

LITERARY REVIEW OF ORGANS AND TISSUE TRANSPLANTATION: A LOOK AT BONE MARROW TRANSPLANTATION

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Abstract: Despite the growing number of people registered for bone marrow transplantation in Brazil, it is still low, so the probability of a patient who needs a transplant finding a compatible marrow is one in a hundred thousand. This organ transplantation process is a surgical procedure that is understood by the removal of an organ, be it (Heart, Lung, Liver, Pancreas, Kidneys, Corneas, Tissues, Bones and Bone Marrow), be it from a living or dead donor (REDOME, 2020).

Bone marrow transplantation is a type of treatment proposed for some diseases that affect blood cells, such as leukemias and lymphomas. It consists of replacing a sick or deficient bone marrow with normal bone marrow cells, with the aim of reconstituting a new healthy marrow (REDOME, 2020). It is in the bone marrow that the hematopoietic stem cells are located, being responsible for the generation of all blood (red blood cells, white blood cells and platelets). In bone marrow transplantation these cells are replaced (REDOME, 2020).

Keywords: Transplants; Donor; Receiver; Relatives; living donor; Dead donor; Probability; Stem cells; Organ donation; donor bank.

RESEARCH METHODOLOGY

Through scientific sites such as ABTO (Brazilian Association of Organ Transplantation), SBTMO – Brazilian Society of Bone Marrow Transplantation, INCA - National Cancer Institute, EBSEH - Brazilian Hospital Service Company - Ministry of Education, REDOME - National Registry of Donors of Bone Marrow, a search was carried out for documents with technical-scientific foundations that would allow identifying data from the literature between 2013 and 2020 for the construction of this work. Books, magazines, legislation and documents from

public bodies relevant to the subject also provide references for qualitative research.

INTRODUCTION

ORGAN DONATION AND TRANSPLANTATION

Organ donation is an encouraging feat that brings the possibility and hope of a new life to a person. Public awareness of organ donation is needed (MINISTRY OF HEALTH, 2022).

The organ transplant process is an entirely surgical procedure, which is understood by the removal of an organ (which can be heart, lung, liver, pancreas, kidneys, corneas and tissues such as bone and bone marrow) from the donor, living or dead, and its reimplantation in the compatible recipient (MINISTRY OF HEALTH, 2022).

It is not today that the idea of transplantation exists, in the second century of the Christian era reports of ideas of replacing diseased parts of the body with others were already identified. Scientifically, transplantation was only possible from the beginning of the 20th century, due to the creation of the vascular anastomosis technique by Alexis Carrel, a research physician (REZENDE et al., 2015).

The word transplant was pronounced for the first time in 1788, by John Hunter, due to his experience and the use of reproductive organs in animals. In 1933, the first human transplant was performed by Voronoy, a Ukrainian surgeon who performed a kidney transplant in order to treat acute kidney failure. In 1963, the first liver transplant was performed, and the first heart transplant only occurred in 1967. In Brazil, in 1964, the first kidney transplant was performed, then there were more than 75,600 solid transplants (MARCONDES et al., 2019).

As per the history of organ transplantation, its beginnings took place in the 1940s, in some cities like London, Paris, Edinburgh and Boston. The first transplant in Brazil

happened later, in 1960, when kidney and heart transplants were performed, spreading to various parts of the world due to the advancement of surgical techniques for transplants (VICARI, 2010). In living patients, the transplant can be performed with the following organs (liver, kidneys, lungs and bone marrow) or through a case of Brain Death - E.M. According to the Federal Council of Medicine (CFM), M.E. it can be conceptualized as “total stoppage of brain functions of known and indisputably verified cause, characterized by perceptive coma, with absence of supraspinal motor response and apnea” (RESOLUÇÃO N°. 1480, 1997 apud REZENDE et al., 2015).

As a world reference in the field of transplants, Brazil has the largest public transplant system in the world, approximately 96% of procedures throughout the country are financed by the SUS (Sistema Único de Saúde). Brazil is also the 2nd largest transplanter in the world, behind only the United States. The public health network provides the patient who will undergo the procedure with free assistance and assistance from surgery to medication and post-transplant follow-up (MINISTÉRIO DA SAÚDE, 2022).

This information is also reaffirmed by Magalhães et al. (2017), saying that currently Brazil has one of the largest free organ and tissue transplant programs in the world, the second in kidney transplants, the United States being the first.

The Organ and Tissue Procurement Service at the Hospital de Clínicas at Unicamp evaluated 1,772 potential donors from 2013 to 2018. Male donors aged between 42 and 55 years prevailed with a rate of 57.39%. This study also showed that the main cause of M.E. with 996 cases evaluated (56.21%) were of vascular origin, then comes the causes of traumatic origins with 501 cases (28.27%), neoplastic (neoplasms of the central nervous

system) with 61 cases (3.44%), infectious with 26 cases (1.47%), and causes classified as others with 188 cases (10.61%). Of all cases, 681 were made available for donation, which is equivalent to 38.43%, including 293 females and 388 males. The main reason for not donating organs was family refusal, with a percentage of 42.8%, the main reports were belief/religion, not believing in M.E., the family member not being a living donor, the delivery time of the body and others, then with 25.75% medical contraindication, 21.63% due to cardiorespiratory arrest, 4.21% positive serologies, 5.49%, which adds up to 60 cases, without giving reasons for refusal and 0.1% due to non-completion of the brain death protocol. The organs with the highest donation rate were kidneys, liver, lungs, heart, pancreas and corneas with more than 90%. The possibility of disposal was also evaluated, the same organs with the highest donation rate had disposal rates of up to 16% for kidneys, 26% liver, 80% heart, 93% lung, 95% pancreas and 28% cornea (BERTASI et al., 2019).

The main reason for family refusal (28%) was the fact that the potential donor was not declared a living donor. The declarant must present this living will to the family or a record expressing their willingness to be a donor, easing the family's difficulty in making the decision, already knowing that this was their wish, thus facilitating acceptance (BERTASI et al., 2019).

Although there are numerous difficulties in starting the donation process, after family authorization and no medical contraindication, the rate of organ donation is greater than 90%, with the following organs being most donated: kidneys, liver, heart, pancreas, lung and cornea (BERTASI et al., 2019).

Brazil has a growing demand for people who need a transplant, this demand is due to the worsening of diseases that weaken the

functioning of various human organs, and for this reason the waiting list is long, which is a life expectancy for many (REZENDE et al., 2015).

According to information from “Associação Brasileira de Transplantes de Órgãos” (“Brazilian Association of Organ Transplants” -ABTO, 2015), in 2014, 7,898 organ donations were registered, a value 3% higher than that registered in 2013. With regard to the rate of donors, this rose from 13.5 per million people to 14.2 per million. However, it must be noted that, despite this growth, the index was still lower than the target proposed by ABTO for 2014, which was 15 donors per million people, and for 2017 the goal is to reach 20 donors per million people. To get an idea of the insufficiency of this index in the country, the United States has an index of 24 donors per million people and Spain, the country with the largest registry of transplants in the world, this reaches 37 donors per million (ABTO, 2015 apud REZENDE et al., 2015).

Currently in Brazil for every one million people who die, only 60 have the ME condition, however, only 50% would be possible donors. For those who need a transplant, the chances of finding a compatible potential donor are four times less due to the small number of possible donors (REZENDE et al., 2015).

According to the Ministry of Health (2014), the body responsible for coordinating the National Transplant System (SNT), in Brazil there are more than 400 units and a thousand teams prepared to perform organ transplants. However, ABTO (2015) highlights the poor logistical distribution of this structure, since most of it is concentrated in single places, such as in the Southeast and South regions, leaving the other regions with a service deficit, especially in the regions North, Northeast and Midwest. Another important point to be highlighted is that, currently, in the country, according to ABTO (2015), a considerable number of patients who are on the waiting list

for an organ donation die before the process takes place (REZENDE et al., 2015).

Faced with the countless possibilities for awareness and social marketing techniques to encourage organ donation, those that focus on trying to convince potential donors stand out, this includes advertising campaigns. The campaigns are carried out in partnership between ABTO, the Ministry of Health, the National Transplant System and the Federal Council of Medicine (Law No. 9434, 1997). It is important to highlight, according to information from the Ministry of Health (2014), that the Brazilian government develops a project to structure social marketing actions in order to guide families to adhere to organ donation, with this the number of transplants performed would increase, decreasing the waiting list (REZENDE et al., 2015).

BONE MARROW TRANSPLANT

Currently, transplantation or grafting of organs and tissues is considered a safe and effective therapeutic alternative in the treatment of several diseases, leading to improvements in the quality and perspective of life. With innovations and improvement of surgical techniques, development of immunosuppressants and immunological understanding of compatibility and rejection, transplants are no longer experimental treatments and appear as very effective procedures in the control of terminal insufficiencies of some organs and failure of some tissues (ABTO, 2009 apud ITNS, 2011 apud SILVA; SOUZA; RIBEIRO, 2019).

Bone Marrow Transplantation (BMT) is used as therapy for pathologies such as Lymphomas and Leukemias (onco-hematological diseases), Severe Aplastic Anemia (hematological diseases), tumors (oncological diseases) and non-neoplastic diseases such as Severe Combined Immunodeficiency (VOLTARELLI; PASQUINI; ORTEGA, 2009

apud CORGOZINHO; GOMES; GARRAFA, 2012).

BMT is a type of therapy proposed for certain pathologies that damage the cells of our blood system, such as leukemias and lymphomas. The person with some of these diseases usually needs to replace their diseased bone marrow with normal cells from another, in order to reconstitute it (MINISTRY OF HEALTH - INCA, 2023).

The bone marrow plays a role in hematopoiesis, that is, in the conception of white and red blood cells and platelets, where stem cells self-renew or differentiate, going through numerous stages of maturation before passing into the blood (BRASIL - INCA, 2010 apud CORGOZINHO; GOMES; GARRAFA, 2012).

Blood is produced in the bone marrow, a spongy tissue rich in hematopoietic stem cells or progenitor cells (stem cells) that is found inside the bones, and has the ability to proliferate and differentiate into erythrocytes, leukocytes and platelets. Bone marrow transplantation (BMT) occurs when diseased or suppressed bone marrow is replaced by healthy bone marrow (REGINO, 2013).

Hematopoietic Stem Cell Transplantation (HSCT) is the treatment for hematological, oncological and immunological diseases that consists of the infusion of hematopoietic stem cells aimed at restoring the patient's medullary function. In autologous bone marrow transplantation (BMT), peripheral stem cells are taken from the patient, stored and infused after a conditioning regimen (chemotherapy) (PORTO et al., 2019).

The first reports of treatments for certain hematological diseases in history date back to 1981 by Brown-Séguard (British neurologist), administering an extract of bone marrow orally to patients with anemia and lymphadenoma. In 1937, Schretzenmayr performed intramuscular bone marrow

infusion (REGINO, 2013).

Two years later, in 1939, the first recorded procedure of intravenous infusion of bone marrow was performed. A patient with aplastic anemia, her brother being the donor. With the end of the 2nd World War, the effects of radiation, after the nuclear bombs of Hiroshima and Nagasaki in Japan in 1945, began to worry, in 1960 genetic factors received greater attention and transplants between compatible brothers began to be performed (REGINO, 2013).

Currently, there are more than 6 million voluntary bone marrow donors registered in the US registry of the National Marrow Donor Program® (NMDP), (BMTBASICAS, 2017) and according to the annual report (2010) of the World Marrow Donor Association there were more of 14.6 million registered donors, with Brazil occupying third place in the ranking (REDOME, 2017 apud SILVA; SOUZA; RIBEIRO, 2019).

Today the country (Brazil) has one of the largest public organ and tissue transplant programs in the world. With 548 health establishments and 1,376 medical teams authorized to perform transplants, the SNT (National Transplant System) exists in 25 states of the country, through the State Transplant Centers. The National Policy for Transplantation of Organs and Tissues is based on the legislation (Laws nº 9,434/1997 and 10,211/2001), with the gratuitousness of the donation, the beneficence of the recipients and non-maleficence in relation to living donors. It guarantees the rights of patients who need these procedures, and regulates the entire care network through authorizations and reauthorizations for the operation of teams and institutions. The transplant policy is in accordance with Laws 8080/1990 and 8142/1990, which govern the functioning of the Unified Health System (SUS) (MARINHO; CARDOSO; ALMEIDA, 2011 apud SILVA;

THE ORGAN DONATION PROCESS AND THE FAMILY APPROACH

In ancient times, there was talk of the possibility of replacing diseased organs with healthy ones, which has always fascinated humanity. After a long history of failures, organ and tissue transplantation became accepted as a valid therapeutic method due to advances in surgical techniques and the introduction of immunomodulatory drugs (ROCHA, 2010 apud FERREIRA et al., 2015).

With that, the transplant made it possible to maintain the lives of many people who were victims of diseases that in the past would not survive the events of an acute condition (SANTOS, 1998 apud FERREIRA et al., 2015).

The increase in the performance of transplants has led, in addition to the cure of previously disillusioned patients, to the appreciation of the human being as a reserve of organs and tissues, raising bioethical and legal objections due to the inviolability and inalienability of the body, which have shaped the standardization of conducts for balancing what is acceptable in breaking the integrity of the human body with the possibility of removing structures for therapeutic purposes (SANTOS, 1998 apud ROCHA, 2010 apud FERREIRA et al., 2015).

Internal organ transplants were the first, but some with external parts of the body have already been performed, such as hand transplants and recently partial face transplants (FERREIRA et al., 2015).

At the beginning of the 21st century in Brazil, the total number of donors did not exceed 700, however, in the last decade the number of donors has grown significantly. In 2017, there were almost 11,000 potential donors, 3,415 actual donors and approximately 7,500 organ transplants. However, although

the number of donations is increasing, the total amount of the waiting list in the first half of 2018, in Brazil, exceeded 24 thousand organs, the difficulty of increasing the number of donors is due to the disadvantage that exists between donors and recipients, where the number of recipients stands out in relation to the number of donors. The pillars for reducing the waiting list are summarized in three factors: donation, transplantation and waiting list. There are several factors that interfere with the validation of the donation process, starting with the way of approaching the family of the possible donor and with the donor, the quality of the organs and tissues must also be taken into account (BERTASI et al., 2019).

As much as we currently have many donations, they are still not enough to supply the waiting list that presents a large number of people. After verification of the potential donor is confirmed and family authorization is obtained, there is still difficulty on the part of the medical team in controlling the homeostasis and hemodynamic stability of the donor. Another problem that prevents the donation of certain organs is the high levels of creatinine and bilirubin, requiring the disposal of kidneys and livers. Thus, care for an effective donor is very complex, from the use of vasoactive drugs, carrying out measures that prevent the worsening of kidney and liver function, to proper care of blood pressure (BERTASI et al., 2019).

Although the number of transplants has increased, the shortage of organs remains one of the biggest obstacles for transplant teams in all countries, as the demand for transplants has been increasing at a higher rate than donations, causing waiting lists to expand (CAMPOS, 2001 apud FERREIRA et al., 2015).

Although the National Transplant System directs efforts to increase the rates

of transplant surgeries in the Brazilian population, the growing disproportion of the number of patients on the list versus the number of transplants is an unquestionable fact, in which, among the limiting factors, are not notification of patients diagnosed with brain death to the Organ Notification, Procurement and Distribution Centers, despite its obligation provided for by law, the lack of continued education policy for health professionals regarding the donation-transplantation process and all the resulting consequences not knowing about this process, in addition to family refusal (ABTO, 2009; MENDES et al., 2012 apud SILVA; SOUZA; RIBEIRO, 2019).

TYPES OF DONORS

There are two types of donor – Living and Deceased:

The first donor is the living donor, with agreement it can be any person, unless the donation harms the health of the individual. In this type of donation, part of the liver, part of the bone marrow, part of the lung or kidneys can be donated. The law allows this donation to be made by relatives up to the fourth degree and spouses, donors from the general population need judicial authorization (ABTO – Associação Brasileira de Transplante de Órgãos).

The second group of donors are the deceased. These are those patients who have been certified as brain dead, most often victims of irreversible brain damage, such as head trauma or stroke (brain stroke) (ABTO – Associação Brasileira de Transplante de Órgãos).

The acquisition of living donor organs has been widely used, it is still useful, but it is equally questionable from an ethical point of view. In Brazil, this type of donation has only been accepted when there is a kinship relationship between donor and recipient.

Organ donation by friends or even strangers has been strongly avoided. The issues involved are the autonomy and freedom of the donor when giving his authorization and the risk/benefit assessment associated with the procedure, in relation to the non-mutilation of the donor (SANTOS, 1998 apud FERREIRA et al., 2015).

For a better understanding of the subject of postmortem organ donation, it is necessary to define death, which is what Ferreira et al. (2015) a biological consent that ends a life, being capable of evoking intense emotional reactions in the individuals who experience it and in those around them. Dying is an inevitable process, which exposes our human condition of vulnerability and characterizes both what is universal and what is unique to us.

Currently, dying is seen as a socially constructed process, which cannot be distinguished from other dimensions of the universe of social relations. Therefore, it is present in our daily lives and, regardless of its causes or forms, its main stage continues to be hospitals and health institutions. Therefore, death can still be considered as something institutionalized and medicalized, especially today, when hospitals have high-tech devices that allow the maintenance of the patient's body in operation, regardless of the quality of life condition.

The definition of death involves several nuances throughout its process. It is a reality that family members and lay people question the criteria for defining brain death. Although it is characterized as clinical death, for family members it is only evidenced by cardiopulmonary arrest. The individual death of the brain does not make individuals face it as death, as the heart continues to beat, giving the impression that the individual is just sleeping. Regrettably, this situation makes it difficult to differentiate between life and death,

causing intense emotion and anxiety for the family (PESSALACIA; CORTES; OTTONI, 2011 apud FERREIRA et al., 2015).

In Brazil, the term brain death was officially accepted after the publication of Resolution 1,346/91 of the Federal Council of Medicine (CFM), updated by Resolution 1,480/97, which proposes a mixture of protocols, with coma being highlighted as clinical criteria. non-reactive and imperceptible deep tissue, apnea, bilateral paralytic mydriasis and absent oculomotor reflex. These parameters must be kept unchanged for a period of more than six hours, in addition to the mandatory performance of confirmation tests. Only then can you consider the individual as a potential organ and tissue donor (BRASIL, 1997 apud FERREIRA et al., 2015, p. 200).

According to this resolution, the potential donor must undergo a clinical evaluation and an additional examination by two physicians who are not part of the transplant teams, and at least one of them must be a neurologist, neurosurgeon or neuropediatrician with a duly registered specialist title. Therefore, brain death can be characterized by the definitive and irreversible loss of brain functions (cerebral hemispheres and brainstem), with a known and clearly determined cause, and the specificity of the diagnosis must be 100% (BRASIL, 1997 apud FERREIRA et al., 2015).

Immediately after confirming the patient's death, a professional informs about the likelihood of organ donation, checks the family's knowledge and preparation on the issue, and explains the donation steps. One of the reasons that contribute to the difficulty in understanding and/or not accepting the diagnosis of BD is because the patient has some vital parameters, such as heartbeat, respiratory movements and body temperature. The family does not see the patient as dead and believes in the possibility of reversing the situation. This hope, largely fueled by storytelling by third parties, as well as by movies and soap operas, makes it more difficult to accept death when

the patient is a child (FERREIRA et al., 2015).

THE ORGAN DONATION PROCESS

Organ donation in the country is regulated by Brazilian legislation on human organ donation, by Law No. 9,434, of February 4, 1997. However, and despite the relevant legislation, what is identified in the country is a high demand for people waiting for a compatible organ donor and, on the other hand, a low supply of possible potential donors (Law No. 9434, 1997 apud SANTOS; MASSAROLLOZ, 2005; ABTO, 2015 apud REZENDE et al., 2015).

The allocation of organs for transplantation must be done in two stages, the first must be carried out by the health team itself, contemplating the criteria of eligibility, probability of success and progress towards science, aiming at broad beneficence. The second stage, to be carried out by a Bioethics Committee, can use the criteria of equal access, the statistical probabilities involved in the case, the need for future treatment, the social value of the recipient individual, dependence on other people, among others. criteria (FERREIRA et al., 2015, p. 201).

Measures and procedures aimed at transforming a possible donor into an effective donor include organ donation. It starts with the detection and preservation of potential donors. The family is later informed by the doctors about the suspected brain death (BD), however, confirmation is only carried out through supporting tests for the diagnosis of BD (MARCONDES et al., 2019).

For the diagnosis of BD to be a safe process, early detection must be carried out, through two neurological clinical evaluations and the completion of complementary graphic examination. The clinical evaluation must be carried out in two moments, respecting the time interval established for each age group of the potential donor: from seven days to two incomplete months, the exam must be repeated every 48 hours; from two months

to an incomplete year, repeat every 24 hours; from one year to two incomplete years, every 12 hours; and over two years old, every 6 hours (MAGALHÃES et al., 2017).

After identification of BD, the next step for organ donation is the eligibility of the possible donor, through family authorization and absence of factors that make donation impossible, such as medical contraindication, cardiorespiratory arrest (CPA), serology or non-completion of the protocol of ME (BERTASI et al., 2019).

After evaluating the patient as a potential donor of organs and tissues, the family must be informed of the irreversibility of the patient's clinical condition and will be approached by the coordinators who make up the CIHDOTT or the Organ and Tissue Procurement Service (SPOT), for the donation of the patient's organs. The information collected by the team that assists the BD patient in the donation process is of great relevance for the validation of the donor in question, only after authorization from the family is the removal and distribution of the organs performed (MAGALHÃES et al., 2017).

For the organ donation process to occur safely, it is necessary to carry out a careful and thorough evaluation of the donor. It is essential that the patient is maintained in intensive care by continuously trained professionals, with specific materials and technology for monitoring and treatment. Among the professionals in this sector, there are also professionals from the Intra-Hospital Commission for Donation of Organs and Tissues for Transplants (CIHDOTT) and the Transplant Center, who must be present in the evaluation and care of the potential donor (MAGALHÃES et al., 2017).

The causes that led the patient to the comatose state must be known, excluding hypothermia and the use of central nervous system depressant drugs. Two physicians

who are not part of the removal and transplantation team are required to carry out the clinical examinations, one of which must be a neurologist. Complementary exams must demonstrate absence of electrical activity or brain metabolic activity or blood perfusion. Clinical and complementary exam findings must be recorded in the Brain Death Declaration Term and duly signed by the physicians who assessed the patient. After confirmation of BD, family members must be welcomed and be aware of the entire brain death diagnosis process (MAGALHÃES et al., 2017).

Potential organ donors are usually hospitalized unexpectedly, mainly due to traumatic causes and congenital or acquired diseases. During the hospitalization process, family members are informed of the severity of the clinical condition and the patient's risk of death. Often, they realize the sobriety of the situation and the imminence of the patient's death, even before the medical information (FERREIRA et al., 2015).

The progress of the organ donation process is a set of actions and procedures that aim to transform a potential donor into an effective donor. This process begins with the identification and maintenance of potential donors. The family members are informed, later, by the doctors, about the suspected brain death (BD), carrying out the supporting tests for the diagnosis of BD. The potential donor is informed to the Organ Notification, Procurement and Distribution Center (CNCDO), which forwards the notification to the Organ Procurement Organization (OPO). After receiving the notification, OPO professionals will assess the clinical conditions of the potential donor and the viability of the organs to be donated, and the CIHDOTT team (Intra-Hospital Commission for Organ Donation and Tissues for Transplantation) will carry out the family interview to obtain

the consent or refusal of the family members. It involves, through the participation of the nurse in the team, the management of nursing care provided to the potential donor and his family, as well as carrying out the family approach. Thus, the nurse's contribution to the success of the transplant becomes undeniable. The process ends if the family refuses, however, if the family members authorize the donation, the OPO informs the feasibility of the donation to the CNCDO, which will distribute the organs, indicating the transplant team responsible for their removal and implantation (MARCONDES et al., 2019).

After the diagnosis of brain death, the potential donor must be notified to the Notification, Training and Organ Distribution Centers (CNCDOs). For this, the doctor must call the Central of his state informing name, age, cause of death and hospital where the patient is hospitalized. This notification is compulsory, regardless of the family's desire to donate or the clinical condition of the potential donor to become an effective donor (table 1) (ABTO – Associação Brasileira de Transplante de Órgãos).

Organ/ Tissues	Maximum withdrawal time	Maximum extracorporeal preservation time
Corneas	6 hours after cardiac arrest	7 days
Heart	Before PC*	4 to 6 hours
Lungs	Before PC*	4 to 6 hours
Kidneys	Up to 30 min after PC*	Up to 48 hours
Liver	Before PC*	12 to 24 hours
Pancreas	Before PC*	12 to 24 hours
Bones	6 hours after PC*	Up to 5 years

* PC: Cardiac Arrest

Table 1 – Organ and Tissues that can be donated.

Source: ABTO – Brazilian Association of Organ Transplantation

Law 10,211, published on March 23,

2001, is clear and objective regarding the requirement of family consent for organ donation. Adoption can only take place after authorization from legal guardians, relatives (of legal age, following the line of succession, direct or collateral up to the second degree of kinship) and spouses. Therefore, family refusal is the greatest limitation for the adoption of organs in the country (MARCONDES et al., 2019).

It is worth mentioning that the lack of preparation of the professional who approaches the family may be the reason for the family's refusal, as it does not effectively clarify all the requirements and procedures to be followed, leading to the refusal of the authorization of organ donation (MARCONDES et al., 2019).

For Santos; Massarolloz (2005 apud CAMPO SILVA; CARVALHO, 2006 apud REZENDE et al., 2015), some donations may not be successful due to society's lack of information about BD, as well as the bureaucratic difficulties faced by family members who have relatives in this context. Also according to the authors, the moment of donation is marked by the emotional fragility of family members who are without motivation due to the loss of a loved one. The difficulty faced by health professionals in the development of the donation-transplantation process is also highlighted, due to the lack of training in the area and lack of knowledge about this process.

An experienced nurse interacts with the family and the multidisciplinary team, helping to make decisions in the right time, ensuring that the process is effective, safe and of quality (MAGALHÃES et al., 2017).

According to the basic guidelines for the capture and removal of multiple organs and tissues from the Associação Brasileira de Transplante de Órgãos (ABTO), the success of the family interview basically depends on three elements: willingness to donate, quality of hospital care received, skill and knowledge of the interviewer (BRASIL,

2009). In addition, it is also noteworthy that the conditions for the family interview involve a broad understanding, on the part of the interviewer, of the situation that the family is experiencing, in which, in a difficult period such as mourning, they will have to decide to donate the organs of their loved one aware that it may have repercussions on new life for another individual. Other important conditions of the interview involve the conversation with the doctor who assisted the patient, the identification of the best person to offer the donation option and, still, a calm and comfortable environment (FERREIRA et al., 2015).

Family members must be informed that the decision to donate does not need to be given at the exact moment of the interview, and that they can think about the matter in order to obtain the best decision. Regardless of the decision made, it must be accepted. It is not recommended to try to convince family members about the good of the donation or to try to influence them with religious or moral arguments. Exposing statistics has no validity at this time. The interviewer must explain that some organs may not be donated and advise that the choice for donation can be canceled at any time, even after signing the consent form (FERREIRA et al., 2015).

The literature records that explaining specific points may be associated with a higher rate of consent, an aspect also related to the time the interviewer spends with the family (BRASIL, 2009; ROZA et al., 2012 apud FERREIRA et al., 2015).

As for how to obtain organs and tissues, specifically speaking of organs derived from human beings, the most important issue is the protection of voluntariness and spontaneity in the act of donating, or whether it is accepted that the common good is above the will of the individual and whether the appropriation of cadaver organs is allowed or whether it

is decided that the individual is the owner of his body and, thus, can use it as he sees fit (SANTOS, 1998; CAMPOS, 2001 apud FERREIRA et al., 2015).

It is a primordial factor for the safety of the transplant that its stages are carried out correctly and well documented, with the organs and tissue being packaged during transport, being extremely important that the ischemia of each organ is known (Table 2). There are actions and procedures to certify that the steps were followed correctly, so as not to harm the receiver and the families involved in the process (MAGALHÃES et al., 2017).

Organ	Ischemia time
Heart	04 hours
Lung	04 to 06 hours
Kidney	48 hours
Liver	12 hours
pancreas	12 hours
intestine	04 to 06 hours

Ischemia time is the time it takes to remove an organ and transplant it into another person.

Table 2 - Statement of acceptable ischemia time for each organ to be considered for transplantation.

Source: Ministry of Health (2022).

The donation process is bureaucratic, time-consuming, exhausting and tiring. Regarding the release of the body, the family is informed about the possibility of delays and interferences in carrying out the tests for the diagnosis of brain death, about the removal time necessary for the extraction of the organs and the sending of the body to the Legal Medical Institute (IML), in cases of traumatic death. However, there are families that do not consider the release of the body complicated, understanding the delay as the normal and due to the existing bureaucracy (FERREIRA et al., 2015).

Although the situation experienced is painful and stressful, there is no regret regarding organ donation. The lack of

understanding of the concept of BD, the religious factor involved and the delay in releasing the body by the IML are pointed out as factors that hinder the donation process (SANTOS; MASSAROLLO, 2005 apud FERREIRA et al., 2015).

It is evident that there are many factors that influence the effectiveness of the donation process, for example, the correct identification of possible donors and the appropriate approach with family members and the viability of the organs. Thus, it becomes important to better understand the profile of potential and effective donors through the causes of brain death and the reasons for accepting or refusing the donation, enabling the establishment of routines and protocols that will guarantee the success of the process (BERTASI et al., 2019).

The assistance provided to the potential donor and the family influence decision-making regarding organ donation. A study pointed out sociocultural issues as determining factors for organ donation by the family, such as: ethnicity, religious beliefs, socioeconomic status and information about donation and transplants, previous experience of the family with donation or transplantation, as well as educational campaigns. In addition to these general factors, those more related to the professionals and the way in which the service is provided also contribute: credibility in the organ transplant and distribution system; degree of satisfaction with medical care and clarifications about brain death; appropriate conditions, right time and level of knowledge of the interviewer during the family approach; information on funeral costs and legislation on organ donation (SANTOS; MASSAROLLO, 2005 apud FERREIRA et al., 2015).

The possibility of making people who are waiting for a transplant happy, through organ donation, consoles and rewards the family, although the pain does not end. The family

expresses its desire to help encourage donation to enable those who need a transplant to continue living (CARVALHO; MIZIARA, 2012 apud FERREIRA et al., 2015).

Additionally, it is perceived that the increase in the rate of donors depends on a view that goes beyond the technical issues of the organ and tissue donation process. Several countries have been systematically working on this process for a long time, incorporating the social approach and ethical vision, based on the voluntarism of families and respect for the right of autonomy of potential donors (FERREIRA et al., 2015).

A study by BERTASI et al. (2019), concludes that initiatives to raise population awareness and open discussion within the family about the act of donation contribute to increasing the rate of effective donors.

However, it is essential to emphasize the responsibility of strengthening the understanding that ethically, donating is a generous option, a gesture of love towards others, and an expression of human solidarity (FERREIRA et al., 2015).

TISSUE TRANSPLANTATION - BONE MARROW

The bone marrow presents itself as a liquid-gelatinous tissue that occupies part of the interior of the bones, being popularly known as 'marrow', producing the components of blood: red blood cells (red blood cells), leukocytes (white blood cells) and platelets. Red blood cells function to transport oxygen from the lungs to cells throughout the body system and carbon dioxide from cells to the lungs for elimination. Leukocytes defend us against contamination and platelets make up our blood clotting system (MINISTRY OF HEALTH - INCA, 2023).

Bone marrow transplantation is a type of treatment proposed for some diseases that affect blood cells, such as leukemias and

lymphomas. It consists of replacing a sick or deficient bone marrow with normal bone marrow cells, with the aim of reconstituting a new healthy marrow (REDOME, 2020).

It is in the bone marrow that the hematopoietic stem cells are located, being responsible for the generation of all blood (red blood cells, white blood cells and platelets). In bone marrow transplantation these cells are replaced (REDOME, 2020).

Hematopoietic stem cells also circulate in peripheral blood (if stimulated with a growth factor drug), and can be collected by apheresis, and in umbilical cord blood, when they are collected after the baby's birth. Therefore, the term "bone marrow transplantation" has been replaced by "hematopoietic stem cell transplantation" for these procedures (REDOME, 2020).

According to REDOME (2020), the main diseases that can be treated with Bone Marrow Transplantation are:

- a) leukemia (cancer of blood-forming tissues, including bone marrow);
- b) aplastic anemia (develops as a result of damage to the bone marrow. Damage may be congenital or occur after exposure to radiotherapy, chemotherapy, toxic chemicals, some medications, or infection);
- c) fanconi anemia (an inherited disorder of DNA repair characterized by progressive pancytopenia with bone marrow failure, variable birth defects and predisposition to haematological or solid tumours);
- d) syndromes caused by medullary deficiency (myelodysplastic syndromes - myelodysplastic syndromes - are due to errors in the production of differentiated cells [white and red blood cells and platelets]. B complex, in addition to the need for blood transfusion. It occurs more commonly in adults over 70

years of age and some cases progress to leukemia. Treatment varies according to the subtype of the disease and the patient's condition. In the most severe cases, the the most indicated treatment is bone marrow transplantation);

e) lymphomas (it is the name of a set of cancers that attack the system responsible for helping to fight infections. The lymphatic system is composed of organs, vessels and lymphatic tissues and lymph nodes, which are distributed in strategic positions of the body to help in the defense against infections);

f) multiple myeloma (disease that causes dysfunction in the immune response, by altering the cells of the immune system, producing defective antibodies, without activity);

g) hemoglobinopathies (genetic alteration, due to abnormality in the structure or production of hemoglobin (substance of red blood cells, responsible for transporting oxygen). Since sickle cell anemia is the most frequent defect among hemoglobinopathies, it is a hemolytic disorder, due to the tendency of red blood cells to acquire a "sickle" shape under conditions of low oxygen tension, compromising the functions of organs and tissues (kidneys, liver, nervous system and Imune system);

h) testicular tumors (These are painless nodules that can cause internal bleeding. When metastases are present, they are difficult to control;

i) neuroblastomas (cancer that arises from nerve cells in various parts of the body, such as the neck, chest, abdomen or pelvis, but is more common in the tissues of the adrenal gland. It develops mainly in children under five years of age).

TYPES OF BONE MARROW TRANSPLANTS

The choice between the types of transplants depends on the type of cancer, age and general condition of the patient, if the choice is allogeneic, a compatible donor is required (REDOME – NATIONAL REGISTRY OF VOLUNTEER BONE MARROW DONORS, 2020).

The transplant can be autogenic (autologous), when the marrow is from the patient, syngeneic, between twins and halogen, from another donor. Transplantation can also be performed from bone marrow precursor cells, acquired from circulating blood from a donor or from umbilical cord blood (MINISTRY OF HEALTH - INCA, 2023).

The umbilical cord is rich in hematopoietic stem cells, which are those capable of producing blood cells (erythrocytes or red blood cells, leukocytes or white blood cells and platelets), essential for bone marrow transplantation (REDOME, 2020).

When the newborn's parents choose to donate the umbilical cord to a Public Cord Blood Bank, the stored units are available to anyone who needs a bone marrow transplant, an indication for patients with diseases of the blood and immune system (REDOME, 2020).

The main advantage that umbilical cord blood has over other methods of obtaining the cells needed to perform the transplant is that these cells are immediately available. There is no need to locate the donor and have the bone marrow removed. In addition, complete compatibility between the cord blood and the patient is not required. With the use of the umbilical cord, some level of non-compatibility is allowed, unlike transplantation with a bone marrow donor, which requires full compatibility (REDOME, 2020).

The biggest disadvantage is the dose of use,

since the donation occurs in a single collection (with no possibility of a new collection) and the volume is restricted. Therefore, the number of stem cells may be limited. Thus, there is a weight limit for the patient, depending on the amount of stem cells removed from cord blood. Patients need to be between 50kg and 60kg. However, today a technique of adding two cords for the same patient is used, which allows for use in adults with greater weight (REDOME, 2020).

AUTOLOGOUS

For this type of transplant, the collected cells are from the patient and reinfused after high-dose chemotherapy (conditioning) with or without total body irradiation (TBI) (REGINO, 2013).

Clean, healthy, and disease-free hematopoietic stem cells (bone marrow) are required. The capture must be carried out during the remission phase of the disease (with no signs of activity), and the material kept in a freezer (REGINO, 2013).

However, it is indicated for patients who reacted completely to conventional treatment and do not have medullary neoplastic infiltration, however, have a high risk of recurrence, as in: Recurrent and violent non-Hodgkin's lymphoma; Multiple myeloma; Repeated or resistant to conventional treatment Hodgkin's lymphoma and advanced and recurrent germ cell tumors (REGINO, 2013).

SYNGENIC

In syngeneic, the cells for transplantation are obtained from an identical twin, therefore, they are perfectly compatible with the patient. It is an unusual type of transplant, and has low toxicities and minimal complications (REGINO, 2013).

ALLOGENEIC

In allogeneic, cells are collected from a histocompatible donor and administered to the patient. This donor can be family (siblings or close relatives) or not (through Bone Marrow Banks and Umbilical Cord Banks) (REGINO, 2013).

This treatment can also be indicated in cases of pathologies in the blood such as severe aplastic anemia (distinguished by the lack of production of blood cells in the bone marrow), myelodysplasia and in some types of leukemia (a type of cancer that compromises the leukocytes, affecting their role and speed of growth). In these specific types of cases, transplantation is complementary to conventional treatments, such as acute myeloid leukemia, chronic myeloid leukemia, acute lymphocytic leukemia and multiple myeloma (MINISTÉRIO DA SAÚDE - INCA, 2023).

THE PATH TO BE FOLLOWED BY THE PATIENT BEFORE THE TRANSPLANT

Bone marrow donation can be either related or unrelated. When in the first case, the donor is a member of the family, in general a brother or one of the parents. There is a 25% chance of finding a compatible donor in the family. If there is a completely compatible sibling (100%) this will be the first alternative to be a donor. Otherwise, the search for alternatives to carry out the transplant begins (REDOME, 2020).

The probability of a recipient having a histocompatible sibling is around 25%. The chances of having a donor in the general population is approximately one in every 20,000 (REGINO, 2013).

The first registrations of donors arise due to the incompatibility between donor and related recipient, the solution is to look for external donors, that is, non-related, and may

be from various ethnic groups. There are more than 25 million donors registered worldwide and in Brazil the body responsible for carrying out the search for compatible donors both in the country and in foreign registries is the National Registry of Voluntary Bone Marrow Donors - REDOME (REDOME, 2020).

It is extremely important that the physician responsible for the case keeps the patient's personal data complete and always updated in the National Registry of Bone Marrow Recipients - REREME, with information on compatibility and the disease for the indication of the transplant. It is also the responsibility of the Assisting Physician to update the conditions of this patient and their evolution while waiting for their transplant. This ensures the patient a chance to receive a new marrow by having their possible compatible donor located (REDOME, 2020).

For greater comfort and peace of mind for the patient, it is advisable that he talks with his doctor in charge, so that there is no doubt about the possible resources for the treatment. This conversation must be made official through a Consciously Free and Clarifying Term (TCLE), assuring the professional that all information about the procedure and the risks of alternative therapies have been passed and clarified (REDOME, 2020).

Regino (2013) says: for the transplant to be possible when the donor is compatible, the recipient must follow some steps:

- a) perform the typification of the tissues of the patient and his potential donors (siblings) through peripheral venous blood tests. The surface antigens of leukocytes, the HLA system (Human Leukocyte Antigen) are studied. The donor of choice is preferably one that has HLA antigens identical to the donor. As the differences increase, complications increase simultaneously, such as patient-to-graft and graft-to-patient rejection;

- b) the donor and recipient lymphocytes are incubated in vitro (Mixed Lymphocyte Culture) for a more effective compatibility assessment;
- c) carrying out molecular typing improves the finding of a compatible bone marrow, enabling more reliable results, with the identification of the DNA of the recipient and the possible donor.

THE BONE MARROW TRANSPLANT PROCEDURE

So that the patient can receive the transplant, he is submitted to a treatment that significantly reduces the diseased cells and destroys his own marrow, receiving a healthy one as if it were a blood transfusion. When found in the bloodstream, the new marrow cells circulate and lodge in the recipient's bone marrow, where they develop (MINISTRY OF HEALTH - INCA, 2023).

Tissue compatibility between the donor and the recipient is essential for the success of the transplant, for this specific laboratory compatibility tests are performed with blood samples from the donor and recipient, these tests are called histocompatibility exams, if there is not a certain compatibility between both, the medulla is rejected by the receiver's organism. Tissue compatibility is defined by means of a set of genes located on chromosome 6, where the donor and recipient must have a completely identical combination (100%). There are cases in which a 90% match allows the marrow to be accepted. (HLA) (REDOME, 2020).

The bone marrow transplantation procedure will be carried out after analyzing the blood tests for the complete determination of the compatibility of both (donor and recipient). And mainly so that the medulla is not rejected by the receiver. From this, the donor is submitted to a surgical procedure,

carried out in a surgical center, under the effect of anesthetics. The procedure consists of multiple punctures performed with needles, in the posterior bones of the pelvis, with the aspiration of the marrow, after its removal does not cause any compromise to health (MINISTÉRIO DA SAÚDE - INCA, 2023).

Being a painful and uncomfortable procedure, bone marrow collection must be performed under anesthesia, usually with general anesthesia, but epidural anesthesia can also be used and after the procedure the donor is discharged within 24 hours (REDOME, 2020).

Several punctures are performed in the region of the donor's bilateral posterior iliac crest, each one aspirating from 2 to 5 ml of bone marrow, until the gain of 10 to 15 ml of marrow per Kg of the patient's weight. From 600 to 900 ml of marrow is collected for a 60 kg patient (REGINO, 2013).

Dimethylsulfoxide (DMSO) is the main substance that ensures cell viability during the freezing process. As soon as the DMSO is placed, the pith must be quickly frozen at -196°C in liquid nitrogen (REGINO, 2013).

For autogenic transplantation, the marrow is collected when the disease is absent, and sent to the Blood Bank, where it will be manipulated for the cryopreservation process (REGINO, 2013).

After the patient undergoes treatment that will destroy his own marrow, a new one will be transfused into his body as a blood transfusion. The new cells called progenitors, when in the bloodstream circulate until they lodge in the bone marrow, where new healthy cells will develop. However, these cells take a certain amount of time to be able to produce white and red blood cells and platelets in the amount necessary to maintain the body's normal rate, the patient ends up being exposed to infections and hemorrhages, making it important for him to be isolated during his

hospitalization period. post-transplantation (REDOME, 2020).

There is also another way of collecting stem cells called apheresis, in this method the donor must use a medication for five days in order to increase the amount of stem cells in the blood. Then, the donor performs the donation through an apheresis machine, removing the donor's venous blood, separating the stem cells, returning to the donor the blood components that are not needed by the recipient. This procedure is performed entirely intravenously and there is no need for anesthesia or hospitalization (REDOME, 2020).

The patient then needs to remain hospitalized and, despite all care, occurrences of fever are recurrent and normal after bone marrow regeneration, the patient continues to receive therapeutic resources, only in hospital regiment, thus being essential, in some cases, the presence of the transplanted patient daily at the hospital (REDOME, 2020).

BONE MARROW TRANSPLANTATION STAGES

In the pre-BMT phase, meetings are held with professionals involved in the procedure, including doctors, nurses, social workers, psychologists, nutritionists, to discuss cases that are indicated for BMT. Families are invited to meet the team, ask questions and receive guidance on the entire process to be carried out, as well as the patient or legal guardian to sign the informed consent form, after which the transplant is scheduled (REGINO, 2013).

The beginning of the treatment consists of installing a central venous catheter, which is an access in a larger vein that maintains a long duration, and through it the patient will receive medications, chemotherapy transfusions, antibiotics and, above all, it will be through the catheter that the donor bone marrow cell transplant will be infused (REGINO, 2013).

The conditioning step is performed through the application of high doses of chemotherapeutic agents, together or not with body irradiation (TBI), which is performed using a cobalt pump or linear accelerator. It aims to destroy all immune cells so that the patient can receive new bone marrow (REGINO, 2013).

During conditioning, some side effects may or may not be noticed in patients, such as: nausea; vomiting; loss of appetite; mucositis; diarrhea; intestinal constipation; alopecia; bleeding complications, among others (REGINO, 2013).

The bone marrow infusion phase (D Zero) occurs at the end of the conditional period, around the second day. Day zero is the day of the infusion, and the marrow thawing must be done in the patient's room in a water bath with a temperature of 37° to 38°C in saline solution and instantly infused with a time of 20 to 60 minutes (REGINO, 2013).

Some side effects can be observed during bone marrow infusion due to the preservative (DMSO) contained in the bag that stores the marrow, such as: nausea, vomiting, feeling hot, throat discomfort, dry cough, tingling, dyspnea, allergic reactions, tremors and fever. There may also be changes in blood pressure and heart rate, for this reason the patient remains monitored throughout the procedure (REGINO, 2013).

In the post-transplant period, a phase known as medullary aplasia is characterized by a drop in the number of all blood cells (leukocytes, platelets and red blood cells). The reduced number of white blood cells, mainly neutrophils, favors bacterial, fungal, viral and protozoal infections (REGINO, 2013).

During the period in which the transplanted cells are not yet able to produce white blood cells, red blood cells and platelets in sufficient quantity, the patient receives supportive treatment through infusion (transfusions)

of red blood cells and platelets, receiving medications that activate the production of blood cells white, important for defense against infections (REGINO, 2013).

In the bone marrow recovery phase and prevention of rejection, known as “Medular Catch” is the post-transfusion moment in which the marrow is already able to produce each blood cell in sufficient quantities, for this it is necessary that the platelets reach 20,000/mm³, without the need for transfusion for two consecutive days; and white blood cells above 500/mm³, also for the same period (REGINO, 2013).

Incompatibility is the most common problem in complications related to bone marrow transplantation, called Graft Versus Host Disease (GVHD), also known as ‘rejection’, the donor’s cells understand that the patient’s body cells are ‘foreign’ and cause an immune response against the patient’s body (REGINO, 2013).

Rejection primarily affects the skin, gastrointestinal tract, and liver. Immunosuppressants are prescribed to patients, reducing the action of the transplanted immune cells against the transplanted organism (REGINO, 2013).

In autologous transplantation, rejection does not happen, since the transplanted marrow is from the patient himself (REGINO, 2013).

After the recovery or “take” of the bone marrow, transfusions and use of intravenous drugs, blood collections for tests, parenteral hydration, guidance and follow-up may be necessary, however, this assistance can be daily in outpatient clinics (REGINO, 2013).

THE RISKS OF BONE MARROW TRANSPLANTATION

For the recipient, the main risks are related to infections and chemotherapy drugs used during treatment. With bone marrow recovery,

the new cells grow with a new ‘memory’ and, as they are the body’s defense cells, they can recognize some organs of the individual as foreign (Graft versus Host Disease), it is common, of variable intensity and can be controlled with appropriate medications. Bone marrow transplant rejection is relatively rare, but it can happen. Therefore, the concern with the selection of the appropriate donor and the preparation of the patient is so important (MINISTRY OF HEALTH - INCA, 2023).

According to the guidelines of the Ministry of Health - INCA (2023), after bone marrow transplantation, the patient may present some warning signs and symptoms such as:

- a) fever, with a temperature equal to or greater than 38°C;
- b) tremors (chills) or feeling generally unwell;
- c) catheter problems;
- d) change in stool consistency or color;
- e) cough or shortness of breath;
- f) nausea and vomiting;
- g) pains anywhere in the body.

Some body regions and certain organs suffer more after BMT, such as: (MINISTRY OF HEALTH - INCA, 2023).

- a) the skin presents eruptions or vesicles (bubbles), pruritus (itching), changes in texture due to lack of elasticity, causing stiffness and color change;
- b) the mouth is dry, painful, sensitive to certain foods and toothpastes and oral antiseptics, hemorrhages, edema, pain and tooth loss, injuries and the appearance of cavities;
- c) eyes with redness, irritation (perception similar to “sand”) and secretions, variations in the field of vision, dryness and lack of tears or hyper-tearing;
- d) the gastrointestinal tract with diarrhea or constant abdominal pain, need to be notified, since they may be manifestations

of graft-versus-host disease, lack of appetite, weight loss, variations in the number of bowel movements, changes in odor, color and stool consistency, or presence of blood;

e) the genital and urinary tract with changes in the appearance of urine such as color, odor, secretions or bleeding with the need to urinate repeatedly, changes in menstrual flow with intensity and number of days;

f) upper airways and lungs with accumulation of secretions (mouth, nose and pharynx), colds, cough (with or without secretion), dyspnoea, epistaxis or headaches.

GVHD presents the following signs and symptoms to the transplanted patient as clinical manifestations (REGINO, 2013):

a) Maculopapular erythema with or without pruritus;

b) Generalized erythroderma with scaling and blister formation;

c) Abdominal pain in the right upper quadrant;

d) Hepatomegaly;

e) Increased liver enzymes;

f) Jaundice;

g) Nausea or vomiting;

h) Anorexia;

i) Abdominal colic;

j) Greenish and watery diarrhea, which can exceed 21 episodes per day.

The problem of rejection of the transplanted tissue by the recipient is caused by protein complexes existing in the cells of the donated tissue. Thus, discovered more than 50 years ago (BECK; TROWSDALE, 2000), the human MHC (Major Histocompatibility Complex) or Human Leukocyte Antigen (HLA) has its genetic loci involved in the rejection of transplants, autoimmune diseases and different clinical situations involving the immune system (KLEIN; SATO, 2000). This

system became known due to the rejection of molecules, recognized as antigens in tissues received in transplants. However, despite the rejections between individuals who are not fully compatible, these structures are primordial in the Immune System (IS), and are present in all nucleated cells, since their primary biological role is in the regulation of the Adaptive Immune Response (CHOO, 2007 apud SILVA ; SOUZA; RIBEIRO, 2019).

The HLA genes are located on the short arm of chromosome 6, more specifically in the 6p21.31 region, differentiated into three classes, I, II and III, which are structurally and functionally different (KLEIN; SATO, 2000 apud SILVA; SOUZA; RIBEIRO, 2019).

Allogeneic HLA antigens can provoke strong immune responses when there is organ or tissue grafting (THOMAS, 2000) between non-genotypically identical individuals, and these responses are responsible for making HLA antigens a major barrier to transplantation between individuals (RAJALINGAM, 2016 apud SILVA; SOUZA; RIBEIRO, 2019).

Histocompatibility between donor and recipient is a prerequisite for the success of any transplant, especially bone marrow (BONTADINI, 2012). Transplant rejection was associated with the development of antibodies in the recipient, since the genetic loci involved in this process are located in the HLA region (MCCULLOUGH, 2016). The genes of this system encode a complex series of molecules related to histocompatibility, playing a central role in the immune response and determining the success of the transplant (THOMAS, 2000 apud SILVA; SOUZA; RIBEIRO, 2019).

For the donor, the risks are few. In a few weeks, the bone marrow is fully recovered. The evaluation carried out in the preoperative period is very detailed, verifying the clinical and cardiovascular conditions of the donor in

order to guide the anesthetic team involved in the surgical procedure. The main symptoms that may occur after donation are: local pain, asthenia (temporary weakness) and headache (they are transient and controlled with simple medications, such as analgesics) (MINISTRY OF HEALTH - INCA, 2023).

Although BMT is a procedure that requires the use of anesthesia, the risks of serious problems occurring during and after the donation are low. The effects after spinal cord removal, in general, are: headache, tiredness and low-intensity pain at the site. Bone marrow recovery is fast and usually happens within 15 days after the procedure (REDOME, 2020).

After this period, a new donation can be made, however, it is recommended to donate every six months, alternating your collection methods (REDOME, 2020).

SPECIFIC CARE AFTER BONE MARROW TRANSPLANTATION

During the first year after BMT, defenses against infections are still not restored. Thus, every transplant patient must avoid contact with animals, plants, people with contagious diseases (such as measles, chicken pox, mumps, herpes and others), children who have received measles, rubella and polio vaccines, as the viruses of these vaccines will be disposed of after the deadline 3 to 4 weeks. Certain contaminations can be transmitted by germs found in swimming pools, ponds and beaches, avoiding bathing in these places during the first year after the transplant (MINISTÉRIO DA SAÚDE - INCA, 2023).

The use of a simple mask is essential within three months after the transplant, and it must be used when in contact with other people, even family members (MINISTRY OF HEALTH - INCA, 2023).

Hand washing is as important as wearing a mask, as many pathologies are transmitted through the hands. It is extremely important to

wash your hands after going to the bathroom and before meals, keeping your nails trimmed and clean (MINISTRY OF HEALTH - INCA, 2023).

When the transplant recipient is a child, the Ministry of Health - INCA (2023) recommends that the child return to school activities in person, after the start of vaccination. It can be included in the Special Education Law to avoid school losses.

SKIN CARE

The skin is especially the most sensitive to the treatment and can show an early reaction of the transplanted cells against the recipient's own organism. Transplanted patients have an increased risk of skin cancer, therefore exposure to the sun is not recommended, especially in the first year after BMT. You must wear a hat or umbrella, and clothes that protect you from the sun. Avoid leaving home at times when the sun is most intense. Always use sunscreen with SPF 30 (gel or oil-free) (MINISTRY OF HEALTH - INCA, 2023).

REDOME (2020), reaffirms that because it is very sensitive to treatment, the skin can quickly manifest the disease against the host, that is, the reaction of the transplanted cells against the recipient's organism. The risk of skin cancer increases for transplant recipients, so the advice not to expose yourself to the sun, more precisely in the first year after transplantation, is very important. Every type of barrier against the sun must be used continuously, such as hats, umbrellas, clothes with sun protection, not exposing oneself to the sun at inappropriate times and the use of sunscreen on the skin in gel or oil-free form with a minimum of 30 for protection factor (REDOME, 2020).

The patient must always use perfume-free moisturizing soap, moisturizing cream based on vitamin A, urea or ammonium lactate after bathing, hypoallergenic deodorant in cream

or antiseptic talc. If you have problems getting the product, just clean your armpits with antiseptic soap, and you must also avoid using cosmetics, make-up and perfumes that could damage the skin. (MINISTRY OF HEALTH - INCA, 2023)

The perianal region can also suffer damage after transplantation, for this the transplanted patient must use soft toilet paper or warm water and antiseptic soap for their intimate hygiene for a while (MINISTRY OF HEALTH - INCA, 2023).

MOUTH CARE

Oral hygiene is essential at all stages of treatment, from the beginning of hospitalization (in the pre-BMT period) to hospital discharge. It is advisable to maintain brushing when waking up, after all meals and before bed. Brushing must be done with a soft bristle brush, to avoid gum bleeding, and fluoride toothpaste. Dental floss must be used exclusively with the guidance of the dentist before brushing to remove food residues that accumulate between the teeth and are not removed during brushing (MINISTRY OF HEALTH - INCA, 2023).

After three months of the transplant, the patient must consult the dentist. After BMT there is a decrease in saliva, which predisposes to cavities and gum disease. If the child receives irradiation in the whole body during the period of development of the permanent teeth, it is necessary to be accompanied by the dentist regularly. Keep lips moistened with vitamin E-based lip moisturizer or with cocoa butter, mineral oil and/or lip sunscreen, when appropriate (MINISTRY OF HEALTH - INCA, 2023).

CATHETER CARE

Porto chat is a venous device, consisting of a reservoir with a perforable membrane and a silicone catheter. Being fixed under the skin

on the chest near the collarbone. Catheter implantation is the responsibility of the specialist physician and must be performed in the surgical center (HCPA – Hospital de Clínicas de Porto Alegre, 2021).

This device is used for medication administration and blood collection. Care during its use is essential to avoid infection, such as: (HCPA – Hospital de Clínicas de Porto Alegre, 2021).

- a) in the case of discharge with a catheter and the needle, there is no need to remove it or push it, its handling must be done only by the doctor or the nurse;
- b) do not wet the bandage when bathing;
- c) if the dressing is dirty, wet or peeling, inform the professional responsible for changing the dressing;
- d) if the patient goes home with the catheter without a needle, there is no need for a dressing. However, if the skin around the catheter shows swelling, pain, redness and/or pus, it must seek medical attention (HCPA – Hospital de Clínicas de Porto Alegre, 2021).

FOOD CARE

The transplanted must follow a specific diet after the BMT. Contaminated food can transmit disease. Therefore, all attention is indispensable to manipulated or raw foods. Meats must be well cooked, fruits and vegetables must be washed under running water and immersed in a sanitizing solution suitable for foods before peeling them, avoid eating seafood, raw eggs, unpasteurized products such as: cheese, yogurt, honey, milk and derivatives and only filtered water (MINISTRY OF HEALTH - INCA, 2023).

The recovery of the transplanted is a slow process, however, progressive. However, it is important to maintain a program of good nutrition, rest and light physical exercise, avoiding sitting still all day, for this he must

consult a doctor about the intensity of the exercises before starting them (MINISTRY OF HEALTH - INCA, 2023).

The reintegration of the transplant patient into society is as important as monitoring the disease. That of multidisciplinary groups and the family is extremely important for their recovery as a person and for the progress of their quality of life (CORGOZINHO; GOMES; GARRAFA, 2012).

FINAL CONCLUSION

The donation of organs and tissues is one of the most noble and humanitarian acts that we can do to our fellow man, the topic addressed shows the importance of such an act and the need for this attitude to be seen as an act of love and hope for those in need. Even if the grief of death is great, the joy of a life starting over is more intense.

But there is still a great deal of prejudice when it comes to organ and tissue donation, thus making the waiting lists ever longer. of bone marrow donors need to be constantly increasing and those who have already done so keep their REDOME registration up to date.

Family preparation, both of the recipient and the donor, is an important factor to be discussed, as this emotional support and care in the pre and post BMT is extremely important, as well as the knowledge of what will be done, it validates the care.

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