ROLE OF PHYSIOTHERAPY IN PEDIATRIC CARDIAC SURGERY

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Introduction

Heart diseases are among the most common congenital defects at birth and affect 80 to 10 children per 1,000 live births. It is estimated that every year in Brazil, there is the appearance of approximately 28 000 new cases of heart diseases, which are needed for the same period, an estimated 23,000 surgical procedures to repair congenital defects only [1]. Records show that 50% of cases require further surgery in the 1st year of life [2-4]. Tetralogy of Fallot, pulmonary valve stenosis, transposition of great vessels or of the great arteries (TGA), patent ductus arteriosus (PDA), aortic coarctation and interauricular (IAC) or interventricular communication (IVC) are among the most common need corrections [5,6].

The most common causes of morbidity and mortality in cardiac surgery in adults are the pulmonary complications that occur with wide variation of incidence: 6% -76% [7]. Data on the incidence in the pediatric population remain undefined. It is known that, the earlier the surgery, the smaller the physical and psychological consequences for the child [8].

Currently, pediatric cardiac surgery has a universe of its own. This involves the integration of clinical data, recent technological advances and development of new surgical techniques. Thus, they are increasingly effective results and generate less aggression to the child [3.9].

In this context, the physiotherapist has been requested in the multidisciplinary team of some health services, in pre-, peri- and postoperatively to improve the patient's condition, prevent and recover from pulmonary complications, assist in social rehabilitation, decrease the deleterious effects from surgery and strict bed rest [8.10]. Specifically, these studies point to benefits such as improved oxygenation, maintenance of satisfactory conditions of ventilation and maintenance of patent airway [3,11]. There is also a trend towards improvement in expiratory tidal volume, lung compliance and resistance [12]. Still, there are indications that the role of the physiotherapist in patients undergoing cardiac surgery reduces the staying time of the intensive care unit (ICU), assists in ambulation as early as possible [5] and reduces hospital stay [13-15].

Aim

Given this reality of care, this study aims to gather scientific evidence on the role of the physiotherapist in the pre-, peri- and postoperative period of cardiac surgery in children.

SOURCES

They were performed systematic searches using the following databases: LILACS, MEDLINE, SciELO, CAPES portal, PubMed and BIREME. The descriptors used to search for articles, according to the Health Sciences Descriptors (DeCS), were "physiotherapy", "postoperative", "heart surgery" and "children", besides the respective terms in the English language "physical therapy" "postoperative", "thoracic surgery" and "children". It was also consulted the bibliographic collection of the State University of Santa Catarina (UDESC) and the Center for Studies of Respiratory Therapy (CEFIR), available online.

Among the publications, there were selected those in Portuguese and English that included literature reviews, treatment and clinical trials of the pre-, peri- and/or postoperative of pediatric cardiac surgery. Were considered relevant and added to the review the records published between 1956 and 2010, or not directly related to physiotherapy, but those that could contribute to the objective of the study.

DISCUSSION

Determine and choose the appropriate physiotherapy intervention to pediatric patients, whether in pre-, peri- or postoperative, requires from the physiotherapist knowledge of the pathophysiology of heart disease in question, and clear understanding of anatomy, the type of surgery, restorative or palliative, and the patient's clinical condition. Based on knowledge and analysis of this information, the physiotherapist can provide more effective approaches [16-18].

It contains some major surgery peculiarities to be considered while handling physiotherapy. One example is a possible evolution of pulmonary hypertension, resulting from the adaptation of pulmonary flow postoperatively, a situation that restricts sudden maneuvers of physiotherapy [4,8,16,19-21].

Another situation is palliative surgical procedures indicated in cyanotic congenital heart disease, such as Glenn correction, considered preparatory to the pediatric technique that currently has most changed the Fontan operation. In such cases, attention should be paid to patient positioning, which must be at least 45 degrees of elevation, and avoid an increase in pulmonary vascular resistance with maintenance of PEEP (positive end expiratory pressure) low (up to 5 cmH20) [4,8,16,19-21].

It is evident that the different surgeries, corrective or palliative, present risks from the intervention itself and the condition of each patient, resulting in a high number of variables to be considered for a successful action. There have been efforts in the search for methods of evaluating the quality of cardiac surgery, risk scores, which use enables comparisons between different services, which allow to infer the prognosis and assist in clinical decision making. Given this context, risk scores adjusted for pediatric surgical procedures have been proposed, despite the wide range of birth defects make it difficult to standardize.

Along these lines, one trial assessed in the pediatric population of a public hospital in the northeast, the applicability of a risk score of mortality adjusted for surgery for congenital heart defects (RACHS-1). We used the RACHS-1 score to classify the surgical procedures in risk categories 1 to 6 and it was performed logistic regression analysis to identify risk factors

associated with mortality. As factors were identified: age, type of heart disease, pulmonary flow, type of surgery, duration of cardiopulmonary bypass (CPB) and time of anoxia. There was linear correlation between the categories of the RACHS-1 and the mortality rate, however, mortality was greater than that predicted by the scoring system, suggesting that although there is ease of application of RACHS-1, this should not be applied to Brazilian reality, because it does not include other variables present in our country. The authors concluded that it was important to create risk models adapted to Brazil [22].

CARDIAC SURGERY PREOPERATIVE (CSPR)

In the pre-operative cardiac surgery (CSPO), the role of the physiotherapist is intended to ensure a patent airway and adequate ventilation, because the child with heart disease with surgical indication may present hypersecretion and atelectasis [5.10]. Another important approach is education, which is to guide the parents about the importance of physiotherapy for the prevention and rapid restoration of respiratory function in children [23,24].

Vibration, tapping, manual chest pressure, suction of the airways, coughing and postural drainage are conventional bronchial hygiene maneuvers available between the resources that can be used. Other possibilities are the technique of expiratory flow increase (EFI), the active cycle of breathing, forced expiration technique as well as encouraging inspiratory exercises and non-invasive ventilation (NIV) [8,10,23]. It is noted that although the combined use of postural drainage and percussion is usual in clinical practice, there are still few comparative studies emphasizing that, especially in heart diseases. Thus, there is the relevance of future research to evaluate such clearance techniques [25] that, in addition to routinely used, are geared to parents for home treatment of their children.

As the guidance is an effective practice for physiotherapy, Garbossa et al. [26] found the effects of physiotherapy guidelines on the level of anxiety in adults undergoing coronary artery bypass grafting. This is a randomized clinical trial with 51 adults divided into control and intervention groups. The levels of anxiety and pain were assessed pre- and postoperatively, and only the intervention group received guidance on surgical procedures and instructions on exercise ventilation. We observed lower anxiety scores in patients who were counseled preoperatively. It is suggested performance of clinical trials with similar purpose and method, because in pediatric patients similar studies have not been found.

There are also few prospective clinical trials to assess the pulmonary complications in children undergoing cardiac surgery, as well as the effects of physiotherapy in the preoperative and postoperative period, regarding prevention of these complications [23.27]. Likewise, few studies have evaluated the incidence of pulmonary complications after heart surgery in adults [23.28-29].

The study by Felcar et al. [23] showed that preoperative physiotherapy associated with post-surgical physiotherapy decreases the frequency and risk of postoperative pulmonary complications in children with heart disease, compared to the intervention performed only after surgery. This study followed 135 children up to 6 years old who underwent surgery for various congenital heart diseases, divided into two groups: one submitted to pre- and postoperative

physiotherapy and the other group only postoperatively. The presence of pulmonary complications, especially pneumonia, associated with other complications, such as length of hospital stay was significantly higher in the group who received preoperative physiotherapy.

There are published reports that corroborate this finding and the indication for physiotherapy in pre- and postoperatively, based on reducing the length of hospital stay and stay in the ICU [13-15].

Garcia & Piva [24] affirmed that the management of children with heart disease should be global in all periods related to cardiac surgery. The process of inclusion of physiotherapy during CSPR has gained space, although the effectiveness of this activity still needs clear-cut research.

CARDIAC SURGERY IMMEDIATE POSTOPERATIVE (CCIPO)

The patient's condition in the immediate postoperative period of cardiac surgeries (CCIPO) depends on three factors: 1) diagnosed heart disease, 2) presence of malformations associated with the cardiac presentation and 3) surgical procedure, which involves the duration of surgery, and anesthetic drugs used, duration of aortic occlusion and CPB, the volume of diuresis output during surgery and received blood and blood products, and perioperative complications [10,11].

Support physiotherapy starts on the child's arrival to the ICU. The professional will collaborate with the team to adjust the positioning of the patient in bed and ensure proper location of vascular access, drainage and tracheal cannula, known the risk of displacement during transport from the operating room [10,11].

Subsequently, it is recommended to perform physiotherapy assessment in CCIPO, which includes: inspection of the chest wall expansion, lung auscultation, chest X-ray analysis, interpretation of arterial blood gases associated with the assessment of the severity of clinical presentation and discussion with ICU staff, verification of ventilatory support, measurement of oxygen saturation (S_pO_2) monitoring and other vital signs [10,11].

In most cases, children undergoing heart surgery are transported to the ICU intubated. It is known that weaning should be a priority, rapid and the extubation should be performed as soon as possible. Usually, the first six hours, after the anesthetic effect and after careful clinical and laboratory evaluation, patients are extubated. This practice reduces the chances of pneumonia and hypertrophy of the diaphragm and increased morbidity and mortality [4]. Simplest cases, of low surgical risk may have even earlier extubation.

Ventilatory support is necessary, often in cases where there is associated respiratory disease, especially pneumonia and bronchiolitis, and cardiogenic pulmonary edema, respiratory system depression by sedation, laryngeal edema, and especially in the presence of pulmonary hypertension [30]. With an indication of support, children are initially placed in controlled ventilation with the parameters adjusted to the respiratory rate for age and interpretation of arterial blood gases. Fraction of inspired oxygen (FiO2) indicated is that sufficient to maintain the partial pressure of oxygen (PaO2) between 80-90 mmHg, S_pO_2 above 90%, the lowest possible inspiratory pressure to maintain the partial pressure of carbon dioxide (P_aCO_2) between

35-45 mmHg and maintaining positive end expiratory pressure of 3-4 mmHg to avoid microatelectasis [10,11,30].

A successful surgery can be determined by the adequacy of ventilatory parameters and oxygen, which depend on the hemodynamics of each variety of congenital heart disease. Specifications of respiratory parameters include maintaining low peak inspiratory pressure, short inspiratory time, tidal volume of up to 7 ml/kg/weight and have great relevance to patient outcomes. The appropriate ventilatory management, as well as patient positioning, help to reduce the maximum intrathoracic pressure and venous stasis of trunk and upper limbs, which facilitates the drainage of blood in the lungs [4,8,16,19-21].

In a study by Freire Sobrinho [3], from the total number of patients in CCIPO, 83% (323) were extubated in the operating room due to intensive physiotherapy support. Only 0.6% of patients (two) required reintubation due to depression of respiratory function. In this research, physiotherapy maneuvers were used for chest expansion and antalgic posture correction, aiming to preserve a satisfactory pulmonary ventilation and maintain a patent airway.

Because pain is a common condition, especially postoperatively, it can be avoided antalgic posture through exercises with the upper limbs associated with breathing and also one should proceed with guidelines on proper positioning in bed [10]. In addition to respiratory dysfunction of the child, other complications are described in CCIPO such as low cardiac output syndrome, characterized by sweating, signs of psychomotor agitation, cold extremities, pale lips, filiform or absent peripheral pulses, hypotension and oliguria. The physiotherapist should be aware of these signals [11].

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