

Use of oral sodium phosphate colonic lavage solution by Canadian colonoscopists: Pitfalls and complications

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A Chan, W Depew, S Vanner. Use of oral sodium phosphate colonic lavage solution by Canadian colonoscopists: Pitfalls and complications. *Can J Gastroenterol* 1997;11(4):334-338. Oral sodium phosphate (NaP) has become an attractive alternative to polyethylene glycol (PEG) for colonic cleansing before colonoscopy, but it potentially has greater complications. This study surveyed members of the Canadian Association of Gastroenterology (CAG) to determine how these colonic lavage agents are used and what complications have been encountered. The Dillman survey technique produced responses from 67% of the 400 members who perform colonoscopy. For the larger out-patient group, respondents used NaP more frequently than PEG (46% versus 35%, respectively, $P < 0.015$). Respondents used NaP and PEG with similar frequencies for the in-patient group (44% versus 43%). Of respondents using NaP, 45% reported excluding its use in patients with renal failure, 30% with heart disease, 13% with incomplete bowel obstruction and 9% with extreme age. Symptoms suggestive of hypovolemia were reported in 9% of those using NaP compared with 3% using PEG ($P < 0.02$). Three patients receiving NaP developed acute renal failure. A greater proportion of those using NaP had small unexplained aphthous ulcers (16%) and excessive luminal bubbling (24%) compared with PEG users (3%, $P < 0.00001$ and 14%, $P < 0.03$, respectively). These data demonstrate that members of CAG use NaP more frequently than PEG as the colonic lavage solution before colonoscopy. A greater number reported complications with NaP versus PEG, and a significant proportion of the respondents appeared to be unaware of the potential for these complications in specific clinical circumstances.

Key Words: Colonic lavage, Colonoscopy, Polyethylene glycol, Sodium phosphate

Phosphate sodique par voie orale pour nettoyer le côlon : pièges et complications signalés par les colonoscopistes canadiens

RÉSUMÉ : Le phosphate sodique oral (PNa) est devenu une solution de rechange attrayante au polyéthylène glycol (PEG) pour le nettoyage du côlon avant la colonoscopie, mais pourrait s'accompagner de complications plus grandes. Cette étude porte sur un sondage auprès des membres de l'Association canadienne de gastro-entérologie (ACG) en vue de déterminer comment ces agents sont utilisés et quelles sont les complications de leur utilisation. Un questionnaire de Dillman a généré des réponses de 67 % parmi les 400 membres qui effectuent des colonoscopies. Pour les patients externes, plus nombreux, les répondants ont utilisé le PNa plus souvent que le PEG (46 %, contre 35 % respectivement, $P < 0,015$). Les répondants ont utilisé le PNa et le PEG à des fréquences similaires pour les patients hospitalisés (44 %, contre 43 %). Parmi les répondants ayant utilisé le PNa, 45 % ont déclaré exclure son emploi chez les insuffisants rénaux et 30 % chez les cardiaques, 13 % en présence d'obstruction incomplète de l'intestin et 9 % chez les patients très âgés. Des symptômes évocateurs d'une hypovolémie ont été signalés chez 9 % de ceux qui utilisaient le PNa, contre 3 % pour ceux qui utilisaient le PEG ($P < 0,02$). Trois patients ayant reçu du PNa ont présenté une insuffisance rénale aiguë. Une proportion plus grande de ceux qui utilisaient le PNa ont présenté de petits ulcères aphteux inexplicables (16 %) et la présence de mousse intraluminaire excessive (24 %) en comparaison avec les utilisateurs de PEG (3 %, $P < 0,00001$ et 14 %, $P < 0,03$ respectivement). Ces données démontrent que les membres de l'ACG utilisent plus souvent le PNa que le PEG pour préparer le côlon avant la colonoscopie. Un nombre plus grand de complications ont été signalées avec le PNa qu'avec le PEG et une proportion significative de répondants ont semblé ignorer les complications potentielles dans certains cas cliniques spécifiques.

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Oral sodium phosphate (NaP), a small volume osmotic cathartic, has recently been recommended as a colonic cleansing agent before colonoscopy (1-5). Because NaP has been shown to be better tolerated by patients while being equally or more effective than conventional osmotically balanced polyethylene glycol (PEG) solutions (1-5) and less expensive (1,6), NaP has become an attractive alternative to the PEG solutions.

Widespread enthusiasm for NaP has been tempered by the issue of its safety. Several investigators (1,3,6,7) have raised concerns about hypovolemia induced by its osmotic action and hyperphosphatemia because of its phosphate content. These investigators demonstrated that a number of patients develop biochemical and/or hemodynamic signs of contraction of the intravascular space, and almost all patients develop transient hyperphosphatemia. In the subjects evaluated these findings did not lead to clinically significant adverse effects. However, patients with renal failure, ileus, ascites, heart disease and extreme age were not included in these studies (1,2,5-7). Given the nature of the potential side effects, it seemed prudent to advise caution in these patient groups and to recommend replacing NaP-induced volume losses with intravenous physiological saline in in-patients with other comorbid medical conditions.

Despite these recommendations there have been both case reports (8) and anecdotal reports (personal communication) of serious complications with NaP when it was used inappropriately. Accordingly, we surveyed the membership of the Canadian Association of Gastroenterology (CAG) to determine how NaP was being used by colonoscopists and to estimate the occurrence of complications using NaP compared with conventional PEG colonic cleansing preparations.

MATERIALS AND METHODS

A one-page questionnaire concerning preferences and experience with colonic cleansing agents (Table 1) was mailed to all practising CAG members in Canada. The Dillman survey technique (9) was used to optimize response rates. Ethics approval was obtained from the Queen's University Human Ethics Committee.

Statistical comparisons were performed using the Fisher's exact test. Results are presented as odds ratios (\pm 95% CI).

RESULTS

Questionnaires were returned by 74% of the 400 members surveyed. Twenty-seven (9%) were excluded from analysis because either the respondents did not perform colonoscopy or the form was incomplete. Therefore, 67% of CAG contributed to the data analyzed in this study.

Preference for colonic cleansing agent: Respondents reported using NaP significantly more frequently than PEG in the out-patient group (Figure 1). Forty-six per cent reported using NaP, compared with 35% using PEG, more than 75% of the time ($P < 0.015$, odds ratio = 1.60 [1.13-2.26]). Of these respondents, 24% reported using NaP all the time whereas 19% reported using solely PEG. In contrast, there was no dif-

TABLE 1
Survey of colonic lavage for colonoscopy

1. Circle present use of specific lavage solution before colonoscopy					
IN-PATIENTS			OUT-PATIENTS		
Golytely (or related solutions)	Oral sodium phosphate	Others (specify)	Golytely (or related solutions)	Oral sodium phosphate	Others (specify)
100%	100%	100%	100%	100%	100%
>75%	>75%	>75%	>75%	>75%	>75%
50%	50%	50%	50%	50%	50%
<25%	<25%	<25%	<25%	<25%	<25%
0%	0%	0%	0%	0%	0%
2. List any patient groups in which you would avoid the use of:					
Golytely _____					
Sodium phosphate _____					
Others _____					
3. List any complications encountered and their frequencies with the use of:					
Golytely _____					
Sodium phosphate _____					
Others _____					
4. Do you give intravenous rehydration in in-patients during lavage?					
<u>Golytely</u>		<u>Sodium phosphate</u>		<u>Others</u>	
Yes %	No	Yes %	No	Yes %	No
5. Have you had difficulty with bubbles within the lumen which would obscure your view of significant lesions?					
<u>Golytely</u>		<u>Sodium phosphate</u>		<u>Others</u>	
Yes %	No	Yes %	No	Yes %	No
6. Have you noticed any unexplained findings that might have been caused by the lavage solution used?					
<u>Golytely</u>		<u>Sodium phosphate</u>		<u>Others</u>	
Yes %	No	Yes %	No	Yes %	No
7. Approximately how many colonoscopies per year do you perform?					
Adults _____			Pediatrics _____		

ference between the proportions using NaP or PEG in in-patients. Fewer than 8% reported using an alternative agent to NaP or PEG more than 75% of the time.

Contraindications to the use of NaP and PEG: To avoid bias in reporting, respondents were asked to list contraindications to the use of NaP and PEG but were not provided with options (Table 1). Of those using NaP on at least some occasions (73%), only 45% reported excluding its use in patients with renal failure, 30% with cardiovascular disease, 13% with incomplete (subacute) bowel obstruction and 9% with extreme age (Figure 2). Of the 72% who reported using PEG at least on some occasions, 22% reported that they excluded its use in those with advanced age, 21% with incomplete bowel

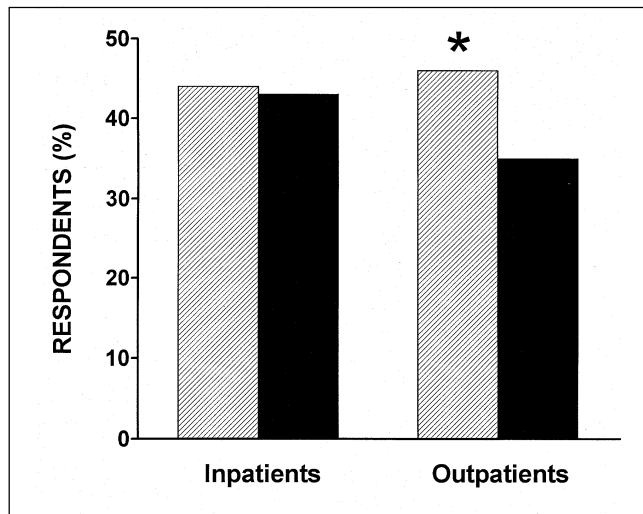


Figure 1) Oral sodium phosphate (NaP) was reported to be used more frequently for out-patient colonoscopy. The hatched bar shows percentage of respondents who use NaP more than 75% of the time for in- and out-patients. The solid bar designates percentage of respondents using PEG more than 75% of the time for in- and out-patients. *NaP is used significantly more frequently in the out-patient group ($P < 0.015$, odds ratio = 1.60 [1.13 to 2.26])

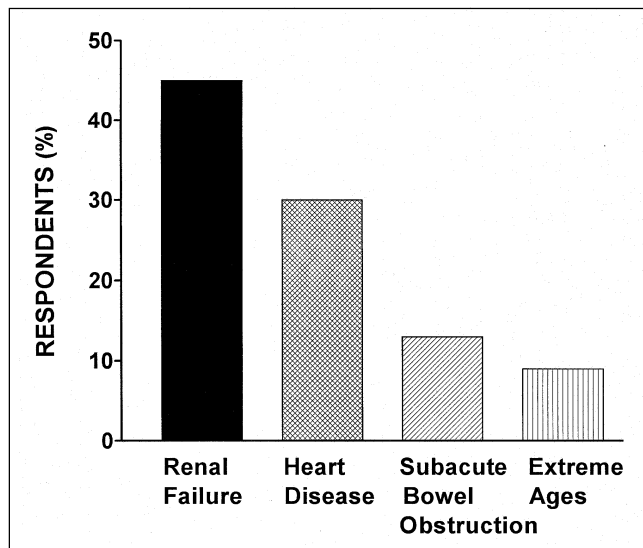


Figure 2) A large number of respondents appeared to be unaware of the contraindications to the use of oral sodium phosphate (NaP). Each bar represents the percentage of respondents who reported renal failure, significant heart disease, subacute (incomplete) bowel obstruction or extreme age as a contraindication to the use of NaP. No specific option was listed on the questionnaire (see Table 1) to avoid bias reporting

obstruction, 16% with cardiovascular disease and 6% with renal failure.

Complications encountered and the use of intravenous re-hydration: Significantly more respondents reported that they had treated patients who had experienced symptoms suggestive of clinically significant hypovolemia with NaP versus PEG (9% versus 3%, $P < 0.02$, odds ratio = 3.12 [1.23-8.05]) (Figure 3). Ten per cent using NaP and 5% using

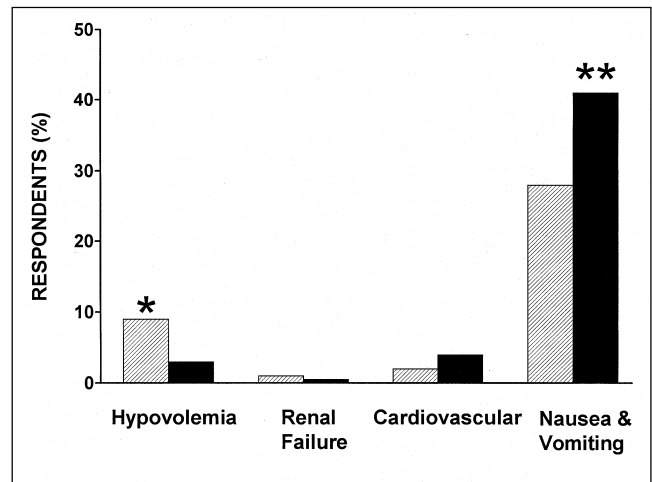


Figure 3) A significantly greater number of respondents reported patients having problems suggestive of hypovolemia with oral sodium phosphate (NaP) compared with polyethylene glycol (PEG). Hatched bars represent the percentage of respondents using NaP who reported problems with hypovolemia, renal failure, cardiovascular disease, and nausea and vomiting. Solid bars designate responses of those using PEG. *Hypovolemia was significantly more common with NaP than PEG ($P < 0.02$, odds ratio = 3.15 [1.23-8.05]); ** Nausea and vomiting were significantly more common with PEG than NaP ($P < 0.02$, odds ratio = 0.60 [0.41-0.90])

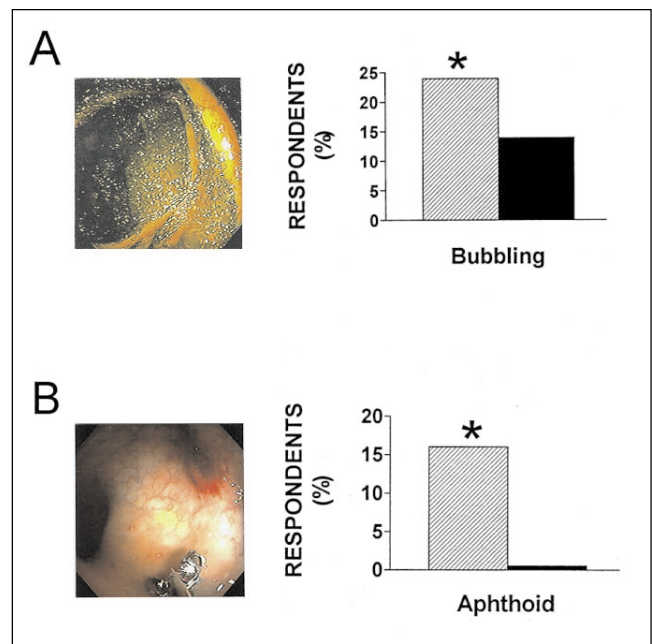


Figure 4) Unexplained aphthous ulcers and bubbling were more common with oral sodium phosphate (NaP) than polyethylene glycol (PEG). **4A Left** Videophotographic image of luminal bubbling. **4A Right** Number of respondents who considered luminal bubbling to be a problem on at least some occasions with oral sodium phosphate (NaP) (hatched bar) compared with polyethylene glycol (PEG) (solid bar) (* $P < 0.03$, odds ratio = 1.85 [1.11-3.08]). **4B Left** Videophotographic image of unexplained aphthoid lesions, which have been associated with NaP use. Tip to tip distance of the biopsy instrument is 7 mm. Biopsy of the lesion demonstrated nonspecific acute inflammation. **4B Right** Percentage of respondents who had observed this problem with NaP (hatched bar) compared with PEG (solid bar) ($P < 0.0001$, odds ratio = 36.22 [4.91-267.26])

PEG used intravenous rehydration on at least some occasions in in-patients during colonic lavage. Three patients were felt to have developed acute renal failure related to their use of NaP versus one patient following PEG use. Cardiovascular complications were reported in 2% using NaP and 4% using PEG. Nausea and vomiting were reported by a larger proportion of colonoscopists with PEG compared with NaP (41% versus 28%) ($P < 0.02$, odds ratio = 0.60 [0.41-0.90]).

Excessive luminal bubbling and unexplained aphthous lesions: NaP may cause intraluminal bubbling, which might obscure the mucosal detail in some patients (Figure 4). Twenty-four per cent of those using NaP reported that they had observed this phenomenon on at least some occasions, compared with 14% using PEG ($P < 0.03$, odds ratio = 1.85, [1.11-3.08]). NaP lavage had also been associated with minute mucosal aphthoid lesions (10); these might lead to diagnostic confusion in some patients (Figure 4). Sixteen per cent of respondents reported seeing these lesions when using NaP compared with 1% using PEG ($P < 0.0001$, odds ratio = 36.22 [4.91-267.26]).

DISCUSSION

Results of this survey suggest that in Canada NaP is now used more frequently than PEG for colonic lavage before outpatient colonoscopy. Because this is a much larger patient group compared with the in-patient colonoscopy group, these data suggest that overall NaP has become the preferred colonic cleansing agent. The data also suggest that patients receiving NaP may experience more lavage-related complications. Most important, many colonoscopists using this agent may not be fully aware of its potential for such complications.

In designing our survey (see Table 1) a one-page format was chosen to minimize reporting bias and maximize response rate, recognizing that it would limit the nature and detail of the conclusions that could be drawn. The survey was deliberately devised so that respondents would not be alerted to the fact that we were most interested in their use of NaP. To obtain an unbiased appraisal of the respondents' working knowledge of complications and contraindications, specific events were purposely not listed on the survey form.

Despite evidence that NaP lavage can produce intravascular volume depletion and hyperphosphatemia (1,3,6,7), albeit clinically insignificant in patients who are otherwise well (7), and despite recommendations that this agent be avoided in patients with renal failure, cardiovascular disease, incomplete bowel obstruction and extreme age (7), a surpris-

ing number of respondents failed to list these as contraindications. It might be argued that the nature of this survey results in under-reporting of these contraindications. However, the fact that renal failure (the most frequently reported contraindication) was identified by only 45% of respondents makes it extremely unlikely that this alone accounts for the low percentage. It is more likely that, although this agent has continued to gain popularity because of patient acceptance and cost, a significant number of colonoscopists are not fully aware of its potential major complications. That a significantly greater number of respondents using NaP had patients experiencing symptoms suggestive of hypovolemia compared with those using PEG, and that three patients developed renal failure, also support this concern because studies that carefully excluded patients (1,2,5-7) avoided these problems.

Colonoscopists should also be aware that NaP has also been reported to cause minor technical and interpretive difficulties. Several reports have suggested that tiny aphthoid lesions may be found in some patients (10,11), which appear to result from the effects of NaP on the colonic mucosa. One study (11) examined the prevalence of these lesions after lavage with either NaP or PEG solution. Colonoscopists who were blinded to the type of lavage preparation used reported finding these lesions in 25% of patients ($n=53$) receiving NaP compared with 2% receiving PEG ($n=44$). Macroscopically these lesions may raise a suspicion of Crohn's disease but biopsies demonstrate only a nonspecific acute inflammatory infiltrate. In the present study a relatively small number of colonoscopists (16%) reported observing such lesions. A randomized blinded study also suggested that in some patients NaP may create bubbling in the lumen that may obscure visualization of the mucosa. Bubbling was noted to be a problem by only a minority of respondents in our study (24%). Simethicone has been shown to resolve this problem almost completely (12).

CONCLUSIONS

This survey suggests that NaP has become the preferred agent for colonic cleansing among CAG members. Their responses suggest that many are unaware of some of the potential complications of this agent. Reports of increased hypovolemia and renal failure with NaP support previous recommendations that NaP be avoided in patients with renal failure, significant cardiovascular disease, incomplete bowel obstruction and extreme age, and that in-patients with ongoing medical problems receive intravenous rehydration during colonic lavage.

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