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CARDIOVASCULAR RISK FACTORS IN CHILDREN AFTER KIDNEY TRANSPLANTATION

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Resume

In this study we have evaluated cardiovascular risk factors in 52 children after kidney transplantation using specific cardiovascular markers such as Pro-BNP, High sensitive CRP and Transferrin along with other data using noninvasive measurements and laboratory data. We have concluded that children who undergo kidney transplantation are at higher risk of cardiovascular events (CVE) in comparison to healthy children. Therefore regular screening of these patients can be helpful to prevent and manage CVE early.

Key words

Pro-BNP, High sensitive CRP, Transferrin, Cardiovascular events, Kidney transplant

Introduction

Kidney transplantation (Tx) is the gold standard treatment for many patients with end-stage renal disease (ESRD) that surpasses dialysis treatments both for the quality and quantity of life that it provides and for its cost effectiveness. The first successful organ transplantation is widely acknowledged to be a kidney transplant between identical twins performed in Boston on 23 Dec 1954, which heralded the start of a new era for patients with ESRD[1], in Belarus pediatrics kidney transplantation first happened in April 2009, with total 333(pediatrics and adults) kidney transplantations in 2015[2]. According the 2010 Global Burden of Disease study, chronic kidney disease was ranked 27th in the list of causes of total number of deaths worldwide in 1990, but rose to 18th in 2010[3]. The incidence of cardiovascular diseases (CVD) among renal transplant recipients was reported to be increased three to fourfold compare with control population [4]. In a retrospective cohort of 1021 renal transplant recipients, documented history of ischemic heart disease and heart failure (HF) were reported to be 10% and 11%, respectively, whereas history of both disorders was detected as 2%. After the first post-transplant year, the incidence of de novo major ischemic event was 1.2 events/100 patient-years, similar to the incidence observed in general population. On the other hand, the incidence of de novo HF was again 1.2 events/100 patient-years, the same as de novo ischemic heart disease in post-transplant patients but two- to threefold higher incidence observed in general population[4] .Renal transplant recipients (RTRs) in combination with cardiovascular events (CVE) accounts for 22% of all deaths.

Aim

The aim of our study is to evaluate early CV changes in children with end-stage chronic kidney disease after kidney Tx.

Materials and methods

Fifty two children who has undergone kidney Tx were recruited in the study which consists of twenty eihght boys and twenty four girls with age ranging from 6 to 22 with the median age of 14 years. Children are divided to three main subgroups according to the main

cause of ESRD; Glomerular, Congenital anomalies of the kidney and urinary tract (CAKUT), Tubulopathies and unknown diseases with 25, 21, 5 and 1 patients respectively.

We have considered median age at manifestation of the disease, duration of the disease before Tx, time on dialyses before Tx, blood pressure, creatinine, urea, uric acid, total cholesterol and lipids fractions, glucose levels, estimated glomerular filtration rate (eGFR), proBNP, high sensitive CRP, transferrin in the blood, body mass index (BMI).

CV organ damage was determined by non-invasive measurements (ultrasound): left ventricular mass index (LVMI), left ventricular hypertrophy (LVG) and carotid Intima media thickness (cIMT).

The concentration of proBNP, high sensitive CRP and transferrin was measured using ELISA commercial kits.

Results and discussion

Median age at manifestation of the disease was 5.5 yrs with duration of the disease before Tx ranging from 1 month till 17 yrs, time on dialyses before Tx from 1 month till 5 yrs 4 months and median age at Tx- 10 yrs.

According to the 24 hours blood pressure (BP) monitoring or profile of BP only 2 patients were without AG.

Creatinine level was 106.8 ± 6.03, Urea 6.95± 0.42, Glucose 5.08 ± 0.07, total cholesterol 3.9 ± 015, high density cholesterol 1.25 ± 0.07, Low density cholesterol 0.49 ± 0.05, triglycerides 1.01 ± 0.07 and Uric acid 337.1 ± 13.67. Body mass index (BMI) was 18.

Most of the RTRs have normal ejection fraction (above 59.6%) and IMT. LVMI was significantly higher in comparing with healthy children ($p<0.05$). There was a trend to increasing cIMT in children after Tx (0,45 (0,3-0,8 mm) in comparison with healthy(0,38 (0,3-0,5).

Markers of CV changers:

ProBNP is a natriuretic neurohormone released mainly from ventricular cardiomyocytes in conditions of volumetric or pressure overload. It is suitable for use as a marker of left ventricular hypertrophy (LVH), a common disorder in renal transplant recipients. ProBNP serum concentration assessment strongly predicted first onset heart failure and augmented coronary heart disease and stroke prediction, suggesting that ProBNP concentration assessment could serve as a multipurpose biomarker in new approaches that integrate heart failure into cardiovascular disease primary prevention. After RT, the NT-proBNP level decreased [5].

High sensitive CRP (hs-CRP) is associated with increased risk for cardiovascular disease. In terms of clinical application, CRP seems to be a stronger predictor of cardiovascular events than LDL cholesterol [5].

Transferrin both low and high transferrin saturation ratios are significantly and independently associated with increased total and cardiovascular mortality [6].

Table 1.Data for Renal transplant recipients

Characteristics	**Glomerular Tx**	**Non-glomerular Tx**	**Statistical significance, p<0,05**
Systolic AG	19/25	17/26	ns
Diastolic AG	15/25	16/26	ns

Night AG	18/25	18/26	ns
Creatinine	99,23 ± 7.73	108,1 ± 7.55	P=0,3
Urea	6,34±0,5	7,1±0,5	P=0,3
Uric acid	317.6 ± 13.78	330.1 ± 17.98	P=0,5
Total cholesterol	4,23±0,24	3,84±0,15	P=0,3
Atherogenecity index	2,62±0,29	2,1±0,14	P=0,007
Glucose level	4,95±0,9	5,19±0,1	P=0,1
eGFR	63,5±3,6	59,7±3,07	P=0,4
ProBNP	177,7±23,4	150,6±35,07	p=0,02
High sensitive CRP	2505±100,5	2718±28,8	P=0,04
Transferrin	15,75±1,05	17,45±0,9	P=0,2
BMI	17,7±0,59	20,8±0,66	P=0,2

Conclusions

Arterial hypertension, Left ventricular dilatation and hypertrophy, cIMT are more common in children with kidney Tx than in healthy children.

Systolic, diastolic and night hypertension with similar frequency were seen in glomerular and non-glomerular RTR.

Total cholesterol, Atherogenecity index and proBNP were sinificantly higher in glomerular versus non-glomerular, but hsCRP in non-glomerular versus glomerular RTR.

Association between LVD, LVH and pro-BNP level was revealed.

Appropriate routine cardiovascular screening and evaluation are needed to reduce late onset CVE incidence.The mortality from CVD in patients with end-stage renal disease (ESRD) is 10-30 times higher when compared with general population [7]. Therefore, renal transplantation is the treatment of choice for many patients in this group [7].

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