METHODS

Albumin Fluorescent Test in Surgical Stress

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Albumin fluorescent test showed that serum albumin concentration was normal in patients with uncomplicated inguinal hernia before surgery, but albumin binding centers were considerably changed. Surgery also modified binding centers, but these changes were less pronounced than before the operation. It was assumed that long-term psychic distress before surgery is responsible for preoperative changes in albumin molecule.

Key Words: *albumin; fluorescent test; stress*

Recently a new type of reaction to pathological stress was revealed: conformation changes in plasma albumin molecules [7]. These changes were detected with a special fluorescent probe. This probe does not fluoresce in water, but in the plasma (serum) it binds to albumin molecule and its fluorescence increases by orders of magnitude [1]. This phenomenon manifests differently in normal and modified albumin.

This effect underlies a new fluorescent test which allows measuring 2 parameters in one sample: total (TAC) and effective albumin concentrations (EAC). EAC depends on both albumin concentration and the conformation of its binding centers. Normally EAC/TAC is close to 1. Toxicity index (TI), estimated by the formula (TAC/EAC)-1, is convenient for clinical practice. Normally TI is close to zero and increases as albumin molecule changes [1]. Both parameters, EAC/TAC and TI, depend only on the state of albumin molecule, but not on its concentration.

It was found that in some pathologies, including purulent surgical diseases, EAC is lower than TAC, sometimes 2-fold and more. In these cases TI increases [3,8-10] reflecting the course of pathological process. However, it remains unclear which component of the pathological process (inflammation, intervention and its consequences including surgical stress, *etc.*) is responsible for conformational changes in albumin molecule. In order to exclude inflammatory process, we analyzed parameters of albumin molecules in patients subjected to planned surgery for uncomplicated hernias.

MATERIALS AND METHODS

Thirty-four patients with uncomplicated inguinal hernias (18 aged under 60 years and 16 over 60 years) hospitalized at Surgical Department of Central Regional Hospital of Sergiev Posad in 1999 were examined. Planned herniotomy under local anesthesia was carried out in all cases; the postoperative period was uneventful in all patients. Twenty donor sera served as the control.

One hour before surgery and on days 1, 4, and 7 postoperation TAC and EAC were measured in venous blood and TI was estimated. The measurements were carried out using Zond-Albumin kits (Zond, Moscow) on an AKL-01 analyzer with attached calibrators [4].

Time course of the analyzed parameters was evaluated for the entire group, for age subgroups, and in subgroups distinguished depending on TI values before surgery (below 0.25, 0.25-0.50, 0.50-0.75, and over 0.75). The results were statistically processed using Student's t test and nonparametrical Van der Verden ranked χ test.

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TABLE 1. Albumin Parameters in Patients Aged under 60 (*n*=18) and over 60 Years (*n*=16) Subjected to Planned Herniotomy (*M*±*m*)

Parameter		Term of investigation			
		before surgery	after surgery, day		
			1	4	7
TCA	under 60 years	43.6±2.7	43.3±3.5	37.5±2.9	42.6±2.9
	over 60 years	44.0±3.2	37.8±3.4	33.5±3.1	31.7±2.8
	total	43.8±2.0	40.7±2.4	35.6±2.0	37.5±2.2
ECA	under 60 years	31.4±2.1	30.5±2.7	24.7±1.9	28.7±2.2
	over 60 years	29.8±3.1	26.5±2.9	21.4±1.8	19.9±1.8
	total	30.7±1.8	28.6±1.9	23.1±1.2	24.9±1.6
TI	under 60 years	0.44±0.08	0.44±0.06	0.55±0.07	0.52±0.06
	over 60 years	0.55±0.08	0.50±0.08	0.59±0.07	0.63±0.07
	total	0.49±0.06	0.47±0.05	0.57±0.05	0.57±0.05

RESULTS

The mean TAC in patients with inguinal hernia before intervention (Table 1) was close to the control values [2,11] and practically the same in both age subgroups. It corresponded to the population norm and coincided with the data obtained by this method in donors by other authors [1].

The mean EAC before surgery was unexpectedly low. Therefore, TI (0.49) was very high in both age subgroups: it several times surpassed that in donors in the same town (0.10±0.03) and published data [2,11]. TI was above 0.25 in 82% patients and in only 20% donors. So high TI values were never observed in donors before.

After surgery TAC slightly decreased, but rapidly restored in younger patient group (Table 1), while TI virtually did not differ the preoperation level. Evaluation with the use of Van der Verden χ test showed that the slight increase in TI after surgery was significant (*p*=0.01) only on days 4 and 7 in the younger age

subgroup. Analysis in subgroups with different pre-operation TI levels showed a significant increase in this index in the subgroups with initial TI below 0.25 and 0.25-0.50 and its significant decrease in the subgroup with preoperative TI above 0.75 (Table 2).

The effect of surgical stress on albumin values is not surprising: surgery is associated with damage to tissues, blood loss, and psychic distress. By contrast, preoperative disorders observed in the majority of examined patients were completely unexpected, because "spontaneous" changes in albumin levels were never before observed in normal subjects [1].

High TI before the intervention cannot be attributed to specific features of this disease, because even in catarrhal appendicitis the preoperative TI did not exceed 0.13 [7]. We assumed that high TI in patients with inguinal hernias before surgery are caused by nonspecific effects of long-term emotional stress, in our case waiting for surgery (this factor is absent in urgent operations, including those for appendicitis). It

TABLE 2. Postoperation Changes in TI (*M*±*m*)

Parameter		TI before surgery				Total (*n*=34)
		<0.25 (*n*=6)	0.25-0.50 (*n*=17)	0.50-0.75 (*n*=5)	>0.75 (*n*=6)	
TI	before surgery	0.10±0.03	0.40±0.02	0.57±0.03	1.09±0.06	0.49±0.06
	on day 4 postoperation	0.29±0.06*	0.62±0.06*	0.62±0.17	0.68±0.11*	0.57±0.05
ΔTI		0.19	0.22	0.05	-0.41	0.08
Percentage of patients with increased TI		100	82	40	0	65
Percentage of patients with TI increased by more than 0.25		33	47	40	0	35

Note. *Significant difference from the preoperation level.

was recently shown that conformational changes in albumin are observed in some mental disorders, particularly in depression, in the absence of organic disorders and in the presence of normal TAC [5,12]. Presumably, albumin levels are highly sensitive to long-term psychic distress.

Hence, TI reflecting changes in the state of albumin binding centers after surgical intervention for herniotomy increases by no more than 0.2 and in some cases even decreases. It seems that all examined patients experienced the entire complex of effects associated with the surgery, but its effect on TI is less pronounced than the presumable effect of long psychic distress.

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