Case report

Impact of cardiac rehabilitation in post-myocardial infarction: a case report

ABSTRACT

The benefits of cardiac rehabilitation have been demonstrated for several years by various studies showing a 25-35% reduction in mortality, fewer complications and improved physical capabilities and quality of life. In this article, we describe the beneficial effect of cardiac rehabilitation on post-myocardial infarction patients with coronary artery disease.

Patient aged 60, chronic smoker, diabetic, hypertensive and dyslipidemic. Admitted for management of a post-infarction complicated by 35% LV dysfunction related to a right coronary occlusion dilated by a stent. The patient was recruited 3 weeks after hospitalization for a cardiac rehabilitation program after an initial clinical and paraclinical evaluation. The final evaluation showed a marked improvement in cardiorespiratory and functional capacity, with improvements in VO2max, SV1, maximum Fc and VE/VCO2 ratio. We also noted an improvement in cardiovascular risk factors with goal attainment, quality of life based on the HAD questionnaire, and adherence to treatment.

Cardiac rehabilitation is aimed at all dilated, operated or medically treated coronary patients. It requires a comprehensive, multidisciplinary approach, and helps to improve exercise performance, quality of life and psychological profile, as well as contributing to better socio-professional reintegration.

KEYS WORDS: cardiac rehabilitation, coronary artery disease, quality of life

INTRODUCTION

Cardiac rehabilitation is playing an increasingly important role in the management of coronary artery disease. However, there is a major discrepancy between the undeniable benefits of cardiac rehabilitation for these patients, as demonstrated by all the studies, and the small number of existing centers, mainly in developing countries. Numerous studies [1,2] have amply demonstrated the benefits of physical exercise for coronary heart disease patients. The first studies showed an improvement equivalent to treatment with beta-blockers [3].

We have chosen to devote this article to the data in the literature, based on a case study validating exercise retraining in post-infarction patients, and to the content and progress of cardiac rehabilitation.

CASE PRESENTATION

Patient aged 63, chronic smoker, diabetic, hypertensive and dyslipidemic. Admitted to the cardiac intensive care unit for management of a post-myocardial infarction complicated by LV dysfunction (LVEF 35%) related to a coronary occlusion successfully dilated by an active stent. He was enrolled in a cardiac rehabilitation program three weeks after hospitalization. An initial medical check-up was carried out, detailing the patient's current condition, medical and surgical history, and treatment received. The assessment was based mainly on the stress test, the six-minute walk test, the evaluation of risk factors and the assessment of quality of life using the HAD score. The program was spread over an average of 20 sessions, with three one-hour sessions per week, starting with 5 watts and reaching 95 watts by the 20th session. It combined muscle strengthening, endurance interval training on a bicycle and risk factor management. Initial assessment of the cardiorespiratory exercise test showed a 1st ventilatory threshold of 60 watts, a maximum load of 90 watts, VO2 max of 12.7ml/kg/min, i.e. 43% of the predicted value, maximum Fc of 126bpm, VE/VCO2 ratio of 32, and a walk test of 502m.

Biologically, the patient had unbalanced diabetes with Hba1 at 11.6%, LDL at 0.92g/l, TC at 2.5g/l, collapsed HDL at 0.27g/l. echocardiographically, the LV was dilated to 61mm in the telodiastole, with hypokinesia in the inferior and inferoseptal regions, with severe LV dysfunction (LVEF 35%). An HAD anxiety and depression questionnaire was administered to the patient, with an initial high score of 31. Therapeutic education focused on weight loss, since he had a BMI of 32kg/m2 and a waist circumference of 102cm, by following a Mediterranean-style diet, reducing consumption of red meats, processed and canned foods, saturated fatty acids and replacing them with unsaturated fatty acids, and increasing intake of vegetable lipids and omega-3-rich fish. We also insisted on reducing salt intake to <5g/dr and water intake to 1L/dr since his LVEF was at 35%, as well as maintaining double platelet anti-aggregation and optimal treatment of heart failure. The final evolution showed an improvement in cardiorespiratory and functional capacities, the 1st ventilatory threshold was shifted to 90watts, the maximum load was 130watts, VO2max was 15.7ml/kg/min, i.e. 84% of the predicted value, maximum Fc was 110bpm, VE/VCO2 ratio was 27, walk test was 540m. The patient maintained physical activity after completion of the rehabilitation program. No major incidents occurred throughout the program, either clinically or electrically. The LVEF assessed at 3 months increased by 10 points from 35% to 45% at the end of the program. His HAD score fell from 31 to 19. The patient also lost weight, with a BMI of 28 and a waist circumference of 97cm. The final risk-factor profile showed Hba1c at 6.7%, LDL at 0.53g/l, TC at 1.8g/l, HDL at 0.62g/l. He is fully adherent to the diet and his optimal heart failure treatment.

DISCUSSION

CR should be considered (class IA recommendations) in all coronary patients, following an acute coronary syndrome (ACS) or angioplasty revascularization [4]. After femoral

angioplasty, the catheterization puncture site is examined before starting CR. A symptom-limited exercise stress test (ESET) can be performed as early as two weeks after an uncomplicated acute coronary syndrome (ACS), as the risk of stent thrombosis is very low (< 0.08%) [5]. In our situation, no cases of stent thrombosis were reported. Therapeutic education is essential in these patients, as is control of risk factors (smoking in particular), return to work is a major concern, and outpatient CR is preferred. Early restenosis can still be detected, although it is now rarer. CR of patients with symptomatic CCS (to reduce the ischemic threshold) or not (to optimize exercise capacity) helps to improve quality of life and discuss the need for further revascularization [6]. Cardiac rehabilitation is not limited to exercise reconditioning; it also includes therapeutic and dietary education, psychological support, help with smoking cessation, returning to work and social reintegration. Of course, it's also an opportunity to identify at-risk patients and optimize drug treatments. A multidisciplinary team of cardiologists, nutritionists, dieticians, physiotherapists and sports educators, nurses trained in therapeutic education, a psychologist-tobacologist and a social worker are on hand to provide comprehensive patient care.

Personalized physical exercise alone lowers morbidity and mortality, reduces symptoms, optimizes risk factors, improves physical and mental balance, and facilitates return to work and social reintegration. Contrary to popular belief, a stay in cardiac rehabilitation after an acute coronary event does not increase the cost of patient care, but rather reduces it [2]. In addition to the reduction in mortality, the rehabilitation group showed a 0.37 mmol/L reduction in total cholesterol, a 0.23 mmol/L reduction in LDL, a 3.2 mmHg reduction in systolic blood pressure, better compliance with smoking cessation and a better quality of life than the control group [7-9], as demonstrated in the meta-analysis by Cornelissen and Fagard [10]. In type 2 diabetic patients, exercise improves all parameters and reduces all risk factors, as demonstrated in 2006 by Thomas et al. [11]: decrease in glycosylated hemoglobin, fasting

blood glucose, insulinemia, LDL-cholesterol, blood pressure, overweight and increase in exercise capacity and HDL-cholesterol. Our patient reduced his TC level by 0.7g/l, LDL by 0.39g/l, balanced his blood pressure figures, which no longer exceed 140/90mmHg, stopped smoking since the event and lost weight, with BMI reduced from 32kg/m² to 28kg/m² and waist circumference from 102 to 97cm.

In the ETICA study, Billardinelli et al [12] compared angioplasty alone with angioplasty followed by exercise conditioning. One hundred and eighteen patients who had undergone angioplasty were randomized into a physical reconditioning group and a control group (medical treatment otherwise identical) for six months. Long-term follow-up (33 ± 7 months) showed a clear reduction in cardiac events (cardiac mortality, angioplasty, coronary artery bypass surgery, infarction in the trained group): 11.9% versus 32.2% ($p < 0.01$).

Vona et al [13] showed in 209 myocardial infarction patients that exercise, whether aerobic endurance or resistance, or both, significantly increased flow-mediated diameter compared with untrained patients ($p < 0.01$). Hambrecht et al [14] demonstrated an improvement in coronary endothelial function by exercise in coronary patients: 19 patients with coronary endothelial dysfunction were randomized into an exercise group and a control group. After four weeks, patients in the exercise group reduced the vasoconstriction initially induced by acetylcholine by 54%, compared with patients in the control group, where no change was observed ($p < 0.05$). They also demonstrated an increase in coronary reserve after adenosine injection in trained patients, where coronary reserve rose from 2.8 ± 0.8 to 3.6 ± 0.2 ($p < 0.01$) compared with the control group. Thus, all these studies argue in favour of an improvement in endothelial function through exercise [15].

Exercise training enhances angiogenesis by stimulating the development of coronary artery collaterals and promotes myocardial preconditioning. This probably explains the increase in

myocardial perfusion demonstrated in the PET study, where the myocardial perfusion gap was markedly reduced after exercise training, a reduction comparable to that observed after angioplasty. Giannuzzi et al [16] studied the effect of exercise training on left ventricular remodeling four to eight weeks after anterior myocardial infarction in 105 patients randomized into an exercise group and a control group. Both groups were assessed initially and at six months by echocardiography and exercise testing. There was no significant change in ventricular volumes between the two groups; on the other hand, exercise capacity increased significantly in the trained group compared with the untrained group ($p < 0.01$). In our situation, LV telesdiastolic diameter increased at 4 months after the event and after the rehabilitation program from 61mm to 58mm, LVEF increased by 10 poins from 35% to 45%, and control measures on the cardiovascular stress test showed a clear improvement in functional and cardiorespiratory exercise capacity as previously mentioned.

CONCLUSION

The efficacy of cardiac rehabilitation has even been compared with that of the key treatments for coronary insufficiency, beta-blockers and angioplasty. All this evidence gives post-infarction cardiac rehabilitation a high level IA recommendation. It should therefore be prescribed for all patients meeting the indications in order to improve functional and cardiorespiratory capacity, and reduce morbidity and mortality, healthcare costs and re-hospitalization.

ICONOGRAPHY

Fig1: Coronary angiography showing occlusion of the right coronary revascularized by an active stent

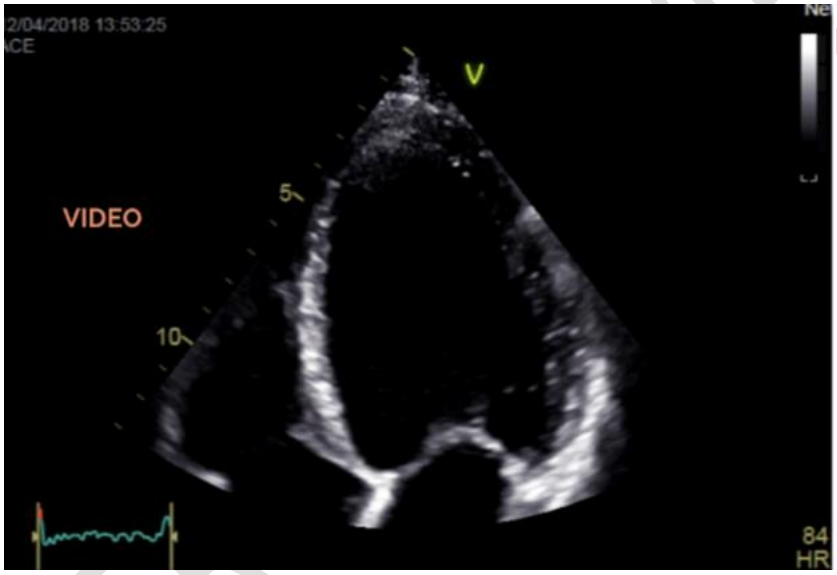

Fig2: Echocardiographic image showing ischemic heart disease in the dilated stage with severe LV dysfunction (EF 35%) during his hospitalization.

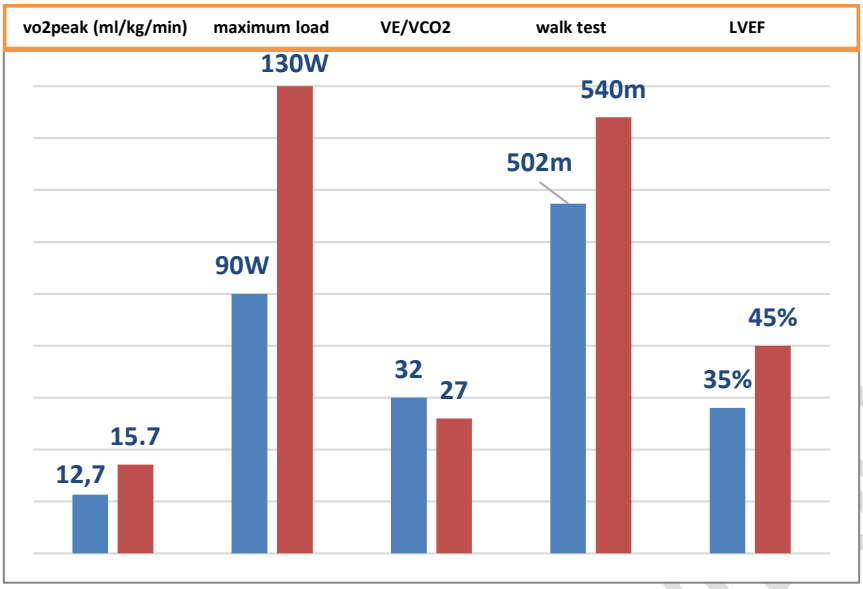

Fig3: Diagram of maximum load, VO2max, VE/VCO2 ratio, walk test and LVEF improvement before and after cardiac rehabilitation.

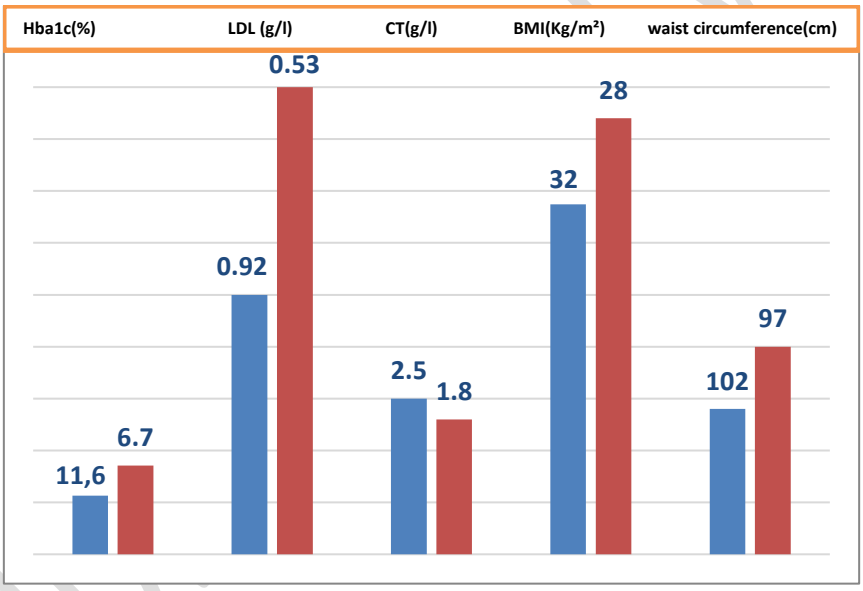

Fig.4: Diagram of cardiovascular risk factor values before and after the cardiac rehabilitation program

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