RESPIRATORY MUSCLE TRAINING IN CORONARY ARTERY BYPASS GRAFT PREOPERATIVE: CASE REPORT

TREINAMENTO MUSCULAR RESPIRATÓRIO NO PRÉ-OPERATÓRIO DE REVASCULARIZAÇÃO DO MIOCÁRDIO: RELATO DE CASO

ENTRENTAMENTO MUSCULAR RESPIRATORIO EN LA REVASCULARIZACIÓN MIOCÁRDICA PREOPERATORIA: REPORTE DE UN CASO

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ABSTRACT

Objective: to demonstrate the importance of respiratory muscle training (RMT) in the preoperative moment in patients undergoing coronary artery bypass graft (CABG). Method: this is a clinical case study, approved by the Ethics Committee of the Department of Health, State of Paraíba, under protocol No. 44/2008, which was developed in the period from September to November 2008, after selecting a patient with sixty-nine years old, female, with a diagnosis of obstructive coronary disease, which subsequently underwent coronary artery bypass grafting. The procedure consisted of 16 training sessions with the brand Threshold®, with reevaluations during the training period and on the 3rd postoperative day (3 rd. PO). Results: the results suggest that respiratory muscle conditioning is relevant preoperatively, increasing respiratory muscle strength and endurance, preventing the occurrence of pulmonary complications. Conclusion: thus, the findings of this study indicate that the direct intervention of a physiotherapist during the preoperative and the inclusion of a protocol for RMT, is beneficial for better recovery of these patients. Descriptors: conditioning; cardiac surgery; physiotherapy.

RESUMO

Objetivo: demonstrar a importância do treinamento muscular respiratório (TMR) no pré-operatório de pacientes submetidos à cirurgia de revascularização do miocárdio (RM). Método: trata-se de um estudo de caso clínico, aprovado pelo Comitê de Ética em Pesquisa da Secretaria de Saúde do Estado da Paraíba, sob o protocolo nº 44/2008, o qual foi desenvolvido no período de setembro a novembro de 2008, após selecionar um paciente com 69 anos de idade, do sexo feminino, com diagnóstico de insuficiência coronariana obstrutiva, que em seguida foi submetido a uma cirurgia de revascularização do miocárdio. O procedimento fisioterapêutico constou de 16 sessões de treinamento com o Threshold®, com reavaliações no decorrer do período de treinamento e no 3º dia pós-operatório (3º DPO). Resultados: os resultados sugerem que o condicionamento muscular respiratório seja relevante no pré-operatório, aumentando a força e resistência muscular respiratória, prevenindo a ocorrência de complicações pulmonares. Conclusão: deste modo, os resultados encontrados neste estudo apontam que a intervenção direta do fisioterapeuta durante o pré-operatório e a inclusão de um protocolo de TMR, seja benéfica para uma melhor recuperação desses pacientes. Descritores: condicionamento; cirurgia cardíaca; fisioterapia.

RESUMEN

Objetivo: demostrar la importancia del entrenamiento muscular respiratorio en el periodo preoperatorio de pacientes sometidos a cirugia de revascularización del miocardio. Método: se trata de un estudio de caso clinico, aprobado por el Comité de Ética in Investigación de la Secretaría de Salud del estado de Paraíba, en virtud del Protocolo N° 44/2008. Fue desarrollado en el periodo comprendido entre septiembre y noviembre de 2008, después de seleccionar un paciente de 69 años de edad, de sexo femenino, con diagnóstico de insuficiencia coronaria obstructiva, que luego fue sometido a una cirugía de revascularización del miocardio. El procedimiento fisioterapéutico consistió en 16 sesiones de entrenamiento (Threshold®), con reevaluaciones durante el periodo de entrenamiento y en el tercer día postoperatorio. Resultados: los resultados indican que el acondicionamiento muscular respiratorio es relevante en el periodo preoperatorio, aumentando la fuerza y resistencia muscular respiratoria y previniendo la ocurrência de complicaciones pulmonares. Conclusión: los resultados encontrados en este estudio indican que la intervención directa de un fisioterapeuta durante el periodo preoperatorio y la inclusión de un protocolo de entrenamiento muscular respiratorio son beneficiosas para una mejor recuperación de estos pacientes. Descriptores: acondicionamiento; cirugía cardíaca; fisioterapia.

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INTRODUCTION

In Brazil, cardiovascular diseases (CVD) are responsible for high rates of morbidity and mortality, being the main cause of death in adults. These diseases occur due to longevity, as well as adoption of idle habits, and exposure to risk factors such as smoking, physical inactivity, hypertension, dyslipidemia, diabetes mellitus, obesity and mental stress, the which are identified as predisposing factors for coronary artery disease (CAD). 1-2

The prevalence of CAD in patients that show risk factors described above has a great number, making it necessary to perform a surgery procedure when it is in a state of advanced disease.

Thus, Coronary Artery Bypass Graft (CABG) is an alternative to the stenosed artery patency, which procedure could impact in pulmonary complications, and are classified into four levels and severity: Level 1 - dry cough, and dyspnea microatelectasis, Level 2 - productive cough, bronchospasm, hypoxemia, atelectasis and hypercapnia, Level 3 - pleural effusion, pneumonia, pneumothorax and reintubation, Level 4 - ventilatory insufficiency. 3-4

However, it questions the existence of some measure preoperative likely to reduce the incidence of pulmonary complications. Except that several authors investigate the role of respiratory muscles in the genesis of complications in the postoperative period.

The loss of respiratory muscle strength in patients undergoing CABG is more significant than the loss of muscle endurance capacity. Nevertheless, several authors to evaluate pulmonary function and respiratory muscle strength, found a decrease in values of maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP) of 59% and 53% respectively, of pre-operative moment to 1st day of postoperative. When comparing the pre-operative values for the hospital discharge moment, it was found that, although the values of MIP and MEP had improved, still stood on a significant decrease of these values. 5-6

In view of the above, we proposed to use respiratory muscle training in prevention and treatment of pulmonary complications, in order to ensure good maintenance and functional recovery after cardiac surgery, beyond to provide a prior theoretical basis and subsequent elaboration and application of a protocol of respiratory muscle training in a patient that suffered such type of surgery procedure.

METHOD

This study is characterized as a case study, which was done after the analysis of literature on this subject, in books, magazines and scientific article recording the problem better from the earlier theoretical ones about this theme. Then, with the approval of the Ethics Committee in Research of the Department of Health of the Paraiba State - Comitê de Ética em Pesquisa da Secretaria da Saúde do Estado da Paraíba (No. 44 on 07.29.2008) we selected a patient, sixty-nine years old, female, diagnosed with Chronic Coronary Insufficiency (CCI), which underwent a physical therapy evaluation on September 22nd, 2008, beginning of the intervention on 24th September of that same year.

The research was conducted at the Clinical School of Physiotherapy - Clínica Escola de Fisioterapia of ASPER, located in João Pessoa/ PB, Brazil. Initially, the patient underwent a physical therapy evaluation and subsequently followed up with TMR during the period September-November 2008, with a frequency of three weekly visits. Every three weeks of training, a review was performed to check the progress before the proposed procedures, analyzing and controlling the gains of respiratory muscle strength and endurance.

For applicability of RMT were used stethoscope, tensiometer, measuring tape, manovacuometer brand GER AR®, pulse oximetry brand NONIN Onyx 9500®, Threshold® IMT, stopwatch and photographic camera. On physical examination it was evaluated the vital signs with blood pressure (BP), heart rate (HR), respiratory rate (RR) and peripheral oxygen saturation (SpO2). The specific pulmonary evaluation included the pulmonary auscultation (PA), respiratory muscle strength through the MIP, MEP, the cirtometry and the test of endurance through the Threshold® IMT. The patient's nutritional status was analyzed by calculating the body mass index (BMI), which showed a value of 25.99 kg/m² is considered overweight in the desired feature. 7

The MIP and MEP were obtained using the manovacuometer brand GER AIR®, which to evaluate the MIP, the patient get out of the FRC to get MEP, it has begun from the CPT. The endurance test was performed with the aid of threshold IMT® from MIP found, here defined as the maximum load (Lmax). Then, after measuring the initial MIP, it was
calculated that 30% of this value and analyzed at the time the patient was able to sustain the load, thereby determining its time limit (Tlim). And for making new benchmarking it was used the same preview load (initial MIP) as described by the author.6

In the mediate postoperative moment, on the 3rd PO, the patient underwent a re-evaluation, which consisted of surgical history, vital signs, pulmonary auscultation, arterial gasometry, cirtometry, among others. The data analysis consisted in describing the results obtained in the form of graphs and tables for a better visualization of the effects.

RESULTS AND DISCUSSION

In relation to the patient evaluated, it was noted that the vital signs during the treatments were kept constant throughout the training, showing a pressure = 110/70 mmHg; FC = 88 bpm, FR = 20 rpm and SpO2 = 90%. Upon inspection it was noted apparently normal skin, thorax with no deformities, mixed respiratory features, regular respiratory rhythm and use of accessory muscles of respiration. Pulmonary auscultation (PA) revealed the presence of normal vesicular sounds, decreased in both hemithorax bases, without rattling.

Radiography study of the thorax showed no changes in soft tissues, as well as in pulmonary transparency, being within normal limits. The ergometric test revealed changes in the ST segment similar to those observed in ventricular repolarization and use of accessory muscles of respiration. Pulmonary auscultation (PA) revealed the presence of normal vesicular sounds, decreased in both hemithorax bases, without rattling.

The result obtained in the evaluation of respiratory muscles was 60 cmH2O to MIP and it was + 70 cmH2O to MEP, they were considered normal for women in this age group. The cirtometry was measured in the axilla, xiphoid, and basal in pre-operative moment, before starting the RMT, after three weeks of RMT and the 3rd PO.

The process began with stretching of the accessory muscles, but also with free asset exercise with the help of the stick associated with diaphragmatic breathing feature. And subsequently with the RMT in adjusted charging according initial measured of MIP, being used 30% of this value. The training was performed over a period of 30 minutes, alternating every five minutes a rest period, associating the diaphragmatic ventilatory pattern (DVP) for one minute.

The progression of load RMT was performed before by the patient's response to the Borg's scale, gradually, always the patient reported levels below 11 (easy) scale. Subsequently, the training continued with a load of 18 cmH2O, progressing to 23 cmH2O, 25cmH2O, 27 cmH2O and 30 cmH2O, for each week trained. The endurance test used as a parameter Imax of 18 cmH2O in all revaluations, which was obtained from 30% of the initial MIP, aiming to measure the progression of Tlim.

When it was observed 84 patients divided into two groups candidates for CAGB surgery, it was realized that the group that received RMT by Threshold® (30 min / day) for two to four weeks before surgery showed a significant increase in MIP and endurance after the RMT, but with a reduction in these values if it is compared to the pre-training levels. The group as control, it was observed the decrease in MIP and endurance in the postoperative period.9

The analysis of MIP and MEP showed a considerable increase during the pre-operative RMT period. Nevertheless, in the postoperative moment, when evaluating the strength on the 3rd PO, there was a decrease of this value at pre-training (Picture 1), bearing in mind that these results were also found by that author in his study.
In terms of changes in maximal respiratory pressures, assigns that they are reduced in postoperative caused by the pain resulting of surgery procedure. But, when performing the RMT, the values return to pre-training levels and not fall below these referred values, as it was observed in patients with no training.6

With respect to the MEP during the evaluation, we noticed a slight increase in these values, even if has not performed out specific RMT to expiratory muscles (Picture 2). Then, through the evaluation on the 3rd PO (postoperative), it was noted there was a significant decrease of this value, although in none of the surveyed studies the authors addressed the expiratory muscle training.

Thus, both the lung function or the movement of the upper thorax structure are highly affected after cardiac surgery, due to the location of the tube, leading to a shallow breathing, as well as resulting in a decrease in tidal volume.6-10

The respiratory quotient found in this research was obtained through the difference between the values measured at maximal inspiration and maximal expiration. And that during the revaluation when comparing the pre-training values after RMT observed the increase of this coefficient at the three measured levels (axillary, xiphoid, and basal), which shows an improvement in thoracic expansion. But when it is compared with values obtained with the 3rd PO, it was noted there was a reduction in the expandability, in order that the sternotomy and postoperative pain are related to decrease thoracic expansion.

Even when analyzing the respiratory quotient pre RMT with the values obtained on the 3rd PO (postoperative) it was verified there was an increase in axillary expandability, and a slight decrease in the basal expandability (table 1). Although we cannot say that this increase of this axillary expandability is an effect of inspiratory RMT, because there is insufficient data in the medical literature. Therefore, these results are consistent with those presented in other
CONCLUSION

Based on the results, we conclude that RMT improved the quality of life of patients by decreasing pulmonary complications, which was an important step for improving the postoperative conditions. Considering that she had good results before the significant increase in MIP and MEP after three weeks of training, in endurance and in thoracic expandability, noting that pulmonary complications are related to the conditions of the respiratory muscles of patients, and these suggestive and remarked results before the process, in order to reduce complications after cardiac surgery.

REFERENCES


