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REVIEWS

Adequate Colon Preparation in Screening Colonoscopy

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Abstract

Colorectal cancer (CRC) is one of the most common forms of cancer worldwide, being the fourth most prevalent cancer and the third most common in terms of mortality. A decrease in the incidence and mortality of CRC has been observed among adults over 50 years of age, screening colonoscopy being a contributory factor for this improvement.

Adequate preparation of the colon is essential for obtaining accurate results and minimizing the risks associated with the colonoscopy procedure. Both ESGE (European Society of Gastrointestinal Endoscopy) and UEG (United European Gastroenterology) recommend adequate preparation in at least 90% of cases, calculated both at the endoscopy center level and for each individual endoscopist. The purpose of our article is to review the literature on different bowel preparation products for colonoscopy and demonstrate the non-inferiority of low-volume preparations over the standard PEG 4L.

Preparations containing PEG are the most common in preparation for colonoscopy. A recent meta-analysis suggests that high-volume, multiple-dose regimens are superior in terms of efficacy to low-volume, multiple-dose regimens, including low-volume PEG with various adjuvants and sodium phosphate, although with lower tolerability. Due to low levels of compliance, tolerability and acceptability, standard 4L single-dose regimens of PEG have been gradually and successfully replaced by newer regimens that include low-volume solutions. An example of low-volume split-dose preparation is the solution of low-volume PEG4000, sodium sulphate, citric acid, sodium citrate, sodium chloride, potassium chloride and simethicone. In several studies this 2 L low volume preparations exhibit similar effectiveness with safety profiles that are comparable to classic 4 L PEG, with lower incidence of adverse effects and good tolerability.

In conclusion, adequate preparation increases the quality of colonoscopy procedures as proper patient preparation is essential to obtain an optimal visualization of the intestinal mucosa. Low-volume bowel preparation is effective, safe and well tolerated by the patients, with higher acceptability compared to the standard volume PEG.

Keywords: colonoscopy, screening, bowel preparation, polyethylene glycol, low-volume, high-volume, effectiveness, tolerability

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INTRODUCTION

Colorectal cancer (CRC) is one of the most common forms of cancer worldwide, having a significant impact on public health. According to data from the World Health Organization - International Agency for Research on Cancer, CRC is the fourth most prevalent cancer after breast, prostate and lung cancers and the third most common in terms of mortality, after lung and breast cancer.^{1,2}

According to the SEER (Surveillance, Epidemiology and End Results) program of the US National Cancer Institute, a decrease in the incidence and mortality of CRC has been observed among adults over 50 years of age. These improvements are most likely due to a combination of screening, improved colorectal cancer treatment, and identification of risk factors.

In contrast, the incidence of early-onset CRC has increased and the reasons are poorly understood. Although family history and hereditary syndromes are responsible for some early-onset cancers, environmental and lifestyle factors could also be contributory.³

In 2022, 13,541 new cases of CRC were reported in Romania, ranking CRC as the most common type of cancer (12.9% of cancers). In the same year, CRC ranked the second in terms of mortality rate, being responsible for 13.1% of deaths.^[4] By comparison, in France, where there is a better organized national colorectal cancer screening program, CRC was the third most prevalent cancer and the second in terms of mortality.⁵ Thus, we can conclude that this type of cancer is preventable, and an effective screening program would improve our national statistics. It remains to be seen to what extent and how quickly such a national screening program will be implemented in Romania taking into consideration the new laws to fight cancer in 2023.

COLORECTAL CANCER SCREENING

The concept of screening in CRC began to take shape in May 1927, when Lockhart-Mummery and Dukes published a paper in the *Surgery, Gynecology and Obstetrics* journal entitled "The Precancerous Changes in the Rectum and Colon", the study being carried out at St. Marks Hospital, in London.⁶ They clearly demonstrated that CRCs were associated with residual adenomatous tissue. Thus, it was suggested that CRC does not arise de-novo from the colonic mucosa, but from a pre-existing lesion. Subsequently, in 1930, Dukes and

his colleagues developed the first staging system for CRC, which demonstrated better survival in patients diagnosed and treated at an earlier stage of the disease.⁷ In 1948, a study was conducted at the University of Minnesota, which included 21,500 people who were screened for colorectal cancer by sigmoidoscopy. An 85% lower than expected incidence of CRC was observed compared to the general population.⁸ Other studies were afterwards carried out, first in the USA by Mandel, Bond and Church and then in Europe by Hardcastle and Kronborg. All these have shown that screening reduces mortality in CRC.^{9,10}

Screening colonoscopy was introduced into guidelines in the 1990s. It was initially recommended that the interval between screening colonoscopy examinations should be around 10 years in the medium-risk population. This interval was based on the 10-15 years expected average "dwell" time for a small polyp to grow and transform into CRC.¹¹ Later, as new scientific data became available, the recommendations became highly individualized depending on the patients' situation.

Many countries offer a systematic screening program to detect polyps and early-stage CRC.

The reasons are, firstly, that early-stage colorectal cancer is asymptomatic or presents only vague symptoms, secondly, that polyps represent well-defined precancerous lesions, and thirdly, that aging is an important risk factor. The population was divided into two categories according to the level of risk of developing colorectal cancer: the medium risk population and the high and very high-risk population. The population over 50 years of age is considered to have a medium risk of developing colorectal cancer, while the high and very high-risk population includes people with a family history of adenoma or colorectal cancer, people with inflammatory bowel diseases, acromegaly and familial syndromes such as FAP (familial adenomatous polyposis) and Lynch Syndrome.^{12,13}

The European guidelines recommend full colonoscopy as the gold-standard screening method for CRC in the medium-risk population, having a higher sensitivity and specificity than any other type of test. The optimal testing interval is between the ages of 50 and 74, with colonoscopy repeated every 5 or 10 years. Flexible sigmoidoscopy performed every 5-10 years may be an alternative for those who refuse colonoscopy. Other less invasive tests, but unable to remove visualized polyps include capsule endoscopy and CT colonography. While certain countries offer reimbursement

for CT colonography in screening programs, the endoscopic capsule for the colon is not recommended as part of the screening as it is not reimbursed.¹⁴

Combining colonoscopy with an annual FOBT test (Fecal Occult Blood Test) or more recently with the more efficient FIT test (Fecal Immunochemical Test) is the option recommended nowadays in most of the screening programs. Non-invasive, non-colonoscopy tests are recommended for the population at medium risk of developing CRC, who is not yet included in colonoscopy screening programs, starting at the age of 50. Tests should ideally be carried out annually and it is recommended that the interval between them should not exceed 3 years. If the tests are positive, a colonoscopy should be performed as soon as possible. The FIT test (Fecal Immunohistochemical Test) is an example of a non-invasive test, being superior to the FOBT test due to its positive predictive value and detection rate of adenomas and cancers. Other methods include DNA-based tests using markers such as M2-PK, but data on their performance are insufficient.^{12,13,15}

ESGE (European Society of Gastrointestinal Endoscopy) recommends that, for people with Lynch syndrome, who are part of the population at a very high risk of developing CRC, colonoscopy screening begins at the age of 25 and is repeated every 2 years. The onset age of screening is 25 years for MLH1 and MSH2 carriers and 35 years for MSH6 and PMS2 carriers. It has been observed that the use of classical chromoendoscopy increases the detection rate by 30%, being even more effective than virtual staining in some studies. In people with inflammatory bowel diseases (high-risk population), screening is carried out 8-10 years after the onset of the disease and should be repeated annually. ESGE defines the population at familial risk of developing colorectal cancer as having at least two first-degree relatives diagnosed with CRC before the age of 50 years. In this category, it is recommended that colonoscopy screening begins at the age of 40.^{16,17}

Tools have been developed to identify the risk for developing CRC, an easy-to-use example for the general population being the mycanceriq.ca website, developed by Cancer Care Ontario.¹⁸

COLONOSCOPY PREPARATION

Probably one of the most important aspects in the screening program is an adequate preparation of the colon. In order to optimize the quality of colonoscopic

procedures, ESGE developed a series of recommendations such as: the duration of the colonoscopy should be between 30 and 45 minutes, the time to observe the mucosa during descent should be between 6 and 10 minutes, a satisfactory rate of detection of adenomas or polyps, the need for cecal intubation, the proper polypectomy technique and the proper preparation.^{19,20} In approximately 28-33% of colonoscopies, bowel preparation is unsatisfactory, leading to hidden costs such as the rate of preventable deaths from colorectal cancer. Colonoscopy preparation is thus essential for obtaining accurate results and for minimizing the risks associated with the procedure. Both ESGE and UEG (United European Gastroenterology) recommend adequate preparation in at least 90% of cases, calculated both at the endoscopy center level and for each individual endoscopist.^{21,22,23}

Table I includes the main recommendations of the European Society of Gastrointestinal Endoscopy (ESGE) regarding preparation for colonoscopy.²⁴

The main recommendations of the European Society of Gastrointestinal Endoscopy (ESGE) regarding preparation for colonoscopy	
1	ESGE recommends a low fiber diet on the day preceding colonoscopy.
2	ESGE recommends the use of enhanced instructions for bowel preparation.
3	ESGE suggests adding oral simethicone to bowel preparation.
4	ESGE recommends split-dose bowel preparation for elective colonoscopy.
5	ESGE recommends, for patients undergoing afternoon colonoscopy, a same-day bowel preparation as an acceptable alternative to split dosing.
6	ESGE recommends to start the last dose of bowel preparation within 5 hours of colonoscopy, and to complete it at least 2 hours before the beginning of the procedure.
7	ESGE recommends the use of high volume or low volume PEG-based regimens as well as that of non-PEG-based agents that have been clinically validated for routine bowel preparation. In patients at risk for hydroelectrolyte disturbances, the choice of laxative should be individualized.
8	ESGE does not suggest the routine use of prokinetic agents for bowel preparation.
9	ESGE recommends against the routine use of enemas for bowel preparation.

Different types of products are used for preparation in the diagnostic or therapeutic colonoscopy: a. PEG (polyethylene glycol) solution based on a mechanical mechanism of action, b. products with sodium phosphate based on osmotic action, with the need for rehydration of patients and c. solutions based on sodium picosulfate and magnesium citrate.

Preparations containing PEG are the most common in preparation for colonoscopy. These are isotonic solutions, thus preventing electrolyte imbalance. PEG works by attracting water into the intestinal lumen, leading to efficient elimination of intestinal contents.

A recent meta-analysis suggests that high-dose, multiple-dose regimens are superior to low-volume, multiple-dose regimens, including low-volume PEG with various adjuvants and sodium phosphate. High-volume PEG was compared with low-volume PEG or non-PEG solutions, with high-volume PEG regimens being superior in efficacy, although with lower tolerability.

Consequently, due to the low levels of compliance, tolerability, and acceptability, standard 4L single-dose regimens of PEG (polyethylene glycol) have been gradually replaced by newer regimens that include low-volume solutions.

An example of a low-volume split-dose preparation is the sodium sulfate, magnesium sulfate, potassium sulfate, which is administered in two 500 mL doses, followed by 1 L of water for hydration. Several studies have demonstrated its non-inferiority compared to low-volume PEG solution, with both types of preparation having similar efficacy and a Boston Bowel Preparation Score (BBPS) score associated with an improved polyp detection rate.^{25,26,27} Another advantage is the ease of administration and palatability of the product.

Another example is the solution of low-volume PEG 4000, sodium sulphate, citric acid, sodium citrate, sodium chloride, potassium chloride and simethicone. In several studies this 2 L low volume preparations exhibit similar effectiveness in colon cleansing during colonoscopies with safety profiles that are comparable to classic 4LPEG, with lower incidence of adverse events and good tolerability²⁸.

In order to increase the quality of colonoscopies and colon preparations, better communication with the patient, awareness campaigns, various instructions or drawings that explain in detail the steps to follow and the importance of adequate preparation or digital tools are being used more and more today.

CONCLUSIONS

Screening for colorectal cancer is a vital aspect in the prevention and the control of this condition, providing the opportunity for early detection of precancerous lesions or cancer in the early stages, when treatment is more effective and the chances of survival are greater.

Moreover, screening offers the opportunity to identify risk groups and provide them with additional guidance and appropriate medical supervision, helping to manage and reduce the risk factors associated with this disease.

Adequate preparation increases the quality of the colonoscopy procedure, as proper patient preparation is essential to obtain an optimal visualization of the intestinal mucosa.

Involvement in regular screening for colorectal cancer and adequate preparation for colonoscopy are the fundamental pillars of the fight against this condition.

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