

Swap Donation: New Hope for Transplant Patients

Vasudevan S

Department of Urology, Medical College, Trivandrum; Kerala Medical Journal*

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The quest for transplantable organs is upmost in the minds of any patient with irreversible organ failure when they are placed in the transplant list. There is a huge demand supply mismatch that makes this problem a real concern for the potential recipient and the family and well-wishers. The supply of organs comes from related live donors, unrelated live donors and deceased donors from brain dead donors. In India the potential renal recipients are nearly 1.5 lakhs yearly whereas the annual kidney transplant rate is probably ten thousand. The ratio is more alarming when liver transplant is considered.

The latest method to overcome this huge deficit is the Swap Donation method. Kidney Paired Donation (KPD) or Paired Exchange is an approach to live donor kidney transplantation where patients with incompatible kidneys swap kidneys to receive a compatible kidney. Ideally it is used where a potential donor is incompatible. Since better donor HLA and age match is correlated with lower lifetime mortality¹ and longer lasting kidney transplants,² many compatible pairs are also participating in swap donations to get more compatible kidneys. In the US, the National Kidney Registry organizes the majority of US KPD transplants including large swap series. It is also organized by UNOS³ and the Alliance for Paired Donation.⁴ Large swap chains involving 60 pairs in 2012⁵ and 70 pairs in 2014⁶ have been organized and completed.

More than one-third of potential living kidney donors who want to donate their kidney to a friend or family member cannot donate due to blood type or antibody incompatibility.⁷ Traditionally, these donors would be rejected and the patient would lose the opportunity to receive a life-saving transplant. KPD overcomes donor-recipient incompatibility by swapping kidneys between multiple donor-recipient pairs. KPD is also being used to find better donor-recipient matches for compatible

pairs who want a lower lifetime mortality^{1,8} and longer lasting transplant.²

HISTORY¹⁴

Year	Event
1986	KPD first suggested by Rapaport
1991	First KPD program started in South Korea by Dr. Park
1999	First European KPD transplants performed in Switzerland
2000	First KPD transplants performed in USA at the Rhode Island Hospital
2001	Hopkins completes KPD transplants and begins first KPD program in USA
2004	Dutch established first national KPD program
2007	NEAD chain started by APD utilizing first bridge donor
2007	Charlie Norwood Living Organ Donation Act clarifies legality of KPD in USA
2008	National Kidney Registry organizes its first transplants on Valentine's Day
2009	Hopkins leads first 16 patient multi-centre Domino Chain
2010	UNOS organizes its first KPD transplants
2012	National Kidney Registry completes largest chain involving 60 participants
2014	National Kidney Registry sets new record with 70 participant chain
2017	First Academic Paper published on "Chronological Incompatibility" outlining the ADP Voucher Program"

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Corresponding Author:

Dr Vasudevan S, Professor, Department of Urology, Government Medical College, Trivandrum; Chief Editor, IMA, KMJ.
E-mail: periamana@gmail.com

OUTCOMES

Researchers have also discovered that better HLA matching not only leads to longer lasting transplants,² but is also correlated with lower patient mortality rates^{1,8,9} because better matched kidneys require less immunosuppression and less immunosuppression reduces nephrotoxicity and other negative side effects from post-transplant anti-rejection medications. Equally important, better HLA matching reduces the number of antibodies that a transplant recipient will create making it easier to get a second, third or fourth transplant.¹⁰ This issue is critical for young transplant recipients who have a life expectancy that is longer than the expected graft survival (i.e. how long a transplanted kidney lasts). Deceased donor kidneys typically last 5 – 15 years¹¹ and living donor kidneys typically last 10 – 30 years.¹¹

Compatible pairs

When KPD first started, the focus was only on enrolling incompatible donor-recipient pairs. As paired exchange grew and the process became faster and more reliable, patients with compatible donors that wanted a better match, began enrolling in KPD. Researchers have identified that a better matched kidney is correlated with better outcomes. Specifically a better matched kidney lasts longer² and may allow for a lower dosage of post-transplant immunosuppressive medications.² Also a better matched kidney transplant is correlated with a lower lifetime mortality rate.^{1,8,9}

For compatible pairs, not only does a better match lead to a better outcome, but it also directly helps other patients with incompatible donors find a match and get transplanted. A favourable blood type compatible pair (i.e. O donor with non-O recipient) will facilitate at least 1 and as many as 6 additional transplants.¹² Compatible pair participation is the fastest growing segment of KPD¹² and holds the promise of facilitating better matches for patients with compatible donors while limiting KPD wait times to less than 12 months for patients that have a cPRA less than 98%.

Advanced Donation

Advanced Donation is the process of donating in advance for a future patient who may develop renal failure 15-20 years later.¹³ This began in 2012 and expanded so rapidly that by 2017 Advanced Donation accounted for nearly half of the chain starts in the United States.

Situation in India

The Swap Donation programme in India has been active for at least 10 years now. Over 1000 cases have been performed. The Institute for Kidney Diseases and Research Centre Ahmedabad (IKDRC) has performed over 300 cases.¹⁶ Apex Kidney Foundation in Mumbai has the Apex Swap Transplant Registry.¹⁷ ASTRA is a database of patients who need kidney transplant along with their family-donors who cannot donate their kidney because of blood group mismatch. This data base is scientific and credible. The computer generates swap pairs based on a few criteria like age of the donor, lymphocyte crossmatch, etc. ASTRA will register patients and donors, search and match pairs from the data pool and identify compatible donor-patient pairs.

Situation in Kerala

The Kerala Government has issued orders facilitating the performance of Swap donations. In a bid to end rampant organ trade and simultaneously assist in the conduct of more transplants for critically-ill patients, the Kerala government is slated to introduce a method of swap donation purely on altruistic means. Through this programme, for example, a husband, incompatible to donate his kidney for his wife, can donate for a stranger of another family, provided anyone related to the stranger can do the same in return for his wife. This will eliminate the problem of living donors who are unable to donate to their own family members simply because they are incompatible medically.

While this mode of organ donation is done on a minimal scale at select hospitals in the state, this is the first time it will be recorded and channelized by the government through the Kerala Network for Organ Sharing (KNOS), the nodal agency that keeps a track of the patients waiting list for transplant of different organs.

In February, the health and family welfare department of the state government issued guidelines for altruistic and swap donation after the proposal was discussed at a meeting of the Cadaver Transplantation Advisory Committee (CTAC) on January 27.

“(When) there is more than one pair and if more than one hospital is involved, the donor will have to travel to the recipient hospital, the donor organ removal must be started simultaneously in both the hospitals. If there is more than one pair, donor-recipient matching will be done by a computer-assisted matching algorithm which will be designed by NIC. The patients with

kidney failure, who have a blood group, compatible donor (near relative), but with positive lymphocyte crossmatch, can be registered under Swap Donation Registry,” the government order read.¹⁵

The government has stressed that these cases of swap donation have to be approved by the authorisation committee of the hospital/district/state in which the transplant is scheduled to be done. Swap donation is only permitted among near relatives of the patients.

The objective is to remove middlemen who stand to gain financially through organ trade. The government will take the role of a middleman to ensure the transplants take place legally.

Swap Liver transplantation

Swap liver transplantation is performed when there is no donor whose blood type is compatible with the patient. Those whose blood type is incompatible but wish to donate their liver to relatives may apply to transplantation centre to be prepared for swap transplantation. Some hepatic patients cannot receive organs from their donors because of the blood incompatibility. Between couples having the same problem, the transplantation is possible from the donor of one to recipient of the other.

After performing all blood tests of the pairs, the weight and anatomy of their liver is examined. The pairs found compatible are met under the supervision of our liver transplantation coordinators.

In swap transplantation, the surgeries of the donor and recipient are started at the same time and the livers are simultaneously removed to perform the transplantation procedure.

END NOTE

Author Information

Vasudevan S, Professor, Department of Urology, Government Medical College, Trivandrum
Chief Editor, IMA, KMJ.

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Editor’s Remarks: This article relates to the latest concept in voluntary organ donation. This method is helping better outcomes for pairs with subopti-

mal matching and helps find donors for pairs with no matching between the pairs. The experiences in Western nations, India and Kerala are discussed.

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