INVITED COMMENTARY

Is it the time to apply the model of Czech-Austrian kidney paired donation program?

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Living donor (LD) kidney transplantation is currently the best treatment of choice for patients with end stage renal disease. However, in a significant amount of cases, there are immunological barriers between the potential donor and recipient. While kidney paired donation (KPD) or kidney exchange program (KEP) would certainly help to overcome these barriers and find immunological appropriate donor for each recipient, a single institutional or even a small country national list can be unsuccessful as numbers really do matter in this situation. In the United States, significant proportion of the KPD is nowadays performed via National Kidney Registry (NKR). In 2008, NKR assisted in 21 KPD (9% of national KDP), while in 2019, 760 KDP (68% of national KDP) was done via NKR [1]. The program has excellent outcomes with 1.6%, 3.2%, 6.2%, and 8.7% graft loss rate at 1, 3, 5, and 7 after kidney transplantation [1,2]. Based on the first 9-year data from NKR, patients in NKR reported significantly greater number of re-transplants (25.6% vs. 11.5%), hyperimmunized recipients (22.7% vs. 4.3% were calculated panel reactive antibody >80%), female recipients (45.9% vs. 37.6%), African American recipients (18.2% vs. 13%), and those on public insurance (49.7% vs. 41.8%) compared with other United States LD recipients [3]. Even after transplanting patients with greater risk factors for worse post-transplant outcomes, nationalized paired donation results in equivalent outcomes when compared with control LD kidney transplantation [4]. NKR is an excellent example of a successful KPD program with outstanding result and rapid growth and presents an acceptable solution for European KEPs.

The first European LD kidney exchange was performed in 1999 at Basel, Switzerland, albeit the Swiss KEP program started after a 15 years intermission [5]. The first nationwide KEP was started in 2004 in the Netherlands, which resulted in 284 renal transplants during the first 12 years. The program was pioneering to accept altruistic donation, and exchange was limited up to four pairs [6]. The UK Living Kidney Sharing Schemes has been operational since 2007 and allowing altruistic donation with limitation to three way exchange it has become the largest KEP in Europe incorporating 250 donor–recipient pairs per periodic match run, where incompatible pairs were included [7]. Opened in 2009, the second largest national KEP currently is the Spanish national program with 25 participating centers and 110 donor–recipient pairs at each match run [6]. It is less problematic to reach the

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sufficient number of pairs for an efficacious optimization and match run in big countries; however, for smaller ones, an international collaboration may give the opportunity to build up the necessary pool of pairs.

The recent article of the *Journal* presented perfect example how small KPD/KEP programs, the originally separated Czech and Austrian kidney paired donation programs, have been merged to increase pool sizes [8]. The first step of their collaboration was a cross-border trans-national exchange in 2016 between Institute for Clinical and Experimental Medicine, Prague and Medical University of Vienna, followed by the merge of their pools for common match runs [9]. The current article of the *Journal* presents the result of 81 KPD transplants performed in this program [8]. Almost 25% of these transplantations have been performed pre-emptively. There were only two deaths and three graft losses, the latter including two cases of early antibody-mediated rejection and one graft loss because of an early vascular complication. Overall 1- and 3-year graft survival was 96% and 95%, and median serum creatinine was 1.35 and 1.30 mg/dl, respectively. Nine patients were diagnosed with ABMR (four after desensitization for preformed DSA) and 15 patients with T cell-mediated rejection and nine with ABMR [8].

The success of this merging may encourage expansion of the current program or may even encourage the further merging of the existing KPD/KEP in Europe. The European Network for Collaboration on Kidney Exchange Programs (ENCKEP) supported by Cooperation on Science and Technology Action under the framework of EU Horizon project started in 2016 to help the exchange of knowledge and best practice sharing of KEPs among the participating 27 countries. The first ENCKEP activity assessment questionnaire has explored 8 small size national KEPs in Belgium, France, Portugal, Sweden, Slovakia, Poland, and Italy in Europe beyond the above presented programs and one center specific successful program in Romania [6,10]. While large countries such as France and Italy might be successful with separated KEP, for small countries it does not seem to be worth launching a *de novo* KEP, since the national donor–recipient pool would be too small. For small countries, joining an existing KEP within a geographically close region would give several advantages: Application of an already operational KEP system could spare the learning curve; it would give a chance to increase the common donor-pool bi- or multi-directionally; furthermore, the transportation of kidneys would not excessively increase cold ischemia time.

In the Central and Eastern Europe (CEE) region, majority of the national transplant activity is usually performed at a single center located in the capital city, which may discourage the participation of smaller transplant centers in a national KEP. For example in Hungary, there are four transplant centers performing yearly about 300–330 deceased donor (DD) and 35–45 LD renal transplantations [11]. The largest center, located at Semmelweis University in Budapest, is providing 55% of DD and 70% of LD of the national activity, while the remaining activity is distributed equally among the medical schools in Debrecen, Pecs, and Szeged, which would forecast their under-representation to achieve a successful optimization match run. We believe instead of building national KEPs by merging large with small center pools together, it is worth thinking about the construction of regional international networks by linking similar size programs/pools. This way comparable sized centers (either some large ones or several medium/small sized ones) could take part with equal chance in the match runs. We strongly believe that the development of such an international cooperation may give the opportunity for further achievements in LD kidney transplantation to many centers located within a short distance in CEE. European Network for Collaboration on Kidney Exchange Programs may provide an appropriate framework to support these projects.

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Conflicts of interest

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