

Optimizing Bowel Cleansing for Colonoscopy

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Abstract

Adequate bowel cleansing is essential for complete examination of the colon mucosa during colonoscopy. Suboptimal bowel preparation has potential adverse consequences, such as missed pathologic abnormalities, the need for repeated procedures, and increased procedure-related complications. Several factors can predict individuals at increased risk for inadequate bowel preparation. If predictors of inadequate bowel preparation are identified, then education should be intensified and a more aggressive bowel regimen recommended. On completion of this article, you should be able to (1) define the frequency of inadequate colon preparations, (2) identify predictors of poor bowel preparation, and (3) use a more aggressive bowel regimen when clinically indicated.

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Colonoscopy is most often performed for colorectal cancer screening. For optimal performance and visualization of mucosal lesions and details, adequate bowel preparation is essential. The degree of bowel cleansing is a critical factor in diagnostic colonoscopy. However, bowel preparation is inadequate in up to 30% of cases¹ and decreases diagnostic accuracy, prolongs the procedure time, decreases surveillance intervals, increases cost, and potentially results in procedure-related complications. In this article, the available bowel preparations are reviewed, considerations for

colonic preparation are highlighted, and steps to optimize bowel preparation are outlined.

TYPES OF COLONIC PURGATIVES

The ideal bowel preparation should effectively clear the colon of stool and provide maximal visualization of mucosa, preserve the gross and microscopic integrity of the colon, and be easily administered, well tolerated, and safe. The ideal colonic purgative does not exist. Available colonoscopy preparations are of 2 broad categories: polyethylene glycol (PEG) based and hyperosmotic. Both types of preparations can produce

adequate bowel cleansing but with variability in tolerance, preparation-induced mucosal changes, and adverse events.

Polyethylene Glycol

The PEG-electrolyte regimens are the most commonly administered preparations. A variety of PEG-based formulations are available, and they differ with respect to volume of solution, electrolyte content, requirement for adjunctive laxative, presence of artificial sweeteners, and efficacy. In general, PEG-based formulations include standard 4-L and reduced-volume 2-L preparations. The 2-L, low-volume PEG preparation is said to provide comparable colonic cleansing as 4-L formulations.^{2,3} However, note that clinical trials of colonoscopy purgatives are often designed as noninferiority studies and are not powered to demonstrate equivalence. In addition, patients with chronic constipation are often excluded from studies. Therefore, low-volume PEG formulations are not sufficient in all patient populations. In a recent meta-analysis, 4-L, split-dose PEG-electrolytes were found to be superior.⁴

Overall, PEG-based preparations are safe and well tolerated. The most common adverse events are nausea, abdominal pain, and bloating. Not surprisingly, the reduced volume regimens decrease nausea and abdominal bloating and may be better tolerated. The PEG preparations are iso-osmotic and are preferred in patients less likely to tolerate fluid shifts, such as those with renal insufficiency, congestive heart failure, or advanced liver disease. Because of their excellent safety profile, PEG-based agents are the most commonly used bowel colonoscopy purgatives.

Over-the-Counter PEG Product

MiraLAX (PEG 3350; Braintree Laboratories Inc) is an over-the-counter product for the treatment of constipation. As a colonoscopy bowel-cleansing regimen, 1 bottle (8.3 oz; 238 g) is mixed with 64 oz of Gatorade (PepsiCo) to create a nonosmotically balanced 2-L PEG formulation. Bisacodyl tablets or magnesium citrate are used in conjunction with the PEG 3350 powder. However, 4-L, split-dose PEG-electrolyte preparations seem to be more effective.^{5,6} In contrast, tolerability (taste and overall experience) is better with MiraLAX/Gatorade than with 4-L PEG-electrolytes.^{6,7} Despite MiraLAX/Gatorade being a hypotonic solution, hyponatremia is rare with the use of this over-the-counter formulation,

which is an option in patients without congestive heart failure, liver disease with ascites, or chronic kidney disease.

Hyperosmotic Preparations

Hyperosmotic preparations contain poorly absorbed multivalent cations or anions with osmotic effects and increase intraluminal water, causing bowel distension and evacuation. The available hyperosmotic agents include sodium phosphate (NaP), sodium picosulfate, and magnesium citrate.

The NaP preparations are effective and may be better tolerated than PEG-based preparations because of lower volume. A meta-analysis found NaP to be more effective in bowel cleansing than standard PEG-electrolytes and comparable in terms of adverse events.⁸ However, most studies compared NaP with standard 4-L PEG-electrolytes. When both are administered in split-dose regimens, no difference in efficacy was seen, but split-dose PEG-electrolytes were better tolerated, with less nausea and vomiting.⁹ Therefore, when administered in split fashion, PEG formulations seem to be better tolerated than NaP, with equal cleansing efficacy.

Potential adverse effects of NaP preparations include fluid shifts, hyperphosphatemia, electrolyte abnormalities, tonic-clonic seizures, mucosal damage, and acute renal failure (acute phosphate nephropathy). Acute phosphate nephropathy is characterized by precipitation of calcium phosphate crystals in the renal tubules, which may cause chronic irreversible kidney injury even in patients with previously normal renal function. Previous renal insufficiency and medications that impact renal function, such as diuretics, angiotensin-converting enzyme inhibitors, and angiotensin receptor blockers, predispose to complications of NaP.¹⁰ Although the incidence of acute phosphate nephropathy is low, the Food and Drug Administration issued a black box warning for acute phosphate nephropathy in those with advanced age, preexisting renal disease, decreased intravascular volume, and use of medications that affect renal perfusion or function. Because of these concerns, routine use of NaP as a bowel preparation is not recommended.¹¹ Despite this statement, a recent large, retrospective cohort study found no increased risk of acute kidney injury with the use of oral NaP compared with PEG even in high-risk clinical subgroups.¹² This finding suggests that serious

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