Efficacy and safety of oral sodium phosphate versus polyethylene glycol solution for bowel preparation for colonoscopy

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Objective: To assess the acceptability, safety and effectiveness of an oral sodium phosphate solution (Exelyte) for colon preparation prior to colonoscopy, compared with a polyethylene glycol solution (Pegleoc).

Method: A colonoscopy-blinded, prospective, randomized, observational clinical study. Patients: One hundred patients undergoing colonoscopy for various indications were randomized (n=50 each) to receive either 90 mL of oral sodium phosphate mixed with 300 mL clear liquid and then consume about 4-5 glasses of water, or 2 liters of polyethylene glycol solution. Result: Sodium phosphate showed a safety profile similar to that of polyethylene glycol. However, patients tolerated it better. The colonoscopy reported similar cleansing of bowel in both groups. Conclusion: Oral sodium phosphate is well tolerated, is safe and provides bowel cleansing similar to that with a polyethylene glycol solution.

Key words: Colon preparation

Polyethylene glycol (PEG) solutions are effective and safe for quick preparation of colon prior to colonoscopy. However, the large quantity of liquid (2 liters) that the patient is required to consume within a 2-hour period limits its acceptability. The patients therefore often fail to comply with the instructions fully, resulting in inadequate bowel preparation in about 20% of cases. Changes in taste and variations in amount of electrolytes added to PEG have not led to any major improvement in acceptability. In addition, administration of a large volume of fluids is contraindicated in the elderly and in children. Vanner et al showed that a low-volume oral sodium phosphate solution can provide adequate bowel cleansing. Subsequently, several comparative studies have shown sodium phosphate to be superior to PEG in all parameters including acceptability, safety and effectiveness.

In India, PEG is currently the most commonly used bowel-preparation solution. There are no data on the use of oral sodium phosphate in India, where dietary habits and lifestyle are different from those in the West. We therefore assessed the acceptability, safety and effectiveness of oral sodium phosphate solution for bowel preparation in Indian subjects.

Methods

This prospective study included patients undergoing colonoscopy as a day-care procedure for various indications. Exclusion criteria were: (a) age less than 16 years or more than 89 years; (b) presence of renal failure, congestive cardiac failure, liver failure, ascites, coronary artery disease, bleeding diathesis, seizure disorder, gastrointestinal perforation or obstruction; (c) history of serious adverse events to other electrolyte-based colonic lavage; (d) serum phosphate levels exceeding 4.4 mg/dL or serum calcium level below 8.4 mg/dL; and (e) pregnancy or lactation.

The institutional ethics committee approved the study protocol. All patients gave informed consent. Patients were randomized to receive either PEG or oral sodium phosphate by draw of lots. They were advised not to take breakfast on the day of colonoscopy. Vital parameters were recorded and blood was drawn for estimation of blood urea, serum creatinine, phosphate, calcium and electrolytes.

Patients randomized to receive PEG were asked to mix the contents of one sachet (137-144 g of Pegleoc Tablets India, Chennai) in two liters of water and to drink this mixture over a 2-hour period. Patients randomized to oral sodium phosphate were asked to mix the contents of 90 mL sodium phosphate (monobasic sodium phosphate 2.4 g + dibasic sodium phosphate 0.9 g per 5 mL; Exelyte; USV, Mumbai) in 300 mL water or a clear lime-based soft drink or coconut water over 15 to 30 minutes. The patients were advised to drink as much water as desired (about 1 liter) after taking sodium phosphate, to ensure hydration and bowel cleansing.

Blood pressure and pulse rate were recorded every hour. Any adverse event or clinical manifestation of electrolyte imbalance or other unusual symptoms were recorded and a check on serum calcium, phosphate and electrolytes was done, if necessary.

Colonoscopy was done about 5 to 6 hours after the start of medication. The colonoscopy (who was unaware of the compound used for preparation) was asked to assess the level of preparation as: excellent (colon empty), good (fluid- and gas-filled colon), satisfactory (particulate formed stool) or poor (large solid stools).
Patients were asked to judge the taste and ease of administration as excellent, good, satisfactory, difficult or intolerable. They also recorded the number of bowel movements and the consistency of last bowel movement. At the end of the study the patients were asked if they would be willing to have the same preparation for colonoscopy, if required, and to assess the product as excellent, good, satisfactory or bad.

Statistical analysis
Chi-squared test was used to compare proportions in the two groups at 5% significance level.

Results
Of the 102 patients who underwent colonoscopy during the study period, two patients were excluded because of high baseline serum creatinine levels. The mean age of the 100 patients studied was 55.5 ± (range 24-87). None of the patients received any medication that could interfere with bowel motility. One patient in the sodium phosphate group had received mebeverine. Indications for colonoscopy are given in the Table.

Among the 50 patients who received PEG, the ease of administration was reported as excellent by 35, satisfactory by 5, and difficult by 10 patients. In those receiving sodium phosphate, 49 patients reported the ease of administration as excellent, one as good (p<0.05).

Five patients receiving PEG and four receiving sodium phosphate reported nausea. A 44-year-old man in the latter group reported tiredness. Serum calcium, phosphate and electrolytes were within normal limits; his symptoms improved with 2 glasses of plain glucose water. Eight patients on PEG and one on sodium phosphate complained of abdominal fullness (p=ns).

The median number of bowel movements in the PEG and sodium phosphate groups was 8 (range 4-15) and 12 (4-15), respectively. In the sodium phosphate group, stool consistency was clear in 46 patients and flecks of debris were present in 4 patients; in comparison, in the PEG group, 43 patients had clear stools and two had flecks of debris (p=ns). Three patients receiving PEG had liquid stools, which prevented proper examination, and a repeat procedure (after sodium phosphate preparation) was needed.

All the 50 patients in the sodium phosphate group and 35 patients in the PEG group were willing to accept the same preparation for a future colonoscopy. Forty-eight patients on sodium phosphate assessed the preparation method as excellent and 2 as good; in the PEG group, 35 assessed it as excellent, 2 as good, 4 as satisfactory and 9 as bad (p<0.05).

The colonoscopist assessed colonic cleansing as excellent in 48 patients and good in 2 patients in the sodium phosphate group, and as excellent in 45 patients, good in 2 patients and poor in 3 patients in the PEG group (p=ns). Full examination up to cecum was possible in all patients receiving sodium phosphate and in 47 patients receiving PEG (p=ns).

Discussion
An ideal method of pre-colonoscopic preparation should be safe, effective, easily administered and well tolerated by the patient. PEG eliminates the risk of explosion that existed with mannitol, and is osmotically balanced. However, it still has problems of discomfort and inconvenience. The large volume of fluid needed to be consumed and poor palatability of PEG solutions cause troublesome side effects. This results in failure to take the required amount of PEG, resulting in poor bowel preparation. Further, large volume of this product is unsuitable in patients with gastroesophageal reflux, lesions of the neck, seizure disorder, etc., and is contraindicated in the elderly and in children.

Oral sodium phosphate, a small-volume solution, has now replaced conventional PEG-based lavage in North America and Europe. Several studies have shown it to be superior to PEG, sodium picosulfate and mannitol. This is a hypertonic solution whose cathartic action results mainly from its osmotic properties. When mixed with water, it becomes a slightly salty yet palatable solution. When mixed with a cold aerated lime drink, its taste is further masked. Frequent bowel movements start after about 20 to 30 minutes. The patient is advised to consume at least 1 liter of water or any other clear liquid to prevent dehydration and ensure passage of clear watery feces.

In our study, all patients in the sodium phosphate group were able to complete the regimen without major complaints. This was in contrast to the PEG group in which compliance was difficult and the frequency of abdominal fullness higher. Frequency of electrolyte disturbance and adverse events was comparable with the two drugs. Their efficacy in terms of number of bowel movements, consistency of last bowel movement and...
cleansing as assessed by the colonoscopist was also comparable. There are some reports of increased incidence of colorectal ulceration following colon preparation using sodium phosphate. Other studies have however not observed this. Sodium phosphate, when used in large quantities (more than 240 mL) as a single dose for the relief of constipation led to symptoms of electrolyte disturbances in the form of hypocalcaemia, hypokalemia and hyperphosphatemia. The US FDA has advised caution when prescribing it to patients with increased risk for electrolyte disturbances, in such patients, baseline electrolytes should be measured before using oral sodium phosphate solution. Some studies reported mild transient electrolyte shifts, which however were within the normal range and were not associated with clinical manifestations. These abnormalities reverted to normal after 12 hours. In two previous publications, serum calcium levels decreased after administration of PEG or oral sodium phosphate. It is also advisable not to administer sodium phosphate to patients with renal failure, heart failure or liver failure and in patients receiving diuretics and digoxin.

In conclusion, oral sodium phosphate is an effective and safe bowel lavage solution, comparable to PEG-based lavage. It has a better tolerance profile when compared to PEG.

References

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