ONCOLOGY

Conformation Changes in Albumin Molecule as a Marker of Dissemination of the Tumor Process

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 138, No. 8, pp. 202-203, August, 2004
Original article submitted December 22, 2003

In 20 patients with stomach cancer the total and effective concentrations of blood albumin were measured using a fluorescent probe and albumin binding reserve was calculated. These parameters in two groups of patients (with local and disseminated process) differed significantly. Evaluation of the effective concentration and albumin binding reserve in cancer patients gives additional valuable information about patient's status. The effective concentration of albumin below 30 g/liter and albumin binding reserve below 70% can be regarded as a prognostically unfavorable sign indicating more extensive dissemination of the tumor process.

Key Words: *stomach cancer; albumin*

The diagnosis of malignant processes is a very important problem of public health. The main instrument for detection and evaluation of the tumor dissemination are radiological, ultrasonic, and endoscopic methods of examination. Detailed information about the tumor is necessary before surgery for choosing treatment strategy. In case of stomach cancer actual dissemination of the tumor process can be evaluated only during the intervention, despite the use of modern methods of examination, such as ultrasonic scanning of abdominal organs, computer-aided and nuclear magnetic resonance tomography, fibrogastroscopy.

New data on changes in the conformation structure of albumin in cancer patients, detected by electron-paramagnetic resonance spectrometry of protein [6], and modern concepts on restructuring of the albumin molecule as an adaptive reaction of the body to pathological process [5] prompted us to investigate the effects of cancer process on albumin binding capacity.

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We studied parameters of albumin molecule in patients with stomach cancer in order to evaluate their significance for estimation of the dissemination of the malignant process.

MATERIALS AND METHODS

Twenty patients with stage $T_3N_xM_x$ stomach cancer were examined. Radical surgery was planned in all cases. Two hours before the intervention venous blood was collected in accordance with all aseptic and antiseptic regulations and total and effective albumin concentrations (TAC and EAC, respectively) were measured as described previously [2,3]. Albumin molecule binding reserve (ABR) was estimated using the formula:

$$ABR=EAC/TAC\times100\ (\%).$$

The patients were divided into 2 groups by the results of intervention: group 1 (n=14), radical surgery, and group 2 (n=6), palliative operation because of dissemination of cancer process. In group 2 the

0007-4888/04/1382-0177

TABLE 1. Preoperative Parameters in Patients with Stomach Cancer before Planned Radical Surgery (μ±s)

Group	EAC	TAC	ABR
Radical surgery (n=14)	43.1±8.7	54.0±9.6	79.5±6.7
Nonradical surgery (n=6)	29.4±6.6	42.2±14.0	69.8±7.5
p	0.005	0.043	0.011

surgery was finished by applying a bypass anastomosis in 3 patients, suturing of the wound in 2 patients, and cytoreductive resection in 1 case.

The results were processed using Statistica 6.0 software and Mann-Whitney nonparametrical test. The differences were considered significant at $p<0.05$.

RESULTS

In all patients TAC was within the normal and little varied. This parameter was significantly lower in patients with stomach cancer in whom the operations could not be performed in the planned volume because of tumor process dissemination. Decreased EAC values below the reference level were observed in some patients after radical interventions and in all patients with inoperable process. This parameter differed significantly in groups 1 and 2. The decrease in EAC reflects true decrease in functional activity of albumin and cannot be detected by other laboratory methods. However, considering numerous physiological functions of albumin, we suggest that detection of a decrease of EAC in cancer patients is more significant than measurement of total protein or TAC in the blood.

The two groups of stomach cancer patients differed also by ABR values. This parameter decreased to 70% in patients in whom radical surgery was impossible (Table 1). Some scientists consider [1] that ABR reflects changes in the conformation structure of the albumin molecule, which impairs protein transporting function. Conformational changes in albumin molecule are reversible and depend on physicochemical characteristics of the blood [1]. The decrease in ABR before the intervention can be due to psychoemotional stress [4,7]. Similar conditions of examinations in both groups, however, rule out the effects of the emotional component. Hence, the detected differences in ABR were caused by the degree of tumor process dissemination.

Small statistical sampling does not permit us to make the final conclusion about the prognostic significance of ABR. However, the findings demonstrate good prospects of this approach; studies on a wider sampling will help to clear out the true significance of conformation restructuring of albumin molecule in malignant process. The data of radiological methods of examination are sometimes insufficient for predicting the course of surgery. Sometimes the picture opening during the operation is unexpected for the surgeon. We consider that measurements of TAC and EAC in cancer patients can provide additional information about patient's status. The decrease in EAC below 30 g/liter and ABR below 70% should be taken into consideration, when estimating possible efficiency of the future intervention and planning its probable variants. A stable irreparable decrease of EAC and ABR can be a sign of greater dissemination and invasive activity of the tumor.

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