

IMAGING DIAGNOSTIC METHODS FOR COLORECTAL CANCER IN CONTEMPORARY MEDICINE. TYPES AND PREVENTION

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ABSTRACT

INTRODUCTION: Colon cancer (colorectal carcinoma) is a malignant tumor, stemming from the wall of the colon. It is the second most common carcinoma in men (after pulmonary and before stomach cancers) and the third most common in women (after breast and uterine carcinomas). Its frequency has been increasing steadily in the last years. It most often affects people past 50 years of age, but about 20% of cases occur before that point. Histologically, 80% of cases are of adenocarcinoma and about 20% - mucinous. Carcinomas generally develop on the basis of adenomas.

AIM: To examine the types, the prevention and the imaging diagnostic methods for the cancer of the large intestine and of the colon of modern medicine.

MATERIALS AND METHODS: This research applies statistical methods. The data was processed through statistical and graphical analyses.

RESULTS: Screening methods applied with success are as follows: rectoromanoscopy, fibrocolonoscopy, irigography, computed tomographic colonography, magnetic resonance tomography. The most frequently used two are irigography with a barium enema and fibrocolonoscopy. The former allows for a thorough radiological topographical analysis of the whole colon, while the latter allows for direct mucosal visualization and biopsy (both cytological and histological) without radiation by means of a flexible metallic tube inserted retrogradely. Fibrocolonoscopy enables minor minimally invasive surgery such as polyp and small tumor removal. Rectoromanoscopy is a dated method, solely with historical significance. The latest imaging diagnostic methods are the tomographic ones – computed tomography, computed tomography virtual colonoscopy, and magnetic resonance tomography. They are highly informative for all diseases of the colon, contributing considerably to tumor staging, and to preoperative assessment.

CONCLUSIONS: Screening programs, timely consultations with specialists and the increasing availability of imaging diagnostic equipment lead to a marked tendency of decreasing colorectal carcinoma mortality in Bulgaria.

Keywords: large intestine, colon, carcinoma, imaging diagnostics, polyps

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INTRODUCTION

The cancer of the large intestine is a condition, one of the many forms of cancer. It is the most frequent type of cancer of the digestive tract organs. It affects males and females within the age group 40 to 60 years, the incidence among males being higher than females. Its incidence in the recent years is constantly increasing. The large intestine is located at the end of the digestive system and has a length of 1.5 – 2 m. It consists of the cecum, the colon ascendens, the colon transversum, the colon descendens, the colon sigmoideum and the rectum. The most frequent findings are located in the rectum and the sigma, less frequently in the other sections of the large intestine. Its growth can be towards the lumen of the intestine /exophytic/ and towards the intestinal wall /endophytic/ (6).

Histologically, 80% of the cases represent adenocarcinoma and 20% of the cases represent a mucinous carcinoma. As a rule, carcinomas develop based on adenomas, which have become malignant. One of the main macroscopic forms of adenomas is the adenomatous polyp – a clustering of abnormal cells on the glands covering the mucosa of the large intestine. As time passes, these polyps grow and degenerate transforming into adenocarcinomas. People who are carriers of the so-called adenomatous polyp syndrome have a higher risk of developing cancer of the large intestine than the average individual. Multiple polyps are formed along the colon in this condition and in a given moment they transform into cancer (4).

AIM

The aim of this paper is to examine the types, the prevention and the imaging diagnostic methods of modern medicine for cancer of the large intestine and colon cancer. Recommendations on prevention in order to improve the health status and to avoid the occurrence of colorectal carcinoma are also provided.

MATERIALS AND METHODS

This research has used statistical methods. The data was processed through statistical and graphical analysis.

PRESENTATION

Colorectal carcinoma occurs based on epithelial dysplasia. More than 95% of the dysplasias are expressed as adenomas. Adenomas with dimensions up to 10 mm become malignant in 5-10% of the cases, while those with dimensions above 20 mm – in 50% of the cases. The progression from normal tissue through adenoma to carcinoma is due to different genetic modifications. They can appear in two ways: activation of oncogenes and inactivation of tumor suppressors (1).

Macroscopically, the following forms can be distinguished:

1. Exophytic form – the cancer grows towards the intestinal lumen; it is more frequently observed in the right half of the colon. It has three types:
 - ◇ polyp-shaped form – the tumor resembles a polyp; it has rounded shape, uneven surface and easily injured structure;
 - ◇ papillomatous form– resembles cauliflower; broadly-based and with deeply furrowed surface;
 - ◇ knot-shaped form– broadly-based thick tumor with uneven, ulcerous surface.
2. Endophytic form – the cancer grows in the intestinal wall and narrows the lumen of the intestine; it is more frequently observed in the left half of the colon. This form has two types:
 - ◇ ulcerative form – this is the most frequent form; it is expressed as an ulcer with elevated edges, with uneven bottom;
 - ◇ diffuse-infiltrative (cirrhosis) form– the cancer process infiltrates the intestine wall, but during the early stages the mucosa may seem normal (1).

Microscopically, colorectal cancer can be: adenocarcinoma, solid cancer, colloidal (mucous) cancer. Usually the diagnosis is adenocarcinoma.

The early stage of the disease has no expressed clinical symptoms or shows slightly expressed non-characteristic abdominal complaints – sense of heaviness after meals, sense of abdominal swelling, tympanites, eructation, and slight colic-like pain. The clinical symptoms become more and more expressed when the tumor grows and during the deep-

er infiltration of the intestinal, wall which affects the function of the intestine.

The cancer of the large intestine results in the following complications: acute bowel obstruction, purulent inflammation and perforation of the intestine, growth in adjacent organs, and bleeding (1).

The diagnosis is compiled with the help of the following imaging methods:

1. Rectoromanoscopy is an examination where the rectum and part of the sigma are examined from the inside with a metal tube of 10 or 15 mm of diameter. Nowadays, rectoromanoscopy has mainly a historical value as it is almost entirely replaced by fibrocolonoscopy (12).
2. Colonoscopy with biopsy (fibrocolonoscopy)

Colonoscopy is an endoscopic examination which is conducted through a soft thin tube called (fibro) colonoscope, having a sophisticated optical system which allows a review of the insides of the entire large intestine. The fiber-optic system also has an insert for biopsies (small tissue bits) for cytological and histological examination. Colonoscopy is also a therapeutic procedure for removal of small polyps and tumors, if necessary (10).

In order to examine the mucosa well, it is necessary for the inside of the intestine to be as clean as possible. The duration of the examination is approximately 25 - 45 minutes. Colonoscopy is conducted with anesthesia, with the participation of an anesthetist. The examination is performed in a left side position or back position. The colonoscope is introduced through the anus. In order to improve the visibility of the mucosa air is insufflated into the intestine. By the expert discretion, biopsies can be taken with endoscopic forceps, clip or brush (10).

3. Irigography/irigoscopy (radiological examination of the large intestine with a contrast agent) – this examination may help establish a defect in filling, narrowing of the lumen, atypical mucous relief, ulcerous niche, and broadening of the intestine above the tumor (1).

This method suggests the introduction in the large intestine, after a cleansing enema, of a contrast agent (1-1.5l) until it is entirely full. The relevant radiological information is obtained and after defecation of the contrast agent, the condition and the view of the mucous relief are established. If nec-

essary, air is insufflated per anum again obtaining a pneumo-relief phase - according to Fisher. Such double contrast can be applied also with small quantity of contrast agent and insufflation of gas – according to Velin. This method provides good sticking to the wall. As normally the hollow organs are not shown by regular radiography, the contrast agent is a metal-containing substance also known as barium meal (1).

4. Computed tomography – a non-invasive diagnostic method for radiological examination which provides section images of internal structures and organs of the body (9).

The examination is performed with iodine-based contrast agent. The contrast agent improves the quality of the received images and is introduced through the vein. Additionally, it can be applied through the mouth or the rectum. The scanner usually takes from 5 to 20 minutes. The patient lies comfortably on a special table, immobilized during the examination. Under the instructions of the physician, the patient holds their breath in certain moments so that clear and accurate images can be produced (9).

Complications: the exposure to x-rays is minimal so there is no risk of developing a malignant new formation. It is possible for allergic reactions to the venous contrast agent to appear.

5. Computed tomography colonography.

The computed tomography colonography, also called virtual colonoscopy is a radiological method for imaging the internal contour of the large intestine. This is a non-invasive and accurate examination of high diagnostic value which avoids the necessity of endoscopic examination of the intestine. The CT colonography also allows a detailed review of the structures and the tissues outside the intestine and discovers all changes in the surrounding tissues as a result of the pathological process – enlarged lymphatic nodes, penetration and pressure in the adjacent organs etc. A fault of this method is the impossibility of a direct review of the condition of the mucosa not associated with a change in its relief. It is extremely important for the patient to conduct the necessary preparation for thorough cleaning of the intestines before the procedure (8).

Risks – The examination is contraindicated for pregnant women due to the radiation burden for the

fetus. Patients with diabetes who conduct an insulin treatment should apply a specific diet compatible with their regime and guaranteeing the adequate cleaning of the intestines.

6. Magnetic resonance

Abdominal organ MRI is a non-invasive medical examination where with the help of a magnetic field and radio frequency waves detailed images of the organs and the structures in the abdominal area are received. Before the examination, all hairpins, zippers, piercings, glasses, prostheses, braces, wigs, etc. should be removed. If the patient has implants/old pacemakers, the examination is replaced by computed tomography. Usually the examination takes between 15 and 40 minutes.

In some cases, in order to achieve a better imaging of the examined organs, it is necessary to introduce a contrast medium. Gadolinium-containing contrasts are used (11).

7. Endoscopic echography

Endoscopic echography or echo-endoscopy is a method combining endoscopic and ultrasound image in order to assess the internal abdominal organs. Images of the walls of the large intestine and of the colon or adjacent structures are obtained through this method. In the presence of colorectal carcinoma it can be established to what degree the tumor has spread in the intestinal wall and the surrounding areas. An assessment of adjacent blood vessels is also made through combining a Doppler image (7).

The exact reasons for the occurrence of colorectal cancer are not entirely clear. All experts consider that the cancer of the large intestine and of the colon are diseases of the modern civilization. For their development great importance have the following factors:

Nutrition – a menu consisting mainly of animal fat, refined products and preservatives, leads to slow passage of the content in the intestines.

The main reason is that meat and animal fats accelerate the growth of intestinal bacteria which produce carcinogens. Fried and smoked products contain even more of these harmful substances. Vegetable products contain a lot of fibers. They can improve the motor activity of the intestines. These products also have more vitamins and antioxidants - A, C and E, which have an anti-cancer effect.

1. Control of the body weight and regular physical exercises – obesity is considered a risk factor. Physical efforts decrease the risk of developing cancer cells because they decrease the quantity of estrogens produced in the body. They also reduce the insulin levels.
2. Quitting smoking and alcohol – smoking is a proven risk factor for developing cancer not only of the lungs but also of the large intestine.
3. Screening – this is the most important measure for early diagnosing and prevention of cancer. Polyps, which can be removed before converting into malignant formations, can be found through screening. The early diagnosis of cancer provides better chances for successful treatment and lowers the frequency of a lethal outcome (3).

Individuals with one or many of the following risk factors should begin screening their condition earlier (after the age of 40) and to conduct it on shorter intervals (every 3 to 5 years):

- ◇ Individuals with family predisposition of polyps or cancer of the colon and/or rectum, especially if their parents or siblings have developed the disease before the age of 60.
- ◇ Individuals with hereditary colorectal syndromes, which present a predisposition for a cancer.
- ◇ Medical history of polyps or colorectal cancer.
- ◇ Medical history of inflammatory diseases of the large intestine (3).

Factors which have to be considered for more frequent examinations and screening through imaging methods, without the presence of a family predisposition:

- ◇ age above 50 years;
- ◇ dietetic mistakes – excessive consumption of red meat and processed meat – sausages, ham, etc.;
- ◇ ulcerative colitis and Crohn's disease;
- ◇ obesity and non-active lifestyle;
- ◇ alcohol abuse;
- ◇ type 2 diabetes;
- ◇ smoking (3).

RECOMENDATIONS

If you have colorectal cancer the way of life and especially the diet have significant importance. Here are the advisory recommendations given by European experts and published in Consumer Reports on Health, which appeal to a healthier way of life:

- ◇ daily use of more fruit, vegetables, whole grain food, fresh fruit juice (mostly lemons) – they create an alkaline environment in the body. Fat and fried foods and red and processed meat (sausages) should be consumed rarely;
- ◇ the consumption of water should be increased (2-2.5 l daily);
- ◇ the intake of some vegetables, which are rich in antioxidants and vitamins, contribute to maintaining the health of the intestines,
- ◇ losing all excess weight, increasing the physical activity;
- ◇ reducing the use of alcohol to minimum;
- ◇ quitting smoking. (5)

CONCLUSION

The regular screening examinations for cancer of the large intestine and of the rectum are very important as they allow discovering the disease at an early stage when the treatment is easier and less traumatic. As the earlier stages of the disease are not associated with the presence of any symptoms, the changes can be found only through screening (regular prevention examinations). A complete prevention is not possible. It is recommended to avoid the risk factors associated with nutrition and to perform regular prevention examinations; the colonoscopic screening each 5 years is recommendable for non-risk patient above the age of 50 years. The early diagnosis and treatment improve the prognosis, the quality of life and the life expectancy (2,13).

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