

# Cardiopulmonary Resuscitation Maneuvers in the Organ and Tissue Donor Patient

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## Review Article

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## Abstract

**Introduction:** After cardiopulmonary resuscitation in a donor patient, the organs and tissues can be affected by times of cardiac ischemia, affecting the recipient. Therefore, we set ourselves the goal of analyzing and summarizing published material on donation of organs and tissues with the fact that the donor has received cardiopulmonary resuscitation maneuvers.

**Methodology:** A major bibliographical review of the main national and international scientific databases (FAMA, IME, Cuiden®, Scopus, CINAHL®, PubMed, Cochrane Library, Web of Science and PsycInfo) was carried out over a period of time in 2012 To the year 2016, under criteria of inclusion and exclusion according to the subject studied.

**Results:** 382 articles in total, of which 360 items were excluded because they did not meet the inclusion criteria. Of these, 22 articles were analyzed. In 14 articles, the benefits of cardiopulmonary resuscitation in the donor organ and had been highlighted. Being only in 8 articles that brings harmful information.

**Conclusions:** The scientific evidence postulates mainly a benefit of the cardiopulmonary resuscitation maneuvers in the donor patient, without involvement in the organs because it increases their Blood perfusion and their oxygenation. However, there is a smaller number of articles that indicates that the fact of performing cardiopulmonary resuscitation in the donor causes total rejection of organs when the recipient receives it.

**Keywords:** Cardiopulmonary Resuscitation; Cardiacarrest; Donation; Asystole

## Introduction

Organ and tissue donation is a major problem in the health system, and although transplants now depend on donations, inclusion of the largest number of donors is a

priority for health organizations. Therefore, patients who have received cardiopulmonary resuscitation (CPR) are required to increase the number of transplants [1].

According to the American Heart Association (AHA) [2], CPR is an emergency procedure that aims to restore breathing and blood circulation to vital organs in those cases where the victim stops breathing suddenly and, as a consequence, ceases to have pulse [3].

All CPR require a clinical situation in the patient who has abrupt, unexpected and potentially reversible interruption of spontaneous heart mechanical activity and spontaneous breathing [4-6]. In this sense, several recent studies have shown that the survival of patients suffering from unexplained Cardiorespiratory arrest is due to the performance of CPR [7-11]. Failure to apply CPR techniques, for 3-4 minutes after stopping, increases patient mortality by 10%. This inability to perform CPR at a stop causes, in the patient's organs, ischemic damage, not being valid for the act of donating [12].

However, these evidences are not taken into account, since in the case of reversing the situation that has caused cardiopulmonary arrest, in their greater percentage, are patients that end up being donors of organs and tissues [13].

According to the National Transplant Organization (ONT), donating organs and tissues is an altruistic gesture, considered the greatest act of kindness among human beings [14], defined by the CNT as a procedure by which organs and tissues are extracted. A human body and reimplanted in another subject, so that the transplantation performs the same function in the new location as the previous one [15-18]. However, there is evidence that, in the case of cardiorespiratory arrest of a donor patient, and after performing CPR, does not interfere with the act of donating, since CPR allows the organs to be kept in optimum conditions while the blood perfusion is maintained [19,20], so that there is no rejection of the organs in the recipient [19].

In this context, the European Council for Cardiopulmonary Resuscitation (CERC) states that donation of organs and tissues following a CPR procedure remain a controversial issue as to whether or not they can be donor patients [6]. Therefore, we set ourselves the objective of analyzing and summarizing published material on organ and tissue donation with the fact that the donor has received cardiopulmonary resuscitation maneuvers.

## Methodology

A primary, secondary and tertiary bibliographic search was carried out on national (Fama, IME and Cuiden®) and international databases (Scopus, CINAHL®, PubMed, The Cochrane Library, Web of Science and PsycInfo). Subsequently a review of the bibliographic references of the articles found was carried out.

In reference to the search strategy, we used health science descriptors (DeCS) related to the subject of study. The search limit was made in articles published between 2012 and 2016, with access to the full text and access to abstracts.

The articles were first selected by reading the summary based on the following inclusion criteria:

- Studies or articles of patients candidates to be tissue donors who have received basic or advanced CPR procedures from health personnel
- Studies or articles with the subject exposed in English or Spanish.

On the contrary, the exclusion criteria were:

- Studies or articles in which they are not considered donors of organs and tissues although they received basic or advanced CPR
- Studies or articles in which CPR maneuvers were performed prior to organ donation.
- Studies with the previous theme in a language other than English or Spanish.

The entire methodological process of study was composed from January to June of the year 2016 (both inclusive).

## Results

A total of 382 articles were found in the searches, of which 91 corresponded to Spanish databases, and 291 to international databases. After reading the articles found, in total, 360 were excluded because they did not meet the inclusion criteria. Therefore, 22 articles were analyzed (10 in Spanish and 12 in English).

Based on the results obtained, two thematic categories have been identified:

### Benefits of Organ and Tissue Donor after Cardiopulmonary Resuscitation

According to a study carried out in Madrid, by Mateos, et al. [21], in the year 2013, CPR maneuvers remain the main link to a cardiorespiratory arrest, since if, after 30 minutes of initiation, spontaneous circulation has not recovered, the patient is considered a potential donor after cardiac and cerebral death. Therefore, the benefits of this study are the availability of organs that decrease the waiting list of patients waiting to be transplanted.

Also, the ERC and AHA update guidelines postulate that the fact of making a CPR benefits because it increases the reserve of organs available to patients that are on the waiting list to be transplanted [2,8,9].

Likewise, in the study of Ortega Deballon, et al. [22], carried out in 2012, they elaborated some options of the management of the victims before an unexpected cardiac arrest, with this, the benefits are obtained to minimize the times of action and to simplify the way to carry out the procedure, since if after 30 minutes of CPR, cardiorespiratory arrest does not reverse, we must take into account from that moment the maintenance of the patient's circulation only to preserve the organs, until the arrival at the hospital. This claim regarding organ preservation is supported by DalleAve, et al. [23], in his study published in 2015, adding further that this option of CPR for organ preservation allows to take advantage of those organs that otherwise would be rendered unusable, Wasting the opportunity to save the life of another person.

Regarding the presence of organ and tissue donors who received a PCR, the study by Orioles, et al. [24] and also by Southerland, et al. [25], carried out during the years 1999 to 2011 and from 1994 to 2011 respectively, were the main results That there was no significant difference between heart recipients with or without a history of donor cardiac arrest. In addition, in a recent study by Arroyo, et al. [26], carried out in Switzerland, they point out that "as long as the donor and recipient criteria are carefully respected, transplantation of any organ can be successful even after prolonged cardiac arrest of the donor".

Authors such as Brindley and Beed [27], in an article published in 2014 in the British Journal of Anaesthesia, analyzed the benefits versus the not so favorable effects of the CPR maneuver, noting that with these maneuvers can prevent the premature death of patients who Had a good quality of life prior to the event and have a good

prognosis, taking into account the paucity of concomitant risk factors after this procedure.

A recent study by Lesieur, et al. [28] with a sample of 596 patients adds that life expectancy increases significantly in patients whose quality of life as a consequence of organ failure is really poor.

### Effect Leading to Cardiopulmonary Resuscitation of the Donor in Relation to Organ and Tissue Transplantation

If a deceased patient meets the "donor after cardiac death" criteria, the protocol is activated, and ventilation and chest compressions (without drugs) continue while the patient is transferred to the transplant hospital. Resuscitation does not stop during the evaluation process, and are considered preservation maneuvers. Death is diagnosed and certified upon arrival at the hospital, by a physician who is not a member of the transplant team. CPR is stopped, and the patient is evaluated, signs of death should be observed for at least 5 minutes to confirm death. The surgical transplant team connects the donor to a circuit called "ECMO" or an extracorporeal filter and roller pump to maintain circulation [21].

According to the CERCP, in its 2015 update, the complex pathophysiological processes that occur after cardiac ischemia and the subsequent re-perfusion response during CPR and after successful resuscitation, form the post-stop syndrome, which is Associates brain injury, myocardial dysfunction and systemic response. However, the severity or duration of this syndrome will depend on the duration and cause of CRP. Overall ischemia / re-perfusion of the organism produced, activates the immunological and coagulation pathways contributing to multiorgan failure and increasing the risk of infection [10].

According to the article by Carmona, et al. [29], the viability of donor organs in asystole depends primarily on the time elapsed between the cessation of spontaneous circulation and the preservation of the same (time of hot ischemia). In order to minimize injuries due to hot ischemia, chest compressions should be maintained until the potential donor arrives at the hospital, as it was observed that the interruption of chest compressions leads to a dramatic decrease in carotid flow, which is extrapolated to the rest of the circulation.

In addition, the major lesions that occur during the period of warm ischemia (from the moment the spontaneous circulation of the donor organ ceases until it

is perfused with the hypotonic preservation solution) are more closely related to re-Perfusion than with the ischemia produced, since during this process oxygen is administered to the cells and the elimination of toxic metabolites is allowed. This situation, although a necessary process, entails metabolic consequences that can trigger inflammatory processes that can influence the rejection by the immune system of the receptor towards the transplanted organ. However, all these negative effects can be practically prevented by administering an intravenous preservation solution<sup>29</sup>.

The study by Nusbaum, et al. [30], carried out in 2014 and that analyzes the situation through the presentation of a clinical case, shows how, in general, the results after a cardiorespiratory arrest continue to be unfavorable, especially in patients with risk factors such as cardiorespiratory arrest Presence, defibrilable initial rhythm, advanced age and prolonged CPR without spontaneous return of the circulation.

The guidelines established in these cases, therefore, exist to conclude the resuscitation efforts in cases of cardiorespiratory arrest, which are considered useless, and which can consequently contribute both physical and emotional wear and tear to health professionals. On the other hand, articles have been found that CPR for organ preservation can have an ethical repercussion both on health professionals and on the relatives of the deceased person. An example of such an affirmation is the article by Anne L. Dalle Ave, et al. [23].

Like other studies [30], it is important to raise public awareness about the maintenance of CPR in order to use the organs of the deceased patient.

## Conclusions

Most of the studies found in more recent literature are in favor of organ donation, even though the donor has received CPR, because after cardiopulmonary resuscitation, donor organs increase their blood perfusion and oxygenation, allowing them to be fit in the receiver. However, a minority of evidence indicates that performing cardiopulmonary resuscitation in the donor causes total organ rejection when the recipient receives it, because the presence of anoxia during the period of ischemia can trigger inflammatory responses, which can mean rejection of the organ by the recipient's immune system.

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