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EXPERIMENTAL METHODS FOR CLINICAL PRACTICE

Lipid Peroxidation in Plasma of Patients with Osteogenic Sarcoma

S. A. Chukaev, Yu. A. Korovkina, and M. D. Aliev

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The intensity of free-radical oxidation reactions assessed by the thiobarbituric acid test and by recording the "fast flash" of Fe^{2+}-induced chemiluminescence is higher in patients with osteogenic sarcoma than in normal subjects. This effect is not sex-dependent and does not depend on previous therapy with drugs triggering free-radical reactions.

Key Words: *lipid peroxidation; osteogenic sarcoma; blood*

Tumors belong to free-radical abnormalities because their development involves changes in the level of lipid peroxidation (LPO) [3] and appropriate restructuring of endogenous systems regulating free-radical oxidation [2].

The intensity and direction of free-radical processes in osteogenic sarcomas are little studied. The reports about the time course of LPO changes in other tumors are contradictory [8].

We studied the intensity of LPO in blood plasma of patients with osteogenic sarcoma and compared it with LPO in normal subjects.

MATERIALS AND METHODS

LPO was assessed in venous blood of 16 patients with osteogenic sarcoma, men and women aged 16-34 years. The control group consisted of 12 age-matched volunteers of both sexes.

Plasma LPO level was measured by spectrophotometry: by the content of products reacting with thiobarbituric acid (TBA) [5] and by the chemiluminescence method — by recording the "fast flash" of Fe^{2+}-induced chemiluminescence (CL) [4]. Plasma for analysis was prepared by centrifugation of venous blood at 900*g* for 15 min.

The results were processed by standard methods of statistical analysis. The significance of differences was evaluated using the nonparametrical Wilcoxon—Mann—Whitney's *U* test.

RESULTS

Determination of the content of TBA-reactive products has been widely used for evaluation of LPO; its sensitivity and specificity are not high, and therefore, it is not recommended as the sole test for assessing the intensity of free-radical oxidation in biological specimens [1]. We used an original method for recording the fast flash of Fe^{2+}-induced CL in biological specimens containing trace amounts of blood plasma.

Our results indicate that blood plasma of patients with osteogenic sarcoma contains higher concentrations of TBA-reactive products (by 70.3%) in comparison with normal subjects (Table 1). Mathematical analysis permits us to regard this reaction as statistically significant, despite wide variation of individual malonic dialdehyde concentrations (C_{MDA}): 0.54-4.85 in the controls and 3.10-5.25 nmol MDA/ml plasma in the patients.

The results of CL analysis indicate that the plasma of patients with osteogenic sarcoma is characterized

Russian State Medical University; Oncology Research Center, Russian Academy of Medical Sciences, Moscow

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TABLE 1. LPO Level in the Plasma of Normal Subjects and Patients with Osteogenic Sarcoma

Parameter	Normal controls (n=12)	Patients with osteogenic sarcoma (n=7)
Amplitude of CL fast flash, arb. units	1.16±0.03	1.29±0.05
men	1.16±0.03	1.34±0.06
women	1.16±0.05	1.25±0.05
Concentration of TBA-active products, nmol MDA/ml plasma	2.69±0.46	4.58±0.33
men	2.96±0.56	4.38±0.46
women	2.48±0.74	4.34±0.63

Note. The values are statistically significant (p<0.05) in comparison with the control.

TABLE 2. LPO Level in the Plasma of Primary Patients with Osteogenic Sarcoma and Patients after a Course of Chemotherapy

Parameter	Untreated patients (n=7)	Treated patients (n=9)
Amplitude of CL fast flash, arb. units	1.29±0.05	1.30±0.05
Concentration of TBA-active products, nmol MDA/ml plasma	4.58±0.33	4.35±0.40

by a higher intensity of the fast flash of Fe^{2+}-induced CL than normal plasma (Table 1). The amplitude of fast flash varied in the patients from 1.13 to 1.49 arb. units, which is 13.2% higher than the mean level in the controls (1.08-1.29 arb. units).

The direction of changes in the amplitude of fast flash and the C_{MDA} in the patients compared with controls virtually is not depend on sex (Table 1). There was a tendency toward a greater increase in the amplitude of fast flash of Fe^{2+}-induced CL in plasma of male patients.

Some drugs used in the therapy of osteogenic sarcoma (adriamycin, cisplatin, etc.) can initiate the free-radical oxidation reactions [6,7]. Our special task was to compare the LPO level in the plasma of primary patients and patients treated with classical antitumor drugs, generally, 3-12 months before hospitalization. The fast flash amplitude and C_{MDA} level in these patients were virtually the same (Table 2), suggesting that drug therapy does not lead to stable alteration of LPO level. This fact indicates adequate defense reactions of the blood plasma antioxidant systems.

It was reported that LPO intensity can increase and drop during different stages of the process in normal and tumor tissues [2,8]. Intensification of free-radical processes is the only tendency in osteogenic sarcoma. Presumably, the decrease in plasma LPO level does not correspond to the studied stage of primary bone tumor.

The time course of free-radical oxidation directly in the tumorous osseous tissue is still unknown.

Thus, LPO processes are intensified in the plasma of patients with osteogenic sarcoma, which should be borne in mind when assessing the total-systems reaction to tumor growth and choosing the optimal approaches to the treatment of this nosological entity.

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