A New Approach to Colon Preparation for Barium Enema: Preliminary Report

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FOR a radiologist to obtain meaningful diagnostic results from a barium enema or an air contrast examination of the colon, it is mandatory that he have a clean colon with which to work. It is also helpful that he have a colon which has been consistently prepared, so that the physiologic state of the colon is nearly identical in all patients whom he examines. Nothing is more frustrating than observing fecal filling defects, fluid within the colon, or large accumulations of gas within the colon at the fluoroscopic screen while attempting to search for intrinsic abnormality of the colon. Yet these difficulties, resulting from the many different methods utilized by physicians for cleansing the colon prior to examination, are commonly encountered along with varying degrees of colonic spasm in an otherwise normal colon. As a result, it is frequently necessary to repeat colon examinations two or three times before the radiologist can be reasonably assured of the presence or absence of colonic pathology.

From the patient's viewpoint, the presently used methods of preparations are both mentally and physically traumatic, and the patient who has had a previous examination of the colon dreads the preparation far more than he does the examination itself. To be told after the examination that he must be re-examined because of poor preparation compounds the situation.

It is for these reasons that pharmaceutical companies and some radiologists have sought a better mode of preparation which is more effective and more pleasant than those which have been used in the past. To date there is no one wonder drug or compound that will accomplish the following desirable objectives: (1) produce a clean colon which is free of oil drops, air bubbles, fine or large fecal material as artifacts, and which is in a state of relative nonirritability; (2) be relatively mentally and physically nontraumatic to the patient; (3) be consistent and reliable; and (4) be inexpensive in terms of materials, time, and personnel.

Of the commonly used methods of preparation, consisting of castor oil, multiple enemas containing various colonic contracting agents, three-day liquid diets, multiple doses of milk of magnesia, and saline purges, few are completely and consistently effective. In most of these methods, the patient is left in varying degrees of dehydration because of purging with hypertonic saline solutions without adequate prior hydration or because of being placed

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on "N.P.O. after midnight" orders. The result of the dehydration is colonic absorption of water from the barium enema mixture, which increases the concentration of the barium sulfate suspension and causes undesired flaking and drying in air contrast studies. Since the degree of dehydration is not known to the fluoroscopist, he cannot decide in advance the best barium suspension or procedure to use for demonstrating colonic pathology. *Thus, it is most desirable to have complete hydration of all patients prepared for barium enema examinations.* A review of the literature indicates that this need has not previously been recognized. The procedure which is to be described results in a more consistent state of full hydration of all patients when they report for barium enema examinations. In addition, the preparation produces colons so free of fecal material that direct air contrast examinations can be performed without encountering even small particulate-sized fecal material in the vast majority of patients.

In recent years, attention has been focused on nonabsorbable colonic contracting agents as modes of preparation utilizing primarily dioxyphenylisatin (Lavema powder*) and bis(p-acetoxyphenyl)-2-pyridylmethane (Dulcolax†). Controlled studies[1,2] have shown that dioxyphenylisatin used alone or bis(p-acetoxyphenyl)-2-pyridylmethane with tannic acid (Clysodrast‡) are effective in cleansing enemas. However, they must be used in the correct concentration by a well controlled, consistent method of giving the enema. Such procedures are time-consuming and require hospital personnel who in this country are in demand and expensive. Also, for some patients, any kind of cleansing enema is mentally and occasionally physically traumatic.

A number of studies[3,4] have been reported on the use of Dulcolax in the preparation of the colon, but used alone it has been found to be of variable consistency and reliability, with completely diagnostically satisfactory removal of fecal material (complete absence of fecal material) in only 70 to 80 percent of the patients. It has been postulated that this inconsistent degree of efficacy is a result of the varying original amounts of fecal material in the colon prior to taking the medication, since before it can be effective, the Dulcolax must come into contact with the mucosa of the colon. When there is a large amount of original fecal material in the colon, poor contact would be expected with poor results, and when small amounts are present, the drug could be expected to be effective.

It was for this reason that the idea was postulated to utilize a gross purging of the bowel in a pleasant manner prior to taking the Dulcolax to allow consistent contact and more reliable results. Combining this objective with the previously stated goal of complete hydration of the patient, the following procedure was developed by trial and error until the best timing, diet, and most pleasant drugs were found.

* Product of Winthrop Laboratories.
† Product of Geigy Pharmaceuticals.
‡ Product of Barnes-Hind Barium Products Company.

METHOD OF PREPARATION

Preparation begins approximately 18 hours before the scheduled time of barium enema examination. For an examination that begins at 8 a.m., preparation begins the day before at noon (Table 1); for one that begins at 1 p.m., preparation begins the day before at 4 p.m. (Table 2). Since most barium enemas are performed in the morning, the following procedure applies to the morning preparation, although the procedure of this study was for afternoon examinations. The patient is given a low residue, nonfat lunch. He is hydrated throughout the day by taking at least one full glass (240 cc.) of water every two hours from noon until midnight. If the patient complains of hunger, sweetened clear liquids, such as clear grape or apple juice, may be substituted for the water. For supper the patient is given a clear liquid diet, consisting of bouillon, plain jello, and sweetened grape or apple juice at 5 p.m.

TABLE 1.—*Procedure to Be Followed for Morning Barium Enema Examinations*

TIME	DIRECTIONS	CHECK AS COMPLETED
12 NOON	Lunch—Eat ONLY the following:	☐
	1 cup of bouillon soup with crackers	
	1 **white** chicken meat sandwich (NO butter, lettuce or other additive)	
	½ glass of clear apple juice, or clear grape juice	
	1 serving of **plain** jello (NO cream, fruit or other additive)	
	1 glass of **skimmed** milk	
1 P.M.	Drink one full glass or more of water	☐
3 P.M.	Drink one full glass or more of water	☐
5 P.M.	Supper—Eat ONLY the following:	☐
	1 cup of bouillon soup	
	1 glass of clear apple juice, or clear grape juice	
	1 serving of **plain** jello (NO cream, fruit or other additive)	
7 P.M.	Drink one full glass or more of water	☐
8 P.M.	Drink the bottle of MAGNESIUM CITRATE (**Cold**)	☐
10 P.M.	Take three (3) DULCOLAX pills with one full glass or more of water	☐
12 MIDNIGHT	Drink one full glass or more of water	☐
7 A.M.	Drink one and one-half glasses of water, and insert the DULCOLAX suppository into your rectum	☐

At 8 p.m., the patient is given 340 cc. of *cold* magnesium citrate solution N.F. (a hypertonic solution). This is followed at 10 p.m. by 3 Dulcolax pills (5 mg. each, making a total of 15 mg.) with a full glass of water. After his glass of water at midnight, the patient is not disturbed until 7 a.m. at which time he drinks one and one-half glasses of water and inserts a 10 mg. Dulcolax suppository into his rectum. By 8 a.m., he is ready for examination, having had one or more final bowel movements resulting from the suppository.

To facilitate accurate preparation, an instruction sheet similar to that shown in Table 2 is given to each inpatient or outpatient at University Hospital to follow and to check his progress. An inpatient who is too ill to follow his own schedule can be handled by the nursing staff. Although on first glance

the procedure may appear too rigid and inflexible, experience with over 2,500 patients has shown that such a rigid diet and schedule are not too difficult to follow for 18 hours. The procedure results in colons which are more consistently and reliably clean than in any previously accurately reported study of preparation procedures known to the author.

TABLE 2.—*The Preparation Sheet Used at The University of Michigan Medical Center*

PREPARATION INSTRUCTIONS for BARIUM ENEMA EXAMINATIONS	DATE	LOCATION	SERVICE
..... APPOINTMENT DATE	Reg. No. Name Address		

Your doctor has requested an examination of your large bowel. If it is to be of greatest possible value, you must co-operate fully in preparing yourself as outlined below, beginning at 4 P.M. the day before your X-ray appointment.

Please follow directions exactly and take ONLY the medication, food and water in the **amounts** shown at the **time** shown.

Please check each step as completed and **bring this paper with you to the X-ray department,** when reporting for examination.

TIME	DIRECTIONS	CHECK AS COMPLETED
4 P.M.	Drink one full glass or more of water	☐
5–6 P.M.	Supper—Eat ONLY the following:	☐
	1 cup of bouillon soup with crackers	
	1 **white** chicken meat sandwich (NO butter, lettuce or other additive)	
	½ glass of clear apple juice, or clear grape juice	
	1 serving of **plain** jello (NO cream, fruit or other additive)	
	1 glass of **skimmed** milk	
8 P.M.	Drink one full glass or more of water	☐
10 P.M.	Drink one full glass of **clear** grape or apple juice	☐
12 MIDNIGHT	Drink one full glass or more of water	☐
1 A.M.	Drink the bottle of MAGNESIUM CITRATE (**Cold**)	☐
3 A.M.	Take three (3) DULCOLAX pills with one full glass or more of water	☐
7 A.M.	Drink one full glass or more of water	☐
8 A.M.	Drink one cup of tea or coffee (sugar if desired but NO milk, cream or lemon)	☐
9 A.M.	Drink one full glass or more of water	☐
11 A.M.	Drink one and one-half glasses of water, and insert the DULCOLAX suppository into your rectum	☐

Report to X-ray Department 4th level (ground floor) University Hospital at scheduled time. Please bring this paper with you.

CONTRAINDICATIONS AND CONDITIONS

This method is not recommended for any patient with known or suspected intestinal obstruction. Patients with known or suspected ulcerative colitis or with marked bloody diarrhea (more than 10 to 12 bowel movements daily) should have the magnesium citrate only and not the Dulcolax. Oral medication should not be taken after five hours prior to taking the magnesium citrate be-

cause it would be swept through the gastrointestinal tract too rapidly to be effective. Needed medication can be given parenterally. Patients on diabetic diets should have the special meal and sweetened juice intake in accordance with diabetic management. Other procedures, such as sigmoidoscopy, glucose tolerance test, or oral cholecystography, should not be performed during the preparation period for barium enema, since they interfere with the procedure and the results.

RESULTS

At this writing, approximately 2,500 patients have been prepared for barium enemas with this procedure without detrimental side effects. An analysis of the first 200 examinations revealed that the colons were completely free of fecal material, fluid, or excessive gas in 95 percent of those prepared, and the remaining 5 percent had only minimal fine particulate material in their cecums. Resulting diagnostic quality films were obtained from all patients upon one examination, eliminating a need for repeat examination because of inadequate preparation. Approximately 98 percent preferred the procedure over any other mode of preparation they had previously had, and most overwhelmingly favored it. A transient sensation of slight nausea was reported in about 20 percent, but most stated that this was not incapacitating. This nausea is attributed to distention of small bowel shortly after taking the magnesium citrate which absorbs large volumes of water from the system as it traverses the small bowel.

Although it was not necessary to repeat the preparation of any patient because of retained fecal material, a few patients were rejected for examination early in the study because of marked mucosally retained barium from upper gastrointestinal examinations performed the day before. This can be obviated by giving patients who are having upper gastrointestinal tract examinations 150 mg. of Colace* (dioctyl sodium sulfosuccinate) after completion of the upper gastrointestinal examination in those patients who are expected to have barium enemas the next day. Controlled studies with 100 patients showed that Colace at this dose was effective in ridding the gastrointestinal tract of barium sulfate without side effects.

A more detailed report of analysis of the 2,500 barium enema examinations performed following this new mode of preparation will be published at a later date.

SUMMARY

A new approach to preparation for barium enema examination is described, utilizing a combination of Dulcolax, magnesium citrate N.F., special diet, and complete hydration. Preliminary analysis of 200 of 2,500 patients so prepared indicates that this procedure is excellent in 95 percent of patients, and diagnostically satisfactory in the remaining 5 percent. No failures were encountered

* Product of Mead Johnson & Company.

when all details of the procedure were observed. Patients who had had previous colon preparations indicate an overwhelming preference for the new method.

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