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Original Research Article

Factors influencing renal graft survival: 7-Year experience of a single center

Rūta Auglienė [a,*], Eglė Dalinkevičienė [a], Vytautas Kuzminskis [a], Mindaugas Jievaltas [b], Laima Peleckaitė [c], Agnė Gryguc [a], Edgaras Stankevičius [d], Inga Arūnė Bumblytė [a]

[a] Department of Nephrology, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania
[b] Department of Urology, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania
[c] Department of Nephrology, Republican Hospital of Panevėžys, Panevėžys, Lithuania
[d] Institute of Physiology and Pharmacology, Faculty of Medicine, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania

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ABSTRACT

Background and objective: The demand for kidney transplants exceeds the existing supply. This leads to a recently growing interest of research in the area of factors that could prolong graft long-term outcomes and survival. In Lithuania, approximately 90% of kidney transplantations are from deceased donors. Donor organs are received and shared only inside the country territory in Lithuania; therefore, donor data is accurate and precise. This study was performed to present particularities of kidney transplantation data in Lithuania and to identify the effect of donor and recipient factors and histologic findings on renal graft outcomes. The aim of this study was to identify the effect of donor and recipient factors and histologic findings on renal graft outcomes.

Materials and methods: We analyzed the influence of deceased donor and recipient factors and histological findings on the graft function in 186 renal transplant patients. Graft survival was estimated within the first year after transplantation.

Results: The donors and recipients were older in worse eGFR group 1 year after transplantation. Dissimilarity of degree of glomerulosclerosis (GS), interstitial fibrosis (IF) and arteriolar hyalinosis (AH) were significant in inferior and superior renal function groups (GS >20% 11.4 vs. 0%, $P = 0.017$; IF 9.3 vs. 0%, $P = 0.034$; AH 69 vs. 26.2%, $P < 0.001$). Nine independent variables were significantly associated with a worse renal transplant function 1 year posttransplantation: AH (OR = 6.287, $P < 0.001$), an episode of urinary tract infection (OR = 2.769, $P = 0.020$), acute graft rejection (OR = 3.605, $P = 0.037$), expanded criteria (OR = 4.987, $P = 0.001$), female gender donors (OR = 3.00, $P = 0.014$), cerebrovascular disease caused donor brain death (OR = 5.00, $P = 0.001$), donor's age (OR = 1.07, $P < 0.001$), and recipient's age (OR = 1.047, $P = 0.022$). Worse renal graft survival 1 year posttransplantation was associated with a delayed graft function and a higher level of glomerulosclerosis in time-zero biopsy.

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* *Corresponding author at*: Department of Nephrology, Medical Academy, Lithuanian University of Health Sciences, Eivenių 2, 50161 Kaunas, Lithuania.
E-mail address: ruta.auglienе@lsmuni.lt (R. Auglienė).

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Conclusions: Donor factors, such as age, female gender, brain death of cerebrovascular cause and expanded criteria donor status had a significant negative impact on the renal graft function 1 year after transplantation. Recipients' age, urinary tract infection and acute graft rejection episodes after transplantation were associated with a worse kidney function 1 year after transplantation. Lower 1-year graft survival was related to a delayed graft function (DGF) and a higher degree of glomerulosclerosis.

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1. Introduction

The number of patients with end-stage renal disease (ESRD) and receiving renal replacement therapy (RRT) is growing rapidly. According to the ERA-EDTA Registry, there were 1019.8 patients per million population on RRT and 459.3 per million population (45%) after kidney transplantation in 2013 [1]. An efficient kidney transplant improves the quality of life [2], corrects metabolic consequences of chronic kidney disease (CKD) [2] and reduces the mortality risk for most patients when compared with maintenance dialysis [3,4]. It also saves treatment costs and helps to maintain social needs, whereas about 60%–70% of kidney transplant recipients successfully return to work [5]. Interest in the research of factors that could prolong graft long-term outcomes and survival is increasing worldwide. This leads to accepting older and expanded criteria donor (ECD) kidneys, individualizing immunosuppression, using molecular therapy, and searching for mechanisms of immunotolerance.

There is a lack of published data about RRT and kidney transplantation outcomes in the Baltic States: Lithuania, Latvia, and Estonia. The Baltic States are heterogenic in prevalent rates (the number of patients per million population that were receiving RRT) of RRT (719.0, 600.3, and 572.1 per million population, respectively) and number of kidney transplantations (227.8, 324.8, and 346.0 per million population, respectively) [1]. Lithuania was the first Baltic state to declare independence from the Soviet Union on 11 March 1990 and since then has made a huge progress in nephrology. A broad network of dialysis units ensures dialysis accessibility for a large ESRD patient population. Since 1996, the amount of patients with ESRD has increased 7 times, and now 491.2 patients per million population ($n = 1460$) are receiving dialysis therapy in Lithuania [1,6]. At present, the kidney transplant waiting list is approximately 175 patients, while the number of cadaveric kidneys transplanted annually remains almost stable at approximately 70. In 2013, 28 kidney transplantations per million population ($n = 77$) were performed in Lithuania. Although approximately 90% of renal transplantations are from deceased brain death (DBD) donors, the number of patients living with transplanted kidney is also growing: 11.4 kidney transplantations per million population ($n = 63$) were performed in Lithuania in 2000 [6], and there were 28 kidney transplantations per million population ($n = 77$) in 2013 [1].

We are also expanding the donor pool and improving graft long-term outcomes in Lithuanian population by using marginal donors, performing time-zero and protocol kidney biopsies, which were started in 2007. Donor organs are received and shared only inside the country territory in Lithuania; therefore, we performed this study to present particularities of kidney transplantation data in Lithuania and to identify the effect of donor and recipient factors and histologic findings on renal graft outcomes. Our goal was to compare donor and recipient characteristics and to ascertain factors related to kidney function 1 year posttransplantation and graft survival.

2. Materials and methods

The Renal Transplantation Center of the Hospital of the Lithuanian University of Health Sciences is particular, because all deceased donors whose kidneys are transplanted are prepared in this hospital; therefore, donor data is adequate and precise. Between January 2007 and December 2013, 197 cadaveric-renal transplantations were performed in our transplantation center (Departments of Nephrology and Urology). Of these transplantations, 11 were excluded as they were from donors < 18 years of age or because of incomplete clinical information. The remaining 186 patients were included in this retrospective, observational study. Recipients with ≥1-year graft survival were selected ($n = 141$) from our cohort for further analysis.

Donor data included age, gender, donor cause of death, history of hypertension, serum creatinine level before procurement, cold ischemia time and donor type (expanded criteria or standard). Information on recipient's age, gender, duration of dialysis, HLA incompatibility, underlying kidney disease, body mass index, acute rejection, posttransplantation infectious complications and diabetes mellitus was involved in analysis. Each HLA mismatch was counted equally for immunologic risk determination (example, 3 from 6; 2 from 6, etc.). Daclizumab or basiliximab with mycophenolate mofetil and steroids were used as an induction immunosuppressive therapy; maintenance immunosuppression consisted of cyclosporine or tacrolimus plus mycophenolate mofetil and steroids in all recipients. The renal transplant function was assessed by the presence of a delayed graft function (DGF) (defined as a need for dialysis within the first week after kidney transplantation [7]) and the estimated glomerular filtration rate (eGFR) at 1 year after transplantation. The values of eGFR were calculated using CKD-EPI formula.

Time-zero biopsies were performed using a 16-G needle gun on the upper kidney pole after reperfusion. Glomerulosclerosis (GS), interstitial fibrosis (IF), tubular atrophy (TA),

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