

Abstract

Purpose: The presence of bubbles during colonoscopy may interfere with polyp detection. The purpose of this study was to determine the frequency, severity and location of colonic bubbles after bowel preparation with split-dose 2L PEG-ELS.

Methods: Consecutive outpts undergoing elective colonoscopy who had been instructed to take 1L PEG-ELS at 6pm the night prior and 1L PEG-ELS 4 hrs before colonoscopy were eligible. All colonoscopies were performed by one investigator (DK). Diet was clear liquids the entire day prior and continuing up to 2.5 hrs before colonoscopy. Bubbles were graded in the cecum, right, transverse, and left colon using a scale where: 1=no/minimal bubbles, 2=bubbles interfere with detecting a 5 mm polyp, 3=bubbles interfere with detecting a 10 mm polyp. The primary analyses focused on the presence of Grade 2 and 3 bubbles. Severity of bubbles in different colon segments was compared via an exact test for marginal homogeneity. The association of various patient and clinical variables with this outcome was assessed via exact logistic regression (univariable & multivariable models). This study was IRB approved.

Results: 102 pts enrolled; 4 were excluded because the prep was not split or was inadequate such that colonoscopy was aborted. Of 98 pts evaluated 54% were male, 67% were > age 50, 12% had GI surgery including 7 with cholecystectomy, and 84% were taking ≥ 1 medication. Most procedures (72%) were done for screening/surveillance. Nearly all (97%) took the entire prep, 80% completed it within 5 hrs of colonoscopy, and prep quality was excellent/good in 95%. 4 colon segments were evaluated in 96 pts; 1 pt had a cecal resection and 1 other pt had an incomplete procedure. Overall, 34 pts (35%) had moderate or severe bubbles in at least one colon segment - 22 moderate, 12 severe, and 9 both moderate and severe. Severity of bubbles was similar between right and transverse colon ($p = 0.544$) but more severe compared to the cecum ($p = 0.011$ and 0.012 , respectively) and the left colon ($p = 0.001$ for both). Of 389 colon segments evaluated, 52 (14%) had moderate bubbles and 15 (4%) had severe bubbles. With multivariable analysis, increasing age was associated with higher odds of moderate or severe bubbles (odds ratio, OR = 2.42, for each successive decade of age; 95% confidence interval, CI: 1.24, 5.01; $p = 0.007$). Antihypertensive use was associated with decreased bubbles (OR = 0.31; 95% CI: 0.10, 0.89; $p = 0.022$).

Conclusion: Colonic bubbles that could hamper polyp detection are present in 35% of patients receiving split dose PEG-ELS. Most bubbles occur in the right and transverse colon, and advanced age is an independent risk for bubbles.

Background

- Colonic bubbles, or foam, can obscure mucosal visibility and interfere with polyp detection
- Risks for bubble formation are unknown
- The incidence, distribution & severity of colonic bubbles with split dose (PM/AM) PEG-ELS has not been described

Aims

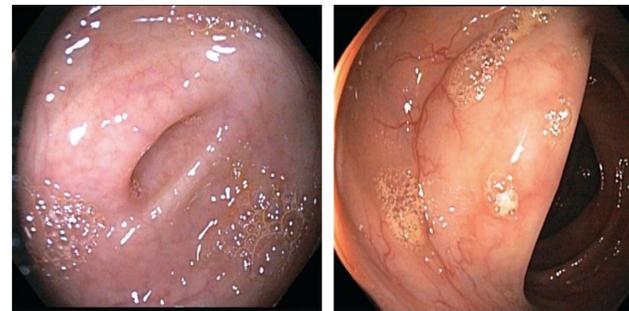
- Determine the incidence, distribution & severity of colonic bubbles after split-dose 2L PEG-ELS
- Assess the clinical factors associated with bubbles

Methods

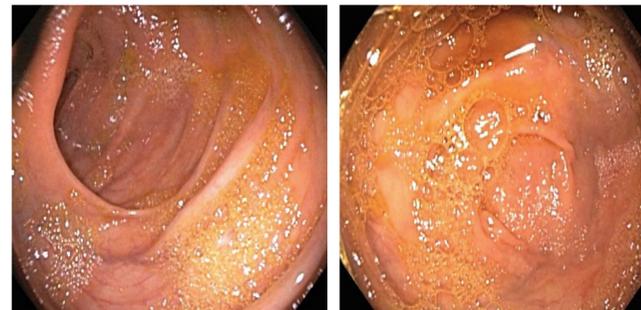
- Prospective study: 102 consecutive pts enrolled
- Enrollment period: 6/09 – 10/09
- Inclusion criteria
 - Outpt colonoscopy with split (PM/AM) 2L PEG-ELS
- Exclusion criteria
 - Unwilling or unable to provide consent
 - Age <18 yrs
 - Pregnant or breast feeding
 - Bowel obstruction
 - Greater than 50% resection of colon
 - Significant psychiatric illness
 - Completed < 75% of purgative
 - Consumed > 100% PEG-ELS (i.e. > 2L)
- Purgative: 2L PEG-ELS with sodium ascorbate, ascorbic acid, sodium sulfate (MoviPrep®)
- PM/AM dosing: 1L at 6 pm, 1L 4 hrs before colon
- Grading of bubbles by endoscopist on withdrawal
 - A/1 = Absent/minimal – no impaired view, no flushing needed to see 5 mm polyp
 - B/2 = Moderate – impaired view, could miss ≥ 5 mm polyp, flushing required
 - C/3 = Severe – impaired view, could miss ≥ 10 mm polyp, flushing required
- 4 colon segments evaluated
 - Cecum, right, transverse, left colon
- Outcome measures
 - Primary:** Presence of moderate (B/2) or severe (C/3) bubbles
 - Secondary:** Pt and clinical variables predictive of moderate (B/2) or severe (C/3) bubbles

Statistics

- Severity of bubbles in 4 colon segments (cecum, right, transverse, left) compared via an exact test for marginal homogeneity
- Patient and clinical variables associated with Grade B/2 and C/3 bubbles assessed via exact logistic regression (univariable and multivariable models)



Grade A/1 = Absent/Mild



Grade B/2 = Moderate



Grade C/3 = Severe

Results

- 102 pts enrolled: 4 excluded because prep was not split or poor prep precluded colonoscopy
- All 4 colon segments evaluated in 96 pts: 1 incomplete colonoscopy, 1 pt s/p cecectomy
- Adequate (excellent/good) prep in 95%

Table 1. Summary of patient characteristics (N= 98)

| | (N*) | (%*) | Moderate/Severe Bubbles | |
|---------------------------------|------|------|-------------------------|-------|
| | | | n | (%**) |
| Age (years), n (%) | | | | |
| ≤ 50 | 33 | (34) | 8 | (24) |
| 51- 60 | 40 | (41) | 14 | (35) |
| > 60 | 25 | (26) | 12 | (48) |
| Sex, n (%) | | | | |
| Male | 52 | (54) | 21 | (40) |
| Female | 45 | (46) | 13 | (29) |
| Indication, n (%) | | | | |
| Screen/Surveillance | 68 | (72) | 26 | (38) |
| Symptom | 27 | (28) | 6 | (22) |
| Antihypertensives, n (%) | | | | |
| No | 49 | (50) | 21 | (43) |
| Yes | 49 | (50) | 13 | (27) |
| Psych Meds, n (%) | | | | |
| No | 83 | (85) | 32 | (39) |
| Yes | 15 | (15) | 2 | (13) |
| Acid Suppression, n (%) | | | | |
| No | 72 | (73) | 27 | (38) |
| Yes | 26 | (27) | 7 | (27) |
| Vitamins, n (%) | | | | |
| No | 69 | (70) | 27 | (39) |
| Yes | 29 | (30) | 7 | (24) |

(* Counts may not sum to 98 because of missing data, and percentages may not sum to 100% because of rounding.

(**) Percentages refer to the fraction of patients with moderate (B/2) or severe (C/3) bubbles within categories of each variable (i.e., n/N).

- 35% had moderate or severe bubbles
 - Most (71%) of these had bubbles in > 1 colon segment
- Bubbles worse in right colon & transverse compared to
 - Cecum ($p = 0.011$; $p = 0.012$)
 - Left colon ($p = 0.001$ for both)
- In total, 389 colon segments were evaluated
 - 14% with moderate bubbles, 4% with severe bubbles

Conclusions

- Colonic bubbles that could interfere with polyp detection are present in 35% of patients receiving split dose PEG-ELS.
- Most bubbles occur in the right and transverse colon.
- Advanced age is an independent risk for bubbles.

Table 2. Summary of Severity of Bubbles

| | N | (%) |
|--|----|------|
| Severity of bubbles, n (%) | | |
| No or minimal bubbles (A/1) | 64 | (65) |
| Only moderate (B/2) | 22 | (22) |
| Only severe (C/3) | 3 | (3) |
| Both moderate and severe (B/2 and C/3) | 9 | (9) |
| Number of segments with moderate or severe bubbles, n (%) | | |
| 0 | 64 | (65) |
| 1 | 10 | (10) |
| 2 | 16 | (16) |
| 3 | 7 | (7) |
| 4 | 1 | (1) |
| Severity of bubbles in cecum, n (%) | | |
| No or minimal (A/1) | 83 | (86) |
| Moderate (B/2) | 11 | (11) |
| Severe (C/3) | 2 | (2) |
| Severity of bubbles in right colon, n (%) | | |
| No or minimal (A/1) | 72 | (74) |
| Moderate (B/2) | 21 | (22) |
| Severe (C/3) | 4 | (4) |
| Severity of bubbles in transverse colon, n (%) | | |
| No or minimal (A/1) | 74 | (76) |
| Moderate (B/2) | 15 | (15) |
| Severity (C/3) | 9 | (9) |
| Severity of bubbles in left colon, n (%) | | |
| No or minimal (A/1) | 93 | (95) |
| Moderate (B/2) | 5 | (5) |
| Severe (C/3) | 0 | (0) |

- Increased risk (multivariate analysis) for moderate or severe bubbles

-Advanced age
 OR = 2.42 for each successive decade,
 95% CI: 1.24,5.01; $p = 0.007$

- Reduced risk (multivariate analysis) for moderate or severe bubbles

- Antihypertensive medications
 OR = 0.31; 95% CI: 0.10,0.89; $p = 0.022$
 - Vitamin use
 OR = 0.41; 95% CI: 0.12,1.26; $p = 0.097$