

Effect of Surgery on T-Lymphocyte Subpopulation

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Summary

The number of whole T-subpopulation cells and T_M -helper and T_G -suppressor cells are evaluated before major surgery and throughout the postoperative course by morphological and histochemical methods. All cells belonging to the T-subpopulation are reduced in number in the first and in the second postoperative day, returning to nearly pre-surgical levels by the third postoperative day. Unchanged T_M/T_G ratio after operation suggests unaffected immunoregulation

Introduction

Numerous clinical and laboratory studies indicate a decrease in systemical immunity after trauma for operative procedure (2, 10, 13). This decrease has been showed to be related to a reduction of T-lymphocytes number and function. Thymus derived lymphocytes are responsible for delayed hypersensitivity, for reaction against antigenically modified by malignant transformation cells and for resistance to viral and other infectious agents. In addition, T-lymphocytes play a central role in regulating the functional activities of various cell population involved in the immune response. Two types of cells are individuated within the T-lymphocyte subpopulation: T_M -helper cells, which promote immune response and T_G -suppressor cells which depress it (4).

Surgical stress and anesthesia cause a transient toxic effect on the whole T-lymphocyte subpopulation, showed by a decrease in number and multiplicative activity (1, 2, 10, 13). Present study was carried out in or-

der to investigate the effect of surgery on the balance existing between T_M and T_G cells.

Material and methods

T-lymphocyte studies were performed in 10 patients for whom surgery for non malignant abdominal disease had been planned. Six patients underwent distal gastrectomy for peptic ulcer and 4 cholecystectomy for gallstones.

All operation were carried out under homogeneous general anesthesia lasting an average of one hour and 30 min (range 45 min - 3 hours). The postoperative course was uneventful in all cases, no patient received blood transfusion. Patients were discharged from the hospital within the 10 days after surgery.

Lymphocyte studies were performed before surgery and throughout the postoperative course in the first (t_1), second (t_2), third (t_3) and seventh (t_7) day.

Twenty milliliters of blood were drawn in heparinized syringe from the antecubital vein at 8.00 a.m. after 12 hour fasting. The technique for T_M -helper and T_G -suppressor cells isolation is reported in detail elsewhere (7). Briefly, mononuclear cells were obtained by density gradient (Lymphoprep, Nyagaard, Oslo) separation and adherent cells were removed. Non adherent cells were pelleted with sheep erythrocytes and rosette forming cells were counted; after sheep red blood cells osmotic lysis, cells were fixed in cold Baker's formalin calcium and sedimentated onto glass slides

Tab. 1 Mean (\bar{x}) and standard deviation (s.d.) of whole T-lymphocyte number and T_M -helper and T_G -suppressor cells number and their percent value on the whole T-lymphocyte subpopulation. Values are obtained before surgery (t_0) and in first (t_1), second (t_2), third (t_3) and seventh (t_7) postoperative day.

		t_0	t_1	t_2	t_3	t_7
T-cells	\bar{x}	846	580*	436*	643	645
	s.d.	207	134	136	334	77
T_M -helper cells	\bar{x}	339	270**	186**	270	333
	s.d.	112	88	86	156	91
T_M -helper cells percent value	\bar{x}	47	46	42	46	50
	s.d.	12	9	10	7	8
T_G -suppressor	\bar{x}	98	62	39**	55	64
	s.d.	70	33	18	47	33
T_G -suppressor percent value	\bar{x}	16	10	9	9	10
	s.d.	7	5	4	4	4

* $p < 0.01$ versus preoperative values; ** $p < 0.05$ versus preoperative value

using a cytocentrifuge and incubated for 60 min at 37 °C with hexazotized pararosa aniline and alpha-naphthyl-acetate at pH 5.8. Cytocentrifugated preparations were washed in distilled water and counterstained with 15% methyl-green.

T_M -helper and T_G -suppressor were counted by light microscope: T_M -cells had a general feature of typical small or medium lymphocyte, easily identifiable by one or two large cytoplasmatic spots of non specific acid esterase activity, while larger T_G -cells were completely esterase negative.

Results

Data of T-lymphocyte study before the operation and throughout the postoperative care are summarized in Table 1 and Fig. 1. Before surgery (t_0) in all patients the number of the whole T-subpopulation cells in the circulating blood was within our laboratory normal range, as well as T_M -helper and T_G -suppressor absolute and percent values. In the first (t_1) and in the second (t_2) postoperative day a profound decrease ($p < 0.01$) in the whole T-cell number was found; recovery to nearly preoperative levels was observed from the third (t_3) day after surgery.

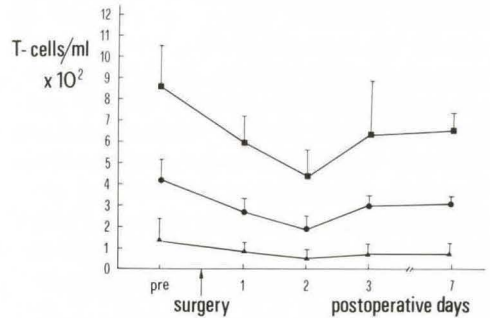


Fig. 1 Mean \pm S.D. of total T-lymphocytes (■—■), T-helper (●—●) and T-suppressor (▲—▲) cell count before the operation and throughout the postoperative course

Similar changes were showed by T_M -helper and T_G -suppressor cells: the number of T_M and T_G significantly ($p < 0.05$) fall at t_1 and t_2 and returned near presurgical values by the third day (t_3) after surgery.

Conversely T_M -cells and T_G -cells percent values on the whole T-lymphocyte subpopulation remained unchanged throughout the postoperative course, both which normal and reduced whole T-lymphocyte number.

Discussion

It is apparent from our data that major surgery results in an immediate decrease in T-lymphocyte number. This decrease lasts only two days, returning at nearly presurgical levels by the third postoperative day. This observation is in keeping with literature data and could account for postoperative immunodepression (2, 10).

Immunological responses against infections or malignant cells seem to be modulated by interactions between T_M-helper and T_G-suppressor cells. Antibody formation, cytotoxic T-cell reactions and delayed hypersensitivity are triggered by T_M-cells activity. T_G-suppressor cells, on the other hand, are stimulated by an excess of antibodies to release soluble factors, which hamper helper cell functions and depress cellular and humoral responses (11). Imbalance or functional alteration in T_M and T_G cell subset may be responsible for immunological disorders. Namely, an excessive T_G activity has been proposed as a possible explanation for the pathogenesis of the hypogammaglobulinemia and other form of antibody deficiencies (8, 10). Furthermore literature data suggest that immunological aberrations in systemic lupus erythematosus, in some malignancy (Hodgkin disease or leukemia) and in fungal infections might be explained by alteration in T_M/T_G regulation (3, 5, 12).

During postoperative immunosuppression, in the first and second day after surgery, the number or both T_M and T_G cells fall and their percent values on the whole T-subpopulation cell does not change. Therefore, it can be supposed that, despite postsurgical immunosuppression, the regulatory mechanisms, namely T_M/T_G ratio remain unaffected.

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