Head transplant: ethical and legal conflicts in the light of brazilian and italian laws

Transplante de cabeça: conflitos éticos e legais à luz das leis brasileiras e italianas

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ABSTRACT
This article aims to confront the procedure of head transplantation, designed by the Italian neurosurgeon Doctor Sergio Canavero, this study is based on the optics of ethic and legality, from the perspective of juspositivism and the comparison of national and Italian legislation. At first, it will introduce a layman perspective in medical terms about the procedure in order to illustrate the complexity of what the Italian doctor intends to achieve. Next, it will address ethical issues, whether it would be ethically correct to prioritize a single transplant instead of several unitary ones, how the disconnection of the spinal cord and the paralysis of the neocortex would eventually worsen the life condition of the recipient patient, and some notes on the safe surgery manual of the World Health Organization. In terms of comparative law, it will make a dialogue between the Brazilian and Italian legislation on organ transplantation in a positivist analysis of the norm and within the scope of ethics, also, it will approach the morality and bioethics of the procedure in the instance of the dignity and probability of patient worsening. The article will adopt a zetetic, inductive approach, in the field of effectiveness and positivism of the norm. Its methodological objective is reflective and exploratory and its research technique will be bibliographical and documental.

Keywords: organ transplantation, head transplant, biolaw, bioethics, comparative law.

RESUMO
Este artigo tem como objetivo confrontar o procedimento de transplant de cabeça, projetado pelo neurocirurgião italiano Doutor Sergio Canavero, este
estudo baseia-se na óptica da ética e da legalidade, a partir da perspetiva do juspositivismo e da comparação das legislações nacional e italiana. Inicialmente, introduzirá uma perspetiva leiga em termos médicos sobre o procedimento, a fim de ilustrar a complexidade do que o médico italiano pretende alcançar. Em seguida, abordará questões éticas, se seria eticamente correto priorizar um único transplante em vez de vários unitários, como a desconexão da medula espinhal e a paralisia do neocórtex acabariam por piorar as condições de vida do paciente receptor, e algumas notas no manual de cirurgia segura da Organização Mundial de Saúde. Em termos de direito comparado, fará um diálogo entre a legislação brasileira e italiana sobre transplante de órgãos em uma análise positivista da norma e dentro do escopo da ética, também abordará a moralidade e bioética do procedimento no caso da dignidade e probabilidade de piora do paciente. O artigo adotará uma abordagem zetética, indutiva, no campo da eficácia e positivismo da norma. Seu objetivo metodológico é reflexivo e exploratório e sua técnica de pesquisa será bibliográfica e documental.

**Palavras-chave:** transplante de órgãos, transplante de cabeça, biolaw, bioética, direito comparado.

1 INTRODUCTION

The *trapianto di testa*¹ is the controversial surgical procedure announced in the mid 2017, by the Italian neurosurgeon Doctor Sergio Canavero and basically consists of the surgically challenging pretension of completely transplanting the head of a living human being to an entire body of a donor.

Doctor Canavero claims that the transplantation and reconnection of the head with a lifeless body had already been a success and that the next step would be the formal transplantation in living patients.

This article does not aim to enter into the strict merits regarding the success or not of the surgery in question but mostly, seeks to bring an analysis and critical reflection about the topic within the scope of national biolaw and the branches of ethics, even because Experts around the world disagree categorically on the possibility or not the transplant.

¹ From the Italian: Head Transplant.
The logical consequence of the terrible failure of the spinal cord transplant would invariably result in the total quadriplegia of the patient\(^2\), although it was not the authors intention to get involved in issues of a specific nature in medicine, the tetraplegia of the recipient of the donated body necessarily enters.

In the philosophical and ethical aspect of the present study, what would be the limit and autonomy of the receiver’s will to perform such a procedure if it could result in complete and total lack of limb mobility? Even in the question that, what is the limit of medical ethics in possibly treating a condition with another that may even be more serious?

Such introductory notes, although extremely superficial, which permeate the present surgical procedure, are necessary as a way to delve a little deeper into the inquiries object of this article, which will seek, at first, to explain the procedure itself in a layman’s way. With notes from published articles by the doctor himself in order to demonstrate the complexity of the intended surgery.

Subsequently, it will address issues related to ethics both medical and human, such as the relation of the number of organs that will be donated to a single person, in detriment of the multiplicity of recipients that could be benefited from specific organs of the newly deceased, as well as more subjective issues, like ethical conflicts regarding the disconnection of the spinal cord, temporary paralysis of the cerebral cortex, the supply of oxygen to the brain and its risks and how the surgery in question could necessarily worsen the condition receiver life.

Finally, it will seek a positivist analysis about the legality of the surgical procedure in question in the light of law n. 9.434/97, which provides for the removal of organs, tissues and parts of the human body for the purpose of transplantation and treatment (Brasil, 1997) in comparison with the RS 810.21 law, an Italian law that provides for the transplantation of organs, tissues and cells (Italy, 2004).

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\(^2\)By way of information, it is necessary to point out that quadriplegia is the inability to move and total simultaneous paralysis of the limbs of the human body (lower and upper), also called quadriplegia or quadriparesia.
It is necessary to mention that the main state of the art, is based on medical articles and articles by the neurosurgeon himself, who set up a kind of team to publish his results on websites and medical journals.

Finally, the authors reserve, for clarification purposes, the designation of macro (in the sense of a total and single transplant for a single recipient) and micro (when dealing with separate organs for multiple recipients).

2 TRAPIANTO DI TESTA, INTRODUCTORY NOTES

Despite the name seeming quite objective, head transplant seems to be notoriously simple for the multiplicity of denominations that could be used here.

In the humble opinion of the authors, the head is just a shell for the most complex organ in the living organism, the brain, in addition to the spinal cord, perhaps one of the most abstruse structures in the human body.

The neurosurgeon mentions in one of his first published articles (Canavero, 2013) that in 1970 Dr. Robert Joseph White\(^3\) and his team managed to transplant the head from one monkey to another, but as there was no technology to unite and reconnect the spinal cord, studies on the subject were set aside, for obvious reasons.

In this same article, Canavero asserts that he overcame this obstacle with a procedure he named “project heaven”\(^4\), from the literal translation of “the adventure of head anastomosis”\(^5\) (Canavero, 2013) in a procedure that he called the “gemini” Protocol or Project\(^6\) (Canavero, 2016), or spinal cord fusion protocol.

The neurosurgeon then began to rescue forces around the world to assemble the first team to perform head transplantation in human beings and in his articles we can see the presence of several highly qualified professionals and scientists who volunteered to participate in the procedure.

\(^3\)Neurosurgeon who became world famous for trying to change the heads of live monkeys. University of St. Thomas (BS, 1951), Harvard Medical School (MD, 1953), University of Minnesota (PhD, Neurosurgery, 1962).

\(^4\) From the original in English: The head anastomosis venture Project.

\(^5\) Anastomosis, roughly speaking, is the connection between two similar structures, such as vessels, nerves, fibers and, in this case, the spinal cord.

\(^6\) From the original in English: GEMINI spinal cord fusion protocol.
Among the main participants is Dr. Xiaoping Ren\(^7\) of Harbin Medical University who co-authored with Dr. Canavero, in the article “Human head transplantation. Where do we stand and a call I'm arms” (Ren, Canavero, 2016), not only harshly criticize medical society, questioning the reason for such harshness with a procedure that could save lives, even going as far as to argue that ethical criticism would be “baseless and populist”\(^8\) (Ren, Canavero, 2016).

In this same article, the two authors celebrate the fact that the Republic of China, through its official communication agency, announced the beginning of cooperation with the team for the first head transplant between human beings, even mentioning an intrinsic planning involving experiments with brain-dead organ donors\(^9\).

At this point, it should be noted that the present study, limited its research only and solely to the legislation applicable to the donation of organs and tissues of the Brazilian and Italian Republics. The first because it is scientifically relevant to the present work and in case of success of the surgery, finding out whether the country's legislation would support such a procedure or whether regulatory updates would be necessary, while the second is relevant because it is the native state of the project's creator.

As a point of curiosity, the Italian legislation was taken into account by the fact that Canavero needed to settle his study's in China and not establish his research center in Italy, his hometown.

The authors point out that the research of Chinese legislation could open space for a very extensive work, which is why the delimitation is necessary.

Throughout this article, the authors will try to demonstrate the main situations that could be subject to ethical violations, not only in humans but also

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\(^7\) Hand and Microsurgical Center, the second Affiliated Hospital of Harbin Medical University; State-Prov… Harbin, China.

\(^8\) From the original in English: Even Dr. White's work has been grossly misconstrued: Ethical criticisms were both unsupported and populist.

\(^9\) Brain death is an ideal situation for organ transplants, given that the patient's recovery is virtually impossible, but at the same time, their organs continue to function for a certain period of time.
in animals, and demonstrate the explanations and solutions presented by the neurosurgeon and his team.

At no time, the success or failure of the surgery will be taken to account. From the technological or medical innovation, financial issues, questions of meritocracy point of view, or who deserved or not to remain alive and prolong their longevity with the procedure, and much less, the philosophical question of the fear of death and the quest for immortality shall be judged.

Canavero gathers several volunteers and curious people around the world with his articles and ideas, not only from the scientific community, but also from volunteers for the first surgery and it is not up to the authors the discussion about the success or not, but only the ethical and legal discussion of the procedure.

Before entering the GEMINI protocol, perhaps the basis of the entire procedure and consequently of the article, it will make some considerations about the ethical issue of the long waiting list of patients for a donor, a situation that submits thousands of Brazilians every day to the hope of survival from only one organ, while the head transplant would save the life of only one person, how many lives could be saved with unit transplants of separate organs, what denominated for elucidation purposes to the continuation of the present article of micro transplants.

3 WAITING LINE, MORAL ISSUES IN MACRO ORGAN TRANSPLANTATION

It is often mentioned that a donor could save dozens of lives, in fact, the Brazilian Organ Transplant Association teaches that “a single deceased donor can save more than eight lives, being able to donate heart, lung, liver, kidneys, pancreas, corneas, gut, skin, bones and heart valves” (Abto, 2021).

Organ donation rates, according to the Brazilian Transplant Registry (RBT) for the year 2020, Covid did not affect the rates of transplants from deceased donors as much as expected as initially expected, the same scenario did not occur in donor transplants live, as they are elective, corneal and kidney transplants were suspended due to the pandemic (Garcia, 2020).
According to the aforementioned registry, the absolute number of effective donors in the year 2020 was 3,323 (RBT, 2020, p. 6) the absolute numbers of transplants in the year 2020 were as follows: cornea (7,127), kidney (living donor – 441 and deceased donor – 4,364), liver (2,050), pancreas (145), heart (307) and lung (65) throughout Brazil (RBT, op. Cit., p. 7).

The numbers are still below previous years but still optimistic about the second year of the SARS-CoV-2 pandemic, given all the restrictions and concerns about contamination resulting from the virus.

For a deeper understanding of the issue of absolute numbers of donors in Brazil, we will make a specific parallel for the states of Mato Grosso do Sul (state of birth of the authors) and São Paulo (largest population in Brazil and headquarters of the Brazilian Academy of International Law).

3.1. MATO GROSSO DO SUL

In the state of Mato Grosso do Sul, the Brazilian Transplant Registry (RBT) for the year 2020 verified an effective number of 46 (forty-six) donors (RBT, op. Cit., p. 50), of which cornea (103), kidney (living donor –1 and deceased donor – 22), liver (does not perform), pancreas (does not perform), heart (3) and lung (does not perform) (RBT, op. Cit., p. 51).

3.2 SÃO PAULO

The State of São Paulo have a much larger number of effective donors, reaching a total of 1,094 (one thousand and ninety-four) in 2020 (RBT, op. Cit., p. 76), of which cornea (2,587), kidney (living donor –227 and deceased donor – 1,543), liver (735), pancreas (101), heart (130) and lung (41).

Returning to the topic at hand, the numbers are undisputed. It appears that the absolute number of effective donors has greatly enhanced the absolute number of effective transplants, precisely because a donor can benefit several recipients.
The point of this topic is whether it would be morally and ethically fair for a person to be saved only to the detriment of safeguarding the longevity or improving the lives of others, in this case even eight people.

In the case under discussion, there remain only a few assertions by Canavero about the possibility of saving lives with a head transplant, but it should be noted that there are some international guidelines for the distribution and equitable access to organ transplants.

The item 17, of the Strategy and Plan of Action on Donation and Equitable Access to Organ, Tissue and Cell Transplantation 2019-2030, of the 57th Directing Council, at its 71st Session of the World Health Organization, Regional Committee for the Americas, held in Washington DC, USA, from September 30 to October 4, 2019, listed the following proposal (WHO, 2019):

“17. The overall objective of this strategy and plan of action is to promote equitable access to organ, tissue and cell transplantation, based on voluntary donation and observing the WHO guiding principles, to help meet the growing demand for these treatments, save lives and improve the health conditions of people and communities. The document focuses on two fundamental areas: the promotion of voluntary donation of organs, tissues and cells to ensure the availability of material for transplants; and strengthening the governance, governing role, and capacities of health authorities to promote equitable access to quality transplants. The proposal is based on the principles and guidelines developed by PAHO/WHO and other relevant actors, such as the Ibero-American Network/Council for Donation and Transplantation (RCIDT) and the United Nations system. It is expected that the proposal will be implemented considering the specific context of health systems and the needs, vulnerabilities and priorities of Member States”.

In item 18 of the same session, in item “c”, it proposes equitable access to organ and tissue transplants as a strategic line of action and in item “b” the strategy to increase their availability through voluntary donations.

The same can be observed in art. 1, item “b” of Resolution CD49.R18 of the 61st Session of the Regional Committee of the 49th Directing Council of the Pan American Health Organization, which dealt with the Guidelines for a Policy on Donation and Transplantation of Human Organs, held in Washington, DC, USA, September 28 to October 2, 2009, which corroborated the aforementioned text by urging the Member States: “b) to promote equitable access to transplant.
services in accordance with national capacities that serve as the basis for public support and voluntary donation” (WHO, 2009).

The text of Resolution CD49.R18 also brings something extremely important in point “c”, when mentioning organ trafficking and transplant tourism, see:

"1. Urge Member States: c) that they fight against the pursuit of economic benefit or comparable advantages in transactions with human body parts, organ trafficking and transplant tourism, and even encourage health professionals to notify the relevant authorities when they become aware of these practices, in compliance with national capacities and national legislation"

Human trafficking, human murder and transplant tourism may even be unknown to the general public, but it exists and must be taken into account. As the present study unfolds, despite not specifically going into this merit, it can be seen from the procedures to be carried out that the head transplant procedure will not be cheap, which could possible enhances the search (legal or not) for compatibles human body’s.

In addition to possibly being time consuming and costly, it will be virtually inaccessible to most people. It is an extremely dangerous combination, between economic power, availability of available organs, an extremely selective surgery (given that only one team in the world would be able to perform it) with the maximum factor of human desperation.

All this culminating in an exponential situation of risk of trafficking in human organs that could not be removed from the equation in any way. As a matter of fact, the World Health Organization, through the Pan American Health Organization, has already deliberated on the equitable distribution of donated organs and despite the indignation of Canavero on the populism of ethical issues, the inequality of head transplantation is verified in numbers.

A micro transplant, in the case of separate organs for multiple recipients, will always result in more lives saved or improved than a macro transplant, in the case of a total and unique transplant for a single recipient, the numbers are public and easy to understand.
To what extent would it be fair to save just one person, regardless of his deeds, actions, merits, fortunes, to the detriment of several others? To what extent would we be willing to regulate a surgery of such magnitude and how would the authorities prepare for a possible surge in human trafficking to obtain organs on the black market?

The question is abstract, subjective and difficult to answer, but valid and not just baseless and populist. But the biggest challenge faced by the first human head transplant team deserves special mention, as it was the main reason why neurosurgeons gave up in 1970: The transplantation and ligation of the spinal cord.

4 SPINAL CORD DISCONNECTING AND ETHICAL CONFLICTS

The vertebral column, in adults, is between 72 and 75 centimeters long, extending from the human skull to the apex of the coccyx and has as its primary functions the protection of the spinal cord and spinal nerves, the support of the body's weight above the level of the pelvis, guaranteeing a partially rigid and flexible axis for the body, in addition to an enlarged base through which the head can rotate and, last but not least, the basic role for the individual's posture and locomotion (Moore, 2011).

Professor Moore teaches that in an adult human there are normally 33 (thirty-three) vertebrae in the spine organized into five regions, namely, 07 (seven) cervical vertebrae, 12 (twelve) thoracic, 05 (five) lumbar, 05 (five) sacral and 04 (four) coccygeal (Moore, 2011).

It is important to emphasize that for the present study we will delimit the lay summary in medicine only and only in the seven cervical vertebrae, which

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10 Keith L. Moore, Ph.D., FIAC, FRSM, FAAA (2011);
11 "The cervical vertebrae form the skeleton of the neck and are the smallest of the twenty-four movable vertebrae, located between the skull and the thoracic vertebrae." (Moore, 2011).
12 "They are located at the top and the ribs are attached to them." (Moore, 2011).
13 "Located in the lumbar region, they are between the thorax and the sacrum." (Moore, 2011)
14 "Sitting between the hip bones and forms the roof and posterosuperior wall of the posterior half of the pelvic cavity." (Moore, 2011).
15 "Tail bones, so to speak, small triangular bone which is usually formed by the fusion of four rudimentary coccygeal vertebrae." (Moore, 2011).
form the region of the skull and neck, object of the research about the transplant itself.

Moore mentions the importance of the vertebra, in addition to its ligaments and muscles in the protection of the spinal cord and doctrine: <The spinal cord is the main reflex center and conduction pathway between the body and the brain> (Moore, Op. Cit., 2011, p. 492). In the shape of the spinal cord, Professor Angelo Machado teaches that:

“The medulla has an approximately cylindrical shape, being slightly flattened in the anteroposterior direction. Its caliber is not uniform, as it has two dilations called cervical swelling and lumbar swelling, located at the cervical and lumbar levels, respectively. These swellings correspond to the areas where the thick nerve roots that form the brachial and lumbosacral plexuses connect to the medulla, destined for the innervation of the upper and lower limbs, respectively. The formation of these swellings is due to the greater quantity of neurons and, therefore, of nerve fibers that enter or leave these areas and that are necessary for the innervation of the upper and lower limbs” (Machado, 2006).

This passage is extremely important for the entire context of the topic, given the complexity of the spinal cord, which corresponds to plexuses whose function is simply to innervate the lower and upper limbs, in addition to the swellings that have nerve fibers that enter and leave these areas and necessarily innervate the limbs. Canavero asserts that he will soon have the technical knowledge to reproduce such a connection in another body, we continue.

According to Angelo Machado, there are 31 (thirty-one) pairs of spinal nerves to which correspond another 31 (thirty-one) medullary segments, thus distributed, 08 (eight) cervical, 12 (twelve) thoracic, 05 (five) lumbar, 05 (five) sacral and usually one coccygeal (Machado, Op. Cit., 2006, p. 37).

The spinal cord is a complex central nervous system, and as such is surrounded by three fibrous membranes called the meninges, dura mater 16, pia

16“The outermost meninges is the dura mater, formed by abundant collagen fibers, which make it thick and resistant. The spinal dura mater involves the entire spinal cord, as if it were a glove's finger…” (Machado, 2006).
mater\textsuperscript{17} and arachnoid mater\textsuperscript{18} (Machado, Op. Cit. 2006, p. 39) and in relation to these meninges there are three cavities or spaces, called epidural\textsuperscript{19}, subdural\textsuperscript{20} and subarachnoid\textsuperscript{21} (Machado, Op. Cit. 2006, p. 41). All complex and relatively boring technical terms (for those who may not have much interest in the topic) were deliberate.

Despite the last intention of entering the world of medicine in a layman's way at the beginning of the project, it was seen at the end of the research that it is extremely important, despite being extremely simple, the basic analysis of at least part of what Dr. Canavero intends to perform.

The intention is to demonstrate the difficulty of the proposed head transplant intended by the Italian doctor. The procedure would have to recreate, after sawing and separating the donor and recipient head, a series of perfect barriers created by the machine that is the human body.

In addition to keeping the brain alive for a considerable period of time, the team would have to saw with a relatively clean cut in a way that facilitates the maximum re-implantation of the head, would have to precisely connect the epidural, subdural and subarachnoid (or else would make life difficult for the patient when he needed to receive general anesthesia, for example), he would have to connect the meninges and fibrous membranes, perfectly reconnect 08 (eight) spinal nerves, go through the connection of the cervical intumescence and finally, reintegrate 07 (seven) cervical vertebrae, before total paralysis of the receiver's brain and even before suturing.

\textsuperscript{17}"The pia mater is the most delicate and most internal meninge. It closely adheres to the nervous tissue on the surface of the medulla and penetrates the anterior median fissure." (Machado, 2006)

\textsuperscript{18}"The spinal arachnoid lies between the dura mater and the pia mater. It comprises a leaflet juxtaposed to the dura mater and a tangle of arachnoid trabeculae, which joins this leaflet to the pia mater" (Machado, 2006).

\textsuperscript{19}Famous even among laymen because of anesthesia. "Epidural, or extradural space is located between the dura mater and periosteum of the vertebral canal. It contains adipose tissue and a large number of veins that constitute the internal vertebral venous plexus." (Machado, 2006).

\textsuperscript{20}"subdural space, located between the dura mater and the arachnoid, is a narrow slit containing a small amount of liquid, just enough to prevent the adhesion of the walls" (Machado, 2006).

\textsuperscript{21}"The subarachnoid space is the most important and contains a reasonably large amount of cerebrospinal fluid or CSF" (Machado, 2006).
The authors point out that this is an extremely simplistic analysis of the complexity of such a surgery, which certainly involves dozens more procedures, anesthesia, oxygenation, and others.

Roughly speaking, this is something extremely complex and difficult, even so Canavero asserts that he will soon be able to perform such a procedure.

In the final part of the topic we will necessarily enter the scope of ethics and law, but a priori it is necessary to demonstrate the process proposed by the team because we hope that readers understand that some situations border on the absurd even for laymen and may necessarily even constitute violations international.

So, let’s go to the method proposed by the Italian doctor. As already mentioned, “HEAVEN”, the adventure of head anastomosis (Canavero, 2013), titled the complete process of head transplantation in living human beings.

The procedure that raised the spirits of this new generation of head transplant enthusiasts was called the “GEMINI Protocol or Project” (Canavero, 2016), or spinal cord fusion protocol.

Before starting, it is necessary to decode some acronyms and terms used by the neurosurgeon for equipment and techniques for some stages of the procedure:


This would be the sequence of procedures that Dr. Canavero hopes to be able to perform for the total success of the surgery. We emphasize that this is an extremely lay study of the procedures, a study carried out by two lawyers, but as a scientific safeguard, we understand that it would not be relevant to the article under discussion if at least the process was not exemplified, even in a simple way.
From this point on, the entire sequence is the fruit of Dr. Canavero and the citation is found in the bibliography at the end of this article, in the published study entitled “Heaven: The head anastomosis venture project outline for the first human head transplantation with spinal linkage (Gemini). SNI – surgical neurology international”.

The donor would be a brain-dead patient, combined with the recipient in height and weight, diagnosed without any brain disease and if possible and time permitting, a donor transfusion protocol would be performed to allow reinfusion after the anastomosis.

The procedure would be performed in a room with ample space, capable of supporting two surgical teams, which would operate simultaneously. Both recipient and donor would be intubated and ventilated through tracheostomy, with the heads fixed through pins, electrocardiogram, transcranial oxygen saturation meters and external defibrillators are placed. Temperature gauges are placed on the eardrums, nasopharynx, bladder and rectum, radial artery cannula is inserted for hemodynamic monitoring.

Antibiotics are provided as usual and used as needed. The recipient's head is then subjected to deep hypothermia at 10ºC while the donor will only receive spinal hypothermia. The donor is positioned in a sitting position to facilitate handling by the surgical teams who then simultaneously work on both necks in order to separate the anatomical structures and expose the carotid artery, arterial vertebrae, jugular veins and spine.

With the help of a microscope, the final part of the total head separation is performed and once the recipient's head is separated, it must be reconnected to the donor's circulation tubes in approximately two minutes, according to Dr. Canavero polyethylene glycol should complete the fusion, some sutures in the arachnoid would help to reinforce the connection. A second application of intravenous injection of polyethylene glycol would be given in four to six minutes.

Bone separation could be achieved transsomatically or through intravertebral spaces. The vascular anastomosis for the cephalosomatic preparation would be performed using bicarotid-carotid and bijugular-jugular
cannulas with a silastic loop. Afterwards, the tubes from the vessels would be removed one by one and the surgeons would sew the arteries and veins of the transplanted head together with those of the new body.

During head transfer, the main vessels are clamped at the tip to avoid air embolism and a subsequent no-reflow phenomenon in small vessels. Upon binding, the donor flow will immediately begin to rewarm the recipient's head. Previously exposed vertebral arteries will also be reconstructed.

The trachea, esophagus, vagus and nerves are reconnected. All the muscles are joined together properly using the markers. The skin is sewn together by plastic surgeons for maximum cosmetic results.

The receiver is then taken to the intensive care unit (ICU) where he will be sedated for three days, with a cervical collar placed. Appropriate physical therapy will be instituted during follow-up until maximal recovery is achieved. (Canavero, 2013).

The process described above is extremely summarized even for reasons of space foreseen in the public notice for this article. We emphasize that this is a totally lay understanding of the authors and possibly quite imprecise.

As previously mentioned, an error in surgery could cause serious damage to the recipient patient, from quadriplegia to even, in the case of total separation of the head, death.

Moore exemplifies what could result from a spinal cord transection, which we have already reiterated, it is not even a total separation of the head and just a transverse twist or break that crosses the section of the spinal cord above C-8 (cervical eight, last before thoracic) by mentioning:

"Spinal cord transection results in loss of all sensation and voluntary movement below the level of injury. Transecting the following levels will cause the indicated effects:
C1-C3: no function below head level; ventilator is needed to maintain breathing.
C4-C5: quadriplegia (absence of upper and lower limb function); there is breath. (emphasis added by the author).
C6-C8: loss of lower limb function associated with loss of hand function and variable degree of loss of upper limb function; the individual may be able to feed himself or propel the wheelchair himself" (Moore, Op. Cit., 2011, p. 502).
The ethical issue in the case under discussion concerns the worsening of the patient's situation. How desperate would a volunteer be to take such a risk? To what extent it's Canavero ready to go in the attempt to improve the life of someone who might become a quadriplegic?

We remind you that the previous citation is about spinal cord rupture and not decapitation of the patient. The neurosurgeon himself mentions that in an experiment with monkeys, one of the guinea pigs “survived, neurologically intact for 36 hours, regaining consciousness after 3 to 4 hours” (Canavero, 2013).

What for the neurosurgeon was cause for celebration, for others is cause for concern. We remind you that 36 hours in the procedure in living human beings would be the exact time in which the recipient patient would remain in the ICU recovering primarily, that is, the patient would undergo a high-risk, extremely traumatic surgery, so that, as a last resort, he could during the recovery period suffer minimal irreversible brain damage, or worse.

Wolpe (2017), of Emory University cites what he calls the “Ren and Canavero's ‘four points’”, the feasibility of spinal cord reconnection; the survival of the ischemic period; psychological adaptation; and immunological rejection (Wolpe, 2017).

Spinal cord reconnection to date is something that only Dr. Canavero considers it possible, based on his initial rhetoric, in theory the plan seems ambitious, but in practice other issues permeate the surgery problem.

Immunological rejection can bring very serious consequences to the receiver, in case of emergency as Dr. Would Canavero have another surgery? How would he preserve the donor's body in case an emergency surgery in three days required him to return the head to the old body? Would this body still be fit?

The most troubling question is why Dr. Canavero needed the support of the Chinese government and even, perhaps, is established there, is there any concern about possible international violations?

José Alexandre Ribeiro Fernandes mentions an excerpt from an article by professor Rosana Guida Krastins when mentioning that the principle of human dignity is enshrined in international standards and that this context should also
be analyzed in the context of organ and tissue transplantation (Krastins, apud. Fernandes, 2017, p. 94).

The very premise of finding someone with the same height, weight and biotype already seems complicated, even starting from the assumption that this person necessarily needs to be in a situation of brain death and that the family members are willing to donate the entire body of the deceased seems to us unimaginable or at least a lottery.

The question that permeates the moral ethics of the procedure is the assumptions of success, to what extent a person in a delicate situation, with a fragile emotional state, willing to do anything to survive, could be deceived by questions that have not yet been proven regarding the success of a single surgery and only corroborated by scientific articles written by the creator of the procedure?

An important point to emphasize rests on the consent, both of the recipient and the donor’s relatives, in addition, in matters of bioethics, such consent to participate in scientific or medical experiments, as in the case in question, must always be necessarily preceded by the possibility of withdrawal on the part of the patient, as well as, in case of any problem, reimbursement or the possibility of compensation in case of damage to the volunteer, as brilliantly adduced by professors Vivian Martins, Alessandra Depieri and Luana da Costa when citing the work of Appelbaum, Lidz and Meisel (Appelbaum & Lidz & Meisel, apud. Sgarbi & Viegas & Leão, 2017).

How could a recipient who suffers a loss from such a procedure be rewarded? Only and only if he had the chance to survive. Would such compensation remain for the family members? In relation to the donor’s relatives, and in case of withdrawal? Would Canavero prepared to inform the recipient that for ethical reasons he would not perform the head transplant at the request of the donor’s relatives and that that body, millimetrically chosen for the transplant would be discarded?
The intention of any surgery, especially organ transplants, is to improve the patient's life and not worsen it. The aforementioned teachers go further and mention:

“The aim of bioethics is to bring biotechnology closer to other branches of knowledge, such as philosophy, anthropology and law. The development of life science made it possible for the aforementioned positivist model to be succeeded by contractual ethics, based on the canons of civil liability”.

To date, it has not been possible to support any of Dr. Canavero in the ethical and legal fields. Again, Sgarbi, Viegas and Leão cite Diniz, corroborating the situation of improving the quality of life by mentioning the principle of maleficence that “implies a *primum non nocere*, that is, the duty to avoid damage, which should be interpreted as an unfolding of the principle of beneficence” (Diniz, apud. Sgarbi & Viegas & Leão, 2017).

The hook mentioned above finds support in the study of civil liability. Would Dr. Canavero settling in other countries because he knows he may suffer domestic reprisals?

At what level could a possible failed experiment result in atrocities, suffering or a totally degrading situation that could reach the level of violation of human rights?

Would such a situation deserve an international reprisal? Torelly’s article when mentioning that <It is unequivocal the existence of a global norm of individual responsibility regarding serious violations against human rights, articulated both in international law and in domestic constitutional orders.> (Torelly, 2018).

In this same article, the professor mentions historical situations that originated and were the basis for contexts such as individual accountability, as in the cases of the courts of truth in military dictatorships that not only add responsibility to the State but also the individual responsibility of public and private agents who incurred in serious violations of human rights (Torrely, Op. Cit., 2018, p. 268).
The individualization of agents can also be seen in the atrocities committed in the second war, including against extremely unsuccessful medical experiments (but in this case on purpose) that even included hypothermia in guinea pigs. At this point, he corroborates Professor Torelly when he mentions:

“The ordinary use by agents of state bureaucracies of state accountability mechanisms will directly impact the process of developing the norm of individual responsibility, as it will allow those social actors who previously sought to persuade about the inadequacy of the legal readings that made it possible to maintain impunity and, at the same time, regarding the existence of an obligation to hold individual violators accountable, they can leverage their position”.

And keeps going:

“There is also the vector of the existence of isolated previous cases of application of the norm of individual responsibility to the legacy of violations left over from the Second World War. In addition to just trying to persuade strategic actors about the existence of the norm of individual responsibility, the legal cases of Nazi criminal prosecutions allow the demonstration that such a norm exists both in international law and in comparative law”.

Despite several theories, experts both outraged and admired, it is not known for sure what could be implicated to Canavero in case of a resounding failure, both internationally and domestically, not even what could happen to world medicine in case of success.

It is not up to these authors to judge or even rush about future negative or positive issues, just and only punctuate their opinions based on ethical studies, which in this case seems to us quite objectionable.

The duty to support medical innovations is intrinsic, as long as the minimum moral limits are observed, chance of success, minimization of risks, chance of compensation, opportunity of giving up and we believe that such a large step in relation to such an extreme scientific innovation would not seems as close to us as Canavero.

Neurosurgeons seem to base themselves on the publication of information and the most objective consent possible from their patients, perhaps already
fearing some reprisal from their professional colleagues or even from international agents.

In any case, it is not for the authors to judge the success or otherwise of the undertaking, the objective of the present study was to demonstrate whether the procedure would be bearably ethical or not and to point out possible situations that the Italian doctor could go through in case of failure and not to accuse or point out pipelines.

Roughly speaking, it seems very likely that Canavero gathered supporters, that are possibly in such desperate life situations that justify such a risk, it turns out that quadriplegia and death may not be the worst situations. The next topic will address a slightly more philosophical, more subjective question, but which causes as much concern as the question physical.

5 TEMPORARY STOP OF NEOCORTEX, REFLECTIONS ON THE STUDY OF CONSCIOUSNESS

Angelo Machado teaches about the divisions of the neocortex:

“Projection areas are those that receive or give rise to fibers directly related to sensitivity and motricity. The other areas are considered association areas and, in general, are related to complex psychic functions. Thus, lesions in the projection areas can cause paralysis or changes in sensitivity, which does not happen in the association areas. Injuries to these areas, however, can cause psychic changes” (Machado, Op. Cit. 2006, p. 263).

Thus, when Machado quotes the Russian neuropsychologist Alexandre Luria, he teaches about the functional areas of the cerebral cortex, such as: projection or primary areas (those directly linked to sensitivity and motricity), areas of association that can be divided into secondary (or unimodal, still related that indirectly with a certain sensory modality or with motricity) and tertiary (or supramodal, which no longer deal with motor or sensitive processing, but with psychic activities such as memory and abstract thinking) (Luria, AR apud. Machado, 2006).

As previously mentioned in the course of this study, Dr. Canavero asserts that he will be able to keep the human brain intact during the head transplant
surgery through deep hypothermia. According to their publications, through the low temperature and a quick execution of two simultaneous medical teams, there would be no significant damage to the recipient's cortex.

It is common sense that one of the biggest problems that can happen to the health of a human being is the lack of oxygen in the brain, including brain death is one of the requirements for transplants.

It turns out that damage can also happen, or sequelae, in case the person returns from a prolonged coma or in the case of surgery-induced paralysis, such as deep hypothermia.

At this point, it should be noted that the head transplant procedures devised by Canavero would also be in breach of the World Health Organization, Safe Surgery Manual, particularly on the issue of loss of airway control or respiratory function.

The aforementioned manual in its objective three lists mainly the maintenance of the airway in its objective three “The team will recognize and effectively prepare for the risk of life resulting from the loss of control of the airway or respiratory function.” (WHO, 2009).

There will be no maintenance of the airway, at least in part, as the head will be completely disconnected from the body for at least one to two minutes, in case of serious problems during the procedure, how would the team react to a possible need to return respiratory functions to the recipient patient?

Despite the short time for research, the authors have not yet found any article by Canavero about emergency situations during the procedure. We are of course talking about people who have kept their heads in place and not transplanted into another body. In this case, some authors disagree about the possible issue of the mind, consciousness and psychic condition after head transplantation.

Of course, everything that is said or published is mere speculation because unfortunately, only with the transplant being carried out and being a success would it be possible to know what would happen to the receiver's psyche.
Thus, this topic will bring the opinion of some authors and researchers on possible situations related to post-head transplantation, identity situations, race, etc.

These situations are cited by Wolpe in the “four points of Ren and Canavero”, the third point, the question of psychological adaptation (Wolpe, Op. Cit. 2017), somewhat ignored by both creators of the procedure but of great interest to possible future research.

Wolpe (2017) comments on a very interesting, but worrying, point about the head transplant being only the basis for future body implantations, such a situation is not so strange, in case of success, it is easy to speculate that a paraplegic person could want an athlete’s body (although that Dr. Canavero himself tacitly mentions that the biotype of the donor and recipient must be similar).

Racial, gender and even longevity issues would open up as a range of opportunities for human improvement (as utopian as such a phrase may seem). Wolpe (2017) cites Benedikter, Siepmann, and Reyman22 when mentioning:

“Although Head-Transplanting and Mind-Uploading23 until the present day are not directly connected to each other through empirical research programs, government investments or specific scientific networks, both from different angles seem to address the two sides of the same coin: the hope of a next “great civilizational leap” consisting of the expansion of the frontiers of human existence through the “improvement” of the human body and the human mind, and - potentially more important - through their mutual emancipation (Wolpe, 2017).

Utopias aside, some Brazilian authors have already thought of more, shall we say, “earthly” possibilities. Master in Law from the University of Lisbon Me. José Alexandre Ribeiro Fernandes addresses the issue in three different vectors, gender, racial and social (Fernandes, Op. Cit., 2017, p. 76-78).

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23In a less literal explanation it would be like sending or moving the mind to another destination.
On the issue of gender, Fernandes (2017) mentions an interview with Dr. Canavero addressing the question that a male person could transplant his head to a female person and raises questions about civil registration among others.

In the present case, we point out that issues of gender, identity and civil registration have already been widely debated and we understand that it would be a prerogative and choice of the person, regardless of the type of surgery or not that was performed, this situation is already pacified today and we do not believe that there would be major changes in the choice of the transplanted, regardless of whether the surgery was for the head or the sex.

Proceeding further, the question of interest here is the contradiction of Dr. Canavero, when mentioning that he could perform such surgery between a male and a female person, but previously, as mentioned in the step-by-step head transplant procedure, teaches that height and biotype must be equal.

Perhaps the neurosurgeon is already taking steps ahead or dreaming of future updates to his research, but it is necessary to mention this contradiction as a scientific safeguard.

Another point that Fernandes mentions is the possible regret, such questioning was also mentioned in the topic of medical ethics and really, how could the medical team preserve the body in conditions of reversal of the surgery?

On the racial issue, Fernandes makes a brief survey on a possible case of head transplantation between people of different skin tones and the issue of racial quotas.

At this point, although we do not have a formed opinion, the question would be more of a mental nature, the psychological of the person who suffers so much with his skin tone to the point of submitting to such a procedure and how society would react to such a situation, given that anyway, your head would keep the original hue.

The social issue, Professor Fernandes brilliantly raises the question of the multiplicity of lives to be saved by micro transplants instead of just one saved by a macro one.
We also share the professor's idea and this subject was discussed in a topic just for this, but in this particular chapter, we reserve the question about the election of people who could receive such a transplant.

How to judge, what requirements, for example, would lead one person to stand out from the other to the point of performing a head transplant? An Einstein? A Leonardo da Vinci? A Tesla? And in the same way that we treat people who brought up countless relevant issues, both in the scientific and social spheres, would it be possible that criminal groups could bring up the procedure to try to increase the longevity of people who committed atrocities against humanity?

Despite playing with figures from the past, this assertion only aims to illustrate abstract possibilities in the context of head transplantation. The ideal question for the philosophical question of consciousness could be about something deeper, like memory, both physical and psychic.

The so called phantom limb theory is not new, amputees may feel like twitching at times, as if trying to move the mutilated limb as if it were still there.

Is it a possibility that the donor's muscle memory stimulated the donor's random movements? Would it be possible that a transplanted person could not, at least in the beginning, measure his new strength and ended up hurting himself, tripping or even falling?

Systemic memory was also on the agenda of Professor Cínthia Roso Oliveira’s article, which mentions that there are reports of recipients who began to acquire habits from their donors (Oliveira, 2018).

All these questions, of course, only permeate the imagination and were brought to this article not only as part of the scientific debate around head transplantation, but also to make the article a little lighter, considering that we understand that perhaps these answers will never will be fully achieved, even if the surgery succeeds, curious situations among transplant recipients still happen and in the humble opinion of the authors, such a head transplant surgery could take decades to even be perfected in animals, let alone humans.
Until then, there are only conjectures and fanciful and utopian hypotheses that seem to have come out of fiction more than a medical article.


Finally, we will make a brief reflection in the light of juspositivism on Brazilian and Italian legislation and what the laws of these countries provide for organ transplantation. One fact that puzzled the researchers was that Dr. Canavero needed the support of the Chinese Government so that he could carry out his research, but we emphasize that we limited the research to Brazil and Italy only so that the project would not be too extensive.

A priori, it is necessary to conceptualize the most recurrent term in this study, head. Moore mentions the head in his chapter seven and conceptualizes it as:

“The head is the upper part of the body which is attached to the trunk by the neck. It is the control and communication centre, as well as the ‘loading platform’ of the body. It houses the brain, so it is the seat of our consciousness: ideas, creativity, imagination, responses, decisions and memory. It contains special sensory receptors (eyes, ears, mouth and nose), devices for voice transmission and expression, as well as portals for the entry of fuel (food) water and oxygen and the exit of carbon dioxide” (Moore, Op. Cit., 2011, P. 816) (emphasis added).

The term “part” is extremely broad, extremely subjective and largely imprecise, but the Brazilian Law also adopted it in its article 1, see “Art. 1 The free disposal of tissues, organs and parts of the human body, in life or post mortem, for the purposes of transplantation and treatment, is permitted pursuant to this Law.,” (Law on the removal of organs, tissues and parts of the human body for the purposes of transplantation and treatment and other provisions, 1997), emphasis added.

As terrifying as it may seem, in terms of juspositivism, the national law would allow head transplants. At a fairly objective level of understanding, it is assumed that the term “human body parts” would encompass virtually anything.
Perhaps a lapse by the legislators or already a broad proposal on purpose to avoid amendments.

This understanding can be corroborated by reading the sole paragraph of the aforementioned article, which reads “Sole paragraph. For the purposes of this Law, blood, sperm and ovum are not included among the tissues referred to in this article.” (Law on the removal of organs, tissues and parts of the human body for the purposes of transplantation and treatment and other provisions, 1997), where it is notoriously denoted that the law purposely wanted to exclude blood, sperm and ovum, not doing so with limbs or parts largest parts of the human body, such as arms, legs and head.

Perhaps the legislators at the time did not even imagine that such a debate could surface, but this is relatively common in the field of law. Our penal code dates back to 1948 and needed to be reformulated because the old one did not even provide for some types of crime.

The term “parts of the human body” is repeated several times in the national transplant law, as can be seen in art. 2 and its sole paragraph, article 3, article 4, article 5, article 6, p. single of article 7, article 8 and almost all others of the norm.

Although a little strange, the way out to prevent such transplants from being carried out in the homeland could be in the collision of article 2, which tacitly mentions:

“Art. 2 The transplantation or grafting of tissues, organs or parts of the human body may only be carried out by a health establishment, public or private, and by medical-surgical teams for removal and transplantation previously authorized by the national management body of the Unified Health System. Cheers”.

The article is tacit when mentioning that it can only be performed by teams authorized by the SUS, which could curb any possible hasty intention to perform the head transplant on Brazilian soil, but it would not be difficult to imagine a possible flood of lawsuits against such bureaucracy.

The same does not occur in the Italian legislation which is much more specific, in its article 1 it mentions:
“Art. 1 Purpose. 1 This law determines under what conditions organs, tissues or cells can be used for transplants. 2 It is intended to help ensure that, for the purposes of transplantation, human organs, tissues and cells. 3 It also aims to prevent the abusive use of organs, tissues or cells in the application of transplantation drugs for humans, in particular trade in organs and to protect human dignity, personality and health” (Italy. 2004. RS 810.21. )

Not only does it tacitly exemplify the terms organs, tissues and cells, but it also conceptualizes them in Article 3, so that there is no doubt about the normative permissions:

“Art. 3 Definitions. According to this law, the following is intended: The. organs: all parts of the body whose cells and tissues form a unit with a specific function; parts of organs with equivalent function and parts of the body composed of different tissues, which perform a specific function; B. tissues: structured cellular aggregates, composed of different similar cells or cells, which in the body perform a common function; C. cells: single cells, unstructured masses of cells, and cell suspensions composed only of the same cells” (Italy, Op. Cit., RS 810.21. art. 3)

In the light of positivism, there is no room in Italian law for such a vague and subjective interpretation, article three tacitly delimits only organs, tissues and cells, while the human head is formed by all these three components.

Despite the literal translation of the expression <...and the parts of the body composed of different tissues, which perform a specific function>, it appears that the legislator is speaking of organs, while the head is not formed solely and exclusively by tissues and nor does it perform a specific function. Perhaps this is why Dr. Canavero preferred the support of the Chinese government.

24From the original in Italian: “Art. 1 Scopo 1 La presente legge stabilize the quality condizioni organi, tessuti or cellule I can't essere impiegati per trapianti. 2 This intends to contribute to far yes che vi siano a disposizione, a scopi says trapiant, organi, tessuti and cellule umani. 3 This intends altresì prevent the abusive impiego of organi, tessuti o810.21810.21 cellule nell'applicazione della medicine I gave trapiant all'essere human, segnately il trade says organi, and proteggere there dignity umana, la personalità e la salute.”
25 From the original in Italian: “Art. 3 Definizioni Ai sensi della presente legge si intendono per: a. organi : tutte I left the body _ take care cellule hey cui tessuti trainee un'unità with a function specifica ; equivalent sleep agli organi I left _ organi con Equivalent function and part of the composite body say tessuti diversi , che svolgono una funzione specifica ; B. tessuti : aggregati cellulari structure , compost say cellule uguali or di cellule diverse , che nel corpo svolgono una funzione in common ; w. cellule : singole cellule , mass says cellule non strutturate and suspensioni says sky iule compose only di cellule uguali”
7 CONCLUSION

The present article sought to understand the complex and innovative, head transplantation procedure in living human beings, devised by the Italian Neurorosurgeon Dr. Sérgio Canavero, inspired by head transplants performed on monkeys by Dr. Robert Joseph White in 1970.

According to Canavero, the studies were stopped in 1970 because there was no technology or technique refined enough to unite the spinal cord. The Italian doctor then devised a procedure to perform such a feat, which he called GEMINI, while the complete head reimplantation procedure was titled HEAVEN.

After an analysis of the history behind the neurosurgeon’s dream, the research resulted in some very specific points about the ethics of the procedure as well as its legality in terms of national and Italian legislation.

At first, the claim to performing a macro transplant (in the sense of a total and single transplant for a single recipient) to the detriment of a micro transplant (in the case of separate organs for multiple recipients) was negative.

Data from transplants in the homeland showed a deficit in donations that would necessarily be aggravated if, instead of benefiting multiple patients, only one was benefited. The queue is long and it would be extremely unfair for those who have been waiting for years to see their entitlement withdrawn due to a high bank account.

Such a situation would also necessarily infringe attempts at equitable distribution of transplants and possibly influence issues such as organ and human trafficking as well as medical tourism.

The spinal cord shutdown proposed by Dr. Canavero, GEMINI, was also harmed, both in medical matters, given that the neurosurgeon himself mentions in his articles that his guinea pigs did not even survive more than thirty-six hours, but also in the field of ethics, since the chances of worsening the quality of recipient patient’s life were much greater than the chances of improvement.

Issues such as the chance of regret, chance of rejection of the transplanted body, reimbursement of family members in case of death, compensation in case of aggravation still remain unanswered in published articles, moreover, at no time
during the research was a protocol for emergency room during surgery in case something goes wrong.

In this question, the article sought to address the topic of insufficient oxygen in the brain, as this could necessarily lead to death or sequelae. The Doctor. Canavero addresses this question with a possible technique of deep hypothermia, which he says would keep the brain intact during the necessarily agile surgery.

The study addressed the consequences of such cerebral palsy and its consequences, not only physical but also psychological, in addition to bringing some utopian situations in case of success of the procedure.

In terms of ethics, it was concluded that the procedure is highly reprehensible, there was no doubt that the procedure does not have any risk containment, minimization of problematic situations and possibly would result in a considerable worsening of the quality of life of the recipient patient in case of failure.

On the issue of legality, delimited by juspositivism, it was verified in a cold analysis of the norm and of the concepts of clinical anatomy that the Brazilian legislation could authorize the transplantation of a head in the homeland due to an extremely broad and subjective legislation, but in the background it would run into future pretensions of surgery in the authorization by the SUS, which provides for such discretion to the Ministry of Health in barring or authorizing the medical team if it deems it competent and specialized for the procedure. It remains clear that in negative cases a flood of injunctions and lawsuits would overwhelm the judiciary.

In Italian legislation, the authors concluded that the procedure was denied, given that the rule of law RS 810.21. leaves no room for such an interpretation and clearly delimits and even conceptualizes tissues, organs and cells.
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