ORIGINAL ARTICLE

Safety of Sodium Phosphate solution in colonoscopy

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Abstract

Objective: Our intent was to ascertain the indications, safety, tolerability and efficiency of oral sodium phosphate as a solution for colon cleansing.

Design and Duration: Descriptive, nonrandomized prospective analysis; from January 2009 to December 2010.

Patients and Settings: The study was conducted at the Endoscopy Suite, Surgical Unit 4, Civil Hospital Karachi; non-emergent, consecutive out-patients were included.

Methodology: A total of 300 non-emergent, consecutive out-patients were included, aged between 18 and 60 years. All the patients were willing and gave written informed consent. Indications for colonoscopy were bleeding per rectum, altered bowel habits, lower abdominal pain, chronic diarrhea and chronic constipation. Patients were excluded from the study if they had specified co morbid. Sodium phosphate solution was advised and complications were noted before and its efficiency was graded during the procedure by the colonoscopist.

Results: Three hundred patients (190 M, 110 F; mean age 40.79 years, range 18 years to 82 years; median age 40 years) participated in the study with an indication for a complete colonoscopy; four patients were rescheduled because of bad bowel preparation. Rating of the colon cleansing in patients was, good in 180 (60%), fair in 72 (24 %) and poor in 48 (16%) out of which four (1.3%) procedures were abandoned. Tolerability of the solution was good in 14 (4.7%), moderate in 183 (61%), and poor in 103 (34.3%). When the complaints of the patients were considered, nausea (44.7%) was the most frequent.

Conclusion: In a developing country like Pakistan, with limited health resources, NaP solution can be considered the best choice with good effectiveness and a low frequency of side effects for colonoscopy.

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Introduction:

An adequate bowel preparation is of utmost importance for the complete and result oriented colonoscopy[1]. Up to one-third of incomplete or failed colonoscopies can be attributed to poor bowel preparation[2]. Many bowel preparations are available all over the world and have been studied and compared plenteously. However, in a country like Pakistan the options are less and barely investigated. Sodium phosphate (NaP) solution, a buffered saline laxative, gained popularity as an alternative method for colonic preparation largely as a result of its smaller volume. Containing monobasic sodium phosphate and dibasic sodium phosphate, NaP acts as an osmotic laxative, cleansing the colon by drawing fluids into the gastrointestinal tract[3]. NaP solution has been extensively researched in adults and has been found to be safe, effective, and well accepted as a bowel preparation prior to colonoscopy when compared to other bowel preparations[4-11]. We conducted this study to assess the tolerability, level of bowel cleansing and safety profile of NaP as a cleansing agent.

Methodology:

The study was conducted at the Endoscopy Suite, Surgical Unit 4, Civil Hospital Karachi; from January 2009 to December 2010. A total of 300 non-emergent, consecutive out-patients were included, aged between 18 and 60 years. All the patients were willing and gave written informed consent. Indications for colonoscopy were bleeding per rectum, altered bowel habits, lower abdominal pain, chronic diarrhea and chronic constipation. Patients were excluded from the study if they had congestive heart failure, chronic renal failure, myocardial infarction in the last 3 months, transient ischemic attack or cerebrovascular accident in the last 6 months, ascites, colostomy, ileus, bowel obstruction, pregnancy or breast feeding. All the patients were advised to take $NaPO_4$ solution in two divided doses of 45 ml each, the first dose was given in the evening before the examination (7:00 p.m.), and the second in the morning before the procedure (7:00 a.m.). Each dose was ingested with at least 240 ml of liquid followed by an additional amount of at least 240 ml. They were instructed to remain on a clear liquid diet for 24 hrs prior to the procedure and encouraged to drink at least 3 L or more of it. Before the examination, patients were asked about their tolerability of the solution and severity graded according to the Schanz criteria[12]. At the same time, patients were inquired about the co morbid diseases along with side effects and were noted. Post procedure, patients were kept in the ward and were discharged after an hour.

Statistical analysis included descriptive statistics and frequency analysis. All the analysis were performed with SPSS version 17 (SPSS Inc., Chicago, IL, USA).

Results:

Three hundred patients (190 M, 110 F; mean age 40.79 years, range 18 years to 82 years; median age 40 years) participated in the study with an indication for a complete colonoscopy; four patients were rescheduled because of bad bowel preparation. Indications for the colonoscopy were bleeding per rectum in 132 (44%), chronic diarrhea in 70 (23.3%), lower abdominal pain in 40 (13.3%), altered bowel habits in 32 (10.7%), chronic constipation 11 (3.7%), iron deficiency anemia (malabsorption ruled out) in 7 (2.3%), evaluation of known ulcerative colitis in 5 (1.7%), and for the screening of colorectal cancer in patients with known inflammatory ulcerative colitis 3 (1%). Findings were normal in 103 (34.3%), hemorrhoids in 63 (21%), ulcerative colitis in 32 (10.7%), intestinal tuberculosis in 26 (8.7%), colorectal carcinoma in 25 (8.3%), solitary rectal ulcer syndrome in 14 (4.7%), colonic polyps in 11 (3.7%), lymphoma in 9 (3%), mass in colon 4 (1.3%), crohns disease in 4 (1.3%), proctitis in 3 (1%) and peutz-jeghers syndrome in 2 (0.7%).The overall assessment of bowel cleansing is shown in Table 1. Rating of the colon cleansing in patients was, good in 180 (60%), fair in 72 (24 %) and poor in 48 (16%) out of which four (1.3%) procedures were abandoned. Tolerability of the solution was good in 14 (4.7%), moderate in 183 (61%), and poor in 103 (34.3%). When the complaints of the patients were considered, nausea (44.7%) was the most frequent as shown in Table 2.

Discussion:

Colonoscopy is an au courant and gold standard procedure for the diagnostic evaluation and for performing variety of therapeutic interventions of the colon[13], along with that its superiority over other screening diagnostic modalities[14, 15]. But the problem lies with the standard cleansing of the colonic bowel[16], in order to achieve the desired goals. It is of utmost importance to have the best cleansing preparation available, with good patient compliance, cost effectiveness, less side effects and have desirable results, but none fulfill all the criteria. Polyethylene glycol (PEG) is being used widely, but a consensus document

Table 1: *Bowel cleanliness quality score of the endoscopist*

Good	Dry colon, no feces
Good	Only transparent fluid
Fair	Fluid feces
Fair	Small amount of solid feces,> than 90 % of the mucosa visible
Poor	Solid feces, < than 90% of the mucosa visible
Poor	Full of stool, couldn't proceed, procedure abandoned

Table 2: *Postoperative complications*

Adverse effects	**No. of Patients (%)**
Nausea	134 (44.7)
Abdominal Pain	62 (20.7)
Vomiting	32 (10.7)
Abdominal bloating	31 (10.3)
Edema	20 (6.7)
Dizziness	20 (6.7)
Headache	16 (5.3)
Hypotension	11 (3.7)

in 2006, by the Association of American Colon and Rectal Surgery (ASCRS), American Gastrointestinal Endoscopy Association (ASGE) and American Gastrointestinal and Endoscopic Surgery Association (SAGES) stated that $NaPO_4$ is an equal alternative with PEG except in those with heart failure, renal failure, hepatic failure, structural intestinal disorders, and in pediatric or elderly individuals[17]. Most of the colonoscopists prefer $NaPO_4$ solutions over PEG or other solutions because it is effective in 30-45 ml doses and its patient tolerability is higher[17, 18].

A total of 300 patients were evaluated and 296 completed the colonoscopy procedure. Colonoscopy can be performed safely with low frequency of side effects in the elderly patients (without co morbidities such as heart failure, diabetes mellitus, chronic renal failure, or hepatic cirrhosis) aged over 70 years[19]. Maximum range of age in our study was 82 years, emphasizing that it can be effective and well tolerated by the elderly patients, if the co morbidities are excluded.

Compliance with colon preparation is the hallmark for the successful and adequate colonoscopy. PEG solution is cumbersome for the patient to comply with, ingesting a large amount of salty liquid in a short span of time. Furthermore, PEG solution is not easily available in this part of the world and partial compliance with the solution may lead to poor colon cleansing, resulting in a compromised colonic examination. This situation affects the cost effectiveness and a negative experience may compel some patients to avoid future colonoscopy examinations[13, 20]. $NaPO_4$ has shown an equal or better patient compliance and tolerability in trials than full volume PEG[21]. In spite of few side effects, all the patients in our study were able to complete the preparation but the tolerability was low, good in only 4.7%.

Colonoscopy solution can lead to a loss of copious amount of fluids. Adequate rehydration during this period is of paramount importance. Dehydration has been hypothesized to be the cause of many adverse events, associated with bowel purgatives[22]. Maintenance of adequate hydration prior to, during and subsequent to colonoscopy may prevent potential dehydration-related complications. Adequate hydration may also increase patient tolerance and compliance, which in turn may improve the quality of colon cleansing. In addition, a favorable bowel preparation experience combined with a safe and successful colonoscopy may promote compliance with repeat screening recommendations[13]. In view of above, in our study particular attention was given to the hydration issue and all patients were instructed to drink at least three liters of fluids prior to the procedure.

Many previous studies have clearly demonstrated that the success of bowel preparation by $NaPO_4$ is highly dependent on the time between taking of the last dose of $NaPO_4$ and colonoscopy. The longer the time, the poorer the cleansing result; poor visibility of bowel mucosa is expected when the time between last dose of $NaPO_4$ and colonoscopy is more than 12 hours[23, 24, 25]. Our study also confirms these previous findings and additionally suggests that colonoscopy should be performed preferably with in 6 hours and at least with in 12 hours from the last dose of $NaPO_4$. In our study, the efficacy was "good" in 60 % of patients, which is slightly less than the previous studies[26, 27]. Our result signifies that $NaPO_4$ solution is an effective and easily tolerable bowel cleansing solution in the majority of the patients.

Good safety profile of $NaPO_4$ solution is most probably due to the exclusion of co morbid patients and an adequate counseling before the procedure[19]. Oral $NaPO_4$ solution is a low volume hyperosmotic liquid, and it is known that it leads

to fluid electrolyte imbalances. In renal function disorders, hypercalcemia and dehydration, and in the patients who use angiotensin converting enzyme or angiotensin receptor blockers, there is risk of hyperphosphatemia and renal failure[28]. Increase in urea, hyperosmolarities, significant hyponatremia, and coma are complications rarely seen with oral $NaPO_4$ [29, 30]. It can be considered a limitation of our study, not to have a measurement of creatinine and electrolytes before and after the intake of solution.

Conclusion:

In a developing country like Pakistan, with limited health resources, NaP solution can be considered the best choice with good effectiveness and a low frequency of side effects for colonoscopy. In spite of this safe profile, fluid and electrolyte disorder by Nap solution in a selected group of patients is of concern and should be cogitated.

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