

A PILOT STUDY

Lipoprotein particle sizes in patients undergoing kidney transplantation

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ABSTRACT

Asymptomatic atherosclerotic disease is prevalent in the middle-aged group of kidney transplant recipients. In order to improve the estimation of their cardiovascular risk, dyslipidaemia pattern is very important to be evaluated. Knowledge of the lipid particle spectrum in patients undergoing kidney transplantation could help the clinicians to timely start intervention and prevention of atherosclerosis with an early hypolipidemic statin treatment (Tab. 2, Ref. 20). Text in PDF www.elis.sk.

KEY WORDS: kidney transplantation, dyslipidaemia, atherosclerosis.

Introduction

Middle-aged patients exhibit a high prevalence of asymptomatic atherosclerosis (1, 2). This is the case also for the group of patients waiting for kidney transplantation because of their chronic kidney disease (3). Patients after kidney transplantation often suffer from dyslipidaemia due to the side-effects of medication, weight gain or diet (4, 5). There is large amount of data about lipid changes after renal transplantation, but not at the time of the procedure (6). In order to know the lipoprotein particle sizes in the serum of these patients prior the procedure, we performed a pilot study evaluating the complete lipid spectrum and measuring the sizes of lipid particles.

Patients and methods

In four patients, two men and two women with the end-stage kidney disease (non-smokers, no alcohol addicts), lipoprotein sizes were evaluated with Lipoprint Quantimetric System (7) before kidney transplant surgery. All of them were untreated with hypolipidemic therapy. Results were compared to the matching group of healthy subjects. Characteristics of the studied sample are shown in Table 1.

Statistical analysis

The data were provided as the means \pm standard deviation. The differences between quantitative variables were compared using the t-test for variables with normal distribution. Differences with p values less than 0.05 were considered as statistically significant. For the statistical analysis, the GraphPad Prism version 5.03 for Windows was used.

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Ethics

The study was approved by the ethical committee, all patients signed the informed consent, and complied with the ethical investigation principles outlined in the Declaration of Helsinki.

Results

Before kidney transplantation, patients with end-stage kidney disease had a significantly different lipoprotein spectrum than the control subjects. They did not differ in the low-density cholesterol (LDL-C) particle sizes, but had a significantly lower high-density cholesterol (HDL-C). They revealed also another lipid pattern with a significantly higher spectrum of very low -density lipoproteins (VLDL) and large and middle size intermediate (IDL) lipoprotein levels. Small IDL particles did not differ from the controls of the same age. The obtained results are shown in Table 2. There were no significant correlations of lipid parameters with other measured parameters of kidney function.

Thus, the measurement of the whole lipid spectrum even before kidney transplantation may be a part of useful laboratory evaluations for the future prognosis.

Discussion

Epidemiologic studies clearly showed that dyslipidaemia represents one of the major risk factors for atherosclerosis and its complications for atherothrombosis (8, 9). Unsatisfactory preventive measures contribute to a very high residual cardiovascular risk (10).

Pathogenesis of the post-transplant atherosclerotic cardiovascular disease most likely involves common risk factors (11). Although dyslipidaemia and cardiovascular diseases are common complications of kidney transplantation, the casual association of dyslipidaemias with cardiovascular risk has not been proven in these groups of patients (12).

Tab. 1. Characteristics of the sample.

n = 4 (2 males, 2 women)
age: 42.5±5.6 years controls: 40.0±4.0 years
BMI: 26.1±3.75 controls: 22.2±2.0
waist circumference: 97.5±8.5 cm controls: 91.4±3.1 cm
blood pressure: BPs: 148.5±11.5 / Bpd: 90.5±5.5 mmHg
controls: BPs: 133.5±5.5/ Bpd: 75.0±8.5 mmHg
BMI – body mass index (kg/m ²), BPs – systolic blood pressure (mmHg), Bpd – diastolic blood pressure (mmHg). Values are displayed as the mean±SD

Tab. 2. Lipid particle sizes among patients undergoing kidney transplantation.

	CKD (n=5) g/dl	Controls (n=5)	p	significance
VLDL	31.35±10.11	22.26±6.109	< 0.05	*
large IDL	22.22 ±6.488	19.11±6.148	< 0.05	*
middle IDL	13.66±4.968	8.840±3.440	< 0.001	**
small IDL	20.22±8.446	19.68±10.88	> 0.05	ns
LDL	116.8±32.22	108.8±64.22	> 0.05	ns
LDL 1	45.42±16.66	39.88±14.24	> 0.05	ns
LDL 2	19.60±13.66	18.06±18.86	> 0.05	ns
LDL 3	1.424±3.333	0.850±1.152	> 0.05	ns
HDL	56.00±11.11	57.84±12.31	< 0.05	*

CKD – chronic kidney disease, VLDL – very low-density lipoproteins, IDL – intermediate density lipoproteins, LDL – low density lipoproteins, HDL – high density lipoproteins, ns – non-significant statistical significance: * p < 0.05, ** p < 0.001

Kidney transplantation is the treatment of choice for most patients with the end-stage kidney disease. Successful transplantation improves their quality of life and reduces their mortality. Patients with end-stage kidney disease suffer from significant comorbidities (12). Cardiovascular disease is the leading cause of morbidity and mortality in the patients after renal transplantation (13). Death from a cardiovascular disease is also the most common cause of the loss of the graft (14). Potential kidney transplant recipients have to be evaluated in order to decrease their subsequent perioperative and postoperative risks and improve their later prognosis (15).

The high rate of cardiovascular deaths in this group of patients is partly due to the large proportion of diabetic comorbidity in the population with the end-stage kidney disease and markedly increased cardiovascular risk (16).

An interesting finding was the detected increased presence of VLDL and large and middle size IDL particles. They are also carrying their certain atherogenic risk potential (17). Together with the low levels of protective HDL-cholesterol levels, with their dysfunctional capabilities, they participate in the increased global atherogenic risk.

Metabolism of lipoproteins might be disturbed by uraemia. After kidney transplantation, the metabolism of lipoproteins is affected also by immunosuppression, hypotensives and other drugs, which may further deepen the changes described.

For the laboratory evidence of lipoprotein metabolism disorders, a clinical equivalent may be found. From the clinical point of view, ischemia in generalized atherosclerosis, which is a significant cardiovascular risk in recipients of transplanted kidneys, can also adversely affect other organ systems in the recipient and the transplanted kidney itself. Ischemia resulting from atheroscle-

rotic changes in the blood vessels after kidney transplantation may, in combination with a rejection response to the transplanted kidney, lead to a serious disorder of the function of the transplanted kidney with a possible loss of this organ. These effects could be pronounced even more after a heart transplantation. Another example of the negative influence of ischemia caused by generalized atherosclerosis are functional and organic changes of the organs of the small pelvis. Reconstruction of the lower urinary tract and its adequate function is a condition and a part of successful kidney transplantation.

Normal function of the lower urinary tract contributes significantly to the success of the kidney transplantation. On the other hand, dysfunction of the lower urinary tract, caused by ischemia can lead to the pain or even loss of the transplanted kidney.

Conclusions

Patients awaiting kidney transplantation bear a higher risk of premature atherosclerosis than the control patients also due to dyslipidaemia (18). Its characteristics differ from the dyslipidemic profile seen in the patients after kidney transplantation.

There was a small increase of atherogenic LDL-cholesterol, however, other atherogenic lipid particles such as VLDL and IDL lipids were present in significantly higher concentrations. As they also carry a certain atherogenic potential, hypolipidemic treatment predominantly with statin is indicated even before transplantation (19). Concomitant constant findings showed also lower HDL-cholesterol levels indicating the usefulness of an early hypolipidemic treatment (20).

All of the aspects and consequences of hyperlipidaemia mentioned above should be the incentive for a complete laboratory and clinical examination focused on the possible disorders of lipoprotein metabolism in patients waiting for kidney transplantation as well as in those after transplantation. The proof of changes in lipoprotein metabolism should be an indication for beginning a prophylactic treatment with hypolipidemics.

These preliminary data need to be confirmed in a larger number of patients, however, it seems to be important to include also laboratory measurements of the lipid particle sizes before kidney transplantation. This evaluation is efficient and cost effective. Early starting of hypolipidemic treatment strategies is mandatory in order to decrease their high atherogenic risk, possibly not in the statin monotherapy, but with combinations of hypolipidemics. The prevalence and ability to modify dyslipidaemias is an important intervention for improving the outcomes after kidney transplantation.

Limitations of the study: This is a pilot study with several monitored patients. These preliminary results have to be proven in the larger patient groups.

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