

Metabolic abnormalities in colorectal cancer patients

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Abstract: Normally, cells grow, divide and produce more cells as they are needed to keep the body healthy and functioning properly. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Aim of the research. The aim of the study was to estimate of the association between the anthropometric obesity, fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides, a homeostasis model of assessment (HOMA-IR) colorectal cancer patients. Colon cancer was diagnosed in 239 patients aged from 35 to 76 years. For each patient, the following data were considered: anthropometric measurements (weight, height, waist circumference values), fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides. Also, three index: BMI (Body Mass Index; kg/m²) HOMA-IR (Homeostasis Model of Assessment - Insulin Resistance; fasting glucose (mmol/L) x fasting insulin (mU/L)/22.5). The average fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides and HOMA-IR index were statistically significantly higher in patients transverse colon cancer ($P < 0.001$). Triglycerides increased with the appropriate forms of CRC by 58.8%, 47%, 52.9% and 64.7%. Studies have shown a violation of the protein and lipid metabolism in patients with colon carcinogenesis, which should be assumed to prevail over anabolic processes.

Keywords: HOMA-IR, Lipid Metabolism, Colorectal Cancer Patients

1. Introduction

Cancer affects our cells, the body's basic unit of life. To understand cancer, it is helpful to know what happens when normal cells become cancerous. The body is made up of many types of cells. Normally, cells grow, divide, and produce more cells as they are needed to keep the body healthy and functioning properly. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells [1, 2]. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell [2, 3]. Present reports indicate that there is a relation between metabolic disorders like: overweight, obesity, hyperglycemia, diabetes, lack of physical activity, lipid management disorders and the increased incidence of cancer [4-7]. Each of these components may be an independent factor, while the co-occurrence of a few of them increases the cancer disease risk.

Other studies have shown a greater risk of colorectal

cancer mortality associated with the presence of metabolic disorders compared to that associated with the individual metabolic components alone [8].

2. Aim of the Research

The aim of the study was to estimate of the association between the anthropometric obesity, fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides, a homeostasis model of assessment (HOMA-IR) colorectal cancer patients.

3. Materials and Methods

Group of conventionally healthy people included 43 patients: 23 men, 20 women, aged from 40 to 65 years (tab.1).

Colon cancer was diagnosed in 239 patients aged from 35 to 76 years. Among them were 54 (29 men, 25 women) patients with rectum cancer, 62 (37 men and 25 women) with sigmoid colon cancer, 27 (15 men and 12 women)

with cecum cancer, 66 (48 men and 18 women) with transverse colon cancer and -30 patients (17 men, 13 women) with diagnosis: "Cancer of large intestine"). The first stage of the disease was diagnosed in 6 patients, the second in 34, the third one in 161 and the fourth stage (inoperable form of colon cancer) was detected in 38 patients.

Table 1. Characteristics of the Patients.

Age (years)	Sex		Colon cancer			
	F	M	Rectum cancer	Sigmoid colon cancer	Cecum cancer	Transverse colon cancer
58.3 5.5	±68	117	62	27	66	30

For each patient, the following data were considered: anthropometric measurements (weight, height, waist circumference values), fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides. Also, three index: BMI (Body Mass Index; kg/m²) HOMA-IR (Homeostasis Model of Assessment - Insulin Resistance; fasting glucose

(mmol/L) x fasting insulin (mU/L)/22.5).

The study protocol was approved by the Local Bioethical Committee and informed consent was obtained from all patients.

Statistical analysis was performed using the statistical package STATISTICA 6. Student's-t test was applied to compare the data in every group when distribution of the variable in all compared groups was normal or nonparametric. P values < 0.05 were considered as statistically significant.

4. Results

There were non statistically significant differences between sex and ages of the patients. The study of organ-specific marker enzyme activity in patients with colorectal cancer found in comparison with a group of conditionally healthy patients, improvement in all cases the average values of AST, ALT, γ -GTP (tabl.2).

Table 2. Characteristics Metabolic Parameters in the Analyzed Group.

	Localization of the tumor process		SC (n=16)	TCC (n=14)	Control (n=21)
	RC (n=43)	CeC (n=14)			
AST (u/L)	29,3±8,4	38,6±6,7*	40,8±9,2*	43,5±8,7*	19,3±4,6
ALT (u/L)	27,8±7,2	40,4±8,5*	39,6±8,1*	37,3±9,6*	22,7±4,6
γ -GTP (u/L)	45,3±16,7	54,2±18,3*	47,5±14,9*	56,3±12,6*	29,4±7,2
Cholesterol (mmol/L)	4,7±1,1 *	5,2±1,4*	5,6±1,2	6,4±0,8*	3,7±1,4
HDL (mmol/L)	1,6±0,2 *	1,8±0,5*	1,94±0,3*	1,86±0,4*	1,5±0,22
LDL (mmol/L)	3,7±1,03*	4,4±1,1 *	5,4±0,7*	3,2±1,2	3,4±1,16
Triglycerides (mmol/L)	0,72±0,3*	0,86±0,2	0,7±18,4	0,87±0,23*	1,4±0,5
HOMA-IR	2,3±0,5	2,7±0,61*	3,4±0,7*	3,9±0,82*	1,3±0,85
Insulin (μ U/mL)	6,2±2,1*	6,9±1,8*	7,7±1,5*	8,8±2,3*	3,3±1,7

Note: * - differences are significant both with a group control and $p < 0.05$.

The average fasting serum concentration of glucose, glycosylated hemoglobin, insulin, total cholesterol, HDL/LDL fractions, triglycerides and HOMA-IR index were statistically significantly higher in patients transverse colon cancer ($P < 0.001$).

Analysis of the dynamics of enzyme activity, their metabolic and structural roles, give a sense of suspense and involvement in the pathological process of all the internal organs, systems and functions of the body in the development of colon carcinogenesis. The appearance in the serum of patients with membrane-structured enzymes in higher values may indicate and reflect the development of membrane pathology, dysfunction of which is formed of nucleocytoplasmic interactions, impaired intracellular metabolism and processes of bioenergy, which is important in the pathogenesis of this cancer diseases.

Triglycerides increased with the appropriate forms of CRC by 58.8%, 47%, 52.9% and 64.7%. Studies have shown a violation of the protein and lipid metabolism in patients with colon carcinogenesis, which should be assumed to prevail over anabolic processes. Thus, the results of study of the state of monitoring parameters in patients with colorectal cancer revealed multiple organ disorders of

metabolic processes, which are based on membrane pathology. Major pathogenetic mechanisms of carcinogenesis may be - bioenergy recovery synthesis inhibition in the body and activation of catabolic processes that are associated with stress function of many organs and tissues.

Glucose homeostasis disorders lead to metabolic changes related to energy consumption, improper secretion of insulin and glucagon, growth hormones and cortisol. Hyperinsulinemia, which accompanies obesity the risk factor as insulin is simultaneously the tumor growth factor while insulin resistance is of importance in metabolic, hormonal, inflammatory, vascular disorders and cancer diseases [9-12].

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