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SAFETY OF MANNITOL USE IN BOWEL PREPARATION: a prospective assessment of intestinal methane (CH_4) levels during colonoscopy after mannitol and sodium phosphate (NaP) bowel cleansing

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ABSTRACT – ***Background*** – Adequate bowel preparation is critical for the quality of colonoscopy. Despite reported occurrence of colonic explosion due to methane and hydrogen production by bacterial fermentation during colonoscopy, gas exchange during the procedure is believed to be effective in lowering existing methane concentration, allowing for safe utilization of mannitol for bowel preparation. Thus, mannitol is widely used for bowel cleansing prior to colonoscopy, considering its low cost and effectiveness for bowel preparation. ***Objective*** – The aim of this study was to assess the safety of mannitol for bowel preparation, when compared to sodium phosphate (NaP). ***Methods*** – We conducted a prospective observational study in which 250 patients undergoing colonoscopy at Universidade Federal de São Paulo and Hospital Albert Einstein (São Paulo, Brazil) were approached for inclusion in the study. Patients received either mannitol (n=50) or NaP (n=200) for bowel preparation, based on physician indication. Study was conducted from August 2009 to December 2009. The main outcome of interest was presence of detectable levels of methane (CH_4) during colonoscopy and reduction in such levels after gas exchange during the procedure. Methane concentrations were measured in three intestinal segments during scope introduction and withdrawal. Safety was assessed as the absence of high levels of methane, defined as 5%. Measurements were made using a multi-gas monitor (X-am 7000, Dräger Safety AG & Co. KGaA, Lübeck, Germany) connected to a plastic catheter introduced into the working channel of the colonoscope. Additional outcomes of interest included levels of O_2. Methane and O_2 levels are reported as ppm. Mean, difference and standard deviation of levels of gas measured in both moments were calculated and compared in both groups. Proportions of patients with detectable or high levels of methane in both groups were compared. Continuous variables were analyzed using *t* test and categorical variables using qui-square tests. The Ethics Committee in both study sites approved the study protocol. ***Results*** – Patients in both groups were similar regarding demographics, colonoscopy indication, ASA status and quality of bowel preparation. Seven (3.5%) patients in the NaP group had methane detected during introduction of the endoscope. Methane levels became undetectable during withdrawal of the scope. None of the patients in the mannitol group had detectable levels of methane. O_2 levels did not differ in the groups. ***Conclusion*** – This is the largest study to assess the safety of mannitol for bowel preparation, considering methane measurements. Our results indicate that mannitol use is as safe as NaP, and gas exchange was efficient in reducing methane concentrations.

HEADINGS – Colonoscopy. Mannitol. Intestinal absorption. Methane.

INTRODUCTION

Colonoscopy is currently the standard method for mucosa imaging of the entire colon and is widely used for the diagnosis and treatment of colonic disorders[10,12,22]. The effectiveness of colonoscopy, including its ability to diagnose precancerous lesions and prevent colorectal cancer, is highly dependent on adequacy of bowel cleansing[7]. In addition to lower effectiveness of the procedure, inadequate bowel preparation in colonoscopy can result in higher costs and complication rates[7,9,23,28].

Ideally, bowel preparation for colonoscopy should reliably empty the colon of all fecal material in a rapid fashion with no gross or histologic alteration of the colonic mucosa. The preparation should not cause patient discomfort or shifts in fluids or electrolytes. In order to achieve that, oral medications that are safe, convenient, tolerable, and inexpensive are to be used. Unfortunately, none of the currently commercially available formulation fit all of the above criteria[22].

Colonic explosion during colonoscopy has been attributed to the presence of inflammable gases - hydrogen (H_2) and methane (CH_4), in combination

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with oxygen (O_2), and application of a heat source (electro cautery or argon plasma coagulation)[13,14,18,25].

Accumulation of colonic gas to potentially explosive concentrations results mainly from inadequate bowel preparation[14]. It has also been hypothesized that methane and hydrogen production by bacterial fermentation during colonoscopy may be increased as a result of non-absorbable carbohydrate preparations for bowel preparation, such as mannitol, sorbitol, and lactulose. For this reason, routine use of non-absorbable carbohydrate preparations is not favored in Europe and in North America[14,21]. Nonetheless, mannitol is widely used globally, due to its effectiveness in bowel cleansing, good tolerability, low complication rates, and low cost[8]. Gas exchange during the procedure is believed to be effective in lowering existing methane concentration prior to colonoscopy, allowing for safe utilization of mannitol for bowel preparation[4].

Mannitol is the most used laxative in Brazil[24,27]. Considering the above, we propose to evaluate the safety of mannitol for bowel preparation, when compared to sodium phosphate, which has been reported as among the most frequently used product for bowel preparation[5].

In order to assess the safety of mannitol, we aimed at evaluating the presence of detectable levels of methane (CH_4) levels during colonoscopy, and whether reduction in detected levels occurred after gas exchange during the procedure, in patients receiving either mannitol or sodium phosphate.

METHODS

Study design

We conducted a prospective observational study of patients undergoing colonoscopy who received either mannitol or sodium phosphate for bowel preparation prior to the procedure.

Study location

Study subjects were enrolled in two sites, both located in São Paulo, Brazil. Hospital A, Hospital Albert Einstein, is a tertiary level private hospital, with 670 beds and performing around 1000 colonoscopies/month. Hospital B, Hospital São Paulo, is a public tertiary level university hospital with 712 bed hospital, performing about 100 colonoscopies/month and providing healthcare services free of charge to users of the Brazilian public healthcare system (SUS).

Selection of patients

From August 2009 to December 2009, adult outpatients with a colonoscopy procedure scheduled at any of the two study sites were invited to participate in the study. Systematic enrollment of patients was performed, once a week in Hospital São Paulo, and twice a week in Albert Einstein. Exclusion criteria were ASA scores III and IV prior to procedure, being hospitalized at the moment of the procedure, and not agreeing to sign an informed consent.

Ethical issues

This study protocol was approved by the Ethics Committees of both institutions involved and was conducted in accordance with the World Medical Association Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects. Written informed consent was obtained from all patients.

Colonoscopic procedure

After accepting to participate in this study, patients were assigned to one of the two study groups, based on physician preference and recommendation.

All patients were asked to adhere to a liquid diet the day before the examination. According to patient's preference, colon cleansing could be performed on a home or Hospital basis. In both regimens drugs dosages were the same. In home cleansing the patient received the drug and was oriented in how to ingest it at home, and arrived at the hospital ready for the procedure. In Hospital cleansing, the patient received the drug into the Hospital, and was observed in the Endoscopy Unit until preparation was considered adequate by the nursing team.

In the mannitol group, patients received 150 g of mannitol diluted in 500 mL of water the night before the procedure (examinations scheduled for the morning or home preparation) or 6 hours prior to the procedure (afternoon or Hospital based examinations). In the NaP group, patients received 20 mg of the salt diluted in 500 mL of water the night before the procedure (examinations scheduled for the morning or home preparation) or 6 hours prior to the procedure (afternoon or Hospital based examinations). In both groups, patients were encouraged to drink water (up to 2 liters) until 3 hours before beginning of the sedation.

Before the procedure, an intravenous cannula was placed in the forearm for the injection of propofol and other medications. According to the ASA Task Force on Sedation and Analgesia by Non-anesthesiologists recommendation, supplemental oxygen (2 L/min) was given to all patients unless specifically contraindicated[1]. Monitoring included continuous electrocardiogram, noninvasive blood pressure measurement and pulse oximetry.

In both groups, we attempted to pass the colonoscope to the cecum with minimum air insufflation or suction. Intermittent infusions of small quantities of water were used as necessary. Not more than 400 mL of water was infused in any one occasion[4]. Based on the need to insufflate air/water the difficulty level of each colonoscopy procedure was subjectively classified in easy, intermediate or difficult.

Gas measurements

The following gases were measured during colonoscopy procedures: oxygen (O_2) and methane (CH_4). Gas concentrations were measured in the rectum and transverse colon during introduction and withdrawal of the scope. A physician blinded to the cleansing solution performed gas measurements. Another single measurement was performed

when reaching the cecum. Measurements were made using a multi-gas monitor (X-am 7000, Dräger Safety AG & Co. KGaA, Lübeck, Germany) connected to a polyvinyl tube that protruded 2 to 3 mm from the working channel of the colonoscope. Methane and O_2 levels are measured as parts per million (ppm).

Study outcomes

The main study outcome was detectable levels during colonoscopy, and decreasing methane concentrations after gas exchange. Additional outcomes of interest included levels of methane and O_2 in both groups. Concentration of any gas higher than 0 was defined as presence of the gas. Methane levels were converted to % LEL (lower explosive limit) by dividing the measured value (in ppm) by 10,000.

Data collection

The following variables were recorded: (1) indication of the procedure; (2) time interval between laxative administration and beginning of the procedure; (3) quality of bowel preparation; (4) time to reach the cecum; (5) total examination time; (6) technical difficulty of the procedure; (7) CH_4 and O_2 in the rectum and transverse colon and when reaching the cecum; (8) presence of complications.

Statistical analysis

Descriptive analysis of patient and procedures characterization was conducted. For continuous parameters, results were expressed as mean (SD). Categorical data were expressed using absolute frequencies and percentages.

Mean, difference and standard deviation of gas levels were calculated. Stratified analysis by colonic segment (rectum, cecum, and transverse), and moment of measurement (calibration, introduction or withdrawal) was also performed. Mean level of gas concentrations during scope introduction and withdrawal were compared.

Patient's characterization, outcomes, and average gas levels were compared in the two groups – receiving mannitol and sodium phosphate. Patients who presented detectable methane concentrations were compared to those without methane detected. Continuous variables were analyzed with two sample Student's unpaired *t* test. Categorical data were examined with qui-square and Fisher's Exact Test when appropriate. Statistical significance level was $P<0.05$. All statistical analyses were performed with statistical software SPSS for Windows (SPSS version 23.0, SPSS Inc.) or EpiInfo 6 (CDC and WHO).

RESULTS

Of the 250 patients included in this study, 136 (54.4%) were male. Average age was 56.2 years (range 19-88 years, SD 12.2). Average time between laxative administration and beginning of examination was 5.84 hours (range 3-14 hours, SD 2.47). Major indications for colonoscopy were screening in asymptomatic patients (n=109, 43.6%), abdominal pain (n=41, 16.4%), diarrhea (n=30, 12%) and constipation (n=29, 11.6%).

Most colonoscopy procedures were performed at Study Site B (n=212, 84.8%). Fifty (20%) patients received mannitol for bowel preparation whereas 200 (80%) patients received sodium phosphate. Of these, 123 (61.5%) performed preparation in the hospital, and 77 (38.5%) prepared at home. Bowel preparation was judged adequate in all except one (0.4%) patient. Time to reach the cecum ranged between 6 and 21 minutes (mean 10.4 min, SD 2.5). Total examination time varied between 14 and 50 minutes (mean 24.2, SD 5.5). Subjects in the study groups did not differ significantly in terms of demographics and clinical characterization (Table 1).

Colonoscopy procedure was considered easy in 194 (77.6%) subjects, intermediate in 47 (18.8%) and difficult in 9 (3.6%). Most study subjects (n= 154, 61.6%) presented some finding in the procedure. Of these, the most significant finding was polyps and/or diverticula (n=133, 86.4%). Ninety-six patients (38.4%) had a normal colonoscopy.

TABLE 1. Characterization of patients enrolled in considering patients receiving mannitol and sodium phosphate. Cohort study to assess safety of mannitol for bowel preparation, Brazil, 2009

Variables	Patients receiving mannitol N (%) (n=50)	Patients receiving Sodium Sulphate N (%) (n=200)	*P*-value
Categorical variables, n (%)			
Male Gender	23 (46)	113 (56)	0.206
Reason for colonoscopy			
Screening / asymptomatic	17 (34)	92 (46)	0.126
Diarrhea	9 (18)	21 (10.5)	0.144
Obstipation	5 (10)	24 (12)	0.693
Melena	0 (0)	11 (5.5)	0.089
Abdominal pain	11(22)	30 (15)	0.232
Others	6 (12)	12 (6)	0.142
Anemia	2 (4)	10 (5)	0.767
Study site			
Hospital A	12 (24)	200 (100)	
Hospital B	38 (76)	0 (0)	
Difficulty level of colonoscopy			
Easy	35 (70)	159 (79.5)	0.150
Intermediate	13 (26)	34 (17)	0.736
Difficult	2 (4)	7 (3.5)	0.865
Continuous variables, mean (standard deviation)			
Age (years)	52.16 (14.23)	57.16 (11.40)	0.963
Duration of colonoscopy (minutes)	23.64 (6.49)	24.31 (5.19)	0.931

Methane concentrations were identified in seven patients receiving sodium phosphate during colonoscopy procedure, all of which had preparation performed at home. CH_4 levels were measured in the rectum in five cases, in the transverse in five and in the cecum in five patients. In all seven patients, bowel preparation was considered adequate. No patients receiving mannitol had detectable amounts of methane. During withdrawal of the scope, no patient presented CH_4 concentrations. Detailed characterization of such patients is presented in Table 2.

No patient had methane gas concentration during scope withdrawal as shown in Table 3. When considering the reduction in gas levels from scope introduction to withdrawal (Δ = level at introduction - level at withdrawal) for rectum and transverse segments, whereas a significant reduction of CH_4 was demonstrated for both rectum and transverse segments (P<0.001), O_2 levels maintained at similar levels.

Subjects presenting with detectable CH_4 levels did not differ from those with undetectable CH_4 (Table 4). However, numbers were small to identify factors associated to this outcome.

DISCUSSION

We hypothesized that detectable and high levels of CH_4 would be present during scope introduction, when gas exchange – air insufflation and aspiration is minimal, particularly in patients receiving mannitol. Although our main goal was to assess whether gas exchange could reduce CH_4 concentration after colonoscopy in patients receiving mannitol solution for cleansing, surprisingly we did not observe high levels of CH_4 concentrations. To our knowledge this is the first report to show such results.

Secondly, as anticipated, CH_4 levels were reduced at the moment of scope withdrawal, when compared to levels at scope introduction, possibly as a result of gas exchange during the colonoscopy procedure. This was true in both study groups.

TABLE 3. Average gas levels in various intestinal segments, before and during colonoscopy. Cohort study to assess safety of mannitol for bowel preparation, Brazil, 2009

	Mean (standard deviation)		
Levels of CH_4 (ppm)	Rectum	Transverse	Cecum
Patients receiving mannitol (n=50)			
Scope introduction	0	0	0
Scope withdrawal	0	0	
Δ (introduction - withdrawal)	0	0	
Patients receiving Sodium Phosphate (n=200)			
Scope introduction	330 (2.436)	620 (4.605)	285 (2.376)
Scope withdrawal	0	0	
Δ (introduction - withdrawal)	330 (2.436)	620 (4.605)	
P-value	<0.0001	<0.0001	
Levels of O_2 (ppm)	Rectum	Transverse	Cecum
Patients receiving mannitol (n=50)			
Scope introduction	20.878 (0.109)	20.776 (0.794)	20.904 (0.028)
Scope withdrawal	20.900 (0)	20.896 (0.0283)	
Δ (introduction - withdrawal)	- 0.02 (0.109)	- 0.12 (0.794)	
Patients receiving Sodium Phosphate (n=200)			
Scope introduction	20.886 (0.125)	20.894 (0.087)	20.866 (0.274)
Scope withdrawal	20.904 (0.039)	20.889 (0.154)	
Δ (introduction - withdrawal)	- 0.17 (0.125)	0.0045 (0.168)	
P-value	0.06	0.99	

TABLE 2. Characteristics of 7 patients with detectable methane (CH_4) levels. Cohort study to assess safety of mannitol for bowel preparation, Brazil, 2009

Patient	Gender	Age (years)	Reason for colonoscopy	Bowel preparation	Quality of bowel preparation	Colonoscopy Findings	Level of CH_4 Rectum, Transverse, Cecum (ppm)	Level of O_2 Rectum (ppm)
1	F	42	Screening	Sodium phosphate/ Home	Adequate	Normal	0 – 0 – 3,000	20.900
2	F	82	Screening	Sodium phosphate/ Home	Adequate	Normal	2,800 – 48,000 – 3,000	20.900
3	M	62	Screening	Sodium phosphate/ Home	Adequate	Diverticula	3,800 – 0 – 0	20.900
4	M	62	Screening	Sodium phosphate/ Home	Adequate	Polyps	15,400 – 21,000 – 32,000	20.900
5	M	46	Screening	Sodium phosphate/ Home	Adequate	Normal	28,000 – 32,000 – 5,600	20.900
6	M	53	Screening	Sodium phosphate/ Home	Adequate	Normal	12,000 – 23,000 – 8,000	20.900
7	F	57	Diarrhea	Sodium phosphate/ Home	Adequate	Diverticula + polyps	0 – 4,000 – 0	20.900

TABLE 4. Comparison of patient characteristics and potential factors associated with presence of CH_4 during colonoscopy. Cohort study to assess safety of mannitol for bowel preparation, Brazil, 2009

Variables	Patients with detected levels of CH_4 N (%) (n=7)	Patients with undetectable CH_4 N (%) (n=243)	*P*-value
Dichotomous variables, n (%)			
Male Gender	4 (57.1%)	132 (54.3%)	0.88
Reason for colonoscopy			
Screening / asymptomatic	6 (85.7%)	103 (43.6%)	0.05
Diarrhea	0 (0%)	30 (12.4%)	0.40
Obstipation	0 (0%)	29 (11.9%)	0.42
Melena	0 (0%)	11 (4.5%)	0.73
Abdominal pain	0 (0%)	41 (16.9%)	0.60
Others	1 (14.29%)	17 (7%)	0.41
Anemia	0 (0%)	12 (4.9%)	0.71
Study site			
Hospital A	7 (100%)	205 (84.4%)	0.25
Hospital B	0 (0%)	38 (15.6%)	
Difficulty level of colonoscopy			
Easy	6 (85.7%)	188 (77.4%)	1
Intermediate/ Difficult	1 (14.3%)	55 (22.6%)	
Continuous variables, mean (standard deviation)			
Age (years)	57.7 (13.12)	56.11 (12.15)	0.7
Duration of colonoscopy (minutes)	24.0 (4.83)	24.2 (5.49)	0.9

Further, despite recent evidence reporting high rates (10%-30%) of inadequate preparation, particularly when performed at home[7,10,12,15,23], our study found that almost all patients had adequate preparation, regardless of having had home or hospital preparation. The fact that our study population was composed only by ASA I and II patients could explain such a good preparation quality.

Hyperosmotic purges with non-absorbable carbohydrates, such as mannitol, sorbitol, and lactulose, exert an osmotic effect, drawing water into the intestine, leading to bowel distention and stimulation of evacuation. The routine use of non-absorbable carbohydrate preparations is not favored in Europe and in North America due to the risk of explosion during electrosurgical procedures[21].

Colonic explosion during colonoscopy has been attributed to the presence of inflammable gases, chiefly hydrogen (H_2) and methane (CH_4) in the colon, which are produced in the colonic lumen from fermentation of non absorbable (e.g. lactulose, mannitol) or incompletely absorbed (lactose, fructose, sorbitol) carbohydrates by the colonic flora[14]. The potentially explosive range of H_2 is 4.1% to 72% and of CH_4 is 5% to 15%. Oxygen concentration must be above 5% in the total gas mixture for theses gases to be combustible[14].

It has been reported that almost half of the patients (42.8%) with unprepared colon have potentially explosive concentrations of hydrogen and methane[20]. Although formation of H_2 is dependent upon the delivery of ingested fermentable material to the colonic bacteria, CH_4 production does not have a clear-cut relation to diet[4]. Gas exchange during colonoscopy (air insufflation and aspiration) has long been reported as efficient in lowering methane concentrations to safe levels[4].

In a systematic review of the medical literature from 1952 to 2006, a total of 20 cases of colonic gas explosion were identified. Eleven cases occurred during surgery and nine cases during colonoscopy procedures. Bowel preparation by ingestion of a mannitol solution was used in 14 cases, a cleansing solution containing sorbitol in one, and enemas with no fermentable agents in the remaining five cases[14].

Selected studies have pointed towards a risk of explosion after mannitol preparation during colonoscopic polypectomy lower than anticipated, with high levels of CH_4 also reported in patients receiving castor oil[4].

Strocchi et al.[25] described absence of explosive levels of methane and hydrogen in patients prepared to colonoscopy with polyethylene glycol solution (Colyte ®). Similar results were obtained by Monahan et al.[18] in patients prepared with polyethylene glycol solutions and phosphosoda enemas for sigmoidoscopy. None of these studies used mannitol as colonic cleansing.

Mannitol is still the most used drug for colon cleansing before colonoscopy in Brazil. Such preference, although not stated, is probably secondary to its low cost, and low ingestion volume. In addition, only recently commercially specific colon cleansing products for colonoscopy have become available in Brazil. Several studies have reported on the use of mannitol in Brazil, demonstrating effectiveness in colon preparation, good tolerability and very low complication rates[3,11,16,17,19,24,27].

Methane production in the bowel is poorly understudied. Methane is produced by a group of anaerobes called methanogens, in the intestine[26]. Interestingly, individuals can be categorized as methane producers and non-producers, respectively about 35% and 65% of healthy Western population[6]. Recently, methane production has been linked to intestinal transit time. An association between methane production and slow transit time has been shown[26]. If the association between elevated methane production and slow intestinal transit time is related to altered colonic flora is still to be proved[2]. Accelerated transit time after mannitol (or any other cleansing colon substance) ingestion could explain such a low methane production. That could also explain why methane concentrations could be present during colonoscopy in patients with less than optimal colonic cleansing, improving the chance of colon explosion during electrocauthery use.

Our results indicate that mannitol use is as safe as sodium sulphate, and gas exchange was efficient in reducing methane concentrations. Further studies evaluating cost-effectiveness of mannitol for bowel preparation in developing settings are warranted and will provide useful results for guidance regarding its use and safety. Such studies should take into consideration recent evidence on factors related to CH_4 production, reported rates of detectable CH_4 levels when using different types of laxatives for bowel preparation, and practices associated to reduction of gas levels during colonoscopy.

Authors' contributions

Paulo GA: study design, data collection, writing. Martins FPB: data collection, writing. Macedo EP: data collection. Gonçalves MEP: data collection. Ferrari AP: study design, writing, critical evaluation and discussion.

Paulo GA, Martins FPB, Macedo EP, Gonçalves MEP, Ferrari AP. Segurança do uso do manitol no preparo para colonoscopia: avaliação prospectiva do nível de metano (CH_4) intestinal durante colonoscopia após preparo com manitol e fosfato de sódio (NaP). Arq Gastroenterol. 2016,53(3):196-202.

RESUMO - ***Contexto*** **-** Preparo adequado é fundamental para garantia de boa qualidade em colonoscopia. Apesar de relatos de explosão do cólon durante colonoscopia, secundários à produção de metano e hidrogênio pela fermentação bacteriana, acredita-se que a troca gasosa durante o procedimento diminua a concentração existente de metano, permitindo a utilização com segurança, de manitol para o preparo de cólon. Assim, manitol é largamente utilizado para limpeza dos cólons antes da colonoscopia, especialmente devido ao seu baixo custo e eficácia. ***Objetivo*** - O objetivo do estudo foi avaliar a segurança do uso de manitol no preparo dos cólons, quando comparado ao uso de fosfo-soda (NaP). ***Métodos*** - Este foi um estudo observacional retrospectivo no qual foram incluídos 250 pacientes submetidos a colonoscopia na Universidade Federal de São Paulo e Hospital Albert Einstein (São Paulo - Brasil). Os pacientes receberam preparo de cólon com manitol (n=50) ou NaP (n=200), de acordo com preferências dos médicos que encaminharam os pacientes. O estudo foi realizado entre agosto e dezembro de 2009. O principal resultado pesquisado foi a presença de níveis detectáveis de metano (CH_4) durante a colonoscopia, e a redução nestes níveis após troca gasosa durante o procedimento. As concentrações de metano foram dosadas com detector multi-gas (X-am 7000, Dräger Safety AG & Co., KGaA, Lübeck, Alemanha) conectado a um cateter plástico que foi introduzido no canal de instrumentação do colonoscópio. Outro achado de interesse foram níveis de O_2. Níveis de metano e O_2 foram relatados em ppm. Média, diferença entre as médias e desvio padrão nos níveis dos gases em ambos momentos foram comparados nos dois grupos. A proporção de pacientes com níveis detectáveis ou altos de metano em ambos os grupos foram comparados. Variáveis contínuas foram analisadas com teste *t* e variáveis categóricas com o teste do qui-quadrado. Os Comitês de Ética de ambas instituições aprovaram o protocolo do estudo. ***Resultados*** - Pacientes nos dois grupos foram comparáveis quanto aos dados demográficos, indicação para colonoscopia, classificação ASA e qualidade do preparo do cólon. Sete (3,5%) pacientes no grupo NaP tinham níveis detectáveis de metano durante a introdução do colonoscópio. Os níveis de metano se tornaram indetectáveis durante a retirada do aparelho. Nenhum dos pacientes no grupo manitol tinha níveis detectáveis de metano. Níveis de O_2 foram semelhantes nos dois grupos. ***Conclusão*** - Este é o estudo com maior casuística que avaliou a segurança do uso de manitol para preparo de cólon, no que diz respeito a dosagem de metano. Nossos resultados indicam que o emprego do manitol é tão seguro quanto o NaP, e que a troca gasosa é eficaz na redução da concentração de metano.

DESCRITORES - Colonoscopia. Manitol. Absorção intestinal. Metano.

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