

IMPACT OF EARLY AMBULATION ON FUNCTIONALITY IN PATIENTS SUBMITTED TO VALVE REPLACEMENT

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Abstract

Objective: To evaluate the impact of early ambulation on the functionality of patients undergoing cardiac valve replacement surgery. **Methods:** Prospective cohort study in patients undergoing cardiac valve replacement surgery. Patients had their functionality assessed preoperatively using the Functional Independence Measurement (FIM) and Perme Intensive Care Unit Mobility Score scales. At ICU discharge, they were divided into two groups: walking group (WG) and, non-walking group (NWG). At discharge, the two functional scales were reapplied in these patients. **Results:** 170 patients were evaluated, 110 (65%) male, with a mean age of 48 ± 2 years. In relation to Perme Score, the WG had a decrease of 11 ± 2 and in the NWG the decrease was 13 ± 2 ($p=0.34$). Regarding FIM, those who walked had a decrease of 27 ± 3 against those who did not walk, which reduced 36 ± 5 , with a significance level of $p<0.001$. **Conclusion:** Based in the FIM data found, patients undergoing cardiac valve replacement surgery who underwent early mobilization had less decrease of functionality compared to patients who did not ambulate.

INTRODUCTION

Cardiac surgery is a highly complex procedure that aims to increase and prolong the quality of life of patients who need this type of intervention. Cardiovascular diseases represent one of the main causes of mortality worldwide [1]. According to DATASUS from January to June 2008, 10 652 coronary artery bypass grafting and / or valve replacement surgeries were performed in Brazil [2]. Population aging, obesity, smoking, physical inactivity and systemic arterial hypertension are important risk factors for heart disease [3].

Even with the whole process of evolution and technological advancement in surgical procedures, there are still countless factors involved in cardiac surgery that can negatively affect functionality. In this context, immobilism and / or prolonged bed rest in the postoperative period stand out as some of the main factors that generate several complications, among them, loss of muscle strength, decreased cardiorespiratory capacity, physical deconditioning, as well as reduction of pulmonary function [4].

Due to the changes that occur in the organism after the surgical procedure, it is necessary to measure the functionality of these patients both before and after the operation. For this purpose, the Functional Independence Measure (MIF) and Perme Intensive Care Unit Mobility scales can be used [5-7].

The role of physiotherapy in early mobilization after cardiac surgery has shown several benefits to the patient, when presenting impairments in terms of functional capacity. Once again, immobility and prolonged rest may lead to decreased range of motion (ROM), loss of muscle strength and others [8].

Thus, physiotherapy will act preventively to avoid/minimize these postoperative complications, performing active kinesiotherapy, intra-unit ambulation, breathing pattern techniques, acting on the functional health of individuals, favoring physical parameters such as gain in muscle mass and strength, improvement in the range of motion of the joints, body balance, increased cardiorespiratory capacity, among others. Thus, accelerating performance in daily activities, favoring the hospital discharge process more quickly and, thereby, improving their quality of life [9,10].

The aim of this study was to evaluate the impact of early ambulation on the functionality of patients undergoing valve replacement.

MATERIAL AND METHODS

This is a prospective cohort study carried out with the group of patients admitted to the Inpatient Unit at the Instituto Nobre de Cardiologia (INCARDIO) in Feira de Santana – BA. From February/2015 to November/2019. The research was approved by the Ethics and Research Committee of Faculdade Nobre, number 2,088,633, and all participants, when invited to participate and agree, signed the Free and Informed Consent Form before the study began.

Eligibility criteria

Individuals of both sexes, aged 18 years or over and submitted to elective valve replacement surgery (aortic and / or mitral) were included. Exclusion criteria were patients with cognitive impairment that prevented functional evaluation, death or patients with more than two postoperative days.

Study protocol

All patients had their functionality assessed preoperatively using the Functional Independence Measure (FIM) and Perme Intensive Care Unit Mobility Score (Perme) scales.

The day after the evaluation, patients were referred to the operating room and, later, to the Intensive Care Unit (ICU). Upon discharge from the ICU, patients were divided into two groups: walking group, who walked at least 15 meters in the ICU until discharge; and, non-walking group who did not walk or did the activity in a distance of less than 15 meters. At the time of hospital discharge, the two functional scales were reapplied in these patients.

Measuring instruments

The FIM was developed in the 1980s by an American Physical Medicine and Rehabilitation Task Force. Created to measure the performance of patients in the performance of 18 tasks classified by subgroups regarding self-care, sphincter control, transfers, locomotion, communication and social cognition, where it is scored on a scale ranging from 0 to 7 points, with 0 being equivalent to total dependence and a maximum score of 126 points which is equivalent to the independent performance of tasks [5].

The Perme Score is a scale that measures, objectively, the mobility condition of the inpatient, it has a score ranging from 0 to 32 points, divided into 15 items, grouped into the following categories: mental state, potential barriers to mobility, functional strength, bed mobility, transfers, walking aid devices and resistance measures. In it, the higher the score, the lower the need for assistance, therefore, the lowest score is indicative of low mobility and greater need for assistance [7].

Data analysis

For data analysis, the program SPSS 20.0 was used. Chi-square was used to assess categorical variables. Continuous data were expressed as mean and standard deviation. Pre- and postoperative values were assessed using the independent Student's T Test. It was considered significant when $p < 0.05$.

RESULTS

During the research period, 230 patients were hospitalized for heart valve replacement surgery, 60 patients were excluded from this total due to a cognitive deficit that prevented functional evaluation, death or patients

with more than two postoperative days (Figure 1).

Therefore, 170 patients were selected, 110 (65%) of whom were male, with a mean age of 48 ± 2 years, BMI 26 ± 1 kg / m², the main comorbidity being systemic arterial hypertension with 39 (55 %). The other clinical and surgical data are shown in table 1.

Table 2 shows the data on the behavior of the intra and intergroup functionality studied. It was found that in Perme scale, the walking group had a decrease of 11 ± 2 and in the non walking group the decrease was 13 ± 2 ($p=0.34$). In relation to FIM, those who walked had a decrease of 27 ± 3 against those who did not walk, which reduced 36 ± 5 , with a significance of $p < 0.001$. The other values are shown in the table below.

DISCUSSION

It was found in the present study that early mobilization had an impact on functionality in patients undergoing valve replacement. Through the FIM it was observed that the walking group lost less function than the individuals who belonged to the non-walking group.

In our study, it is possible to verify that the mobilization protocols, as well as the walking itself, as well as those of therapeutic exercises are shown to be successful in preventing and attenuating some post-surgery comorbidities. Possibly, the increase in respiratory capacity through responsible muscle activation, stimulates the contraction of all peripheral muscles, increasing strength and preventing hypotrophy [11].

In line with the aforementioned, Ko et al. mention that early postoperative physiotherapy is increasingly recommended as it has many benefits in relation to muscle strength, physical conditioning, and health-related outcomes, that is, through walking, to enhance muscle activation, generating increased strength, as well as promoting improvement in circulation favoring the transport of oxygen to the tissues, confirming that there may be improvement in terms of obtaining functionality, which positively agrees with the data obtained in our work , showing that the intervention of the physiotherapist is of paramount importance in the postoperative period, so that he will use kinesiotherapeutic techniques for the recovery and rehabilitation of patients [12].

It is notable that ambulation is part of the care protocol, that is, performing ambulation in isolation may not be enough to prevent the patient's loss of function, this is confirmed by the study by Zanini et al. where they evaluated and demonstrated that the patients who performed ambulation together with other activities improved in terms of functional capacity, pulmonary function and muscle strength when compared to those who did only inspiratory muscle training (IMT) or who did not undergo any intervention [13].

The approach of Hodgson et al. also suggests benefits regarding the effects of early mobilization, emphasizing that active kinesiotherapy, as well as, walking associated with the use of new care protocols, such as cycle ergometry and electrical stimulation, for example, can provide improvement and restore strength, being essential the intervention in the immediate postoperative period, favoring the confirmation of the results presented in our work [14].

It also corroborates with the present research, the study carried out by Almeida et al. that approached physical exercise as being a fundamental component in a cardiac rehabilitation program, benefiting the gain of functionality and, therefore, the kinesiotherapy protocols [15]. He also pointed out that active exercises have an effect on the stimulation of blood circulation, where, in addition to improving venous return, it favors the gas exchange mechanism, intensifying the optimization of physical and cardiopulmonary capacity. These data reinforce the findings of the present research, raising the hypothesis that the need for physical therapy intervention results in the improvement of functional outcomes.

Results similar to our study were also found by Sarti, Vecina, Ferreira, who stated that early physical therapy intervention prevents and decreases complications caused by immobilization, in addition to optimizing recovery, significantly improving the functional dependence of patients, as well as decreasing the time of hospitalization, which automatically reduces costs for the unit [16].

We also observed a reduction in functionality in the postoperative period when compared to the preoperative period. This reduction is due to the impact generated by the surgery, requiring an early rehabilitation protocol. Obtaining a positive correlation with our study Moradian et al. concluded from their research that immediate intervention associated with other therapeutic measures can be viable and safe, promoting benefits in respiratory capacity, as well as in physical conditioning, improving muscle function [17]. Factor that can be explained by the influence of mobilization in increasing the production of oxygen to the cells, generating the energy support necessary for muscle contraction.

The studies found in the literature regarding cardiac surgery corroborate the effectiveness of early mobilization, where, in line with the findings of the present study, Rocha et al. describe that immobilism causes complications after cardiac surgery, which can be explained by the decrease in muscle strength, that is, these complications affect the integrity of the muscles and decrease function [18]. According to Truong et al., the physiological mechanisms by which they can lead to this weakness and loss of muscle mass are related to decreased protein synthesis, indicating catabolism of this musculature, thus demonstrating that mobilization is essential and can improve strength, in addition to decreasing oxidative stress promoting increased functionality, which may justify the findings of the present study [19].

In another study carried out by Monteleone et al., reports that prolonged rest is associated with negative outcomes, that is, the decline in the ability to walk, which may prevent progress in improving and recovering the patient, therefore, an efficient treatment protocol is necessary mobilization as a way to mitigate major complications, it has been seen that this intervention is closely related to the benefits shown in the present study [20].

This study has as a limitation a sample calculation and non-evaluation of variables such as type of vasoactive drugs used in the ICU that could interfere with the patients' hemodynamics or information related to the pain scale that can be a limiting factor for mobilization, that could interfere with the quality of care functional capacity and it was not a randomized study.

CONCLUSION

It is concluded from this study that patients who underwent cardiac valve replacement surgery who underwent early ambulation had less loss of functionality compared to patients who did not walk. It can also be pointed out that there is a lack of data in the literature on the respective topic that could contribute to the discussion of the results and findings presented.

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Table 1. Clinical and surgical data of the studied patients.

Variable	Walking group (n = 71)	Non-Walking group (n = 99)	p ^a
Gender Male Female	49 (70%) 22 (30%)	61 (62%) 38 (38%)	0,14 ^a
Age (years)	46 ± 8	49 ± 9	0,47 ^b
BMI (kg/m ²)	25 ± 4	27 ± 4	0,38 ^b
Comorbidities SAH	39 (55%) 21 (30%) 15	46 (46%) 29 (29%) 21	0,23 ^a 0,69 ^a 0,54 ^a 0,65 ^a
DM DLP Sedentary life	(21%) 27 (38%)	(21%) 35 (35%)	
CPB time (min)	62 ± 8	65 ± 9	0,26 ^b
MV time (hours)	6 ± 3	7 ± 4	0,68 ^b
Grafts number	1 ± 1	1 ± 1	0,87 ^b

^a. Chi-square; ^b. Independent Student's T test; BMI - Body Mass Index; SAH - Systemic Arterial Hypertension; DM - Diabetes Mellitus; DLP - Dyslipidemia; CPB - Cardiopulmonary Bypass; MV - Mechanical ventilation.

Table 2. Behavior of the intra and intergroup functionality studied.

Variable	Walking group (n = 71)	Non-Walking group (n = 99)	p ^a
Perme scale	31 ± 1 20 ± 4 -11 ± 2	30 ± 1 17 ± 3 -13 ± 2	0,57 0,43 0,34
Preoperative ICU discharge Delta			
FIM Preoperative ICU discharge Delta	125 ± 1 98 ± 4 - 27 ± 3	125 ± 1 89 ± 7 - 36 ± 5	0,92 <0,001 <0,001

^a. Independent Student's T test; FIM - Functional Independence Measure.

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Figure 1.docx available at <https://authorea.com/users/333608/articles/459757-impact-of-early-ambulation-on-functionality-in-patients-submitted-to-valve-replacement>