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Identifying immunological markers for bowel cancer

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Abstract

The role of immunological processes in the pathophysiology of colorectal cancer has received a lot of attention lately and has been extensively researched. Immune processes are significantly regulated by cytokines and antimicrobial peptides (AMP). Numerous studies have demonstrated the significance of cytokines in the prognosis and surveillance of malignant oncological illnesses. In group II, the blood serum concentration of Calprotectin was found to be greater in 13 patients (92.0%) and lower in 1 patient (8.0%) compared to control limits (χ=24.27, p<0.001). The obtained results show that, in comparison to the control group, the concentration of Calprotectin rises statistically consistently by 3.5 times, with a coefficient of integrity of p<0.001. According to the data, there is a statistically significant rise in Calprotectin concentration (3.5 times higher than in the control group) with a p-value of less than 0.001. The average mathematical density of this indicator is 3.42±0.48 pg/ml, the minimum density is 0.7 pg/ml, and the maximum thickness is 6.1 pg/ml.

Keywords: Colorectal cancer; Calprotectin; CEA; Antimicrobial peptides

1. Introduction

One of the most prevalent malignancies worldwide is colorectal cancer (CRC). Beyond the age of fifty, the incidence gradually rises. Its tendency to stay asymptomatic makes early diagnosis challenging. Due to their many similarities, rectal and colon cancer are frequently combined into one category. With about 1.4 million new cases identified in 2012, colorectal cancer ranks third in terms of incidence worldwide. There were 40.1 new instances of colon and rectal cancer for every 100,000 men and women annually. Every 100,000 men and women, there were 14.8 deaths annually. Based on death cases from 2010 to 2014, these rates are age-adjusted. The current research focuses on adenocarcinomas, which are the most common histological form of colon cancer.

In addition to measuring the amounts of these markers in the feces and plasma of patients with colorectal cancer, polyps, and control patients, this study aims to investigate the differences between these groups and the diagnostic utility of these indicators. Furthermore, our goal was to evaluate the correlation between clinicopathologic factors related to cancer and polyps and the levels of CEA and Calprotectin in the plasma and stools. Plasma samples were collected for the working group from 19 controls, 23 polyps, 64 cancer patients, and 16 controls, 8 polyps, and 8 cancer patients' feces.

In the group with colorectal cancer, the male to female ratio was 30/34 and the mean age was between 30 and 81. In the control group, the mean age was between 31 and 56. All patients in the colorectal cancer group had physical exams, urinalysis, chest x-rays, and abdominal ultrasonography. Before receiving any medication to lower Cal levels, blood samples were taken. The collective of the biochemistry department at the Azerbaijan Medical University provided blood samples for the control group. Patients in the control group did not exhibit any imprisonment or systemic or local inflammation. The control group consisted of patients with normal WBC and CRP levels for leukocytes. Age, WBC

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glucose, lactate dehydrogenase (LDH), aspartate aminotransferase (AST), and CRP levels of individuals with elevated plasma lipase and amylase were measured. For measuring plasma Cal values, blood samples were taken to biochemical tube and then aliquots of serum were stored for assaying.

In the past, the study concentrated on a small number of protein markers, such CEA, as well as several clinical and histological variables. About half of CRC patients have blood levels of the glycoprotein known as carcinoembryonic antigen (CEA), which is implicated in cell adhesion [1, 6]. It is employed in clinical practice and is a well-established prognostic factor. It has been found that preoperative CEA is a significant prognostic factor when analyzing subgroups of patients (stage I/II). If a recurrence occurs, CEA may increase; the stated sensitivity and specificity are 64% and 91%, respectively. Made up of light (MRP 8) and heavy (MRP 14) chains, calprotectin (Cal) S-100 is a 36 kD weight heterodimer that is a member of the calcium binding protein family. It was initially recognized as an antimicrobial protein in granules of neutrophils. Cal forms 60% of the total cytosolic protein in neutrophils. Yui et al. found that, the reason for the increase was the migration of leucocyte to the site where an inflammation and tissue disruption occurs. It's released from stimulated neutrophils and monocytes during cell death and cell rupture. It's also found in plasma, urine and various body fluids as dissolved, from as well as in the intestinal fluid and stool [3, 4]. Cal levels in serum and various body fluids can be used as a marker of inflammation. The increase of Calpro in colorectal cancer are shown in many studies. The blood samples were centrifuged for 15 minutes at 3000xg. Serum Cal was determined using Cal ELISA Kit (Cat no: CK-E90177), purchased from Eastbiopharm (China) following the manufacturer's instructions. The Human Cal ELISA was an enzyme-linked immunosorbent assay for the quantitative detection of human Cal. Cal levels were expressed as ng/ml. The limit of detection of Cal was determined to be 20 ng/ml. The intra-assay and inter-assay coefficient variations were <8.1% and <7.6%, respectively. Statistical Analysis in this study, the results of $p<0.05$ was accepted for the evaluation of significance. Cal values were significantly higher in adenomatous polyps (AP) cases than in control group ($p=0.001$), value range from 32 to 490 ng/ml. So far, despite many published recommendations to include new prognostic markers, no consensus has been reached to incorporate any of these in the daily routines. The sensitivities of fecal Calpro in CRC was determined. Fecal occult blood test is a noninvasive test to detect low sensitivity for CRC [5, 6]. Colonoscopy is used for diagnosis and it is uncomfortable, expensive and invasive procedure for patients [2, 7].

The results of our study was shown that the increase of calprotectin is effective in the steps of colorectal carcinogenesis.

According to the findings of our investigation, calprotectin levels can be raised to counteract the progression of colorectal cancer.

ELISA was used to determine the fecal supernatants from extraction and plasma samples. Between controls, polyps, and cancer patients, there was a statistically significant difference in plasma Calpro. The cancer group had substantially higher plasma CEA levels than the control group ($p = 0.008$) and the polyp group ($p = 0.012$). Clinicopathological factors, CEA levels, and plasma Calpro did not differ from one another. The area under the curve (ROC) for plasma CEA and Calpro differs in the cancer group (0.571) and control group (0.728, 0.571). The dissimilarities in the area under the curve (ROC) between the polyps and cancer groups for plasma CEA and plasma Calprotectin are 0.735 and 0.614, respectively.

Consequently, the only distinguishing sign for colorectal cancer is plasma CEA levels. Calprotectin and plasma CEA are useful in the diagnostic distinction of polyps from colorectal cancer. A potential novel marker for colorectal cancer is fecal calprotectin. Large-scale clinical trials are required to boost the diagnostic usefulness of plasma and fecal indicators.

2. Conclusion

Colorectal cancer (CRC) is one of the oncological problems seen at different rates in different countries of the world. According to statistics, colorectal cancer ranks second after lung cancer among cancer-related deaths. 98% of colorectal cancers are adenocarcinomas. This situation reveals the socio-economic nature of the colon cancer problem and the prevention of this pathology, showing the relevance of the issue of early diagnosis and treatment. Based on the results obtained for the first time, it was determined that AMP and cytokines are tested with high specificity and sensitivity in the differential diagnosis of malignant and benign colon tumors, as well as the correlation between cytokines and AMPs.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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