
Organ Transplant and Challenges

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Introduction

In the 1950s, the first attempts at immunosuppression for kidney transplantation involved total irradiation and was met with some degree of success. The use of chemical immunosuppression, initially with 6-mercaptopurine and then with combination of azathioprine and steroids, avoided the problems associated with irradiation and improved outcomes significantly. It was the discovery of cyclosporine in 1976, and its introduction in clinical practice in 1984, that dramatically changed the landscape of OT(Organ Transplant) resulting in an increased one-year survival in both kidney and liver transplant recipients (95 and 75% respectively). Modern immunosuppressive agents (tacrolimus, sirolimus, mycophenolic acid, and everolimus), allow us to currently enjoy superior outcomes and a reduction in adverse immunosuppressive effects.

The next important milestone in the development of OT was the founding of the United Network of Organ Sharing (UNOS) in 1984. This organization manages all transplant activities in the US including the maintenance of a national transplant list for all types of transplantation, data collection, and coordination of educational activities. There are a number of organizations in Europe and Asia with similar responsibilities.

In 1992, a group of anesthesiologists and critical care specialists, under leadership of Dr. Yoogoo Kang from the University of Pittsburgh, proposed the creation of a multidisciplinary society to meet the educational needs of medical professionals involved in transplantation and improve the quality of care for transplant recipients. The first two meetings which focused on preoperative care, were held in Pittsburgh in 1984 and 1986. After the success of these first meetings, The International Society for Perioperative Care in Liver Transplantation was created in 1990. It was subsequently re-named The International Liver Transplantation Society (ILTS). At about the same time in Europe, Dr. John Farman founded the Liver Intensive Care Group of Europe (LICAGE). Most recently (2016) The Society for the Advancement of Transplant Anesthesia (SATA) was founded. Today, specialists in Anesthesia and Critical Care increasingly have leadership roles in national and international transplantation societies.

Objective:

- To study recent trends in organ donation
- To study challenge in organ donation
- To study modern rules in organ donation
- To study Specific contributions of anesthesia and critical Care in Organ Transplantation

Specific contributions of anesthesia and critical Care in Organ Transplantation

Advances in anesthesia and critical care, primarily in preoperative evaluation and optimization, intraoperative management, and postoperative care have contributed significantly to the success of OT. The most important contributions have been made in:

- Establishing evaluation and treatment protocols for transplant candidates with comorbidities including CAD, cirrhotic and alcoholic cardiomyopathy, porto-pulmonary hypertension and hepato-pulmonary syndrome, as well as recommendations for the management of hyponatremia
- Introducing the use of perioperative ultrasound and intraoperative TEE monitoring
- The management of coagulopathy, including recommendations on the use of viscoelastic testing and on transfusion component therapy
- Evaluation and management of perioperative hemodynamic instability including post-reperfusion and vasoplegic syndromes
- The management of infections in the immunosuppressed patient

Despite these contributions, transplant anesthesia as a subspecialty is rarely represented at national anesthesia meetings. The situation is similar with the major anesthesia journals. This is changing. *Anesthesia and Perioperative Care for Solid Organ Transplantation* is a new section in BMC Anesthesiology and was established to provide the opportunity for anesthesiologists and critical care specialists to present their work in the field of OT. The Section Editors, Drs. Saner and Bezinover have many years of experience in transplantation. They are experts in the field of perioperative care for these very challenging patients and are actively involved the transplant societies ILTS, LICAGE, and The Transplantation Society (TTS).

Challenges in organ transplantation

Many challenges remain in the field of OT and provide fertile ground for research. The primary challenge in transplantation today for all organ types is the disproportion between organ demand and organ availability. Strategies to overcome this problem include transplantation using extended criteria grafts (ECD), donation after cardiac death (DCD), the use of machine perfusion for graft preservation of inferior quality (or initially discarded) grafts, as well as the use of living donors and split liver grafts. Additional challenges involve perioperative patient care, graft survival, and optimization of immunosuppression protocols. There are several ongoing studies in these areas. There are, however, some specific challenges associated with transplantation of individual organs.

Kidney transplantation

There are several areas of research specifically aimed at increasing organ availability and survival to include: optimization of ex-vivo machine graft perfusion and protocols for using extended criteria grafts, preoperative candidate evaluation, graft and recipient matching, pretreatment of recipients (using ischemic preconditioning) and donors (using mild hypothermia) To help alleviate the shortage of kidneys for transplantation, UNOS has recently introduced a paired donation kidney transplant pilot program. This program helps people who have identified (incompatible) living donors find well-matched donors and receive a transplantation.

Liver transplantation

Several strategies have been developed to increase organ availability include living donor liver transplantation (LDLT), split liver transplantation, and utilization of ECD and DCD grafts. The regenerative ability of liver is well known, however in contrast to renal grafts, living donation of hepatic grafts is *significantly* more complicated and puts the donor at greater risk as well. Today, several countries have established LDLT programs with South Korea, Turkey, Japan, and the US being leaders in the field.

Split liver transplantation also offers the possibility to perform two transplantations using one donor. Unfortunately, this option is limited due to the small size of the grafts and can be used only for children and smaller adults.

Pancreas transplantation

The first successful pancreas-kidney transplant was performed in 1966 by Drs. Richard Lillehei and William Kelly at the University of Minnesota. They performed the first singular pancreas transplant in 1968. The pancreas-kidney transplant procedure is very common today due to the high incidence of diabetic nephropathy associated with diabetes mellitus. Isolated islet transplantation is being performed with increasing frequency and is the topic of much ongoing research.

Intestinal transplantation

The first attempts at transplanting intestines were performed in 60s. These initial attempts, however, were not successful with the majority patients succumbing to rejection, infections, and surgical complications. Only after introduction of cyclosporine (and later tacrolimus) did intestinal transplantation become possible. The first successful intestine transplant was performed in 1988 by Dr. E. Deltz in Germany. Intestinal transplantation can be performed alone or as a part of multi-organ procedure. Despite significant improvements in survival, rejection and cytomegalovirus infections are still significant problems. The refinement of existing immunosuppressive protocols and the development of new drugs is a priority of research in this field.

Other approaches currently in use for cardiac transplantation is acceptance of organs with mild coronary artery disease (CAD) and the use of previously grafted hearts.

Other areas under investigation include preventing and managing chronic rejection, preventing postoperative infection and malignancy, optimization of postoperative outcome, refining surgical techniques, and improving cardiac recovery assessment of donors after hypoxic events.

On the horizon

The new BMC Anesthesiology section, *Anesthesia and Perioperative Care for Solid Organ Transplantation*, was established to provide the opportunity for specialists involved in the care of transplant patients to submit their manuscripts on these topics. We would like to invite Anesthesiologists and Critical Care specialists, as well as all other specialists involved in OT, to submit manuscripts for consideration to this new section of BMC Anesthesiology.

Conclusion

India's healthcare landscape is marked by a stark contrast between medical advancements and the critical shortage of organs for transplantation. The disparity between the burgeoning demand for transplants and the limited supply of organs is a complex issue rooted in societal, infrastructural, and procedural challenges.

The persistent dearth of deceased donors underscores the need for a comprehensive approach to address the underlying factors. Deep-rooted misconceptions, religious beliefs, and a lack of awareness about organ donation hinder public participation. Overcoming these barriers necessitates sustained and targeted awareness campaigns that emphasize the nobility of organ donation and dispel myths surrounding the process. Additionally, simplifying the consent process and streamlining the bureaucratic hurdles can encourage more families to consider donation during their time of grief.

The intricate nature of organ transplantation procedures and the specialized infrastructure required pose significant challenges. Upgrading healthcare facilities, training skilled medical personnel, and investing in advanced technology are essential to enhance the success rates of transplants. Moreover, establishing robust quality control mechanisms is crucial to ensure patient safety and build public trust in the transplantation process.

Bridging the demand-supply gap in organ transplantation is a multifaceted challenge that demands innovative solutions. Exploring alternative sources of organs, such as controlled donation from living donors, while adhering to stringent ethical guidelines, can be considered. Incentivizing organ donation through tax benefits or other measures may also encourage public participation. Furthermore, promoting research and development in organ preservation and artificial organs can provide additional avenues to address the shortage.

transforming India's organ transplantation landscape requires a concerted effort from government, healthcare providers, and the public. By raising awareness, improving infrastructure, and streamlining processes, it is possible to create a more conducive environment for organ donation and transplantation. Ultimately, addressing this critical healthcare challenge will save countless lives and enhance the quality of life for those awaiting life-saving transplants.

It is imperative to recognize that organ transplantation is not merely a medical procedure but a humanitarian endeavor. By fostering a culture of empathy and compassion, India can move towards a future where every patient in need receives the gift of life.

Abbreviations

CAD	Coronary artery disease
DCD	Donation after cardiac death
ECD	Extended criteria grafts
ILTS	International Liver Transplantation Society



LDLT	Living donor liver transplantation
LICAGE	Liver Intensive Care Group of Europe
OT	Organ transplantation
SATA	Society for the Advancement of Transplant Anesthesia
TTS	The Transplantation Society
UNOS	United Network of Organ Sharing

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