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Is a Single Dose of Sodium Phosphate (90 mL of SWIFF®) or a Split Dose of Sodium Phosphate (45 mL of SWIFF®) Better to Cleanse the Large Bowel?

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ABSTRACT

Aim: To compare a single dose of sodium phosphate (NaP) (90 mL of SWIFF®) and a split dose of NaP (45 mL of SWIFF(r)) given 6 hours apart for the endoscopic cleansing the colon.

Method: From February 2012 to August 2012, 81 patients were consecutively assigned to receive either a single dose of NaP (90 mL of SWIFF®) or a split dose of 45 mL of NaP (45 mL of SWIFF®) at 6 hours apart in an alternate day manner. The cleanliness of the large bowel was compared by using the Ottawa scale scoring criteria. Electrolyte levels were measured after the procedures.

Results: The Ottawa scale was 4.78 ± 1.96 in the group receiving a single dose compared with 3.25 ± 2.40 in the group receiving the split dose, $p = 0.002$. The results of electrolytes were Na 142 mmol/L, K 4.05 mmol/L, Cl 103 mmol/L, and Ca 11 mg/dL in the group receiving a single dose compared with Na 144 mmol/L, K 3.83 mmol/L, Cl 106.94 mmol/L, Ca 8.78 mg/dL in the other group, there being no statistical difference.

Conclusion: The split dose of 45 mL of NaP (SWIFF®) given 6 hours apart was cleansing better than a single dose of NaP (SWIFF®90 mL) which . There were no abnormal changes in the electrolyte levels.

Key words: Colonoscopy, large bowel cleansing, sodium phosphate

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Introduction

Colonoscopy is performed more and more often nowadays as a routine examination. Over the past two decades, several bowel preparation protocols have been proposed, including those of castor oil, anthroqinones, diphenylmethanes, phenopthalein, and magnesium citrate, in combination with a low residue diet. Along with these oral bowel cleansing agents, rectal enemas have also been used for traditional bowel preparation[1,2].

In 1980, Davis et al.[3] developed a polyethylene

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glycol (PEG)-based solution. PEG has become the most often used cleansing agent in recent years. Many studies have demonstrated its good tolerability and effectiveness in cleansing the colon. The main disadvantages of PEG are the large volume needed to drink, the poor tolerance by some patients, and its limited availability. Five to fifteen percent of patients were reportedly unable to finish the prescribed dosage[4,5]. PEG is not available in Lao People's Democratic Republic (Lao PDR).

Sodium phosphate (NaP) has been used for bowel preparation since 1969[6,7]. In 1990, oral sodium phosphate, a highly osmotic cathartic containing monobasic and dibasic sodium phosphate, was first evaluated by Vanner et al. who compared NaP with PEG solutions[8]. Several similar studies have since been conducted most of which have suggested the superiority of NaP for adequate and safe mechanical bowel preparation[9,5, 3,7,11].

In Laos, NaP (SWIFF®90) is the only available solution for is cleansing the large bowel. Despite its cost-effectiveness, several studies[8,10,12,13,16] have pointed out some studies potential problems with NaP, such as hyperphosphatemia, hypocalcemia , hyponatremia , congestive heart failure and renal failure.

The aims of our study were to assess whether a single dose of 90 mL of NaP is better than a split dose of 45 mL given 6 hours apart to cleanse the large bowel and to detect the electrolyte changes in both groups.

Patients and Methods

A prospective observational study was conducted at the GI Department of Mahosot Hospitial, the teaching hospital in Vientiane. A total of 81 consecutive inpatients and outpatients aged over 18 who were referred for diagnostic and therapeutic colonoscopy between February 2012 and August 2012 were recruited. Patients received either a single dose of 90 mL of NaP (SWIFF®, Berlin Pharmaceutical Industry Co., Ltd., Bangkok, Thailand) or a split dose of 90 mL of NaP (45 mL twice at 6 hours apart). Drug administration was by a trained nurse supervisor in an alternative day fashion who gave instruction according to the assigned bowel preparation scheme. Inclusion criteria were inpatients and outpatients aged 18 or over who were scheduled for colonoscopy and were willing to sign an informed consent. Exclusions were patients with the following disorders: chronic kidney disease (serum creatinine ≥140 μmol/L), high blood pressure on long-term medication, chronic congestive heart failure, previous colectomy or bowel resection, massive ascites, suspected bowel obstruction, megacolon, and acute coronary syndrome.

Pre-Colonoscopy Preparation

On the day before the procedure, the patient was advised to have a clear soup diet, without vegetables or fruit. The patient in the single group was instructed to take 90 mL of NaP at about 6:00 p.m. with 2 litres of drinking water. The patients in the double-dose group was to take 45 mL of NaP at 6:00 p.m. with 1 litre of drinking water, followed by a second dose of 45 mL of NaP at 12:00 noon with another litre of drinking water. The colonoscopy procedure was scheduled at 9:00 a.m. in the next morning.

Data Collection

As part of routine pre- procedural evaluation, patients were interviewed by the nurse assistant. The data collected before the procedure were age, sex, dosage of NaP, indication for coloscopy, CBC, ionogram, creatinine and calcium. After the procedure, only ionogram and calcium were measured. Phosphate and magnesium measurements were taken owing to limitations at our laboratory.

Colonoscopy and Quality of Bowel Preparation

All colonoscopies were performed by staff gastroenterologists who were asked to follow the Ottawa bowel preparation scale score (rage 0-14). To make it easier to read, the Ottawa scale score was displayed on the wall in front of the endoscopist's desk. The higher the score, the worse is the bowel preparation. The endoscopist rated the bowel preparation quality during the procedure and recorded the results on a standardized form.

Statistical Analysis

Data were presented as means and standard deviations. Fisher exact test was used to compare nominal and categorical measurements. Absolute values were compared is both groups with student's t-test generated by SPSS version 10. A p-value ≤0.05 was considered statistically significant. We did not perform the power statistics.

Results

Eighty-one consecutive patients (44 females/37 males) completed the study. In the group receiving a single dose, most were female (29 females/12 males), while the apposite was the case in the group receiving a split dose (15 females/ 29 males).

The indications for colonoscopy and the endoscopic findings were listed in the order of decreasing frequency in Table 1. The most common indication was hematochezia, while the most common finding was normality followed by colon cancer.

Regarding age, the average age in the single-dose group was lower, but without statistical difference. Sex distribution was comparable. Similar remarks could be

Table 1. The indications and the endoscopic findings from the study (n= 81).

Indications	Findings
1. Hematochezia (n=22)	1. Normal coloscopic findings (n=50)
2. Suspected colon cancer (n=20)	2. Colon cancer (n=10)
3. Unexplained abdominal pain (n=17)	3. Acute colitis (n=6)
4. Constipation (n=9)	4. Colonic diverticulosis (n=6)
5. Chronic diarrhea (n=7)	5. Rectal cancer (n=5)
6. Iron deficiency anemia (n=5)	6. Colonic ulcer (n=2)
7. Dysenteric syndrome (n=1)	7. Colonic polyps (n=2)

*Extra finding: Presence of a live Ascaris in one case

Table 2. Patient's characteristics in the study.

	Single dose (n=41)	Split dose (n= 40)
Age (yrs)	42.4 ± 14.07	49.85 ± 12.90
F/M	29/12	15/29
WBC (cells/mL)	7873.41 ± 3741	8259.75 ± 3392.10
Hct (%)	36.95 ± 7.02	40.65 ± 8.12
Hb (g/dL)	11.32 ±2.15	12.54 ± 2.61
platelets (cells/mL)	388717.51 ± 626590.67	267014 ± 123816.05
Creatinine (g/dL)	90.98 ± 22.47	100.62 ± 21.82
Calcium (g/dL)	14.49 ± 24.06	8.98 ± 0.91
Na	139.50 ± 21.91	143.67 ± 4.10
K	4.22 ± 0.43	4.16 ± 0.56
Cl	104.22 ± 4.58	106.73 ± 6.23

Table 3. Laboratory measurements before and after ingestion of NaP in the two study groups.

Study group		Measurements before NaP	Measurement after NaP	Mean difference (95%CI)	*p*-value
Single dose	Creatinine	90.98 ± 22.47	(not available)		
	Calcium	14.49 ± 24.06	11.36 ± 15.28	(-6.09, 12.34)	ns
	Na	139.50 ± 21.91	142.29 ± 5.00	(-9.06, 4.49)	ns
	K	4.22 ± 0.43	4.05 ± 0.52	(0.01, 0.34)	ns
	Cl	104.22 ± 4.58	103.63 ± 7.35	(-1.94, 3.03)	ns
Split dose	Creatinine	100.62 ± 21.82	(not available)		
	Calcium	8.98 ± 0.91	8.78 ± 0.96	(-.206, 0.060)	ns
	Na	143.67 ± 4.10	144.08 ± 4.70	(-2.170, 1.34)	ns
	K	4.16 ± 0.56	3.83 ± 0.53	(.81, 0.57)	ns
	Cl	106.73 ± 6.23	106.94 ± 6.80	(-2.97, 2.55)	ns

Table 4. Comparison of bowel preparation quality the both study groups.

Preparation group		
Mean score		*p*-value
Single dose	Split dose	
4.78	3.25	0.002

made regarding WBC (WBC 7873.41 ± 3742 vs. 8259.75 ± 3392.10), Hct (36.95 ± 7.02 vs. 40.65 ± 8.12), platelets (388717.51 ± 626590.67 vs. 267014 ± 123816.05), Hb (11.32 ± 2.15 vs. 12.54 ± 2.61), Creatinine (90.98 ± 22.47 vs. 100.62 ± 21.82), Calcium (14.49 ± 24.06 vs. 8.98 ± 091), Na (139.50 ± 21.91 vs. 143.67 ± 4.10), K (4.22 ± 0.43 vs. 4.16 ± 0.56) and Cl (104.22 ± 4.58 vs. 106.73 ± 6.23). None of the laboratory parameter changes reached a statistically significance. We did not see any overt clinical manifestation of the laboratory changes.

Quality of Bowel Preparation

Poor quality of bowel cleansing was noted vs. in both groups, although the mean total of Ottawa scale scores was not above 4, which was quite good (Table 4). We did not calculate the segment score (right-colon segment, mid-colon segment or left-colon segment) and the amount of residual fecal volume.

As shown in Table 4, the lowest mean Ottawa preparation score was in the group receiving a split dose at 6 hours apart. Comparison of the mean scores favored the split dose with *p*-value of 0.002.

Discussion

The main purpose of this observational study was to determine which one of the two dosing strategies would be better to cleanse the colon of patients without co-morbidities (such as congestive heart failure, CKD, high blood pressure and acute coronary heart disease, or severe liver disease). The study results favored the split dose regimen. Unfortunately, we could not measure serum phosphate and serum magnesium to find out adverse changes from NaP intake, as observed in previous studies[3,6,11]. However, we did not observe clinical manifestations of hyperphosphatemia. There were also no statistical differences regarding the changes of Ca, Na, K, and Cl.

Yoshioka et al. reported an increase in serum phosphate level after NaP, but it was not clear if any patient was symptomatic; other laboratory parameters were not affected[14].

Misha et al.[15] reported two patients with renal impairment who developed severe symptomatic hyperphosphatemia after oral NaP. Two reasons may help explain our findings. First the average age of our patients were below 60, serum phosphate being known to correlate with increasing age. Secondly, significant co-morbidities were excluded at entry into our study.

Conclusions

In adults under 60 years old without co-morbidities, a split dose of 90 mL of NaP cleanse the colon better than a single dose or 90 mL of NaP. The electrolyte changes in both groups did not reach a statistical difference.

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