

The Journal of **Alternative** and **Complementary Medicine**

Journal of Alternative and Complementary Medicine:
<http://mc.manuscriptcentral.com/jaltcompmed>

Efficacy of Bolus Lukewarm Saline and Yoga Postures as a Colonoscopy Preparation: A Pilot Study

Journal:	<i>Journal of Alternative and Complementary Medicine</i>
Manuscript ID:	Draft
Manuscript Type:	Original Articles
Date Submitted by the Author:	
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Keywords:	yoga, CAM, exercise
Abstract:	<p>Background Colonoscopy is now the gold standard for colon cancer screening and a vital diagnostic and therapeutic tool in 21st Century medical practice. Although advances have been swift since colonoscopy came into wide use a generation ago, its effectiveness can be compromised by patients' ability to adequately prepare for the procedure. Many patients dread this task more than the procedure itself. While no prep regimen can be ideal for all patients, the authors present a novel approach that represents a potential time saving improvement for younger, healthier patients. It is a modern version of an Indian practice called shankh prakshalana, in which lukewarm saline is used in combination with five yoga postures to cleanse the bowel.</p> <p>Objective To examine the safety, efficacy, and tolerability of lukewarm saline and yoga (LWS/Yoga) as a colonoscopy preparation in comparison with NuLytely® (PEG-3350, sodium chloride, sodium bicarbonate and potassium chloride solution) used according to the manufacturer's instructions.</p> <p>Research Design A pilot study comprising 54 healthy adults, ages 18 to 65, equally divided into two groups: Group A preparing with lukewarm saline and yoga postures (LWS/Yoga); and Group B preparing with NuLytely® as directed on the label.</p> <p>Measurements We collected data on the quality of bowel preparation, patient safety, patient tolerability, and side effects.</p> <p>Setting</p>

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	<p>A Joint Commission accredited outpatient endoscopy clinic.</p> <p>Interventions Patients performed the series of five yoga postures known as shankh prakshalana, interrupting the exercises at regular intervals to consume 480 mL of lukewarm saline. The solution was prepared by adding 9 grams of sodium chloride [NaCl] per liter of lukewarm water, [99 -102°F / 37.2 - 38.9°C].</p> <p>Results The mean total score was significantly better in Group A vs Group B (20.63+/-5.09 Vs. 16.48+/-5.18, P<0.0007). In Group A, 24/27 (88.9%) of patients had Excellent or Optimum total scores, compared with 21/27 (77.8%) in Group B (not significant). In our pilot study, LWS/Yoga, used under supervision, produced better colon preparation than Nulytely, used as directed.</p> <p>Limitations: A randomized, endoscopist blinded study is needed to confirm these results.</p> <p>Conclusion: Shankh prakshalana is effective as a colonoscopy preparation.</p>
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Peer Review

Efficacy of Bolus Lukewarm Saline and Yoga Postures
as a Colonoscopy Preparation: A Pilot Study.

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Running head: Bolus lukewarm saline and Yoga for colonoscopy prep

Introduction

Colonoscopy and polypectomy have been proven to detect and prevent colorectal cancer (1). Growing community awareness has helped to increase the number of colonoscopies performed each year in the United States, but poor bowel prep remains a significant limiting factor in the success of this procedure. Poor colon preparation is associated with missed lesions, increased risk of procedure-related complications, and, too often, the frustration of having to repeat the procedure. This leads to dissatisfaction among endoscopists as well as patients. Among the wide variety of prep regimens available, none is ideal; and patients' own levels of application vary considerably. The search for a "perfect prep" continues (2, 3).

Polyethylene glycol- (PEG) based preparations are now the most commonly used. These are safe and effective, although the unpalatable taste and large volumes required (4 liters) are obstacles for many patients (4). In 2003, low-volume PEG-SF 2-liter solutions such as HalfLytely[®] were found safe and effective; however, palatability and tolerability remain concerns (5). Among other options, sodium phosphate-based preps have been shown to be better tolerated than PEG and PEG-SF preps (6, 7). The PEG based preparations are known to cause local cellular injury, although the actual clinical significance of this side effect is not known (8). The sodium phosphate (NaP) solutions are associated with acute renal toxicity even in healthy patients (9).

An ideal preparation should be safe, effective, fast, palatable, and impose few dietary restrictions on the patient. *Shankh prakshalana* may be a candidate. This method is a yogic process that uses lukewarm saline water and a series of five *asanas*, or postures, to clean the intestinal tract. It came to our notice in 2002, when my team performed a colonoscopy on a young woman of Indian descent who refused conventional bowel prep products and applied her

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3 own method – *shankh prakshalana*. Her preparation was superior and warranted further
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5 investigation, which led to this pilot study.
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9 *Assessing the medical value of a centuries-old practice.* According to a 2007 CDC survey, 38%
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11 of American adults reported using some form of Complementary and Alternative Medical
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13 (CAM) therapy in the previous 12 months (10). Another national survey found that 15 million
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15 American adults used Yoga at some point in their lives (11). Although credible scientific
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17 research is needed to demonstrate the medical value of CAM therapies, (12) their appeal is
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19 clearly substantial.
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25 Yoga originated in India more than 5,000 years ago. The Sanskrit word *yoga* translates as
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27 “to unify” – referring to a union of mind and body achieved through adherence to a system of
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29 spiritual, moral, and physical directives. Studies on transcendental meditation have shown that
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31 experienced practitioners are able to exert autonomous nervous control (13). Beneficial effects of
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33 yoga on cardiovascular and neuroendocrine systems have been reported in a number of studies
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35 (14, 15, 16) and yoga has also been shown to improve myocardial perfusion and help in the
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37 regression of coronary lesions (17, 18).
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43 This pilot study assesses the efficacy of *shankh prakshalana* as a bowel prep for
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45 colonoscopy. We have also delineated the basic mechanisms of its action in the gastrointestinal
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47 system and standardized the process of its administration.
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50 51 **Patients and Methods**

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53 The study was approved by the Institutional Review Board (WHMC- IRB 2005-31) at
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55 Wyckoff Heights Medical Center in Brooklyn, New York, an affiliate of Weill Medical College
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3 of Cornell University. It should be noted that this pilot study was not a randomized trial. Patients
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5 were informed about the trial and those who were willing to try the BLS/Yoga condition were
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7 treated in that way (Group A). Those not willing to undergo the BLS/Yoga preparation were
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9 placed in the control condition (Group B). The endoscopist was not blinded to treatment
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11 condition. Patients referred for colonoscopy, with good general physical status (American
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13 Society of Anesthesiologists class 1 or 2) were considered for inclusion. Patients with salt
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15 sensitivity, hypertension, chronic heart failure, chronic renal insufficiency, chronic liver diseases,
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17 arthritis, chronic obstructive pulmonary disease, or coronary artery disease were excluded.
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19 Patients with a history of colectomy, inflammatory bowel disease, and diarrhea were also
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21 excluded. Eligible patients were enrolled in the study with informed consent.
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Instructions for All Patients

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30 Patients were asked to eat their usual mid-day meal on the day before the colonoscopy
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32 procedure. From 2pm on, they were instructed to take only clear liquids. Specific suggestions
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34 included apple juice, grape juice, Gatorade, clear broth, hard candy, popsicles, Jell-O, tea, and
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36 coffee.
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Instructions for Group A

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43 Patients were given a DVD of the *shankh prakshalana* postures to watch and practice.
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45 The patients maintained NPO status after 12 midnight and reported to the endoscopy unit at 9am
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47 on the day of the examination in comfortable, loosely-fitting clothing. They were asked to turn
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49 off phones and beepers and to relax. The examination room was a quiet environment with an
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51 available dedicated bathroom. Vital signs were recorded.
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3 The LWS solution was prepared by dissolving 9 grams of sodium chloride in one liter of
4 lukewarm water (99 -102 °F). Patients were instructed to drink 16 ounces (480 ml) continuously
5 as a bolus. They were further instructed that if drinking a bolus of 16 oz. was not possible, then
6 they should drink a bolus of 8 oz. (240 mL) instead. At the conclusion of the trial it was
7 observed that there were, in fact, two subgroups of patients within Group A: those who drank 16
8 oz. bolus ("16 oz. subgroup") and those who drank 8 oz. ("8 oz. subgroup") and they are referred
9 to in the methods and results below.
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20 Patients performed the process under the supervision of the author, (V.A.), according to
21 the instruction sheet shown in Figure 1. Each patient repeated steps 1 through 9 – one “set” –
22 until bowel movements were clear. Patients were instructed to interrupt the process whenever
23 they had the urge to defecate, and not to strain during defecation.
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29 The total solution intake, time to first bowel movement and total time spent until clear
30 bowel movement was recorded. Basal metabolic profile was drawn before and after the process
31 to assess electrolyte levels. After completing the process, patients were asked to evaluate the
32 difficulty of the exercises and the palatability of the solution.
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39 All colonoscopy examinations were performed by the author (V.A.) within two hours of
40 patients' completion of the *shankh prakshalana* regimen photographs were taken at six different
41 areas (Rectum, Sigmoid, Descending Colon, Transverse Colon, Ascending Colon, Cecum);
42 figure 2 is a representative photograph of Group A patient.
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49 **Preparation Assessment for All Patients**

50 The quality of bowel preparation was assessed using a 4-point scale in each of 6 sites.
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52 Based on the incidence colon polyp/colon cancer – (rectum 20%; sigmoid 25 %; descending
53 colon 15 %; transverse colon 10%; right colon 30%) – the investigator evaluated preparation in
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3 the rectum, sigmoid, descending colon, transverse colon, ascending colon, and cecum. Poor prep
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5 (solid/semi-solid/thick stool) was rated as 1. Sub-optimum prep (particles of stool preventing
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7 reliable exam) was rated as 2. Optimum prep (clear stool with some particles not interfering with
8
9 the exam) was rated as 3. Excellent prep (no remaining stool particles) was rated as 4. Total prep
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11 score was computed as the sum of the scores for the six anatomical areas. Aggregating these
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13 individual ratings resulted in the following overall scale: 19-24 – Excellent; 13-18 – Optimum;
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15 7-12 – Sub-optimum; and 1-6 – Poor.
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20 Excellent and optimum preps were considered acceptable while suboptimum and poor
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22 preps were considered unacceptable. Photographs were taken to document the investigator's
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24 assessments.
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27 28 **Instructions for Group B**

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30 Patients were directed to use NuLytely[®] (PEG-3350, sodium chloride, sodium
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32 bicarbonate and potassium chloride solution) between 6 and 10pm on the evening prior to
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34 examination. They were directed to drink the solution at a rate of 240mL (8 oz.) every 10
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36 minutes, according to the manufacturer's instructions and remain NPO following their
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38 preparation until presenting at the office the next day for the colonoscopy procedure.
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43 44 **Statistical Analysis**

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46 Primary Aim: To compare the BLS/Yoga group A with the NuLytely control group B on
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48 total prep scores and scores at each of the six assessed sites: rectum, sigmoid, left colon,
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50 transverse colon, right colon, and cecum.
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52 53 **Secondary Aims, Within the Yoga Group**

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- 1) Determine how the 8 oz. v/s 16 oz. bolus drink – affects the quality of preparation and speed of action, measured by time to first bowel movement and time to complete the prep regimen.
- 2) To compare pre- and post-procedure electrolyte levels: Na, K, Cl, CO₂, BUN, Creatinine, and Glucose.

Statistical Methods

Comparisons between groups in the study were made using the Mann-Whitney test for each of the continuous measures. This test was employed to compare yoga group A vs. NuLytely® control group B; and within the yoga group to gauge how the 8 oz. v/s 16 oz. of solution intake affected the quality of colon lavage.

A comparison of pre- and post-procedure electrolyte levels was made using the Wilcoxon signed rank test. The difference between the measures was calculated as Post minus Pre.

Results were considered significant at $\alpha=0.05$ level of significance. Data are summarized as frequency and percentage or mean and standard deviation (SD).

Results

Arya.Table 1 – Patient Demographics and Baseline Characteristics:

	Group A	Group B
Total patients	N=27	N=27
	N (%)	N (%)
Sex		
Male	8 (29.6)	15 (55.5)
Female	19 (70.4)	12 (44.5)

Age		
20-40	17 (62.9)	2 (7.4)
40-60	9 (33.3)	19 (70.4)
>60	1 (3.7)	9 (33.3)
Race		
Caucasian	14 (51.8)	17 (62.9)
African American	2 (7.4)	2 (7.4)
Hispanic	7 (25.9)	7 (25.9)
Other	4 (14.8)	1 (3.7)

The pilot study included 54 patients divided into two groups of 27. Yoga Group A composition: 8 male, 19 female, aged 21 to 63 years, with a mean age of 38. NuLytely® Group B composition: 15 male, 12 female, aged 37 to 78 years, with a mean age of 55. These gender and age differences suggest that younger females may be more willing to try the BLS/Yoga prep technique.

For NuLytely® control group B, prep parameters are taken from the manufacturer's package insert, as control group participants undertook prep at home and these data were not recorded. Hence comparisons in the time to first bowel movement and the amount of solution consumed cannot be drawn with confidence. The difference in overall prep time, however, is remarkable.

Mean Grading score

Complete colonoscopies were performed on all patients by the same gastroenterologist. The mean total prep score was significantly better in Group A vs. Group B (20.63+/-5.09 vs.

16.48+/-5.18, P<0.0007). In Group A, 24/27 (88.9%) of patients had Excellent or Optimum total scores, compared with 21/27 (77.8%) in Group B (not significant).

Arya.Table 2 - Bowel cleaning score comparison in each segment

Score	BLS/Yoga	NuLytely	P-value
Rectum	3.52*	3.3**	<0.2252
Sigmoid	3.48	3.19	<0.1853
Left colon	3.48	2.44	<0.0003
Transverse colon	3.52	2.33	<0.0001
Right colon	3.41	2.63	<0.0060
Cecum	3.22	2.44	<0.0177
Total	20.63	16.48	<0.0007

*SDs for all segments are all approximately 0.90 for BLS/YOGA

**SDs for all segments are all approximately 1.00 for NuLytely

BLS/Yoga vs. NuLytely[®] The BLS/Yoga regimen provided superior prep in all segments. BLS/Yoga prep was done same day, while the NuLytely[®] prep was done the evening before. It is known that patients taking prep on the same day of the procedure achieved better prep in all segments of colon (19, 20). Hence timing of the prep could be a factor in these results.

Arya.Table 3a - Subgroup analyses of bowel cleaning scores within the BLS/Yoga group:

8 oz. "Bolus" vs. 16 oz. "Bolus" drinkers.

Score	8 oz. "Bolus" Score (SD)	16 oz. "Bolus" Score (SD)	P-value

Rectum	3.00 (1.21)	3.93 (0.26)	<0.0102
Sigmoid	3.08 (1.16)	3.80 (0.41)	<0.0693
Left colon	3.17 (1.19)	3.73 (0.46)	<0.2655
Transverse colon	3.17 (1.19)	3.80 (0.41)	<0.1535
Right colon	3.08 (1.16)	3.67 (0.49)	<0.2201
Cecum	3.00 (1.21)	3.40 (0.63)	<0.5786
Total	18.50 (6.84)	22.33 (2.06)	<0.2376

Arya.Table 3b - Subgroup analyses of bowel cleaning scores within the BLS/Yoga group:

Total time spent and time to first bowel movement.

	8 oz. "Bolus" Minutes (SD)	16 oz. "Bolus" Minutes (SD)	P-value
Total time spent	119.17 (39.30)	87.80 (38.60)	<0.0310
Time to first bowel movement	57.42 (21.05)	25.80 (4.83)	<0.0001

In consuming the solution, the volume of intake makes a difference. Within the BLS/Yoga group, 15 out of 27 patients, drank 16 oz. (480 mL) in less than 120 seconds every 8 to 10 minutes, while 12 out of 27 patients, took in 8oz. (240mL) in less than 60 seconds every 8 to 10 minutes. There was no difference in bowel prep scores (Table 3a). However, the 16 oz. "Bolus" drinkers had their first bowel movement sooner (on average, 25.8 minutes vs. 57.42 minutes) and spent less time (87.8 minutes vs.119.17 minutes) completing the prep (Table 3b).

Arya.Table 4 - Pre and post procedure electrolytes in the BLS/Yoga group

Score	Mean difference (SD)	P-value
Sodium	0.20 (3.40)	<1.000
Potassium	0.09 (0.47)	<1.000
Chloride	6.60 (2.70)	<0.0020
CO ₂	-5.44 (3.78)	<0.0156
BUN	-3.00 (2.69)	<0.0039
Creatinine	-0.022 (0.11)	<0.4219
Glucose	-9.00 (6.00)	<0.0039

A pre and post basal metabolic profile was collected on 9 patients. No difference was seen in sodium and potassium levels. A statistically significant difference was observed for Chloride, CO₂, BUN, Creatinine and Glucose levels. These changes were clinically insignificant.

Arya.Table 5a – Symptoms and Side Effects: BLS/Yoga

Symptom and Side-effects	Patient number N (%)
None	17 (60)
Mild nausea	4 (14)
Mild abdominal cramps	3 (11)
Mild dizziness, diaphoresis	2(7)
Vomiting	1 (4)
Urination	1 (4)

Arya. Table 5b - Tolerability: BLS/Yoga

Tolerability	Patient number N (%)
Solution palatability	
Unpleasant	2 (7.4)
Pleasant	25 (92.6)
Exercise	
Difficult	1 (3.7)
Easy	26 (96.3)

Nausea and abdominal cramps were the most common side effects reported in Group A (25%) compared to Group B ($\leq 50\%$). Other adverse reactions included dizziness and diaphoresis in 2 patients and vomiting and urination in one patient each. These adverse reactions were transient and all patients completed the BLS/Yoga process. The majority of the patients found the lukewarm saline solution palatable (92.6%). Reactions to the *shankh prakshalana* exercises were positive (96.3%). All patients reported that the exercises made it easier to drink the required amounts of solution rapidly; and all professed their willingness to repeat the process in future.

Discussion

The results of this pilot study suggest that the ancient practice of *shankh prakshalana*, using warm salted water and yoga poses, may be more effective than one of today's most widely-used commercial colonoscopy preparation products. It is certainly faster, and well tolerated by the healthy patients in the study. The results warrant further exploration of the physical mechanisms of this ancient practice – within the framework of contemporary science.

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3 *Experience with saline lavage solutions.* High-volume (9 - 13 L) balanced electrolyte solutions
4 (BES) have been successfully used for gut lavage (21, 22, 23, 24). In all these studies the
5 solution intake was at a rate of 25-30 ml /minute for 4-6 hrs. Clinically insignificant electrolyte
6 abnormalities and a weight gain of 0.9 Kg was reported as side effects. Together, these studies
7 demonstrate that normal saline can provide efficacious gastrointestinal lavage without causing
8 significant electrolyte imbalance or cardiopulmonary side effects in healthy individuals. The
9 landmark study by Davis, et al, reported that when balanced electrolyte solution was perfused at
10 a rate of 30 ml /minute for 3 hours, net absorption of water and salt was 2400 mL and 375 meq.
11 respectively (25). Although they reported 0.5 kg weight gain with BES, no clinically significant
12 electrolyte changes were reported in normal subjects with – or without – PEG. The addition of
13 PEG may be only beneficial for patients who cannot readily excrete salt and water load, i.e. CHF
14 and CRF (25).
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31 The BLS/Yoga patients drank 240 mL – 480 mL in 60 – 120 seconds, almost ten times
32 faster rate than above studies (21, 22, 23, 24, 25). There seems little cause for concern about
33 weight gain, fluid absorption or electrolyte imbalance in healthy patients using the *shankh*
34 *prakshalana* method, especially as the solution exits the body so quickly.
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42 **LWS/Yoga and electrolytes**

43 Fluid secretion in the gastrointestinal tract is mainly by active transepithelial secretion of
44 chloride ions, while fluid absorption is primarily by uptake of sodium (26). During fasting,
45 sodium coupled with chloride is actively absorbed against an electrochemical gradient by the
46 intestinal mucosa (27). Electrogenic sodium absorption takes place in the distal colon with a final
47 outcome of stool dehydration (28). Potassium movement in the gastrointestinal tract is passive.
48 In our pilot study, we obtained pre and post basal metabolic profile data on nine BLS/Yoga
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3 volunteers. We observed no significant change in sodium and potassium values, clinically
4 insignificant hyperchloremia, slightly elevated BUN, and low HCO₃. As noted, previous studies
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6 have reported similarly minimal electrolyte abnormalities (21,22,23,24,25). It is known that
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8 depending on the electrolyte composition of the meal, chloride secretion can be inhibited or
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10 stimulated (26). The 0.9% normal saline, also known as “Physiological Saline,” has an
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12 osmolality of about 300 mosm, matching the osmolality of plasma. The saline solution empties
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14 from the stomach rapidly and exponentially (29). As the solution is isotonic, it should not get
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16 absorbed from the gastrointestinal tract, especially when consumed in bolus form. The resulting
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18 high flow rate allows minimal time for ionic exchange.
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The role of “bolus” drinking on gastric emptying

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29 The most striking result in our study is the speed of the BLS/Yoga method: 101minutes
30 was the average time for successful completion of the process. The authors’ hypothesis is that
31 rapid consumption of the solution (Dumping) plays a central role in producing the rapid result.
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33 Rather than sipping slowly, *shankh prakshalana* practitioners drink the solution right down,
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35 swallowing continuously. Consuming 8 oz. (240ml) in less than 60 seconds or 480 ml (16 oz.) in
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37 less than 120 seconds creates a substantial bolus of solution. NuLytely[®] patients and the
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39 LSW/Yoga patients consumed similar amounts of the respective solutions every 8 to 10 minutes.
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41 The difference is *how* they drank it. The NuLytely[®] patients sipped at a measured rate of 25-30
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43 ml per minute. Applying first order kinetics (with a time to 50 % emptying of 8-18 minutes) of
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45 inert isotonic liquid emptying,(30,31) it is reasonable to conclude that during this process a much
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47 larger volume will empty out into the small bowel. We observed that the 15 out of 27 who were
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49 the most rapid BLS drinkers had their first bowel movement within 15-30 minutes (avg. 25
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3 minutes) and completed the process in a remarkable 87 minutes. The gastrocolic cholinergic
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5 propulsive reflex might be playing an important role in the success of this process (32).
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8 **Effect of temperature on gastric emptying**

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10 Studies in animals have shown that the heating of the thoracic esophagus and stomach
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12 provokes a partial inhibition of the contraction at the cervical level of the esophagus while
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14 cooling does the reverse (33). The authors suspect that the relatively warm saline solution's
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16 relaxing effect on the cervical esophagus enhances the effect of what we have called "bolus
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18 drinking." In humans, cold liquids have been shown to slow gastric emptying to a statistically
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20 significant degree, while the emptying rates of warm and control drinks were not statistically
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22 different (34). Although there are individual variations in gastric emptying of liquids, warm
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24 liquids are known to cause the adaptive relaxation of gastric muscle, allowing a greater volume
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26 to be consumed (35,36). These findings suggest that warmer temperature has a positive role in
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28 the efficacy of this process.
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35 **Effect of Gravity and Posture on Gastric emptying**

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37 The unique component of this cleansing process is the series of exercises. We know
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39 intuitively that changes in posture can influence the intragastric distribution of liquids. Simply
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41 lying on one's right side can increase the gastric emptying of a saline test meal which does not
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43 activate duodenal receptors (37, 38). Moore, et al noted a marked effect of body posture on
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45 radionuclide measurements of gastric emptying (39). Gravity, coupled with postural change,
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47 influences the gastric configuration, which in turn changes intragastric meal distribution, leading
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49 to a more rapid emptying of non-nutrient inert liquids (40). Among the many factors which
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51 influence the gastric emptying are volume, calories, temperature, exercise, posture, osmolarity
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53 (41,42,43). We speculate changes in the gastric configuration during Yoga postures in
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3 conjunction with deep inhalation and exhalation. We are confident that such evident physical
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5 changes play a role in accelerating gastric emptying.
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8 9 **Effect of Exercise on Gastrointestinal Motility**

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11 Animal studies have shown that in both fed and fasted states, exercise induces giant
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13 migratory complexes, defecation and mass movement (44,45). In human studies, acute aerobic
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15 exercise decreased colonic phasic motor activity, resulting in less resistance to colonic flow,
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17 while post exercise increased the amplitude of propagated waves was thought to enhance
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19 propulsion causing, which was followed by increased propagating waves after stopping (46).
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21 Kim, et al found that an exercise as simple as walking improved colonoscopy preparation among
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23 younger, non-obese patients with no history of abdominal surgery (47). We speculate, in the
24
25 BLS/Yoga regimen, the first four postures are specifically aimed at improving gastric emptying.
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27 The fifth posture (squatting) affects the colonic motility by increasing the intraabdominal
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29 pressure.
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35 **Effect of Deep Breathing on Gastric Emptying**

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37 The yoga postures begin with a deep inhalation and end with exhalation. The resulting
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39 movements of the diaphragm change the gastric configuration, which in turn has an effect on
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41 intragastric meal distribution and gastric emptying. Changes in gastric configuration during
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43 diaphragmatic movement are well evident from radiological studies. The authors speculate that
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45 deep breathing does in fact have some role in faster gastric emptying.
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49 **The role of yoga itself**

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51 The authors have identified a number of ways in which the physiology of the *shankh*
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53 *prakshalana* process contributes to a relatively rapid cleansing of the bowel. The role of
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55 relaxation – of turning inward, away from a harried workaday life – is harder to measure. The
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3 BLS/Yoga regimen is performed in a calm environment. The postures are motivated by deep,
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5 rhythmic inhalation and exhalation, which aim at the relaxation of mind and body. An interesting
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7 bit of anecdotal evidence in our study is that the patients who failed to have success with the
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9 BLS/Yoga process, mentioned that they felt unable to concentrate.
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13 Yogic methods have had thousands of years to perfect themselves through use, and with
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15 more investigation, are becoming better understood. Modern biomedical research has identified
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17 more of the mechanisms by which mind and body interact (48). Advanced practitioners of yoga
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19 can regulate autonomic functions including heart rate and respiration. That yogic breathing can
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21 influence the autonomic nervous system suggests that it may also influence gastro-intestinal
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23 motility. And, for the relaxed mind in a relaxed body, thinking “clean” may play some role in
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25 becoming so. *Shankh prakshalana* began as a purification process, after all.
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30 **A simpler, faster, economical solution for healthy patients**

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33 In this pilot study, BLS/Yoga prep was performed under a physician’s supervision. We
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35 believe this process can be performed with equal success by patients following an instructor on a
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37 DVD. For healthy patients, this could be a faster, palatable and less expensive alternative for
38
39 bowel prep than most commercial solutions.
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43 In Hindi, *shankh* means “conch.” The sea shell, with its convoluted chambers, is a
44
45 metaphor for the gastrointestinal tract. *Prakshalana* means “to clean” In an effort to make this
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47 millennia-old method more widely known in the West, we have simplified *shankh prakshalana*
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49 to *Shudh*, a Sanskrit word meaning “purity.” We believe *Shudh* colon prep has a place in the
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51 modern physician’s arsenal of colonoscopy preps.
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Conclusion:

The study demonstrated the effectiveness of Low volume (3 Liters) BLS/Yoga in colonoscopy preps. A new mechanism of colon preparation is explored. The “bolus drinking” (Dumping) of LWS in conjunction with Yoga postures (deep breathing, gravity, gastric configuration, and exercises) achieved faster gastric emptying leading to successful colon prep for colonoscopy.

Acknowledgement

The authors thank Dr Martin Lesser for statistical analysis, Dr Ashok Valluri and Mr Jiten Patel for their help in preparing the manuscript.

Author Disclosure Statement

- **Guarantor of the article:** Vijaypal Arya ,MD.
- Specific authors contributions: Vijaypal Arya: conception and design of study, supervision of Yoga, performance of all colonoscopies. Vijaypal Arya, Kalpana A.Gupta, Swarn V Arya: Analysis and interpretation of data, preparation of manuscript.
- **Financial support:** None.
- **Potential competing interest:** Vijaypal Arya: President, Vikalp Inc. Kalpana A.Gupta and Swarn V Arya state no conflict of interest.

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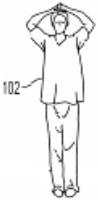












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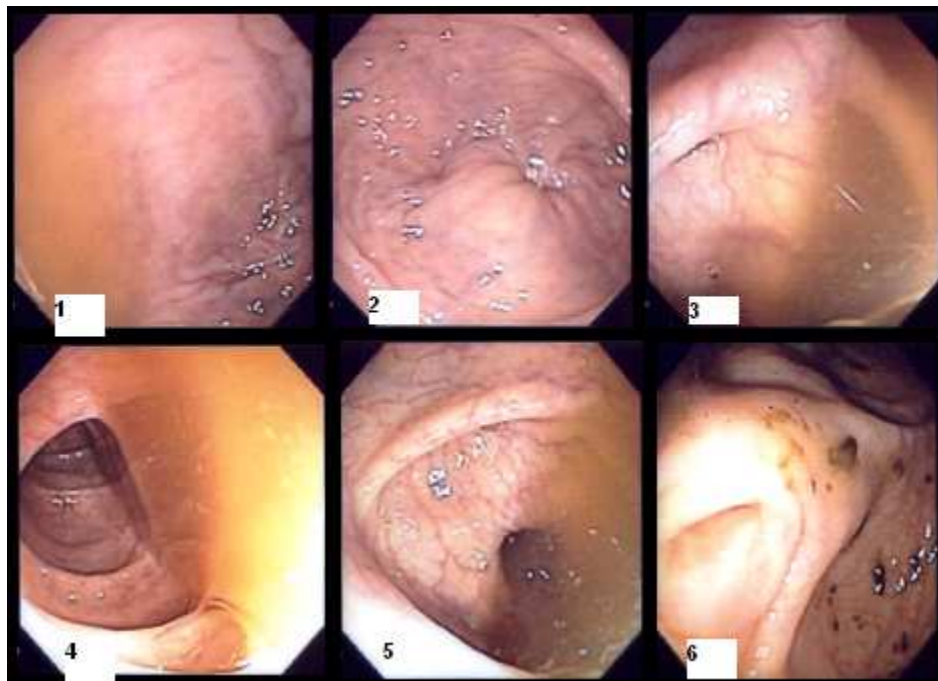
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For Peer Review

Arya.Fig 1- BLS/Yoga FOR COLON PREP

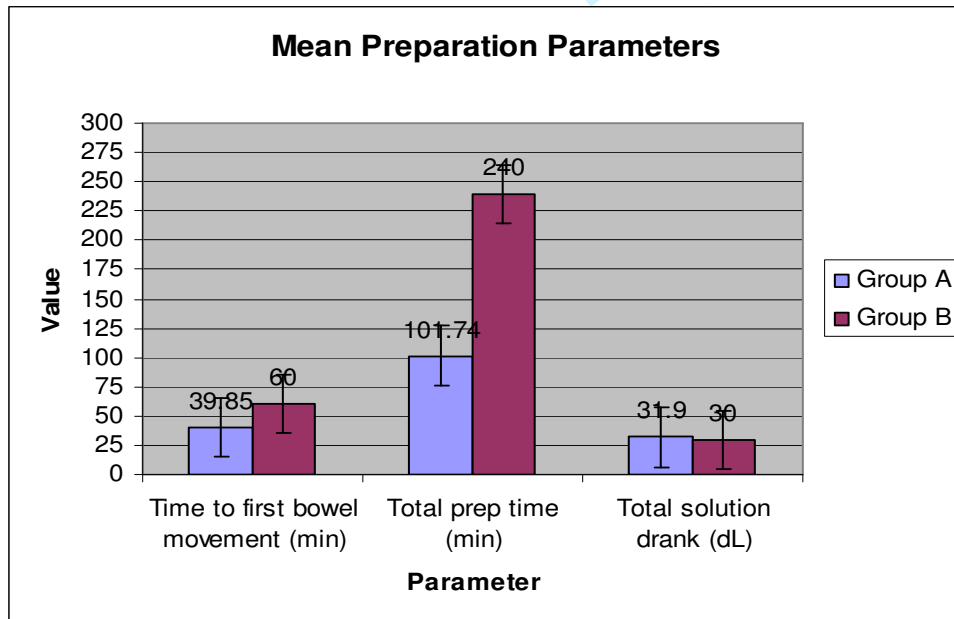
Follow Steps 1 to 8 and keep repeating these steps until you have clear bowel movement.					
Step	Drink 2 glasses, 8 Oz (240ml) each, of the prepared LWS solution. Drink continuously rather than sipping.				
	Get Ready	Inhale		Exhale	Repeat
Upward Stretch Step 2	 <p>Hands: Interlace fingers, hands on head, palm facing up Feet: Feet together, stand erect.</p>	 <p>Hands: Stretch upwards. Feet: Stand on toes stretch up.</p>		 <p>Return to ready position</p>	The Upward Stretch ten times
	Get Ready	Inhale	Exhale	Inhale	Repeat
Side Stretch Step 3	 <p>Hands: Interlace fingers, stretch arms upwards, Palms facing up. Feet: 1-2 feet apart</p>	 <p>Hands: Bend both arms to right. Feet: 1-2 feet apart</p>	Return to ready position	 <p>Hands: Bend both arms to left. Feet: 1-2 feet apart</p>	The Side Stretch five times on right and five times on left.
Step	Drink 2 glasses, 8 Oz (240ml) each, of the prepared LWS solution. Drink continuously rather than sipping.				
Twist Stretch Step 5	 <p>Hands: Stretch arms, palm facing downwards. Feet: : 1-2 feet apart</p>	 <p>Hands: Left Hand on Right shoulder and Right Hand on small of back, Palm facing out. Rotate your upper body towards the right. Try to see your left heel. Feet: 1-2 feet apart</p>	Return to ready position	 <p>Hands: Right Hand on left shoulder and left Hand on small of back, Palm facing out. Rotate your upper body towards the left. Try to see your right heel. Feet: 1-2 feet apart.</p>	The Twist Stretch five times on right and five times on left.
Push up Stretch Step 6	 <p>Hands: lie down on stomach, raise your body. Feet: 1-2 feet apart</p>	 <p>Hands: Twist towards the right turning your head to the right until you see the heels. Feet: 1-2 feet apart</p>	Return to ready position	 <p>Hands: Twist towards the left turning your head to the left until you see the heels. Feet: 1-2 feet apart</p>	The Push up Stretch five times on right and five times on left.
Step	Drink 2 glasses, 8 Oz (240ml) each, of the prepared LWS solution. Drink continuously rather than sipping.				
Squatting Stretch Step 8	 <p>Feet: Squat on 1 feet foot apart. Hands: Palm on knees</p>	 <p>Feet: touch right knee to left toe Hands: Palm on knees</p>	Return to ready position.	 <p>Feet: touch left knee to right toe Hands: Palm on knees</p>	The Squatting Stretch five times on right and five times on left.
At any point if you have an urge to defecate, go to the toilet but do not strain					

Arya.Fig 2

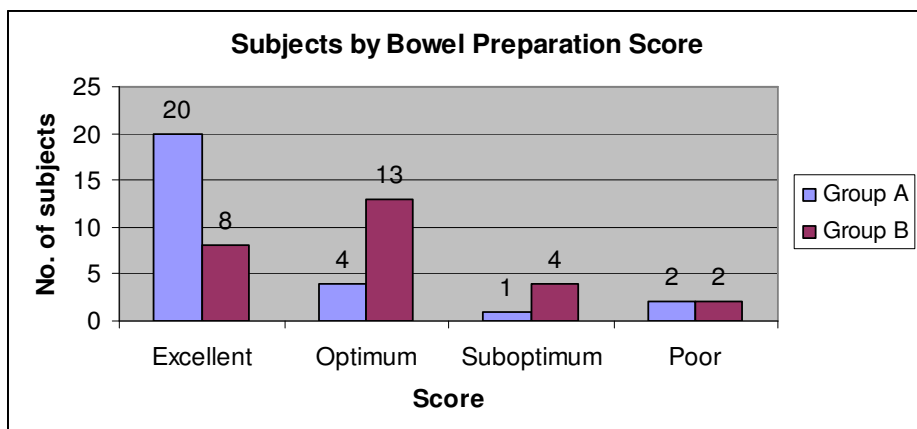


- 1: Rectum**
- 2: Sigmoid**
- 3: Descending Colon**
- 4: Transverse Colon**
- 5: Ascending Colon**
- 6: Cecum**

Arya.Fig 3 – Mean Preparation Parameters



Arya.Fig 4 – Bowel Prep Scores



Or Peer Review

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