Transplantation - the ultimate method of treating end-stage organ failure

(Transplantacja – ostateczna metoda leczenia schyłkowej niewydolności narządów)


Abstract – The paper presents the development of transplantation in Poland, with particular emphasis on kidney transplant. Attention was paid to the legal conditions – including the notion of the donor’s "presumed consent" as well as the social aspects of transplantation.

Key words - transplantation, presumed consent, the recipient, the donor.

Streszczenie – W pracy przedstawiono rozwój transplantologii w Polsce, ze szczególnym uwzględnieniem przeszczepu nerki. Zwrócono uwagę na uwarunkowania prawne – między innymi pojęcia „domniemanej zgody” dawcy, a także aspekty społeczne transplantologii.

Słowa kluczowe - transplantologia, domniemana zgoda, biorca, dawca.

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Authors’ contributions to the article:
A. The idea and the planning of the study
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Accepted for publication: January 31, 2017.

I. INTRODUCTION

Despite the rapid pace of development of medicine, there are still problems associated with end-stage organ failure. With the development of the science of transplantation, more and more people get another chance at life. Organ transplantation is the only effective method of treating end-stage organ failure, which occurs in the course of many diseases. This treatment has become commonplace around the world. In Europe, there are currently more than 250 thousand people living with active organ transplantation [1].

Modern advances in transplantation have become possible thanks to research conducted in the last century by hundreds of researchers around the world. It concerned the development and refinement of techniques of transplanting tissues and organs, knowledge of histocompatibility antigens, donor selection and the recipient’s understanding of the mechanisms of the immune response, methods of diagnosis and treatment process of rejection, knowledge of mechanisms of ischemic organ damage, ways to store organs before surgery, detection of drugs with immunosuppressive and treatment regimens and, very importantly, knowledge of early and late complications of the use of immunosuppression, including bacterial infections, fungal and viral infections, and the actions of oncogenic activity of immunosuppressive drugs. A number of these studies were awarded the Nobel Prize. Of the 93 awarded the Nobel Prize in Medicine and Physiology in the years 1901 to 2002, eleven issues related to transplantation [2].

With these achievements, organ transplantation has become a safe, effective and much-needed treatment. In Poland, transplantation has been an established method of treatment since 1967. Most transplanted kidneys come from
deceased donors, transplants from living donors account for only about 5% of all transplants [3].

With the development of transplantation, a new definition of death emerged, which is not fully understood by the man who was raised in the belief that death is the cessation of vital organs. It created the concept of brain death, which is based on the finding of irreversible changes in the brain structure, the preserved blood circulation, persistent organ functioning.

It was assumed that the finding of brain death begins the whole transplant procedure, which is an opportunity to continue and improve another life.

Better results in organ transplantation have led to increased acceptance of this form of treatment, both by society, the sick, the church, and by health care personnel. Nowadays it has expanded and there are new indications for transplantation, e.g. to qualify elderly people for the treatment.

Transplantation faces many problems. One of them is the still growing waiting list for a transplant. Unfortunately, there is a shortage of organs. In Europe alone, more than 45,000 people are still waiting for a kidney transplant, and 15 to 30% of candidates submitted to liver or heart transplantation die while waiting for a transplant [4]. Another important issue is consent to organ donation. Despite the fact that in Poland we have regulations regarding the acceptance of the donation, there are still conflicts in this area. Typically, hospitals require the consent of the family, even in the case of the death of a person who has already filed a declaration of consent to organ donation for transplantation.

For this reason, the medical community and Christian clerics decided to go out and meet people in order to show how important and valuable it is to donate organs.[5,6]

The aim of our work was to present the subject of transplantation in Poland in legal, social and medical terms.

II. BEGINNINGS OF TRANSPLANTOLOGY

Transplantation is the youngest field of medical science; the beginning of its development is commonly dated back to 1945 when three doctors: Dr Earnest Landstein, Dr Charles Hufnagel and Dr David Hume of Peter Brent Brigham Hospital in Boston transplanted a kidney to a young, pregnant woman with gestosis, from a patient who died in the same hospital. Doctors Joseph Murray, John Merrill, and F.D. Moore of Boston in 1954 made the first successful kidney transplant from a living donor. Ronald Herrick was the donor while the recipient was his twin brother – Richard. The recipient lived with a transplanted kidney 8 years. In 1990 Dr. Murray received the Nobel Prize.

In Poland, the first successful kidney transplant from a deceased donor was conducted by Professor Jan Nielubowicz in Warsaw on 26 January 1966. The recipient was an 18-year-old student of the school of nursing. This gave hope for an effective fight against kidney disease. However, in practice it encountered many obstacles. Firstly, there was no law regulating organ transplantation. Secondly, Poland occasionally used criteria for the diagnosis of brain death. A dynamic and vibrant development of transplantation in the 80s contributed to the use of a new immunosuppressive drug – cyclosporine. Then, however, the kidneys were taken always after final cardiac arrest, which was associated with ischemia of the organ. It ended up that the patient in the postoperative period was still on dialysis. The initially sceptical medical community did not help the development of transplantation. By the end of 1997, there had been performed 4964 transplants [7, 8].

The first attempt to transplant the pancreas in Poland was conducted in 1985 by Professor Stanislaw Zielinski in Szczecin, unfortunately it was unsuccessful. The first successful transplantation of the pancreas and kidneys in Poland was conducted on February 4, 1988 by Professor Jack Schmidt in Warsaw.

The first attempt to transplant a heart was made by Professor Jan Moll in 1969. A successful heart transplant was performed in 1985 by Professor Zbigniew Religa in Zabrze.

Liver transplantation in Poland is carried out occasionally, until 2000 there had been 214 procedures performed. The first successful liver transplant was performed by Professor P. Kaliciński in 1990. Currently, the aim is to transplant from a family member, which procedure has sensational final results.

III. KIDNEY TRANSPLANTATION

Chronic renal failure (CRF) is understood as a complex disease being a consequence of urinary tract infections which lead to damage to the kidneys, the reduction and the full dysfunction of kidney. Most common are three types of the disease: glomerulonephritis, diabetes and hypertension [9]. Nearly 20% of all dialysed patients in Poland are due to complications of diabetes. The third factor – high blood pressure is a cause of end-stage chronic renal failure in Poland in 9% of patients [9]. The development of the disease is slow, the symptoms appear late and can be difficult to diagnose. Only changes in the sediment of urine, anaemia or hypertension indicate renal failure.
Epidemiological studies have shown that chronic kidney disease, running with a reduction in glomerular filtration rate, is an important risk factor for coronary heart disease. Cardiovascular complications are the leading cause of death in patients receiving dialysis. Kidney transplantation is the only and most effective method of treating irreversible renal failure. Border age for transplantation is from 5 years of age and 60 years of age. Kidney transplant is also a form of renal replacement therapy in contrast to dialysis. It uses a kidney taken from a closely related person / family member (family transplant) or from an unrelated person who has been diagnosed with symptoms of brain death (a transplant from a deceased donor) [9]. The kidney is selected based on the compatibility of antigen typing results between recipient and donor. Then the kidney is placed in the left or the right iliac fossa. The organ is then combined with the body with joint or external vessels. The ureter is implanted into the recipients' bladder. Immediately after closing the ureter with the bladder and releasing the clamp, the urine begins to be produced [10]. Patients must take immunosuppressive drugs throughout the transplant to prevent organ rejection by the body. A successfully performed kidney transplant provides an almost complete recovery for a few to several years. A family kidney transplant offers a chance to heal more quickly, reducing the long waiting (using dialysis) for transplantation of kidneys taken from cadavers [11].

IV. THE LEGAL ASPECT OF ORGAN PROCUREMENT

There is a considerable problem when the family must consent to organ donation from a deceased person. Issues relating to the procurement and transplantation of cells, tissues, and organs have been regulated in “The cell, tissue and organ recovery, storage and transplantation Act” of 1st July 2005 (Journal of Laws No. 05.169.1411 as amended). However, ex mortuo procurement raises many doubts and the provisions of the Act are sometimes misinterpreted. Under the Act, the collection of cells, tissues, organs from cadavers is possible when the person did not object to that while living. This is the so-called presumed consent. In the legislation of developed countries, there are three regulatory approval issues for the procurement of organs from corpses:

1) The adjustment of the formal approval of future donor
2) control the consent of the family of the deceased,
3) regulation of presumed consent, or – adjustment possibilities to object by the future donor.

Polish transplant law and "The cell, tissue and organ recovery, storage and transplantation Act" of 1st July 2005 (as amended), regulates the objection, or presumed consent. Some transplant doctors and lawyers approve implied consent as progressive in relation to the other. The construction of presumed consent is future-oriented. It does not violate the rights of deceased people, and at the same time gives you the chance to save the lives of other patients. It is comfortable in that it does not require the consent of the family. The doctor does not need to obtain the consent of the family or even inform the family that tissues or organs have been derived from the dead.

Article 5.1. of the Transplant Act of 1st July 2005 "On the collection, storage and transplantation of cells, tissues and organs," states: "Collection of cells, tissues or organs from human corpses for the purpose of transplantation can be done if the deceased person did not express opposition during life."

Article 6.1. provides ways to express this opposition: "The opposition is expressed in the form of:
1) entry in the central register of objections to procure cells, tissues and organs from human corpses;
2) a written statement provided with the signature;
3) oral statements made in the presence of at least two witnesses, confirmed in writing by them "[12].

A doctor, before collection of the cells, tissues or organs of a deceased person, is obliged by Article 10 of the Act to obtain information if there is no objection in the Central Register of Objections. One of the duties of the physician is to provide a human corpse with proper appearance after collection of organs.

V. THE SOCIAL ASPECT OF TRANSPLANTATION

In Poland, sociological studies conducted have shown that the public has a positive attitude to transplantation as a form of treatment. This is evidenced by studies conducted by the Public Opinion Research Centre commissioned by Poltransplant in 1997. The conducted surveys show that the majority of Poles, i.e. 87% accept organ transplantation, as one of therapies. Only a small percentage of the population expressed their veto – 7% [13].

A problem occurs when organ donation concerns a loved one. Then, the situation changes and acceptance of organ donation decreases drastically. And so in 2002 in the case of 593 potential dead organ donors, the removal of organs was abandoned in 45 cases because of the family's objection [14]. The main reason for the lack of family's acceptance of the removal of organs is the deep-rooted cul-
tural and religious awareness. There is a belief that the removal of organs after death constitutes lack of respect for the body throughout the act of death. Another important reason is the lack of public awareness regarding the concept of "brain death" [14]. It is difficult to understand for people that artificially sustained viability of the organs, blood circulation and respiration is not a sign of life. In the minds of many, there is a belief that death occurs with the cessation of heart beat, since it was considered for a long time as the principal bodily organ. Some objections of families also vary in relation to individual organs. It happens that there is consent to collect the kidney, but not the heart, motivated by the fact that if the heart is taken, death will occur. This is an absurd situation, however, when human emotions are involved. Legal considerations allow organ donation without the family’s consent but the social reality is somewhat different. The family, which is in great grief due to the loss of a loved one, is not able to decide on the next step to proceed with the corpse. The majority of the population believe that there is a relationship between body and soul. After death, the soul leaves the body, and the body should be buried with dignity, respect and intact. The cult of the human body after death and family relation, which refers to religion, suggests that they do not really know their own religion. The Bible does not speak of the body of the deceased; it is a common source of morality.

Another perspective on transplantation is that of the medical environment. Here, an attitude of acceptance is prevailing. In the medical community, it is considered a moral obligation to use all available methods of treatment, and such action is understood as care for the health of the patient, which is the most important asset. The doctor transplanting a grafted organ has a positive impact on "the patient - recipient" relation, and does not harm the donor as this person is dead [15]. It should be noted that raising awareness about organ transplantation as a field of science is in the interest of the whole society. Many people are not entirely convinced. They are more willing to sacrifice their body than the close person. In spite of the existing resistance, most people accept transplantation therapy. Consent to this method of treatment has not yet become widespread, but increased knowledge and awareness among people increases this approval.

VI. INSUFFICIENT AMOUNT OF DONORS IN RELATION TO THE NEEDS

The main problem is the insufficient number of organs for transplantation. One reason for this situation is the insufficient awareness of people about the sacrifice of their loved one’s organ (living donor) and donating an organ or tissue after their death. Then, an increase in the number of objections in the Central Registry of Objections is observed. Now the situation has improved and there has been a decline in objections (Figure 1).

In 2008, there was an increase of 20% in the number of transplanted organs from as compared to 2007 – this gives great hope that transplantation is entering a phase of re-development. The Resolution of the Sejm of 13 June 2008, which supports the work of transplantation, has become the impetus for the meetings of the National Consultant for Transplantation Clinical, Professor Wojciech Rowiński, MD with local authorities of all provinces to discuss the needs and possibilities of increasing access of residents to medicine [16]. Still, there is a high demand for organs. In the last four years, the number of patients waiting for a kidney transplant has stayed at more or less the same level (Figure 2.).

![Figure 1. The number of objections in the Central Register of Objections in the years 2007-2009](image1.png)

![Figure 2. Number of people waiting for kidney transplantation in 2007-2010](image2.png)
In 2007-2010, transplants from living donors were not satisfactory in terms of numbers (Figure 3). You can still see a deficit compared to the needs of the patients, but in 2010 this number doubled compared to previous years.

In Podlaskie in the past four years there has been a large increase in transplanted kidneys (Figure 5). This is the result of good coordination with local offices as well as professionally prepared medical personnel.

In Poland, since 2007, we have had a slight upward trend in renal transplantation (Figure 4). The information campaigns conducted for the public as well as professional training of coordinators brought results.

V. RULES OF TYPING DONOR ORGANS

1. Family transplants

Kidney transplantation from a family donor (living) has many advantages. First of all, the treatment can be properly planned and carried out in optimal clinical conditions for the patient. The second important issue is the status of the transplanted organ [17]. Unlike organs taken from the dead that are always to some extent damaged by the lack of oxygen, the organ originates from a family member and almost to the last moment before the transplant works normally in the body of the donor, which greatly increases the chances of immediate function after the transplant. Another advantage is the possibility of calm and very accurate measurement of histocompatibility antigens in family transplants. Finally, the most important thing – you can try to call the tolerance to donor antigens in recipient, handing him a marrow or blood cell donor organ. Long-term observations of renal transplant from someone with immediate family clearly indicate a much longer graft survival compared with the survival of kidneys taken from cadavers. Chances of long-term survival of the recipient, who re-
ceived a kidney from his brother or sister with the same HLA antigens, are 95%, whereas in the case of kidneys coming from the father or mother – 85%. Kidneys are not the only organs that can be collected from the donor family; they can provide the liver, pancreas, the lobe of a lung and intestine. Only a fragment of the organ is required for transplantation. Usually performed is the transplantation of a liver fragment from one of the parents to the sick child [17]. Prolonged waiting for a suitable liver taken from a deceased person significantly reduces the chance of child survival. According to opponents of transplants, collection of organ from the family is above the sacred principle of “primum non nocere”. Each surgery includes, of course, an element of risk; however, when examining several thousand operations with the use of collected kidneys, the risk of death has been found to be 0.03-0.1%. The risk of complications in the early postoperative period, such as wound infection, bleeding, pulmonary embolism, venous thrombosis, is 2-3% [17]. It has been shown also that unilateral nephrectomy (removal of the kidney) does not increase the frequency of hypertension or impaired function of the remaining kidney in more than 600 donors followed for more than 20 years.

2. Eligibility of the living for kidney donation
A kidney transplant from a healthy person to the patient with end-stage renal failure is a great gift and is increasingly propagated and used worldwide. It requires thorough examination of a candidate for donation to minimize the risk of deteriorating the health of the person who declares willingness to donate an organ to another person. This applies to both the effects of perioperative and remote removal of one of the two functioning kidneys. Research on the donor candidate is also for the benefit of “the recipient”. This excludes the possibility of transferring lesions with a transplanted organ and thus the exposure of the person receiving the organ for the development of, for example, an infection or cancer. The legal conditions for organ transplantation from living donors are precisely defined by the Act on Transplantation (“The cell, tissue and organ recovery, storage and transplantation Act”) of 1 July 2005, Journal of Laws No. 05.169.1411 as amended [Chapter 3, art.12, 13] and other Resolutions of the Minister of Health. They present the details of the health requirements to be met by a candidate for a living donor. The living kidney donor may be a relative in a straight line, sibling, spouse, adoptee, or a person unrelated to the recipient if the district court agrees after hearing the application of the candidate and the opinion of the Ethical Committee [12]. Both the potential donor and the recipient must give informed consent to the procedure and at any stage of qualification, they have the right to withdraw from the past decision. Informed consent is possible only if:

- the donor candidate and the recipient are informed in detail about the type of surgery and the risks related to the surgery for the donor and the recipient
- the donor candidate has the full capacity for legal transactions and has freely expressed consent to provide the kidneys for transplantation to the recipient

Having obtained the initial of the donor candidate and the recipient, further qualification of the donor is carried out, which consists of:
- determination of the donor’s blood group,
- exclusion in the recipient of antibodies incompatible with the donor
- determination of donor HLA
- assessing the health of a candidate for the donor [18].

3. Deceased organ donor
The greater part of donors are people who have died with evidence of brain death. The process of establishing brain death can be described in two phases: Stage I: suspicion of brain death
Second stage: the execution of a series of examinations confirming brain stem death.

The diagnosis of brain death is determined by the Brain Death Committee (Table 1). The committee consists of: a specialist in neurology, neurosurgery, anaesthesiology and intensive care and in forensic medicine (Article. 9, paragraph 3 of the Act of 1 July 2005, Journal of Laws No. 169, item 1411). Transplantation from the dead requires organs to be maintained in a good functional status until the collection [18-20].

Table 1. Criteria for clinical diagnosis of brain death [21]

<table>
<thead>
<tr>
<th>Absolute conditions</th>
<th>No brain function</th>
</tr>
</thead>
<tbody>
<tr>
<td>No use of sedation, drugs, relaxants and other toxic agents</td>
<td>No symptoms of epilepsy</td>
</tr>
<tr>
<td>No serious electrolyte disturbances and endocrine</td>
<td>No reaction to pain on the cranial nerves</td>
</tr>
<tr>
<td>No deep hypothermia</td>
<td>No action of the brain stem</td>
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<td></td>
<td>Sleep despite acidosis stimulation</td>
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<td></td>
<td>Lack of pupillary and corneal reflexes</td>
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</table>
VI. SUMMARY

The authors present the history of organ transplantation in Poland and worldwide. The kidney is a frequently transplanted organ. Successful kidney transplantation can cure end-stage renal failure and improve the patient’s quality of life. A kidney can be transplanted from a living donor or a dead person.

Transplantation engenders legal issues. Families should give consent to the collection of organs. However, in Polish legislation, there is the so-called adjusting presumed consent, or the lack of objection by the donor (no objection in the Central Register of the Objections). In the years 2006-2007, there has been a reduction in the number of transplants. It was connected with the uncertainties presented by the media concerning brain death and fears about the donation from people who do not live. The positive attitudes of the medical staff have led to an increasing number of transplants in Poland.

VII. REFERENCES

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