Chapter 11

Cardiopulmonary arrest: care after return of spontaneous circulation

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ABSTRACT
Research Question: What are the procedures to be taken during the care of a patient after the return of spontaneous circulation as a result of a Cardiorespiratory arrest?
Objective: To identify in the literature what care should be applied in patient care in the face of the return of spontaneous circulation after cardiorespiratory arrest.
Hypothesis: Specific care, such as hemodynamic support, correctly performed in the care of patients with post-return of spontaneous circulation, can contribute favorably to their rehabilitation.
Type of study: Quantitative method aided by bibliography review methodology.

Keywords: Cardiac Arrest, Cardiopulmonary Resuscitation, Return of Spontaneous Circulation.

1 INTRODUCTION

Saving lives is the guiding principle of health professionals during urgent and emergency care in emergency units. Cardiorespiratory arrest (CRA) is one of the most delicate occurrences for rescuers, since each minute and maneuver performed increases the chances of survival. Furthermore, the chances of sequelae to the patient decrease, such as brain damage due to the patient's difficulty in staying for a long time without oxygen, the so-called hypoxia, which tends to affect the brain within 5 minutes. Thus, the faster and better the patient is attended to, the greater will be his or her chances of surviving the CA, as well as of remaining without cerebral sequelae [1-2] .

Cardiac arrest (CA) is the sudden interruption of the individual's vital signs, such as the absence of heartbeat and respiratory movements, as well as circulatory failure. CA is a pathology that affects mainly adult males rather than children, due to the existence of diseases related to the cardiovascular system, such as atherosclerosis, caused by bad habits such as smoking. Moreover, CA can also be verified when the individual does not present any verified pulse in less than 10 seconds [3-5] .

The procedures to care for a patient in cardiac arrest are composed of Basic Life Support (BLS) and Advanced Life Support (ALS). The BLS is formed by a set of techniques used in a sequenced way that range from chest compressions, airway openings, artificial respiration and use of the defibrillator. VAS, on the other hand, corresponds to the monitoring of basic life support practices, added to the handling of medication in the patient, as well as treatment of the cause that triggered the CRA, such as drowning [1,6-7].

Patient resuscitation procedures correspond to the application of BLS in order to preserve the patient's life. To do this, health professionals need to artificially maintain the arterial flow to the brain, as well as to other organs vital to human survival until spontaneous breathing returns. Another technique used for patient resuscitation is positive pressure ventilation, which consists of a device that sends oxygen to the patient when there is no oxygen circulation in the airways [8] .

Moreover, CRA can affect an individual at any time and place, so it is necessary that the lay population knows the main resuscitation techniques in case of CRA. One of these techniques, BLS, is to perform 30 chest compressions on the victim, who must be lying on a flat surface, followed by two ventilations, after the lay rescuer verifies that the victim is not breathing [9] . This maneuver must be repeated until the spontaneous circulation returns or until the arrival of rescuers, where electric shocks will be administered through a defibrillator by this professional [8-10] .

The training of the population to provide help to victims of CRA can help in the rescue of victims. The training for the lay rescuer trains him/her to perform BLS maneuvers, as well as to know and use the contacts for help, such as the 192- Mobile Emergency Care Service (SAMU). This way, more people would learn how to perform CPR and more lives would be saved. Making clear the importance of the primary health care team, such as doctors and nurses, in performing post-cardiac arrest care. Therefore, CPR care is as important as CPR, because it guarantees the victim's life maintenance. . [10-12]

The relevance of this research is due to the importance of showing, not only to the academic and health population, but also to the population in general, the innovations about the study to improve the urgency and emergency care in emergency units for patients who are victims of cardiac arrest, as well as to demonstrate the care applied to them in the post-return of spontaneous circulation resulting from a cardiac arrest [8] .

Considering the above, it is relevant to answer the research question: What are the precautions to be taken during the care of a patient in the post-return of spontaneous circulation as a consequence of cardiac arrest?

Furthermore, we follow the following hypothesis that: Specific care, such as hemodynamic care, performed correctly in the care of a patient with a post-return of spontaneous circulation condition, may contribute favorably to their recovery.

In addition, the general objective of this study is to identify in the literature the care to be given to patients after the return of spontaneous circulation after cardiac arrest.

2 METHODS

This is a narrative literature review that consists of broad, specific papers to describe and discuss the State of the Art topic of a publication on a given topic, grounded from a theoretical point of view. Moreover, the narrative literature review does not inform the reader of the search platforms as well as the evaluation criteria.

Narrative reviews basically consist of an analysis of the general literature published and the author's personal critical analysis. This category plays a fundamental role in continuing education because it allows the reader to acquire and update knowledge about a specific theme in a short period of time. Thus, the narrative literature review was based on scientific articles, monographs, books, and national and international guidelines that address the research theme studied.

3 RESULTS AND DISCUSSION

3.1 PROCEDURES FOR RESUSCITATION OF A PATIENT WITH CARDIORESPIRATORY ARREST (CRA) AND THE TRAINING OF STAFF TO DEVELOP THEM

To provide excellent care, it is necessary to train the multifunctional team, such as physicians, nurses, and physical therapists, so that everyone can work with the same standard of qualification to perform the necessary procedures for resuscitation after cardiac arrest. The multifunctional team is of utmost importance for the permanence of the patient's vital signs, as well as for the recovery of limb movements paralyzed during cardiac arrest.

Health professionals, such as nurses, in urgent and emergency care are faced with several occurrences that require agility, concentration, and knowledge, since there is always the possibility of cardiac arrest, which can lead the patient to death if they do not receive proper care. This care involves both

small and medium intensity interventions, basic life support (BLS), and high complexity interventions such as advanced life support (ALS). Thus, to apply them, nurses should be able to perform procedures and also be trained to always provide the best possible care . [13]

In addition to these requirements, these professionals need to work in harmony and synchronism for all steps of BLS and VAS to be performed successfully. Nurses are usually the first members of the urgent and emergency care team to have contact with the patient, so they need to be familiar with cardiopulmonary resuscitation (CPR) techniques. Within these techniques, which must follow an order of application, nurses may use both the BLS maneuvers, such as identification of vital signs and chest compressions, and the VAS maneuvers, such as airway clearance, as well as drug administration to treat the possible causes that culminated in reversible sequelae of CRA [4,14-16] .

The knowledge of the protocol, of these maneuvers, by the rescue team, as well as for the nurse, will make the difference in the final result of patient care, which is the reestablishment of his vital signs, in order to ensure his life [13] . These protocols of maneuvers applied to CRA patients are constantly updated in order to improve the BLS and AVS, so that these professionals require continuous training to be able to apply the procedures with new mechanisms of cardiorespiratory resuscitation (4).

This knowledge, practiced by nurses, will be even more important when the patient is a victim of Cerebral Cardiorespiratory Arrest (CRA), since there will be a sudden loss of cardiac, respiratory and cerebral functions, which can be diagnosed by checking the absence of vital signs of each organ, respectively: absence of central pulse, ventilatory movements, as well as the state of unconsciousness. Therefore, the procedure of care for CKD must be initiated by BLS to revive the victim as soon as possible in order to reduce the chances of brain sequelae [17-19] .

These updates to CPR maneuvers, both BLS and VAS, are carried out by the *American Hearth Association* (AHA), which in 2020 added new information and guidelines to follow. One of these revisions is that the routine dual use of sequential defibrillation is no longer recommended. In addition, it is recommended that drug administration be through the intravenous route during resuscitation of the CRA patient. Also according to the AHA, the use of epinephrine remains in effect with the recommendation that it be administered as early as possible .[20-21]

The *American Hearth Association* (AHA) also brings updates in the case of cardiac arrest care in pregnant women. According to the association, nursing teams should be aware that the resuscitation care of pregnant women with cardiac arrest should take into account all efforts for maternal resuscitation, i.e., the pregnant woman should be prepared for an emergency cesarean section, if necessary, in order to preserve the life of the neonate and thus better apply resuscitation maneuvers in the mother [20] .

It is of utmost importance that the management of the emergency care unit evaluate their teams in order to diagnose and solve any deficiency in CRA care by the rescuers. This assessment of the nurses' knowledge and skills in CRA care should be done through practical and theoretical simulations that portray real occurrences, in order to bring the professional as close as possible to a future occurrence. The AHA also

recommends the use of *debriefing* , after resuscitation of a CRA patient, both for professional rescuers, such as nurses, and for lay rescuers, arguing that its use will do these professionals good physically and mentally . [20]

To offer an even more effective care to the population, emergency care units have organized Rapid Response Teams (RRT) to speed up this process and not overburden nurses. The RRT is composed of highly trained professionals to reduce the number of CRA cases outside the Intensive Care Unit (IT) space. In addition, RRTs are always in communication with other professionals, such as physicians, nurses, and physical therapists, with the goal of preventing the onset of a CRA. Thus, patient monitoring is of paramount importance to diagnose both cardiac arrest and CRA [22-23] .

3.2 POST-CARDIAC ARREST HOSPITAL CARE

The BLS and VAS procedures for resuscitation of victims of cardiac arrest are essential to save their lives. However, patients who have had a return of spontaneous circulation (ROSC) need extra care, since they are high-risk patients who may die at any time from another CRA as a result of insufficient blood supply in a certain part of their body, causing their organ functions to become more fragile. This post-CA framework is composed of three stages that the patient will have to go through to achieve rehabilitation in full . [24]

These stages start after CA and ROSC, which occur within the first 20 minutes, considered the immediate and early stage, reaching up to 6 hours after the occurrence of CA. Between 6 hours and 12 hours the patient migrates to the intermediate stage, where care is redoubled so that the reperfusion injury is stagnant. From 12 to 72 hours, the patient is in the recovery stage, a delicate period in which care must be intensified so that another CA does not occur (24-26).

After 72 hours, the patient's rehabilitation will begin. In this case, the *American Heart Association* (AHA) recommends that the patient be constantly evaluated according to his physical, cognitive, and psychosocial needs, in order to provide physical therapy, for example, if he has lost movement of any limb. In addition, an assessment of neurophysiological function is recommended, according to the AHA, since some CA patients suffer stroke after cardiac arrest. This evaluation should include tests such as Somatosensory Evoked Potentials (SSEP) and Electroencephalogram (EEG) . [20]

In addition, the AHA also advises performing a Cranial Tomography, Magnetic Resonance Imaging, as well as Magnetic Resonance Spectroscopy and Positron Emission Tomography (PET), which will determine the existence of brain lesions to rule out possible hemorrhages causing the stroke [20] . During this period that the RCE patient was under observation, some care and advanced life support (ALS) are taken and applied for his stable condition, such as optimized ventilatory, hemodynamic, neurological and metabolic support . [24]

Ventilatory supports have the functionality of keeping the airways oxygenated as well as the other parts of the body [26] . For the care of ROSC patients, according to AHA recommendations, it is very

important to keep attention to their oxygenation, as well as to keep blood pressure stable (20). Therefore, it is important to evaluate if the use of tracheal breathing will be necessary in the patient, since during CPR, to maintain ventilation, the bag-valve-mask is used, in order to increase the effectiveness of ventilation [24].

Furthermore, according to the AHA guidelines, it is also important to evaluate percutaneous coronary intervention, performed during CPR, to bring oxygen to the heart, as well as maintain control of body temperature and multimodal neuroprognosis. Next, hemodynamic support must be applied, since ROSC patients need to have their cardiac signals monitored in order to avoid a decrease in circulation and in the patient's blood volume and, consequently, a drop in blood pressure, i.e., the volume of blood reaching the heart will be compromised as well as the volume of blood sent to the rest of the body by the heart [20] .

Another support to be administered by the ROSC team is the metabolic one, which consists in the frequent monitoring of the patient's blood glucose, in order to diagnose the increase in potassium and magnesium, since potassium alterations in the blood are considered one of the reversible consequences of CA. To this end, the glycemic level considered normal for people who have suffered a CA is around 144 mg/dl . [24]

Another maneuver used to prevent death in patients affected by CRA is Therapeutic Hypothermia (TH), which consists in the practice of controlling the patient's body temperature through a circuit of central and peripheral thermoreceptors. Temperature control through the practice of TH has three levels: mild (34-32°C), moderate (32-28°C) and deep (< 28°C), which will be administered according to the level of severity of the neurological lesions [27-31] .

According to the AHA guidelines for care of CRA patients, therapeutic hypothermia should be performed in such a way as to lower the patient's body temperature intentionally for a certain period of time and then by gradually increasing the temperature [22,27] . Thus, this maneuver will allow the preservation of the injured regions caused during CRA and the possibility of oxygen reduction again . [27-28]

4 CONCLUSION

Given the above, we identified in the literature the care to be taken during the care of a patient post-return of spontaneous circulation as a result of a CRA, in addition to BLS and VAS, are: the stages of immediate or early attention, recovery and rehabilitation, as well as conducting physical, neurophysiological, cognitive and psychosocial assessments, to detect sequelae. It is also recommended to perform tests such as Cranial Tomography, Magnetic Resonance Imaging, as well as a Magnetic Resonance Spectroscopy and Positron Emission Tomography (PET), to check for brain damage.

In addition, other care is recommended, such as optimized ventilatory, hemodynamic, neurological and metabolic support and Therapeutic Hypothermia (TH). Thus, specific care, such as hemodynamic support, correctly performed in the care of patients with post-return of spontaneous circulation, can contribute favorably to their rehabilitation. Thus, specific care, such as hemodynamic support, correctly

performed in the care of patients with post-return of spontaneous circulation, can contribute favorably to the maintenance of the victim's life and to his recovery.

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