
AIR BUBBLES AND DOUBLE CONTRAST BARIUM ENEMA

Ekwan CHANSUE, MD, Linda PANTONGRAG-BROWN, MD

ABSTRACT

To minimize the problem of multiple air bubbles within the colon during double-contrast barium enema (BE), 100 mg of Simethicone was added to 600 ml of barium suspension which was prepared from barium powder.

One-hundred and three patients had BE with Simethicone and 93 patients had BE without Simethicone. The group with Simethicone showed significantly higher number of good studies (none or minimal air bubbles) than the group without Simethicone ($p = 0.001$).

Simethicone is very cheap and safe drug. It is easy to mix with barium suspension and is recommended to be added when prepared the barium solution manually from the powder.

INTRODUCTION

Barium enema (BE) is an important radiological evaluation of colon and widely used in Thailand and all developing countries. Although colonoscopy is a widely-used procedure for colonic screening for carcinoma in Europe and America at present time,¹ Thailand is still not quite ready to adopt the same policy because of limited resources for both well-trained colonoscopists and colonoscopes. Therefore, BE is still a tool for colonic cancer screening as well as for polyp detection. In order to detect a small lesion, such as adenomatous polyp which is a precursor of carcinoma,² good BE technique is necessary. Double contrast BE is a current standard for good colonic study.³ However, multiple air bubbles, produced during the procedure, can be a big

problem and sometimes mimic or masking polyps. Barium sulfate suspension, available in USA is usually sold as factory-prepared liquids and defoaming agent is usually added.⁴ These have been well designed and possessed a uniformity of quality. However, in Thailand, the suspension is mixed from the powder, prior to the study, and most commercially available products do not contain defoaming agents. We encounter the problem of multiple air bubbles fairly often, therefore, led us to find the simple and cheap way to eradicate or minimize this problem. Simethicone (Dimethyl polysiloxane) has the defoaming property⁵ and is chosen as an agent for our study.

Department of Radiology, Chulalongkorn University, Rama IV Road, Bangkok 10330, Thailand

Address for correspondence:

Linda Pantongrag-Brown Department of Radiology Chulalongkorn University Hospital Rama IV Road, Bangkok 10330
Tel: 256-5364 Fax: 2564417 E-mail: abrown@mozart.inet.co.th

MATERIAL AND METHODS

From April to December 1998, 208 patients scheduled for outpatient barium enema examinations at our institution were prospectively randomized for the study. The patients were divided into two groups by the radiological technologists on duty. The first group comprised of 109 patients received barium enema with simethicone and will be called a study group. The second group of 99 patients received barium enema without simethicone and will be called a control group. Six patients from each group were excluded from the study due to history of previous colonic surgery.

Of the remaining 103 patients in the study group, there were 49 men and 54 women, age range 20-92 years old (mean, 53 years). The remaining 93 patients in the control group was comprised of 34 men and 59 women, age range 16-85 years old (mean, 50 years).

The barium enema was performed by radiology residents using the double-contrast technique in a disposable bag unit (Super XL Enema Bag System, E-Z EM Caribe Inc, Westbury, N.Y.). The barium solution for two patients was prepared by mixing 1,000 grams of barium sulfate with 900 milliliters of water. Two-hundreds milligrams of Barytgen (Fushimi Pharmaceutical Co, Ltd. Kagawa, Japan) was also added for improving mucosal coating. This preparation made about 1,200 milliliters of the barium solution with concentration of about 120 grams percent, weight/volume. One-hundred milligrams of Simethicone (1.5 ml of Mylom containing Simethicone 40 mg/0.6 ml, Unichem Pharmaceuticals Co, Ltd., Thailand), as recommended by Skucas,⁶ was then added to half of the barium solution (600 milliliters) and was used for a patient in the study group. The other half contained no simethicone and was used for a patient in the control group.

The four overhead views (PA, AP, Right and Left lateral decubitus) were reviewed for the presence and the amount of air bubbles by one of the two authors blindly. The amount of air bubbles in each segment of the colon (ascending, transverse, descending and rectosigmoid) were graded subjectively into four groups which include none, minimal, moderate and large. Good study was defined as none or minimal amount of air in all segments of the colon. Moderate or large amount of air bubbles in any part of the colon was considered as inadequate study.

Comparison of the differences in the study and control group are done by using Pearson Chi-Square or Fisher's Exact Test where appropriate.

RESULTS

The amount of air bubbles in each segment of colon is shown in Table 1. The study group which simethicone was used shows no air bubbles in higher percentage than the control group (76-81% versus 48-56%).

Using the definition of good study as none or minimal air bubbles and inadequate study as moderate or large amount of air bubbles, all segments of colon in the study group using simethicone are considered good study in significantly higher number than the control group. As shown in Figure, the study group has good studies of ascending colon in 99 cases (96%) comparing to 66 cases (71%) in the control group ($p < 0.001$); of transverse colon in 97 cases (94%) versus 72 cases (77%) ($p = 0.001$); of descending colon in 94 cases (91%) versus 76 cases (82%) ($p = 0.049$); and of rectosigmoid colon in 100 cases (97%) versus 81 cases (87%) ($p = 0.013$). The difference is the most significant in the ascending colon.

The definition of good study as a whole is by having none or minimal air bubbles in all segments of colon. If there is any part of colon considering having moderate or large amount of air bubbles, the study is called inadequate. By this definition, the study group using simethicone shows significantly higher number of good studies than the control group. As shown in Table2,

good barium studies are found in 89 cases (86%) of the study group comparing to 62 cases (67%) of the control group (p=0.001, Pearson Chi-Square).

None of the patients show adverse reaction relating to Simethicone.

Table 1. Comparison of percentage of cases in study group/control group based upon air bubbles in each segment of colon

	Ascending	Transverse	Descending	Rectosigmoid
None (%)	76/56	78/50	80/48	81/50
Minimal (%)	20/15	16/28	11/33	16/37
Moderate(%)	4/24	6/17	9/13	3/13
Large (%)	0/5	0/5	0/6	0/0
Total (%)	100/100	100/100	100/100	100/100

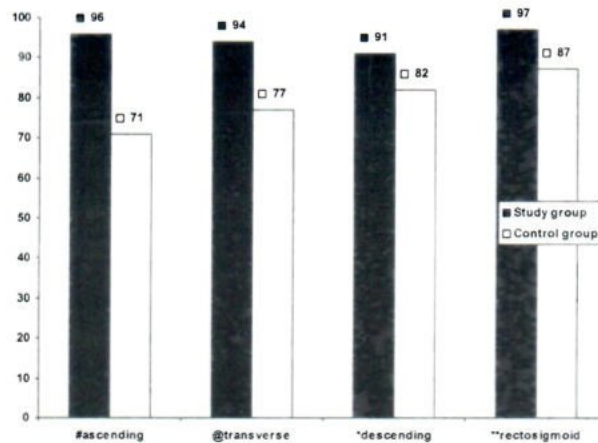


Fig. Comparison of percentage of good barium studies in the study group using simethicone versus control group in each segment of colon
p <0.001, @ p =0.001, * p =0.049, ** p =0.013

Table 2. Comparison of quality of barium enema examinations in the study group using simethicone and control group

	Study group (%)	Control group (%)
Good study	89 (86%)	62 (67%)
Inadequate study	14 (14%)	31 (33%)
Total	103 (100%)	93 (100%)

p =0.001

DISCUSSION

The result of our study shows that Simethicone significantly reduce the air bubbles during double contrast study therefore, improve the quality of the study. As shown in Table 2, good study was found in 86% of cases using Simethicone versus 67% without it ($p=0.001$).

Simethicone has a defoaming action within the GI tract by changing the surface tension of gas bubbles, enabling them to coalesce. Simethicone also disperses and prevents formation of mucus surrounding gas pockets, allowing these entrapped gas to be easily coalesced.⁷ Other factors must also involve in air bubbles forming since about 14% of cases still have a problem in spite of Simethicone usage. The rate and the pressure of air pumping, which was done manually, may add to air bubbles forming, which cannot be controlled in this study. Other uncontrolled conditions, such as intracolonic temperature, physiologic characteristic of individual colon, may have some impact on bubbles forming.

Although we cannot entirely eradicate the air-bubbles problem within the colon during double-contrast BE, Simethicone proves to be quite effective in minimizing this problem. Simethicone is very cheap and easy to mix with barium suspension before the study. The calculated cost of Simethicone in each patient is about 5 Bath (Thai money) or 15 cent (US money). It is also a safe drug and normally use for treatment of gas pain, post-operative distension, dyspepsia and flatulence.

We believe Simethicone is very cost-effective way to improve quality of the double-

contrast BE and recommend for the institution where barium suspension has to be prepared manually from the powder prior to the procedure.

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