

Comparison of left versus right lateral starting position on colonoscopy: a systematic review and meta-analysis of randomized controlled trials

Daryl Ramai^a, Jameel Singh^b, Olivia W. Brooks^a, Mohamed Barakat^c, Babu P. Mohan^d, Saurabh Chandan^e, Shahab R. Khan^f, Banreet Dhindsa^g, Amaninder Dhaliwal^h, Andrew Ofosuⁱ, Douglas G. Adler^d

The Brooklyn Hospital Center, NY; Mather Hospital, Port Jefferson, NY; University of Utah School of Medicine, Salt Lake City, Utah; CHI Health Creighton University Medical Center, Omaha, Nebraska; Rush University Medical Center, Chicago, Illinois; University of Nebraska Medical Center; Moffitt Cancer Center, University of South Florida, Tampa, Florida; Stanford University, California, USA

Abstract

Background Modifying patient position during colonoscopy has been proposed as a simple and inexpensive technique to increase luminal distention and improve navigation through the large bowel. The left lateral (LL) decubitus starting position is commonly used during colonoscopy. However, reports indicate that other starting positions may offer additional benefit. We aimed to determine if the right lateral (RL) starting position compared to the standard LL starting position could improve outcomes in colonoscopy.

Methods We searched PubMed, Medline, and EMBASE through June 2020 to identify studies comparing RL and LL starting positions during colonoscopy. The primary outcomes included mean cecal insertion time and cecal intubation rate, and adverse events were assessed by pooling data using a random-effects model expressed in terms of odds ratio (OR), mean difference, and 95% confidence interval (CI).

Results We identified 5 randomized controlled trials, including 809 participants, that compared LL vs. RL colonoscopy. The pooled OR for cecal intubation rate was 1.3 (95%CI 0.8-2.3; P=0.3). The mean difference in mean cecal insertion time was 0.08 (95%CI -0.09 to 0.26; P=0.4). Heterogeneity between studies was low ($I^2=0\%$). No complications were reported in either arm of the study. Pain scores assessed using a visual analog scale were comparable among both arms of the study.

Conclusion The RL starting position for colonoscopy was comparable to the LL and offered no additional benefit in terms of cecal intubation time, intubation rate, or patient discomfort.

Keywords Right lateral, left lateral, colonoscopy, starting position, cecal intubation

Ann Gastroenterol 2021; 34 (5): 699-704

^aDepartment of Internal Medicine, The Brooklyn Hospital Center, Brooklyn, New York (Daryl Ramai, Olivia W. Brooks); ^bDepartment of Internal Medicine, Mather Hospital, Port Jefferson, New York (Jameel Singh); ^cDivision of Gastroenterology, The Brooklyn Hospital Center, Brooklyn, New York (Mohamed Barakat); ^dDivision of Gastroenterology and Hepatology, University of Utah School of Medicine, Salt Lake City, Utah (Babu P. Mohan, Douglas G. Adler); ^eDivision of Gastroenterology and Hepatology, CHI Health Creighton University Medical Center, Omaha, Nebraska (Saurabh Chandan); ^fDivision of Gastroenterology, Rush University Medical Center, Chicago, Illinois (Shahab R. Khan); ^gGastroenterology and Hepatology, University of Nebraska Medical Center, Omaha, Nebraska (Banreet Dhindsa); ^hDivision of Gastroenterology, Moffitt Cancer Center, University of South Florida, Tampa, Florida (Amaninder Dhaliwal); ⁱDivision of Gastroenterology, Stanford University, Stanford, California (Andrew Ofosu), USA

Conflict of Interest: Douglas G. Adler: Consultant – Boston Scientific; all other authors: no conflicts of interest

Correspondence to: Douglas G. Adler, MD, FACP, AGAF, FASGE, Professor of Medicine, Director of Therapeutic Endoscopy, Director, GI Fellowship Program, Gastroenterology and Hepatology, University of Utah School of Medicine, Huntsman Cancer Center, 30N 1900E 4R118, Salt Lake City, Utah 84132, USA, e-mail: Douglas.adler@hsc.utah.edu

Received 27 October 2020; accepted 5 February 2021; published online 3 June 2021

DOI: <https://doi.org/10.20524/aog.2021.0639>

© 2021 Hellenic Society of Gastroenterology

Introduction

Colonoscopy is a routinely performed procedure essential for colorectal cancer screening, surveillance of polyps and inflammatory bowel disease, and the diagnosis and management of lower gastrointestinal symptoms [1-3]. Each year, approximately 14 million colonoscopies are performed in the United States [4,5]. Conventionally, the left lateral (LL) decubitus position has been the preferred starting position for colonoscopy. Facilitating the insertion process not only decreases procedural difficulty but may reduce time pressure during withdrawal, allowing more time for adenoma detection [6,7].

To facilitate efficient colonoscopic insertion, several ancillary strategies have been studied, including the application of external abdominal pressure and changes to the patient's physical position [8]. Uddin *et al* compared LL with prone positioning in 101 patients [9]. The study reported that prone positioning resulted in significantly shorter cecal intubation times (424 vs. 550 sec, P=0.03) and less need for patient repositioning (8% vs. 28%, P=0.009). However, a larger study by Vergis *et al* had contrasting results and failed to show any benefit from prone positioning [10]. Other body positions have

been proposed, including tilt down and supine, though with limited results [11-14].

The right lateral (RL) position has been proposed as an alternative starting body position for colonoscopy. RL has been most studied compared to other starting positions. Recently, Greene *et al* randomized 94 patients to RL and 91 patients to LL starting positions for colonoscopy [15]. It was proposed that air would preferentially fill the left colon with an RL starting position, thus increasing luminal distention and improving navigation through the large bowel. However, the study failed to show an association between cecal intubation time and patient position (RL 542.6±360.7 sec vs. LL 497.85±288.3 sec, $P=0.354$). Pain scores were also comparable ($P=0.078$). To evaluate the current evidence further, we conducted a systematic review and meta-analysis to compare the effect of LL and RL starting positions on colonoscopy outcomes.

Materials and methods

Search strategy

We conducted a comprehensive search of several databases and conference proceedings, including Medline and EMBASE, through Sept 2020. An experienced medical librarian helped with the literature search, using inputs from the study authors. We followed the Preferred Reporting items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines by using a predefined protocol to identify publications that reported studies comparing LL and RL starting position for colonoscopy [16,17].

Key words used in the literature search included a combination of “left lateral”, “right lateral”, “colonoscopy”, “cecal intubation”, “body position”, “decubitus position”, and “starting position”. The search was restricted to studies in human subjects published in peer-reviewed journals. Two authors (DR, OB) independently reviewed the title and abstract of studies identified in the primary search and excluded studies that did not address the research question, based on pre-specified exclusion and inclusion criteria. The full texts of the remaining articles were reviewed to determine whether they contained relevant information. Any discrepancy in article selection was resolved by consensus, and in discussion with a co-author.

The bibliographic section of the selected articles, as well as the systematic and narrative articles on the topic were manually searched for additional relevant articles. Details on the search strategy are presented in Supplementary Table 1.

Study selection

In this meta-analysis, we included only randomized control trials (RCTs) that evaluated and compared RL and LL starting positions for colonoscopy. Pediatric studies (age <18 years) were excluded. Studies were eligible for inclusion, irrespective of their sample-size, inpatient/outpatient setting and geography, as long as they provided data needed for the analysis. In the event of multiple publications from the same

cohort and/or overlapping cohorts, data from the most recent and/or most appropriate comprehensive report were retained.

Data abstraction and quality assessment

Study references and citations were collected in EndNote X9 (Thomson Reuters, New York, NY). Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia) was used to further screen and extract relevant studies. The full text of each selected article was reviewed to verify that it contained relevant information. To identify other potentially eligible publications, the bibliographic sections of the selected articles were manually searched for additional relevant articles. Data on study-related outcomes in the individual studies were abstracted by 2 authors (DR, JS), and 2 authors (DR, JS) did the quality scoring independently. The Jadad scale for RCTs was used to assess the study quality [18].

Outcomes assessed in study cohorts

The primary outcome was pooled cecal intubation rate, defined as colonoscope cannulation of the cecum. The secondary outcome included pooled cecal intubation time and procedure-related adverse events, including pain or discomfort evaluated using a visual analog scale.

Statistical analysis

We used meta-analysis techniques to calculate pooled estimates using a random-effects model [19-22]. We assessed heterogeneity between study-specific estimates using the Cochran Q statistical test for heterogeneity and the I^2 statistic [23-26], where values of <30%, 30-60%, 61-75%, and >75% were suggestive of low, moderate, substantial, and considerable heterogeneity, respectively. Publication bias was ascertained qualitatively, by visual inspection of a funnel plot and quantitatively, by the Egger test. A P -value <0.05 was considered statistically significant [27-29]. Statistical analyses were conducted using STATA software, version 16.0 (College Station, TX: StataCorp LLC).

Results

Search results and study characteristics

From an initial total of 558 studies, 535 records were screened after deduplication and 16 full-length articles were assessed. Five studies were included in the final meta-analysis [15,30-33]. Fig. 1 shows a schematic diagram of the study selection.

A total of 809 patients (408 LL vs. 401 RL) were included in the final analysis. Additional details of study characteristics with patient demographics are summarized in Table 1. Four studies [15,30-32] were published as full manuscript publications while 1 study [33] was published in abstract

format. Each study was from a geographically different location: the United Kingdom [30], Mexico [31], Canada [15], Indonesia [32], and Portugal [33]. A detailed assessment of study quality is given in Supplementary Table 2.

Cecal intubation

When all 5 studies were analyzed using a random effects model, RL and LL body positions had comparable rates of cecal intubation (odds ratio [OR] 1.3, 95% confidence interval [CI] 0.8-2.3; $P=0.3$; $I^2=0\%$) (Fig. 2). Upon analysis of cecal intubation time, the standardized mean difference was not statistically different between RL and LL positions (OR 0.08, 95%CI -0.09 to 0.26; $P=0.4$; $I^2=0\%$) (Fig. 3).

Patient discomfort and adverse events

Discomfort was assessed according to a visual analog scale that is a validated and reliable pain-related scale used

to assess patient discomfort [34]. Vergis *et al* reported the RL starting position was more comfortable for patients than the LL (2 vs. 3, $P=0.02$). However, a study with a similar sample size by Bayupurnama *et al* [32] reported comparable pain scores (RL 4.10 vs. LL 4.42, $P=0.59$). Mocanu *et al* [33] reported no significant difference in pain scores (RL 3.92 vs. LL 3.94, $P=0.05$). Greene *et al* [15] also reported no significant difference in pain scores (RL 3.20 vs. LL 2.55, $P=0.078$), though this study used the Nurse-Assessed Patient Comfort Score. None of the studies reported any adverse outcomes following RL or LL starting body positions.

Validation of meta-analysis results

Heterogeneity

We assessed the dispersion of the calculated rates using I^2 percentage values. We found no significant heterogeneity in the reported pooled outcomes.

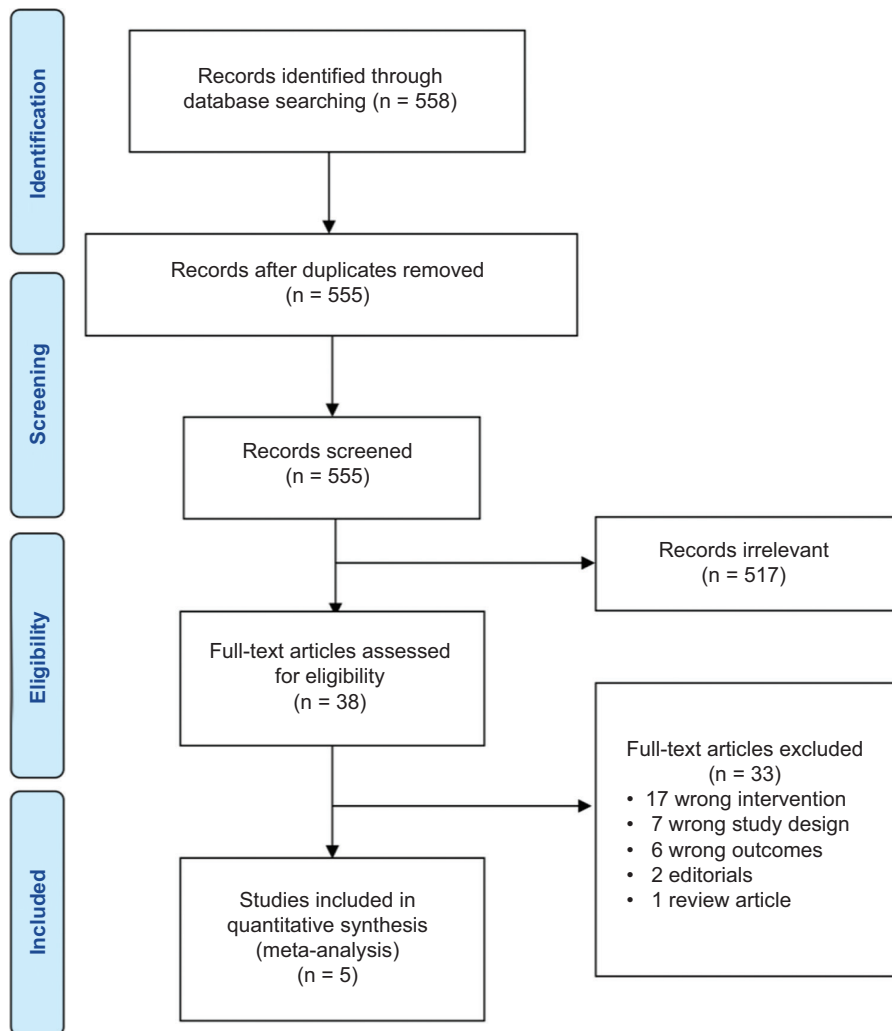


Figure 1 Study flow chart

Table 1 Characteristics of studies included in meta-analysis

Study author, year [Ref.]	Setting	Country	Starting position	# of patients	Mean age (SD±)	BMI (±SD)	Cecal intubation time (sec) (±SD)	Cecal intubation rate (%)	Adenoma detection	History of GI surgery	VAS (SD)
Vergis et al 2015 [30]	Multicenter	UK	LL	77	60	25	---	77/80 (96.3%)	12/77	n=31	4.25 (1.87)
			RL	75	62	25	---	75/83 (90.4%)	15/75	n=32	3.75 (1.88)
Gonzalez et al 2018 [31]	Single-center	Mexico	LL	95	57±17	27±5	209.8±375.3	95/105 (90.5%)	---	---	---
			RL	84	59±14	27±6	242.5±391.2	84/97 (86.6%)	---	---	---
Greene et al 2020 [15]	Multicenter	Canada	LL	91	60	29	166±288.3	86/91 (94.8%)	59/91	n=41	2.55
			RL	94	61	28	180.85±360.7	89/94 (94.9%)	53/94	n=45	3.2
Bayupurnama et al 2020 [32]	Single-center	Indonesia	LL	51	47±15.6	---	230.6±315.0	44/51 (86.3%)	---	---	4.10 (2.69)
			RL	54	47±14.1	---	273.8±292.8	47/54 (87.0%)	---	---	4.42 (2.99)
Mocanu et al 2017 [33]	Single-center	Portugal	LL	94	64	26	---	---	---	n=34	3.94
			RL	94	61	27	---	---	---	n=44	3.92

SD, standard deviation; BMI, body mass index; GI, gastrointestinal; VAS, visual analog scale; LL, left lateral; RL, right lateral

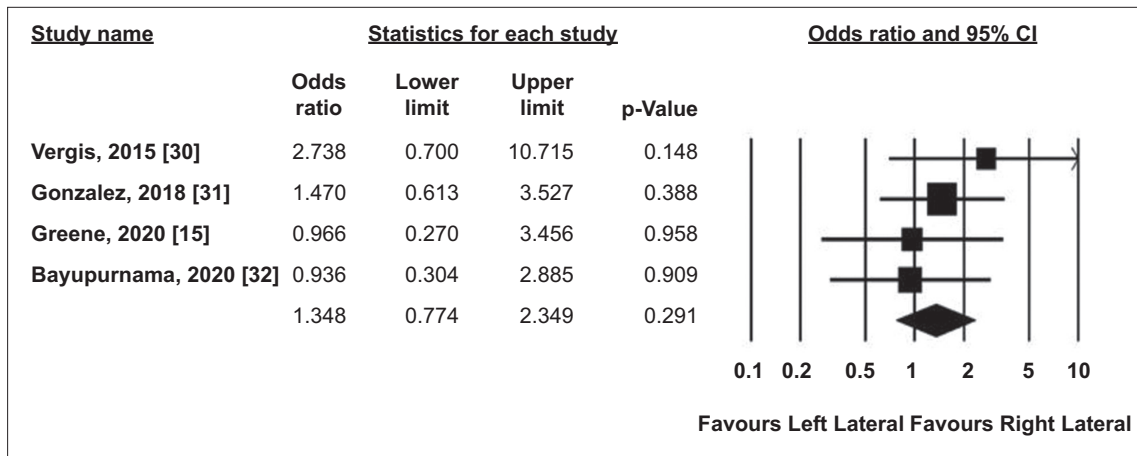


Figure 2 Forest plot for cecal intubation rate
CI, confidence interval

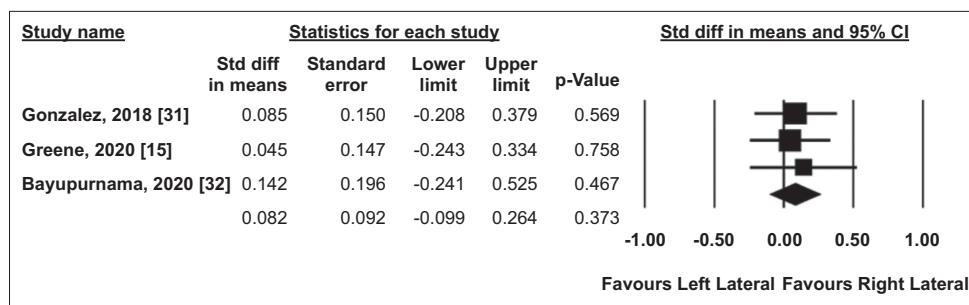


Figure 3 Forest plot for cecal intubation time
CI, confidence interval; Std diff, standard difference

Publication bias

A publication bias analysis was not done, as the total number of studies included in the analysis was less than 10.

Discussion

This is the first systematic review and meta-analysis to compare LL and RL starting positions for colonoscopy. We found that neither the LL or RL patient position resulted in higher rates of cecal intubation. Cecal intubation times were comparable between both positions. Additionally, both positions were associated with similar patient-reported pain scores.

The Right Or Left in COLonoscopy (ROLCOL) trial by Vergis *et al* [30] reported a 30% better cecal intubation time starting from the RL position [30]. The study also reported better patient comfort using the RL starting position. It was thought that the RL position would optimize visualization and improve adenoma detection rate by potentially filling air in the left colon [35,36]. However, our findings disagree with those of Vergis *et al* and are in agreement with Greene *et al* [15], Mocanu *et al* [33] and Bayupurnama *et al* [32], who failed to show a benefit of RL over LL.

It was noted that the RL position may be useful in negotiating an acute sigmoid angle in female patients [37]. However, the RL position carries risks and certain patients may not be good candidates for this position. Patients are potentially at risk for gastroesophageal reflux and aspiration in the RL position [38,39].

The strengths of our review are as follows: systematic literature search with well-defined inclusion criteria, careful exclusion of redundant studies, inclusion of good quality studies with detailed extraction of data, rigorous evaluation of study quality, and statistics to establish and/or refute the validity of the results of our meta-analysis. We reported results based on current standards of quality measures in colonoscopy, as put forth by gastrointestinal societies such as the American Society of Gastrointestinal Endoscopy and the American College of Gastroenterology.

There were also several limitations to this study, most of which are inherent to any meta-analysis. We were unable to perform pooled analysis of adenoma detection rate as most studies did not report this outcome. Unlike the other studies included for meta-analysis, the Bayupurnama *et al* [32] article involved water-immersion, which may have affected outcomes. Additionally, most studies lack blinding, although it would be difficult or impossible to blind endoscopists to starting position.

This study is the most comprehensive review comparing the RL and LL body starting positions for colonoscopy. Ultimately, the RL starting position was comparable to the LL starting position and offered no additional benefit in terms of cecal intubation time, intubation rate or patient discomfort.

Summary Box

What is already known:

- Changes to the patient's physical position may facilitate efficient colonoscopic insertion
- The left lateral (LL) decubitus starting position is most used during colonoscopy
- Previous studies have investigated other starting positions on colonoscopy outcomes

What the new findings are:

- This study compares the right lateral (RL) and LL starting positions for colonoscopy
- The mean difference in cecal intubation time was comparable
- RL offers no additional benefit in cecal intubation rate
- Patient discomfort was comparable between RL and LL starting positions

References

1. Kaminski MF, Regula J, Kraszewska E, et al. Quality indicators for colonoscopy and the risk of interval cancer. *N Engl J Med* 2010;**362**:1795-1803.
2. Lieberman DA, Rex DK, Winawer SJ, Giardiello FM, Johnson DA, Levin TR. Guidelines for colonoscopy surveillance after screening and polypectomy: a consensus update by the US Multi-Society Task Force on Colorectal Cancer. *Gastroenterology* 2012;**143**:844-857.
3. Burke KE, Naylor J, Campbell EJ, Ananthakrishnan AN, Khalili H, Richter JM. Interval colorectal cancer in inflammatory bowel disease: the role of guideline adherence. *Dig Dis Sci* 2020;**65**:111-118.
4. Seeff LC, Richards TB, Shapiro JA, et al. How many endoscopies are performed for colorectal cancer screening? Results from CDC's survey of endoscopic capacity. *Gastroenterology* 2004;**127**:1670-1677.
5. Peery AF, Dellon ES, Lund J, et al. Burden of gastrointestinal disease in the United States: 2012 update. *Gastroenterology* 2012;**143**:1179-1187.
6. Wallace MB, Wang KK, Adler DG, Rastogi A. Recent advances in endoscopy. *Gastroenterology* 2017;**153**:364-381.
7. von Renteln D, Robertson DJ, Bensen S, Pohl H. Prolonged cecal insertion time is associated with decreased adenoma detection. *Gastrointest Endosc* 2017;**85**:574-580.
8. Wayne JD, Yessayan SA, Lewis BS, Fabry TL. The technique of abdominal pressure in total colonoscopy. *Gastrointest Endosc* 1991;**37**:147-151.
9. Uddin FS, Iqbal R, Harford WV, et al. Prone positioning of obese patients for colonoscopy results in shortened cecal intubation times: a randomized trial. *Dig Dis Sci* 2013;**58**:782-787.
10. Vergis N, Scarborough AJ, Morris JA, Hoare JM. Prone or left for colonoscopy? A randomized controlled trial of prone versus left-sided starting position for colonoscopy. *J Clin Gastroenterol* 2018;**52**:e82-e86.
11. Zhao SB, Yang X, Fang J, et al. Effect of left lateral tilt-down position on cecal intubation time: a 2-center, pragmatic, randomized controlled trial. *Gastrointest Endosc* 2018;**87**:852-861.
12. Early D, Larue S, Weinstock L, et al. Impact of tilt-down positioning compared with left lateral positioning on ease of colonoscopy

- insertion during colonoscopy. *J Clin Gastroenterol* 2020;**54**:558-560.
13. Zhao S, Yang X, Meng Q, et al. Impact of the supine position versus left horizontal position on colonoscopy insertion: a 2-center, randomized controlled trial. *Gastrointest Endosc* 2019;**89**:1193-1201.
 14. Klare P, Huth R, Haller B, et al. Patient position and hypoxemia during propofol sedation for colonoscopy: a randomized trial. *Endoscopy* 2015;**47**:1159-1166.
 15. Greene A, Borgoankar M, Hodgkinson K, Garland C, Bacque L, Pace D. A randomized controlled trial comparing right and left lateral decubitus starting position on outcomes in colonoscopy. *Surg Endosc* 2020;**34**:3656-3662.
 16. Moher D, Shamseer L, Clarke M, et al; PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;**4**:1.
 17. Shamseer L, Moher D, Clarke M, et al; PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ* 2015;**350**:g7647.
 18. Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials* 1996;**17**:1-12.
 19. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials* 1986;**7**:177-188.
 20. Sutton AJ, Abrams KR, Jones DR. An illustrated guide to the methods of meta-analysis. *J Eval Clin Pract* 2001;**7**:135-148.
 21. Higgins JP, Thompson SG, Spiegelhalter DJ. A re-evaluation of random-effects meta-analysis. *J R Stat Soc Ser A Stat Soc* 2009;**172**:137-159.
 22. Riley RD, Higgins JP, Deeks JJ. Interpretation of random effects meta-analyses. *BMJ* 2011;**342**:d549.
 23. Mohan BP, Adler DG. Heterogeneity in systematic review and meta-analysis: how to read between the numbers. *Gastrointest Endosc* 2019;**89**:902-903.
 24. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**:557-560.
 25. Kanwal F, White D. "Systematic reviews and meta-analyses" in clinical gastroenterology and hepatology. *Clin Gastroenterol Hepatol* 2012;**10**:1184-1186.
 26. Guyatt GH, Oxman AD, Kunz R, et al; GRADE Working Group. GRADE guidelines: 7. Rating the quality of evidence— inconsistency. *J Clin Epidemiol* 2011;**64**:1294-1302.
 27. Easterbrook PJ, Berlin JA, Gopalan R, Matthews DR. Publication bias in clinical research. *Lancet* 1991;**337**:867-872.
 28. Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* 2000;**56**:455-463.
 29. Rothstein HR, Bushman BJ. Publication bias in psychological science: comment on Ferguson and Brannick (2012). *Psychol Methods* 2012;**17**:129-136.
 30. Vergis N, McGrath AK, Stoddart CH, Hoare JM. Right Or Left in COLonoscopy (ROLCOL)? A randomized controlled trial of right- versus left-sided starting position in colonoscopy. *Am J Gastroenterol* 2015;**110**:1576-1581.
 31. Gonzalez FM, Bueno N, Casillas GB, et al. Comparison between conventional left lateral position and right lateral position as the starting position in colonoscopy. *Gastrointest Endosc* 2017;**85**:AB179-AB180.
 32. Bayupurnama P, Ratnasari N, Indrarti F, et al. The effectiveness of right- vs left-lateral starting position in unsedated diagnostic colonoscopy with modified-water immersion method: a randomized controlled trial study. *Clin Exp Gastroenterol* 2020;**13**:369-375.
 33. Mocanu I, Laranjo A, Pires S, et al. Colonoscopy on the left, right? *United European Gastroenterol J* 2017;**5**:A461.
 34. Skovlund E, Bretthauer M, Grotmol T, Larsen IK, Hoff G. Sensitivity of pain rating scales in an endoscopy trial. *Clin J Pain* 2005;**21**:292-296.
 35. Lee SW, Chang JH, Ji JS, et al. Effect of dynamic position changes on adenoma detection during colonoscope withdrawal: a randomized controlled multicenter trial. *Am J Gastroenterol* 2016;**111**:63-69.
 36. East JE, Suzuki N, Arebi N, Bassett P, Saunders BP. Position changes improve visibility during colonoscope withdrawal: a randomized, blinded, crossover trial. *Gastrointest Endosc* 2007;**65**:263-269.
 37. Thomas-Gibson S, Matharoo M. Patient position change in colonoscopy: Dogmatic or pragmatic? *Gastrointest Endosc* 2019;**89**:1202-1203.
 38. Fusaroli P. Right lateral decubitus for routine colonoscopy: beware the potential risk of aspiration. *Am J Gastroenterol* 2016;**111**:898.
 39. Kapur KC, Trudgill NJ, Riley SA. Mechanisms of gastro-oesophageal reflux in the lateral decubitus positions. *Neurogastroenterol Motil* 1998;**10**:517-522.

Supplementary material

Supplementary Table 1 Search strategy

Search Strategies		
Medline (OVID) Search Strategy [June 26, 2020]		
Ovid MEDLINE(R) ALL <1946 to June 25, 2020>		
#	Searches	Results
1	exp Colonoscopy/	30029
2	Colonic Diseases/	16004
3	Colonic Neoplasms/	70652
4	Endoscopy/	52008
5	2 or 3 or 4	136005
6	limit 5 to yr="1966-1980"	16844
7	1 or 6	46395
8	prone position/ or supine position/ or posture/ or Patient Positioning/	76561
9	7 and 8	150
10	(patient* adj2 position*).ti,kf. or (patient* adj2 position*).ab. /freq=2	2355
11	(colonoscop* or sigmoidoscop* or (lower adj2 endoscop*)).tw,kf.	33854
12	10 and 11	13
13	((left or right) adj2 (lateral* or side* or horizontal*) adj5 (colonoscop* or sigmoidoscop* or (lower adj2 endoscop*))).tw,kf.	135
14	(insert* adj3 colonoscop*).ti. or (insert* adj3 colonoscop*).ab. /freq=2	68
15	((position* or prone* or supine* or posture* or sit or sitting or left-side* or right-side* or tilt-down*) adj3 (colonoscop* or sigmoidoscop* or (lower adj2 endoscop*))).tw,kf.	145
16	9 or 12 or 13 or 14 or 15	393
17	(exp child/ or exp infant/ or adolescent/) not exp adult/	1872688
18	(newborn* or new-born* or neonat* or neo-nat* or infan* or child* or adolesc* or paediatr* or pediater* or baby* or babies* or toddler* or kid or kids or boy* or girl* or juvenile* or teen* or youth* or pubescen* or preadolesc* or prepubesce* or preteen or tween).ti.	1490253
19	(pediatr* or paediatr*).jw.	569434
20	("30660634" or "31104750" or "29674012" or "31205654" or "31563558" or "30516549" or "31577857" or "31044751" or "29981190" or "31662539" or "31242327" or "29164303" or "29158180" or "29381877" or "28644314" or "28940818" or "28726147" or "29668929" or "27631316" or "28937025" or "27431209" or "28667446" or "27875189" or "28179979" or "27015235" or "29075963" or "28275018" or "29384933" or "28542331" or "27838810" or "29359000" or "27639546" or "27028973" or "26982385" or "27126252" or "27013363" or "27439969" or "27701933" or "27573775" or "26526085" or "27249984" or "27356828" or "26089103" or "27249986" or "27087943" or "26855536" or "26279350" or "25639787" or "26416195" or "26401478" or "25495115" or "25675176" or "25624710" or "26019465" or "26126161" or "25359528" or "25987802" or "26282949" or "25647725" or "26737194" or "25910661" or "25413483" or "25102984" or "25220519" or "24711476" or "25278714" or "25245745" or "23606303" or "25046348" or "25436406" or "24629419" or "24750155" or "26158158" or "25493011" or "24282136" or "24434085" or "25436403" or "26135254" or "23143737" or "22950958" or "23536312" or "23368405" or "23314857" or "24078934" or "23114184" or "24078933" or "23261097" or "22143991" or "22317441" or "22658386" or "23366739" or "22920402" or "21932422" or "22556131" or "21482207" or "21357518" or "21353843" or "20711732" or "21872091" or "21353864" or "21481862" or "21745014" or "22003656" or "20950801" or "21455041" or "21816067" or "21668569" or "19926419" or "20232413" or "19089490" or "19688402" or "20051552" or "20879994" or "21114406" or "19481671" or "19197187" or "19188799" or "19467939" or "18723413" or "19430864").ui.	120
21	or/17-20	2446226
22	16 not 21	306
23	limit 22 to english	267

Embase (OVID) Search Strategy [June 26, 2020]

Embase Classic+Embase <1947 to 2020 June 25>

#	Searches	Results
1	exp colonoscopy/	79761
2	body position/ or head-down tilt/ or prone position/ or sitting/ or supine position/	64331
3	patient positioning/	20147
4	2 or 3	82280
5	1 and 4	294
6	(patient* adj2 position*).ti,kw. or (patient* adj2 position*).ab. /freq=2	3757
7	(colonoscop* or sigmoidoscop* or (lower adj2 endoscop*)).tw,kw.	65752
8	6 and 7	36
9	(insert* adj3 colonoscop*).ti. or (insert* adj3 colonoscop*).ab. /freq=2	164
10	((left or right) adj2 (lateral* or side* or horizontal*) adj5 (colonoscop* or sigmoidoscop* or (lower adj2 endoscop*))).tw,kw.	327
11	((position* or prone* or supine* or posture* or sit or sitting or left-side* or right-side* or tilt-down*) adj3 (colonoscop* or sigmoidoscop* or (lower adj2 endoscop*))).tw,kw.	328
12	5 or 8 or 9 or 10 or 11	896
13	(exp child/ or adolescent/) not exp adult/	2461810
14	(newborn* or new-born* or neonat* or neo-nat* or infan* or child* or adolesc* or paediatr* or pediater* or baby* or babies* or toddler* or kid or kids or boy* or girl* or juvenile* or teen* or youth* or pubescen* or preadolesc* or prepubesc* or preteen or tween).ti.	1912925
15	(pediatr* or paediatr*).jx.	745563
16	("30660634" or "31104750" or "29674012" or "31205654" or "31563558" or "30516549" or "31577857" or "31044751" or "29981190" or "31662539" or "31242327" or "29164303" or "29158180" or "29381877" or "28644314" or "28940818" or "28726147" or "29668929" or "27631316" or "28937025" or "27431209" or "28667446" or "27875189" or "28179979" or "27015235" or "29075963" or "28275018" or "29384933" or "28542331" or "27838810" or "29359000" or "27639546" or "27028973" or "26982385" or "27126252" or "27013363" or "27439969" or "27701933" or "27573775" or "26526085" or "27249984" or "27356828" or "26089103" or "27249986" or "27087943" or "26855536" or "26279350" or "25639787" or "26416195" or "26401478" or "25495115" or "25675176" or "25624710" or "26019465" or "26126161" or "25359528" or "25987802" or "26282949" or "25647725" or "26737194" or "25910661" or "25413483" or "25102984" or "25220519" or "24711476" or "25278714" or "25245745" or "23606303" or "25046348" or "25436406" or "24629419" or "24750155" or "26158158" or "25493011" or "24282136" or "24434085" or "25436403" or "26135254" or "23143737" or "22950958" or "23536312" or "23368405" or "23314857" or "24078934" or "23114184" or "24078933" or "23261097" or "22143991" or "22317441" or "22658386" or "23366739" or "22920402" or "21932422" or "22556131" or "21482207" or "21357518" or "21353843" or "20711732" or "21872091" or "21353864" or "21481862" or "21745014" or "22003656" or "20950801" or "21455041" or "21816067" or "21668569" or "19926419" or "20232413" or "19089490" or "19688402" or "20051552" or "20879994" or "21114406" or "19481671" or "19197187" or "19188799" or "19467939" or "18723413" or "19430864").pm.	110
17	("31869466" or "32433167" or "31667695" or "31869470" or "32128607" or "32267568" or "32458286" or "32336256" or "32068535" or "32011402" or "32199773" or "32095167" or "30914345" or "31801775" or "31260589" or "31882879" or "31289848" or "30829676" or "29417332" or "30301334" or "29397494" or "30154661" or "30300987" or "29781328" or "30186088" or "28241409" or "27480288" or "28365356" or "27683963" or "28570883" or "27018077" or "27443823" or "26753889" or "27596107" or "27644552" or "28078148" or "26762775" or "25652842" or "25842183" or "25346004" or "26380054" or "25407805" or "25516670" or "24299144" or "24439784" or "23562347" or "23772270" or "23575398" or "23967383" or "23663559" or "23086122" or "23931865" or "23460054" or "22987217" or "22398080" or "22018551" or "22678462" or "22107065" or "22271416" or "22100624" or "22640654" or "22176613" or "22606416" or "20730449" or "20740366" or "21298530" or "21679946" or "21894202" or "20516399" or "19996985" or "19930147" or "27956997" or "21176147" or "20333800" or "20438892" or "20042716" or "19891018" or "19358723" or "19465681" or "18647285" or "17710548" or "17934833" or "18266570" or "17141776" or "17694881" or "19803850" or "17321243" or "18019875" or "17983066" or "17156149" or "17141772" or "17640320" or "17223936" or "17241863" or "17283177" or "17615257" or "17114627" or "16479430" or "16680656" or "16843848" or "16492920" or "16377328" or "16150858" or "16521190" or "16028443" or "16278131" or "16145343" or "24387728" or "15134267" or "15202047" or "14970300" or "15098039" or	191

	“15039159” or “15300577” or “15083326” or “12601201” or “12768392” or “12430076” or “12034925” or “12492196” or “11883342” or “12147833” or “11246352” or “11768820” or “11591962” or “11985980” or “11285543” or “11280569” or “11303973” or “11742167” or “10882954” or “11149303” or “10924558” or “10924550” or “10691273” or “10613478” or “10498362” or “10063842” or “10376459” or “9746180” or “9456980” or “9577904” or “9199924” or “8892060” or “8881056” or “7779671” or “7583039” or “8082503” or “1553939” or “1397910” or “1988271” or “2032597” or “1993418” or “1756937” or “1872396” or “1805398” or “2107779” or “2916518” or “3291887” or “2895264” or “3390671” or “3338051” or “3197990” or “3189553” or “3666159” or “3101488” or “3817580” or “6688216” or “6826002” or “7075566” or “7119410” or “6121202” or “7393250” or “7352779” or “7378698” or “505088” or “498895” or “445883” or “875458” or “915091” or “841087” or “779070” or “1115946” or “1078585” or “1200842” or “4816804” or “4817215” or “4856946” or “4545437” or “4544004” or “4479382” or “4406620” or “4846340” or “4594336” or “4739195” or “4584039” or “4740558” or “4567587” or “4117806” or “4259073” or “5109748” or “5573745” or “5472671” or “5409823” or “5472669” or “5481229” or “5420268” or “14159368” or “13927028” or “13537817” or “13189017” or “21011519”).pm.	
18	(“31953727” or “32458999” or “31061892” or “30788124” or “31211893” or “29779795” or “31583326” or “30675926” or “29292858” or “29998160” or “29743829” or “28470438” or “28428714” or “28381846” or “27014755” or “26846118” or “27059039” or “26074684” or “26448917” or “26167083” or “25743720” or “25262100” or “25956838” or “24566740” or “25196871” or “23859449” or “22925287” or “22586546” or “23021168” or “22840291” or “22817789” or “21535226” or “22163078” or “21686105” or “22163081” or “21672243” or “20923378” or “20593332” or “19922923” or “21088743” or “19647642” or “19555938” or “19107096” or “17149549” or “16278132” or “12024136” or “12195326” or “12397274” or “11323595” or “11819670” or “8857135” or “8536905” or “8503077” or “862586” or “992255”).pm.	40
19	or/13-18	3201984
20	12 not 19	630
21	limit 20 to (conference abstract or conference paper or “conference review”)	370
22	20 not 21	260
23	limit 21 to yr=“2018 -Current”	48

Supplementary Table 2 Jadad scale for randomized controlled trials

Study quality	Vergis <i>et al</i> [30]	Gonzalez <i>et al</i> [31]	Greene <i>et al</i> [15]	Bayupurnama <i>et al</i> [32]	Mocanu <i>et al</i> [33]
Randomization present	1	1	1	1	1
Appropriate randomization utilized	1	1	1	1	1
Blinding present	1	1	1	1	1
Appropriate blinding method utilized	1	1	1	1	1
Appropriate long-term follow up	1	1	1	1	1
Max score	5	5	5	5	5