

T- AND B-LYMPHOCYTES IN PATIENTS WITH CHRONIC RENAL FAILURE AND RECIPIENTS OF AN ALLOGRAFTED CADAVERIC KIDNEY IN THE PERIOD IMMEDIATELY AFTER TRANSPLANTATION

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Investigations of the thymus-dependent and thymus-independent lymphocyte populations in patients with chronic renal failure showed that mainly the system of T-lymphocytes is depressed in these patients. Both populations of lymphocytes participate in the rejection reaction, but to different extents. In inflammatory conditions, suppurative liquefaction of the tissues, furunculosis, hematoma, and so on, the T-lymphocytes are activated only slightly but the B-lymphocytes considerably in response to stable doses of immunodepressants. The proof of the participation of both lymphocyte populations in the rejection reaction provides fresh approaches to the diagnosis of various pathological states in the recipients.

KEY WORDS: T- and B-lymphocytes; chronic renal failure; kidney transplantation; rejection reaction.

Although considerable progress has been achieved in the field of kidney transplantation, the frequency of cases of irreversible rejection reaction (28%) still remains high [1]. This is in agreement with results obtained by other workers [3], who consider that the rejection reaction is the most frequent (48%) cause of failure of kidney transplantation.

The similarity between many of the symptoms of the rejection reaction due to transplantation immunity and complications resulting from immunodepressive therapy makes their differential diagnosis difficult, for it has to be based on different functions of the thymus-dependent and thymus-independent populations of lymphocytes. A new approach to the diagnosis and new actual methods of diagnosis of reactions due to transplantation immunity and to the microbial factor are thus particularly interesting at the present time.

The first studies of functional activity of T- and B-lymphocytes in recipients were undertaken quite recently [5, 6].

The object of this investigation was to study the diagnostic possibilities of immunologic reactions used to assess cellular immunity in diseases and after transplantation of the kidneys.

EXPERIMENTAL METHOD

Observations were made on 150 patients (aged 17-32 years) with a terminal stage of chronic renal failure (CRF) due to chronic pyelonephritis, chronic glomerulonephritis, and other diseases of the kidneys (polycystic kidney, urolithiasis).

To study the state of the thymus-dependent and thymus-independent lymphocyte populations the following methods were used: 1) the blast-transformation test (BTT) with phytohemagglutinin (PHA) and pokeweed mitogen (PWM) as mitogens, by a modified method of Moorhead et al. [4]; 2) the rosette-formation test by a modified method of Cruchaud and Frei [2] to investigate T- and B-lymphocytes (T- and B-RFC); determination of activated lymphocytes in peripheral blood by Smetana's method [7].

EXPERIMENTAL RESULTS

When indices of cellular immunity were studied in patients with CRF in a terminal stage, attention was

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TABLE 1. Indices of BTT, RFC, and Activated Lymphocytes (in %) in Patients of Different Nosologic Groups ($M \pm m$)

Nosologic group	Satisfactory period	BTT		RFC		Lymphocytes				Lymphocyturia
		PHA	Pokeweed	T	B	activated	transitional	unactivated		
								basophilia of cytoplasm		
								intense	not intense	
Chronic glomerulonephritis, CRF, terminal stage	90	43,0 \pm 5,9	24,3 \pm 6,3	20,5 \pm 11,3	22,5 \pm 3,8	1,8 \pm 0,9	4,3 \pm 2,1	25,0 \pm 6,3	69,0 \pm 2,4	2,0 \pm 0,8
Chronic pyelonephritis, CRF, terminal stage	35	41,6 \pm 3,2	20,4 \pm 1,8	26,9 \pm 11,1	23,3 \pm 7,0	1,0 \pm 0,7	2,0 \pm 0,5	24,0 \pm 6,5	73,0 \pm 6,0	Single cells
Other kidney diseases CRF, terminal stage	25	42,0 \pm 6,0	23,0 \pm 5,5	33,3 \pm 14,5	20,0 \pm 5,5	2,5 \pm 0,4	8,0 \pm 1,4	23,0 \pm 6,3	66,5 \pm 6,5	1,0 \pm 0,5
Healthy subjects	20	62,0 \pm 5,7	30 \pm 6,6	—		2,5 \pm 0,7	1,2 \pm 0,9	23,0 \pm 1,1	72,5 \pm 4,0	0

TABLE 2. Indices of Cellular Immunity (in %) in Recipients of Cadaveric Allografted Kidney ($M \pm m$)

Index	Before operation (n = 33)	Satisfactory period (n = 28)	Subacute rejection reaction (n = 2)	Acute rejection reaction (n = 23)	Inflammatory changes, suppurative focus present
BTT to PHA	46,5 \pm 4,6	19,9 \pm 3,2	28,8 \pm 3,2	45,8 \pm 4,8	23,9 \pm 4,1
BTT to PWM	26,0 \pm 4,1	13,9 \pm 2,7	19,3 \pm 1,6	28,6 \pm 5,8	27,7 \pm 2,7
Activated lymphocytes	2,0 \pm 0,5	1,6 \pm 0,4	4,0 \pm 0,4	7,2 \pm 4,3	4,0 \pm 1,2
T-RFC	26,9 \pm 8,0	13,9 \pm 2,9	27,0 \pm 2,9	40,0 \pm 4,8	20,1 \pm 6,0
B-RFC	24,1 \pm 1,2	10,3 \pm 2,4	16,0 \pm 1,8	21,0 \pm 3,6	22,6 \pm 7,5

Note. n) Number of recipients.

concentrated on the number of lymphocytes in the peripheral blood, the number of hemodialyses performed, the patient's age, the duration of the illness (under or over 5 years), and the blood urea. The investigations showed that the number and functional activity of the lymphocytes were lower in the patients than in healthy subjects (Table 1).

The reactivity of the T- and B-lymphocytes in the recipients of a cadaveric kidney was studied in 33 patients in the course of the post-transplantation period. In the immediate period, lasting 3 months, 41 acute rejection reactions were diagnosed and were characterized by a sharp decline in function of the transplanted kidney.

It was concluded from an analysis of the reactivity of the T- and B-lymphocytes of the recipients of the allografted cadaveric kidney that an acute rejection reaction during the first 2 weeks cannot be diagnosed by tests of reactivity of T-lymphocytes, for in 81.3% of cases their functional activity did not correspond to a rejection reaction, whereas the functional activity of the B-lymphocytes in 50% of cases preceded, and in 50% coincided with the rejection reaction. The difference in the behavior of the T- and B-lymphocytes was due in all probability to the nature of the rejection reaction, for in the later period (starting with 5 weeks) the diagnostic value of tests of reactivity of the T-lymphocytes increased whereas that based on reactivity of B-lymphocytes decreased (Tables 2 and 3). It was concluded from the results of these investigations that both lymphocyte populations participate in the rejection reaction, but to different degrees.

Investigation of T- and B-lymphocytes is valuable, for they respond differently in different situations. In inflammatory conditions, abscess formation, furunculosis, hematoma, etc., a small increase was observed

TABLE 3. Blast-Transformation Activity of Lymphocytes in Acute Rejection Reactions

Index	Time after allografting, weeks										
	1			2		3-4			5-12		
No. of acute rejection reactions	16			2		11			12		
BTT											
PHA	+1	+2	-13	+1	-1	+3	+6	-2	+9	+2*	-1*
%	6,2	12,5	81,3	50	50	27,3	54,3	18,1	75	16,6	8,4
PWM	+8	+8		+1	-1	+3	+3	-5	+7†	+3	-2
%	50	50		50	50	27,3	27,3	45,4	58,5	25	16,5

Note. +) number of rejection reactions during which BTT preceded their clinical manifestations; +-) in which BTT coincided, and -) did not correspond with clinical manifestations. *) Rejection reactions developed against the background of sepsis; †) three of the rejection reactions developed against the background of sepsis.

in the activity of the T-lymphocytes and considerable activation of B-lymphocytes in response to stable doses of immunodepressants (Table 2).

Proof of the participation of both lymphocyte populations in the rejection reaction offers fresh approaches to the diagnosis of various pathological states in the recipient.

It was concluded from a comparison of cellular methods of investigation with other methods that the former must be used in clinical practice for the investigation of recipients of cadaveric allografted kidneys.

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