at 3 METs, prosthetic ambulation requires a 9% to 28% increase for the unilateral below-knee amputee, a 40% to 65% increase for the unilateral above-knee amputee, a 125% increase for the hemipelvectomy patient, and a 280% increase for the bilateral above-knee amputee. Knowing the NYHA functional classification, one can estimate the cardiac functional capacity and the patient's ability to ambulate with a prosthesis. Except for some unilateral below-knee amputees, class III patients usually function at a wheelchair level. Class II patients, except bilateral above-knee amputees, may have the capacity to walk with a prosthesis.[9] Monitoring can be a way to convince the patient with lower-extremity amputation that it is safe to proceed with prosthesis training or that prosthetic training is contraindicated and that functioning at the wheelchair level is consistent with a person's cardiac capacity.

Stroke patients have functional impairments including paresis, paralysis, spasticity, and sensory perceptual dysfunction.[10] These patients may perform

a variety of aerobic activities, and stationary arm-leg cycle ergometry may be used. Activities should be modified to satisfy the needs of the individual. A trained hemiplegic patient who ambulates with or without a lower-extremity orthosis walks at a speed that is 40% to 45% slower than the normal individual, yet the energy cost of ambulation is 50% to 65% higher.[11] Monitoring of the patient during training to negotiate stairs, use ambulatory aids, establish wheelchair activities, and perform upper-extremity strengthening exercises is useful. Monitoring may convince the patient that physical rehabilitation training is feasible and will improve the patient's psychological comfort.[12]

In spinal cord injury, there are multifactorial reasons to reduce exercise capacity including loss of muscle pump action causing decreased venous return, muscle weakness or atrophy, altered respiratory system function, small cardiac chamber size, greater use of type II muscle fibers, sedentary lifestyle, impaired autonomic nervous system, impaired neurosystem control, and altered hormonal effects. Wheelchair propulsion, arm ergomety, wheelchair cycling using arm cranks, and hybrid exercises involving arm ergometry combined with lower-extremity functional electrical stimulation can be used as modes of aerobic exercise for these patients.[9]

Musculoskeletal pain is another common problem to hinder CR. Neurogenic intermittent claudication due to spinal stenosis is often confused with vascular claudication especially in elderly patient. Low back pain from degenerative spondylosis or disc herniation is not unusual. Lower limb pain due to arthritis, radiculopathy, or diabetic neuropathy also interrupts active involvement of CR program. Comprehensive managements to reduce musculoskeletal pain including physical therapy, medication, pain block, specific exercises or surgery as indicated might be necessary. In this situation, the purpose of pain control is to keep aerobic exercise enough to get the goal of CR.

Conclusion

We definitely agree that CR program can help the recovery of physical function and the secondary prevention more effectively. This benefit can be available not only for 'good candidate' but also for the patient with multiple comorbidities. So the CR program should be adapted and modified for those patients with the same training principles. This is an area where physiatrists can take a leadership role, as most existing programs are limited in the ability to compensate for them. Actually CR program is more desperately needed for those patients and comprehensive and multidisciplinary approaches should be taken to provide it successfully.

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