

Polyethylene glycol 3350 without electrolytes for treatment of childhood constipation

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ABSTRACT

QUESTION I have come across many pediatric patients with functional constipation. Is polyethylene glycol 3350 without electrolytes a safe and effective long-term treatment option for these patients?

ANSWER Functional constipation is a common and often difficult problem for parents and families to deal with. Polyethylene glycol 3350 is a safe and effective long-term laxative in pediatric populations, but there are limited studies for its use in children younger than 2 years of age.

RÉSUMÉ

QUESTION J'ai vu de nombreux patients pédiatriques souffrant de constipation fonctionnelle. Le polyéthylène glycol 3350 sans électrolyte est-il sans danger et efficace comme option de traitement pour ces patients?

RÉPONSE La constipation fonctionnelle est un problème fréquent et souvent difficile pour les patients et les familles. Le polyéthylène glycol 3350 est un laxatif à long terme sûr et efficace en pédiatrie, mais il existe peu d'études sur son utilisation chez les enfants de moins de 2 ans.

Constipation is the most common cause of abdominal pain in the pediatric population.¹ It is the cause of an estimated 3% to 5% of pediatric visits to physicians, with up to one-third of children between 6 and 12 years of age reporting constipation at least once a year.² Up to 95% of children referred for evaluation of constipation have no underlying pathologic condition and receive a diagnosis of functional constipation.² Despite the scope of this problem, many of the conventional treatments for functional constipation are variably effective and have potential adverse effects, leading to repeat visits to the doctor's office.³ Lactulose, one of the more commonly used osmotic laxatives, can produce a large amount of gas as a result of bacterial fermentation, which can cause bloating and abdominal pain. Mineral oil, usually given as a lubricant to help passage of hard stool, is associated with aspiration and lipid pneumonia.³ Enemas using phosphate, mineral oil, or normal saline are effective in relieving rectal disimpaction, but carry the risk of mechanical trauma upon administration and are not recommended for repeated use in the pediatric population.

Polyethylene glycol (PEG) 3350 solution without added electrolytes is an odourless osmotic laxative, which, unlike other colonic lavage solutions, carries no risk of salt absorption and hence no risk of electrolyte imbalance.⁴ Provided in powder form, this chemically inert substance has very little grit when mixed with juice or water and is absorbed only in trace amounts from the gastrointestinal tract.⁵

Disimpaction

In a prospective, double-blind, parallel study, Youssef

et al⁴ randomized 40 children between 3 and 18 years of age into 4 groups; each group used different doses of PEG 3350 daily (0.25 g/kg/d, 0.5 g/kg/d, 1.0 g/kg/d, or 1.5 g/kg/d) for 3 days to a maximum of 100 g per day. This study showed that after 3 days of treatment with PEG 3350, 95% of children who used the higher doses (1.0 to 1.5 g/kg/d) became disimpacted, while only 55% of those who used the lower doses (0.25 to 0.5 g/kg/d) became disimpacted. Plasma electrolytes were unchanged in the children of the 2 groups receiving the higher doses of PEG. Although adverse events included flatulence or bloating (18%), loose stools (13%), nausea (5%), vomiting (5%), and pain or cramping (5%), all the children in the study said they would take another 3-day course of PEG 3350 to treat any future fecal impaction.

Maintenance and treatment

There is a growing body of literature to support the efficacy and safety of PEG 3350 in the treatment of children with a diagnosis of functional constipation. Most studies start with 2 years of age as the lower age limit,⁶⁻⁸ but some use 4 years of age as the lower age limit.^{9,10} Multiple studies have shown that PEG is effective at increasing the number of bowel movements per week, decreasing the straining associated with bowel movements, as well as softening the consistency of the stool.^{6,7,9-11} The effects of PEG have been shown to start within the first week of treatment⁹ and can still be seen for up to 30 months after treatment has started, with no change in the effectiveness of PEG.⁶ The starting

dose for the use of PEG as a long-term laxative seems to be between 0.4 and 0.8 g/kg/d, as either a single or twice daily dose.^{6,9-11} This dose can be tailored to effect for each patient during treatment, with a range of concentrations being used: one study stated a range of 0.27 to 1.4 g/kg/d,¹¹ and another showed a similarly wide range of 0.3 to 1.8 g/kg/d.⁶ By altering the doses during treatment, parents, with the advice of physicians, were also able to decrease the minor adverse effects of diarrhea, bloating, cramping, and gas, all of which were associated with the use of PEG.^{8,9,11} The maximum daily dose recorded in these studies was 51 g/d, although the length of treatment at this dose was not described.⁸


Safety

The safety profile of PEG as a laxative has been reported in various journals^{12,13}; 2 long-term studies included bloodwork.^{8,10} In a prospective observational study of 83 children receiving PEG for 3 to 30 months,⁸ the test results for hemoglobin, hematocrit, serum electrolyte, blood urea nitrogen, creatinine, and albumin levels and osmolality were normal in all patients who had bloodwork done. Although there were slightly elevated alanine aminotransferase (ALT) levels at first, they resolved by 8 weeks in all but 1 of the patients. Three patients had slightly elevated aspartate aminotransferase (AST) levels (all <1.5 times normal); however, their AST levels returned to normal while still receiving PEG. In another study,¹⁰ 30 of the 39 children randomized to receive PEG had bloodwork results; these revealed very mildly elevated platelet counts in 4 children and mildly elevated AST and ALT levels in 2 children. Follow-up plasma electrolyte levels were normal for all. Repeat bloodwork results while taking PEG showed that all AST and ALT values became normal and only 1 of the 4 children continued to have a mildly elevated platelet count. One child was allergic to PEG (ie, skin rash), but all children continued to grow in height and weight over the 12-month course of the study.

Infants and toddlers

Recent retrospective chart reviews have shown that PEG can be effective, safe, and well tolerated in children younger than 2 years of age.^{5,14,15} The length of treatment was variable (3 weeks to 21 months¹⁵ and 1 to 37 months⁵), but all outcomes showed that PEG was safe and effective as a long-term laxative. The long-term doses of PEG varied (0.3 to 2.1 g/kg/d,⁵ 0.4 to 1.9 g/kg/d,¹⁴ or 0.26 to 1.26 g/kg/d¹⁵); however, the mean effective dose of 0.8 to 1.0 g/kg/d was similar in all these studies. The minor adverse effects of increased gas and diarrhea could be decreased with a decrease in the dose of PEG.^{5,15} No child refused PEG.^{5,14} All bloodwork results, including complete blood count, electrolyte level, renal function, and liver function, were within normal limits for those children tested.⁵ One of the limitations of these studies is the small sample size for children younger than 1 year old.

Conclusion

Polyethylene glycol 3350 without electrolytes is a safe, effective, and well-tolerated option for treatment of constipation in children. A 3-day course of PEG 3350 at a dose of 1.0 to 1.5 g/kg/d can be used for fecal disimpaction. For maintenance therapy, a starting dose of 0.4 to 0.8 g/kg/d can be initiated then titrated to maximum, depending on effectiveness of therapy and severity of side effects. Parents should be educated about potential rare side effects, including flatulence, loose stool, nausea, vomiting, and abdominal cramping. 

Competing interests

None declared

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