e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(1); 49-55

Original Research Article

Oral Simethicone, a Mouth Dissolving Film; Use as a Pre-Endoscopy Measure: A Single-Center Experience

Ayaskanta Singh[1], Swarup Kumar Patnaik[2], Jimmy Narayan[3], Kanishka Uthansingh[4], Debakanta Mishra[5], Manjit Kanungo[6], Saroj K. Sahu[7], Manas K. Behera[8], Girish Kumar Pati[9]

[1,7]Department of Gastroenterology, SUM Ultimate Medicare, Siksha 'O' Anusandhan deemed to be University, Bhubaneswar, India

[2,3,4,5,6,9]Department of Gastroenterology and Hepatobiliary Sciences, Institute of Medical Sciences and Sum Hospital, Siksha 'O' Anusandhan deemed to be University, Bhubaneswar, India

[8]Department of Hepatology, SCB Medical College and Hospital, Utkal University, Cuttack, India

Received: 25-10-2023 / Revised: 23-11-2023 / Accepted: 26-12-2023

Corresponding Author: Dr. Girish K Pati

Conflict of interest: Nil

Abstract:

Introduction: The stomach and duodenal bubbles and foam affect the proper mucosal visibility during endoscopy, which results in the missing diagnosis and increases the procedure time. The present study aimed to evaluate the role of oral simethicone as a pre-endoscopy measure.

Methods: In the present study, 200 cases received the pre-medication and the remaining 200 without premedication as control subjects. The cases were randomized into two groups; the first group received the simethicone mouth-dissolving strip 10 minutes before the endoscopy procedure. The second group received no medication and was included as a control. The analysis of endoscopy images was handled by the investigator blindly. The mucosal visibility scores, duration of the endoscopy, and the patient's satisfaction levels were recorded in the designed proforma. SPSS software version 22 was employed for statistical analysis for the current study.

Results: The pre-medicated group had a significantly better mucosal visibility score than the control group in gastric lumen (0.16 ± 0.39 vs. 1 ± 0.97, p = 0.0001) and duodenal lumen (0.1 + 0.31 vs. 0.81 + 0.88, p = 0.0001). The patient satisfaction score was better than the control group with a significant difference (7.44± 1.45 vs. 5.4 ± 1.53, p = 0.0001); however, there was no significant difference in the mean procedure time (1.5 ± 0.41 minutes vs. 1.55 ± 0.63 minutes, p =0.4).

Conclusion: Pre-medication with simethicone before the UGIE study improves mucosal visibility and patient satisfaction scores.

Keywords: Simethicone; Endoscopy; Bubbles; Foam; Mucosa.

Introduction

The upper gastrointestinal (UGE) endoscopy or, Oesophago-gastro-duodenoscopy (OGD) is the most common diagnostic and therapeutic method for the detection of most of the gastrointestinal disorders (GID) occurring in the upper gastrointestinal tract (UGT) [1,2]. There ought to be clear and adequate mucosal visibility to correctly identify and characterize suspicious lesions during endoscopy procedures. The air bubbles significantly compromise the mucosal visibility and foam, which are present over the gastric and duodenal mucosa, resulting in poor mucosal view, prolonged endoscopy time, decreased diagnostic accuracy, and patient tolerance [3,4]. Impaired mucosal visibility might lead to missed diagnoses in early or subtle lesions, precluding the implementation of early aggressive curative measures [3,4]. Therefore, adequate pre-endoscopy preparation is the most important modifiable measure, which can be adapted to improve mucosal visibility and missed diagnosis by decreasing the air bubbles and foam present over gastrointestinal (GI) mucosa. An appropriate preparation method is non-toxic, patient and user-friendly, readily available, and administrable, and must be capable enough to remove the air bubbles and foam. No standard pre-endoscopy measure has been universally recommended except fasting before a UGI scope. However, the Gastroenterological Society of Australia has recommended the use of simethicone before endoscopy procedures, as they have considered that continued use of simethicone is reasonable, as it improves the mucosal visibility during gastroscopy and colonoscopy, which leads to better adenoma detection at colonoscopy as

mentioned by evidence level: IA, Recommendation Grade A [5]. Simethicone is a chemical mixture of dimethyl polysiloxane and silica gel. It is non-toxic and non-interfering in nature, as it is non-absorbable by GI mucosa. Moreover, it improves mucosal visibility by clearing the air bubbles and foam over the GI mucosa through its predominant surface tension-lowering effect. Furthermore, it can characteristically reduce air bubbles and surface tension [6].

To date, there has yet to be a well-defined global recommendation for the use of simethicone before endoscopy, and there is a paucity of reports known from the present study aimed study was to evaluate the role of oral simethicone as a pre-endoscopy measure.

Methods

Study Design, Setting and Population

The current study was a prospective clinic-observational case and control study of 200 patients undergoing UGI Scopy and 200 Healthy controls. Informed written consent was sought and obtained from each patient. Ethical approval was obtained from the Institutional ethics committee before the commencement of the research, carried out at the Department of Gastroenterology and Hepatobiliary Sciences, IMS & SUM Hospital, Bhubaneswar, had undergone a UGE study in-between June 2019 to December 2019.

This randomized, blinded study was conducted among patients over 18 years old who consented to participate. The exclusion criteria were patients with GI malignancies, features suggestive of portal hypertension, GI bleeding, and known allergy to the concerned pre-medication (simethicone). Moreover, patients with a history of pregnancy, lactation, or upper GI surgery, significant co-morbidities, and life-threatening GI diseases were excluded from the study. The necessary approval from the Institutional Ethical Committee was obtained before including patients in the study protocol. The study participants were included after taking proper informed consent. The patients were randomized into 1:1 ratio in two groups by random computer-generated numbers before the endoscopy procedure; the first group received the simethicone mouth dissolving strip containing 62.5 mg of simethicone (Gasofilm prepared by Delvin Pharma Chennai, India) 5-10 minutes before endoscopy procedure and defined as patients. In contrast, the second group received no medication and served as control.

The subjects had undergone pre-endoscopy preparation with mandatory fasting for 6-8 hours. The patients were assessed for mucosal visibility scores, total endoscopy procedure duration, and patients' satisfaction levels.

Methods of Endoscopy Assessment

An experienced gastroenterologist carried out the endoscopy procedure by using Olympus 180 (Elvis Exera II GIF 180 H) or 190 series (Evis Exera III, GIF 190 HQ) (Olympus Medical, Tokyo, Japan) in all the patients. The endoscopist had more than ten years of experience in gastro duodenoscopy procedures. The endoscopy procedures in all the patients were carried out without sedation or anesthesia. Dedicated staffs were assigned to record the relevant data peri-procedurally for subsequent analysis. The endoscopist and his team involved in the endoscopy study; were fully blinded about the group allocation. The whole endoscopy procedure was video recorded. Following the process, an experienced endoscopist, who had not participated during the endoscopy procedure, was assigned to evaluate the endoscopic videos and images.

Outcome measures

As the primary objective was to assess the mucosal visibility, the endoscopic mucosal visibility score was stratified into four categories to separately measure the amount of gastric and duodenal foam and air bubbles based on findings of previous studies: Category (0) - Absence of air bubbles and foam, with an excellent mucosal view; Category (1) - Presence of small amount of air bubbles and foam, with a mildly compromised mucosal view; Category (2) - Presence of many air bubbles and foam with a moderately compromised mucosal view; Category (3) - Presence of excessive amount of air bubbles and foam with a significantly compromised mucosal view. This category of patient required cleaning with a water jet [7,8]. The concerned blinded investigator analyzed the specific endoscopic visibility categories following the completion of endoscopy procedures.

The total duration of the endoscopy procedure and the participants' satisfaction scores were also assessed subjectively following the completion of the endoscopy procedure. The post-procedural patient subjective satisfaction score was graded into 10 arbitrarily, in which 0 was assigned for the worst satisfaction level, 10 was given for the best satisfaction level and in-between scores as intermediary satisfaction. The subjective post-procedural satisfaction score was determined based on abdominal pain and discomfort, bloated sensation in the abdomen, nausea, and retching within 30 minutes of the endoscopy procedure.

Statistical analysis

The statistical analysis was carried out by SPSS software version 22. We calculated that the minimum sample size would be 72 in each group with 1:1 random allocation for a power of 80% and type I error of 0.05, with the assumption of good mucosal visibility by 65% during normal gastroduo-

denoscopy and expected improvement of 20% following simethicone pre-endoscopy administration. Continuous variables were expressed as mean ± standard deviation, and discrete variables were defined as the number and percentile (%). Unpaired Student's t-test performed a comparison of constant variables in-between two groups. Fisher's exact or chi-squared test was used to compare categorical variables whenever appropriate. The 'p-'value < 0.05 was considered to be significant in our study. Appropriately matched patients and controls were recruited in the study based on age, gender, and indications for UGIE as covariates.

Results

Baseline characteristics of the patients

In the present study, 400 patients underwent a UGE study. The mean age at the baseline of the study participants was 40.49±13.71 years; males (M) outnumbered females (F) (M:F ratio-1.51: 1). The mean duration of all the UGE procedures was 1.53±0.53 minutes, and the mean score of all the patients' post endoscopy satisfaction levels was 6.42±1.8. A fraction of 61.25% of the patients had undergone a UGE study for their dyspeptic symptoms, followed by 29.5% of cases reported abdominal pain. A fraction of 61.25% and 69.25% cases had an excellent endoscopic mucosal view, i.e., category '0' type mucosal view in the stomach and duodenum, respectively.

A fraction of 59.5% of patients had excellent endoscopic mucosal visibility in the gastric and duodenal lumen. The mean endoscopy mucosal visibility score was 0.53±0.81, irrespective of the gastric or duodenal lumen. In contrast, the mean endoscopy mucosal visibility score in all the patients was 0.6±0.86 and 0.45±0.75 in the gastric and duodenal lumen, respectively.

Treatment outcome

Out of 400 patients, 200 were cases, whereas an equal number of patients served as controls. The baseline demography of all the patients, cases, and controls is described in Table1.

Table 1: Baseline Demography of Cases (n= 200) and Controls (n = 200)

Parameters	Total Patients (n-400)	Cases (n-200)	Controls (n-200)	'p-value (cases & controls)
Age in Years (Mean ± S.D.)	40.49±13.71	41.71±12.96	39.26±14.36	0.07
Male: Female Ratio	1.51: 1	1.43: 1	1.59:1	0.68
Indication for endoscopy, n (%)				
Dyspepsia	245 (61.25%)	116 (58%)	116 (58%)	1
Abdominal Pain	118 (29.5%)	59 (29.5%)	61(30.5%)	0.82
Others	37 (9.25%)	25 (12.5%)	23 (11.5%)	0.75

Data are shown as n (%); S.D: Standard Deviation; p: probability

The pre-medicated group had a significantly better mucosal visibility score than the control group in the gastric lumen, which was 0.16 ± 0.39 vs. 1 ± 0.97, at p= 0.0001and duodenal lumen 0.1 + 0.31 vs. 0.81 + 0.88, at p= 0.0001.

Endoscopic mucosal visibility categories were narrated in the patients' gastric and duodenal lumen, cases, and control described in Tables 2 and 3.

Table 2: Endoscopic mucosal visibility categories in the Gastric lumen

Categories, n (%)	Total Patients (n=400)	Cases (n=200)	Controls (n=200)	'p'- value (Cases & Controls)
0	245(61.2%)	171 (85.5%)	74 (37%)	0
1	86(21.5%)	27 (13.5%)	59 (29.5%)	<0.0001
2	53(13.2%)	2 (1%)	51 (25.5%)	<0.0001
3	16(4%)	0 (0%)	16 (8%)	<0.0001

Abbreviations: n – number

Table 3: Endoscopic mucosal visibility categories in the duodenal lumen

Categories, n (%)	Total Patients (n-400)	Cases (n-200)	Control (n-200)	p-value (Cases & Controls)
0	277(69.2%)	182 (91%)	95 (47.5%)	0
1	72(18%)	17 (8.5%)	55 (27.5%)	<0.0001
2	45(11.2%)	1 (0.5%)	44 (22%)	<0.0001
3	6(1.5%)	0 (0%)	6 (3%)	0.0136

Data are shown as n (%); p: probability. Endoscopic mucosal visibility scores of all the patients, cases, and control were illustrated in Table 4.

Table 4: Endoscopic mucosal visibility scores

Endoscopic Mucosal Visibility Score (Mean ± S.D.)	Total Patients (n-400)	Cases (n-200)	Controls (n-200)	p-value (cases & controls)
Stomach	0.6±0.86	0.16±0.39	1±0.97	0.0001
Duodenum	0.45±0.75	0.1±0.31	0.81±0.88	0.0001
Both Gastric & Duodenal Lumen	0.53±0.81	0.15±0.61	0.97±1.34	0.0001

Data are shown as n (%); p: probability. Although the pre-medicated group had a significantly better patient satisfaction score compared to the control 7.44± 1.45 vs. 5.4 ± 1.53, at p= 0.0001), the mean endoscopy procedure time was not significantly different with 1.5 ± 0.41 minutes vs. 1.55 ± 0.63 minutes, at p= 0.4. The total Endoscopy procedure time and subjective patient satisfaction scores of all the patients, cases, and controls are described in Table 5.

Table 5: Total Endoscopy procedure time and Subjective patient satisfaction scores

Parameters (Mean ± S.D.)	Total Patients (n-400)	Cases (n-200)	Controls (n-200)	' p' value (cases & controls)
Total Endoscopy procedure time in minutes	1.53±0.53	1.5±0.41	1.55±0.63	0.4
Subjective patient satisfaction score	6.42±1.8	7.44±1.45	5.4±1.53	0.0001

Data are shown as n (%); p: probability.

Patients follow up

No patient follow-up was required; however, only post-procedural patient satisfaction levels were measured from each patient from the case group.

Discussions

To my knowledge, this study might be the first Indian observer-blinded randomized study from this part of the Coastal Eastern region that comprehensively evaluated oral simethicone's response before the UGI Endoscopy study. There is no unanimous global consensus or recommendation regarding pre-endoscopy preparation except for mandatory 6-8 hours of pre-endoscopy fasting. As a routine protocol [6,8], hours of compulsory pre-endoscopy have usually been advised to the patients before endoscopy procedures in the current study center. Most Indian centers follow this practice. However, the difficulties during endoscopy procedures faced by the endoscopist are because of air bubbles and foam, which significantly compromise mucosal visibility and substantially prolong the total procedure time. The maximum difficulties faced during such procedures are narrow-band imaging (NBI), endoscopic mucosal resection (EMR), and endoscopic mucosal dissection (ESD), for which clear mucosal visibility is the must-be observed for accurate delineation and characterization of subtle lesions; these lesions may be easily missed, as stated by the previous study [9]. It has been known that pre-endoscopy fasting helps clear the food and liquid residues from the gastroduodenal lumen. It does not affect air bubbles and foams in the GI lumen; the bubbles are usually produced due to air trapping in the water molecules in the GI lumen. The gas in the GI tract is derived either from swallowed air or during the fermentation of foods by the gut microbiome. Simethicone can significantly improve mucosal visibility through its anti-surface tension activity property. Some of the studies in the past have supported the beneficial role of UGI Endoscopy, colonoscopy, and video capsule endoscopy studies by using the such inert, non-absorbable, safe, non-toxic compound as efficient antifoaming agents [6,10,11].

The oral pre-medication of simethicone before endoscopy could help the missing lesions; hence, the oral route was selected only for the endoscopy procedure. Pre-medication was advised as per the previous report, experiencing its safety pattern both for the patient and the endoscope [5]. However, its use was not attempted in any other form, as there was the risk of developing bio film formation and superadded infection inside the endoscope channel, which might be difficult to flush out even by repeated endoscope reprocessing [12]. The difference in endoscopy mucosal views before and after using simethicone during the endoscopy procedure was observed shown in Fig.1.

A significantly better endoscopic mucosal visibility in the pre-medicated group than in the control group was observed in the present study, which corroborated with similar observations from other centers [13-18].

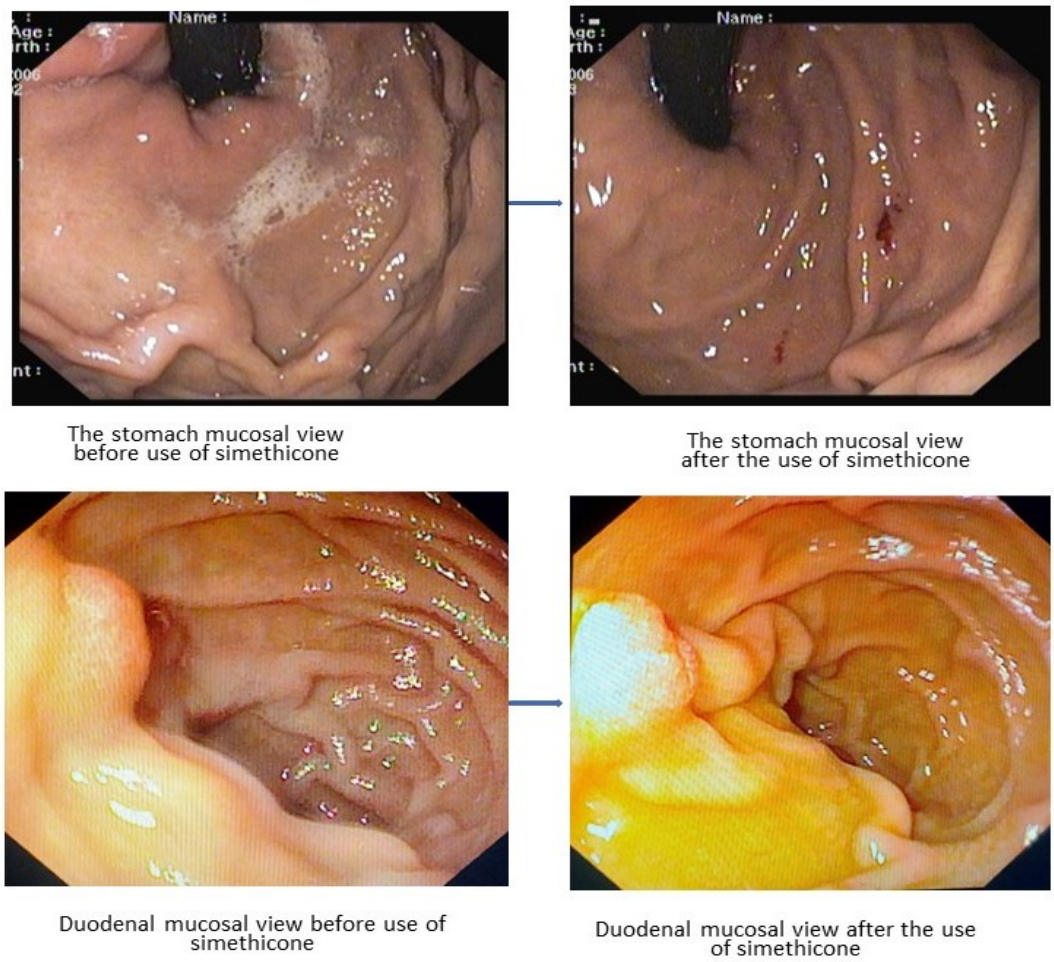

Figure 1: Endoscopy mucosal views before the use of simethicone and after the use of simethicone during the endoscopy procedure

Although the present study findings were similar to other published Indian reports [13,14] few differences existed among those studies. The present study used simethicone containing 62.5 mg oral mouth dissolving strip in Eastern Indian populations.

In contrast, using a liquid drink containing 125 mg activated dimethicone and 50 ml water in Southern India [13]. Moreover, another study from Northern India applied a liquid drink containing 40 mg simethicone emulsion, 600 mg effervescent N-Acetylcysteine (NAC) tablet, an effective mucolytic, and 100 ml water [14]. In the current study, the mean total endoscopy procedure time was not significantly different between the case and control groups, as observed [17]; however, other studies [13,15,16] revealed a considerably lesser time in the pre-medicated group compared to that of the control group observed.

The current study observed significantly better post-endoscopy patient satisfaction amongst the pre-medicated group than the control group, as similarly observed by the previous investigators [13, 15, and 17]. However, another study did not find any significant difference between the pre-medicated and control groups [16], which contradicts the present findings.

Though the present study is a well-matched randomized case-control study with an appropriate sample size for each group, the study has a few limitations.

Limitations

In the present interventional study, the mucosal clearance based on assessing air bubbles and foam clearance was purely subjective as evaluated by a single person only. It might be much better if evaluation could be carried out based on image processing and quantitative scales to eliminate any measurement errors and biases. Also, we could not assess to what extent an increase in the quality of mucosal images by a decrease in the number of air bubbles and foam could improve the diagnosis of subtle pathological lesions during endoscopy. There might be a role of mucus during UGI scope, which can significantly compromise the mucosal view and lead to missed diagnosis frequently and might extend the total endoscopy procedure time due to the requirement of frequent water flushing

for adequate clearance. However, it was not pre-medicated in any cases with mucolytics such as NAC or Pronase; its beneficial role during UGI scope was well supported and substantiated by previous studies [14, 19-23]. The idea of the present study was to observe whether simethicone alone was sufficient for better endoscopy scores. The current study did not assess the frequency of water flushing for mucus clearance during endoscopy.

The study has the potential value for the diagnosis of detecting the gastro-duodenoscopy images

Conclusion

In conclusion, the present study finding was the first of its kind from eastern India. It vividly examined the role of simethicone as a pre-endoscopy preparation and mandatory 6-8 hours of fasting. Although we experienced a significantly better mucosal view during UGI scope and better post-endoscopy patient satisfaction scores among the included cases, there was no significant difference in the total endoscopy procedure time. Based on the study findings, oral simethicone is recommended for pre-endoscopy preparation. However, randomized double-blinded multi-centric case-control studies in the future should validate the current results before the firm recommends its use as a pre-endoscopy preparation.

Supplementary Information The offline version of the supplementary material may be available from corresponding author with reasonable information.

Declaration

The authors Singh A, Patnaik SK, Narayan J, Uthansingh K, Mishra D, Sahu S K, Behera MK, Pati GK, declare no conflicts of interest directly relevant to the content of this article. This document expresses the observation of use of simethicone.

Ethical approval: The study protocol was reviewed by the institutional review board (IRBs) of the respective database. The institutional ethical clearance was taken according to the WMA Declaration of Helsinki-ethical principles for medical research involving human subjects. Consent to participate Informed consent was obtained from the study participants before enrolling into the study.

Author contributions

The authors collectively take responsibility for all aspects of the work, ensuring its accuracy and integrity, as well as participating in manuscript revisions and approving the final version.

References

1. Rex DK, Petrini JL, Baron TH, Chak A, Cohen J, Deal SE, et al. Quality indicators for colonoscopy. Gastroint Endo. 2006; 63(4): S16-28.
2. Cohen J, Safdi MA, Deal SE, Baron TH, Chak A, Hoffman B, et al. Quality indicators for esophago gastroduodenoscopy. Gastroint Endo. 2006; 63(4): S10-5.
3. Kwan V, Devière J. Endoscopy essentials: preparation, sedation, and surveillance. End. 2008; 40 (01):65-70.
4. Liu X, Guan CT, Xue LY, He S, Zhang YM, Zhao DL, et al. Effect of premedication on lesion detection rate and visualization of the mucosa during upper gastrointestinal endoscopy: a multicenter large sample randomized controlled double-blind study. Surg endo. 2018; 32:3548-56.
5. Devereaux BM, Taylor AC, Athan E, Wallis DJ, Brown RR, Greig SM, et al. Simethicone use during gastrointestinal endoscopy: Position statement of the Gastroenterological Society of Australia. JGH. 2019; 34 (12):2086-9.
6. Brečević L, Bošan Kilibarda I, Strajnar F. Mechanism of antifoaming action of simethicone. J Appl Toxicol. 1994; 14 (3):207-11.
7. Banerjee BH, Parker J, Waits W, Davis B. Effectiveness of preprocedure simethicone drink in improving visibility during esophagogastroduodenoscopy: a double-blind, randomized study. JCG. 1992; 15 (3):264-5.
8. Bertoni G, Gumina C, Conigliaro R, Ricci E, Staffetti J, Mortilla MG, et al. Randomized placebo-controlled trial of oral liquid simethicone before upper gastrointestinal endoscopy. Endoscopy. 1992; 24 (04):268-70.
9. Ali S, Zhou F, Braden B, Bailey A, Yang S, Cheng G, et al. An objective comparison of detection and segmentation algorithms for artifacts in clinical endoscopy. Sci Rep. 2020; 10 (1):2748.
10. Song HJ. Optimal bowel preparation for capsule endoscopy and device-assisted enteroscopy. KJG. 2020; 75 (2):74-8.
11. Hassan C, Bretthauer M, Kaminski MF, Polkowski M, Rembacken B, Saunders B, et al. Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) guideline. Endoscopy. 2013; 45 (02):142-55.
12. Ofstead CL, Wetzler HP, Johnson EA, Heymann OL, Maust TJ, Shaw MJ. Simethicone residue remains inside gastrointestinal endoscopes despite reprocessing. Am J Infect Control. 2016; 44 (11):1237-40.
13. Koushik A, Saketh V, Ganesh P, Shanmugha nathan S. Effects of Pre-Procedure Activated Dimethacone on Mucosal Visibility during Oesophagogastroduodenoscopy: A Case-Control Study. JCDR 2020; 14(7).

14. Anikhindi SA, Kumar A, Uedo N, Singla V, Anikhindi A, Sharma P, et al. Pre-endoscopy drink of Simethicone and N-Acetylcysteine significantly improves visualization in Upper Gastrointestinal Endoscopy. J Dig Endosc. 2021; 12 (01):011-8.
15. Chen X, Dai N, Deng Y, Sun X, Zhang M, Pan J, et al. Premedication with reformulated simethicone and sodium bicarbonate improves mucosal visibility during upper gastrointestinal endoscopy: a double-blind, multicenter, randomized controlled trial. BMC Gastroenterol. 2021; 21:1-9.
16. Ahsan M, Babaei L, Gholamrezaei A, Emami MH. Simethicone for the preparation before esophagogastroduodenoscopy. Diagn Ther Endosc. 2011; 2011.
17. Keeratichananont S, Sobhonslidsuk A, Kitiyakara T, Achalanan N, Soonthornpun S. The role of liquid simethicone in enhancing endoscopic visibility prior to esophagogastroduodenoscopy (EGD): A prospective, randomized, double-blinded, placebo-controlled trial. J Med Assoc Thai. 2010; 93 (8):892-7.
18. Wu L, Cao Y, Liao C, Huang J, Gao F. Systematic review and meta-analysis of randomized controlled trials of Simethicone for gastrointestinal endoscopic visibility. Scand J Gastroenterol. 2011; 46 (2):227-35.
19. Elvas L, Areia M, Brito D, Alves S, Saraiva S, Cadime AT. Premedication with simethicone and N-acetylcysteine in improving visibility during upper endoscopy: a double-blind randomized trial. Endoscopy. 2017; 49 (02):139-45.
20. Neale JR, James S, Callaghan J, Patel P. Premedication with N-acetylcysteine and simethicone improves mucosal visualization during gastroscopy: a randomized, controlled, endoscopist-blinded study. Eur J Gastroen Hepat. 2013; 25 (7):778-83.
21. Monrroy H, Vargas JI, Glasinovic E, Candia R, Azúa E, Gálvez C, et al. Use of N-acetylcysteine plus simethicone to improve mucosal visibility during upper GI endoscopy: a double-blind, randomized controlled trial. Gastrointest Endosc.2018; 87 (4):986-93.
22. Basford PJ, Brown J, Gadeke L, Fogg C, Haysom-Newport B, Ogollah R, et al. A randomized controlled trial of pre-procedure simethicone and N-acetylcysteine to improve mucosal visibility during gastroscopy–NICEVIS. Endosc Int Open. 2016; 4(11):E1197-202.
23. Veeraraghavan K, Abel J, Shreyas V, Malini TT, Vijayaraghavan D, Sangeetha AV, et al. Efficacy of Simethicone and n-acetylcysteine combination premedication prior to esophagogastroduodenoscopy to improve mucosal visibility–a prospective double blinded randomized placebo controlled trial (CTRI/2017/09/009913). Endoscopy. 2018; 50 (04):OP212.