EFFECT OF INTRAVASCULAR LASER IRRADIATION OF BLOOD ON GROWTH AND METASTASIZATION OF LYMPHOSARCOMA IN RATS

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KEY WORDS: helium-neon laser; tumor; metastases.

Laser radiation of nontraumatic intensity is widely used in medicine to stimulate repair processes and to activate immunity. Particularly strong beneficial effects have been observed after intravascular laser irradiation of blood. This method has been successfully used in the treatment of septic endocarditis, destructive pancreatitis, and acute cholecystitis [1, 2, 5]. Considering data now available on the antitumor properties of regenerating tissues, and also on the close interconnection between nonspecific immune defense and antitumor resistance, the possibility of strengthening antitumor resistance of the body by intravascular irradiation of blood with low-energy lasers can be postulated.

The aim of this investigation was an experimental study of the effect of intravascular laser irradiation of blood on growth and metastasization of a Pliss lymphosarcoma in rats.

EXPERIMENTAL METHOD

Two series of experiments were carried out on 46 Wistar rats with a Pliss lymphosarcoma transplanted subcutaneously into the trunk. The tumor was transplanted as a 20% suspension in a dose of 0.2 ml subcutaneously. In series I, on the 15th day (once), and in series II on the 15th and 16th days (twice) after transplantation, when the volume of the tumor had reached 20-30 cm^3, laser irradiation of the blood was carried out by introduction of a light guide 200 μ in diameter into the caudal vein. Radiation from a laser on copper vapor and a helium-neon laser (λ = 510 nm and λ = 633 nm respectively) was used. The output power at the end of the light guide of both lasers was 4 mW and the exposure 4 min. In the experiments of series II, the light guide was introduced into one of the control groups of animals, but without irradiation. Since the results of both control series of experiments were identical, they were pooled for presentation in Table 1. The animals were killed with ether on the 25th day after transplantation and a rate of growth of the tumor was estimated (by weight and volume of the tumor nodule) and the development of metastases (the number of animals with metastases and the weight of the metastases) were analyzed. The experimental data were subjected to statistical analysis by nonparametric tests [3].

TABLE 1. Effect of Intravascular Irradiation of Blood by Low-Energy Lasers on Development of Pliss Lymphosarcoma in Rats

Series	Group	No. of animals	Weight of tumor, g	Inhibition of tumor growth, %	Frequency of metastasization, %	Weight of lymph nodes per animal mg
I	Control	7	36,6±11,4		71	346,7±57,1
	Laser (λ = 633 nm)	7	5,1±2,5	86	28	105,9±8,4
			p_v<0,01		p_f<0,01	p_v<0,01
II	Control	18	18,6±7,5		83	387,4±67, 4
	Laser (λ = 633 nm)	7	1,8±0,3	90	14	0
			p_v<0,01		p_f<0,01	p_v<0,01
	Laser (λ = 510 nm)	7	2,6±4,3	86	0	0
			p_v<0,01		p_f<0,01	p_v>0,01

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EXPERIMENTAL RESULTS

The experimental results given in Table 1 show that a marked antitumor and, in particular, antimetastatic action was observed after intravascular laser irradiation of the blood. Characteristically the antitumor effect of two irradiations of the blood was appreciably greater than that of a single irradiation.

The action of red (λ = 633 nm) and green (λ = 510 nm) laser radiations was approximately the same. To judge by the results, irradiation of the blood acted as a stimulus for rapid resorption of the tumor, which was reflected in a sharp reduction in its weight and disappearance of metastases. Metastases of Pliss lymphosarcoma, as we know, begin to appear on the 6th-8th day after transplantation of the tumor, and for that reason, since irradiation began so late, existing metastases were undergoing resorption.

The study of blood films from the irradiated animals showed an increase in the absolute number of lymphocytes on the 16th and 22nd days after tumor transplantation.

According to data in the literature, during intravascular laser irradiation of the blood, cellular immunity is stimulated [4, 5]. The immunostimulating properties of laser irradiation of the blood evidently explain the antitumor effects obtained in these experiments.

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CONDITIONS OF FORMATION OF ANTITUMOR CYTOTOXIC T LYMPHOCYTES AND INHIBITION OF THEIR ACTIVITY BY SUPPRESSOR T CELLS IN MIXED HUMAN LYMPHOCYTE AND TUMOR CELL CULTURE

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KEY WORDS: T lymphocytes; tumor cells; suppressor cells.

A mixed culture of lymphocytes and tumor cells (MCLTC) is an experimental model used to study antitumor immunity. In MCLTC cytotoxic T lymphocytes (CTL) are formed against human and mouse tumor cells [2, 6, 7, 12, 13]. As a rule CTL activity is depressed in cancer patients and animals with tumors, as a result of the action of suppressors of macrophagal and T-cell nature [4, 5, 9, 11, 14].

The aim of this investigation was to study the conditions of formation of antitumor CTL in MCLTC and depression of their activity by suppressor T cells, using fractions of peripheral blood lymphocytes, isolated in a Percoll gradient, for culture.

EXPERIMENTAL METHOD

Mononuclear cells were isolated [3] from the blood of patients with colorectal carcinoma (CRC). The isolated cells were incubated for 45 min at 37°C on plastic Petri dishes to remove

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