

Evaluation of the Effectiveness of Patient's Position Change during the Withdrawal Phase of Colonoscopy from Left Lateral Decubitus to Supine Position on Increasing Adenoma Detection Rate: A Randomized Controlled Trial

Abdolreza Emami¹, Javad Shokri Shirvani^{2*}, Saman Alhooei³, Akramasadat Hosseini⁴, and Hemmat Gholinia Ahangar⁵

¹Student Research Committee, School of Medicine, Babol University of Medical Sciences, Babol, IR Iran

²Associate Professor of Gastroenterology and Hepatology, Department of Internal Medicine, School of Medicine, Babol University of Medical Sciences, Babol, IR Iran

³Assistant Professor of Gastroenterology and Hepatology, Department of Internal Medicine, School of Medicine, Babol University of Medical Sciences, Babol, IR Iran

⁴Assistant Professor of Pathology, Department of Pathology, School of Medicine, Cancer Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, IR Iran

⁵Assistant Professor of Cardiac Anesthesia, Department of Anesthesiology, School of Medicine, Babol University of Medical Sciences, Babol, IR Iran

*Corresponding Author

Javad Shokri Shirvani, Associate Professor of Gastroenterology and Hepatology, Department of Internal Medicine, School of Medicine, Babol University of Medical Sciences, Babol, IR Iran.

Submitted: 2023, Jan 17; Accepted: 2023, Mar 15; Published: 2023, May 09

Citation: Emami, A., Shirvani, J. S., Alhooei, S., Hosseini, A., Ahangar, H. G. (2023). Evaluation of the Effectiveness of Patient's Position Change during the Withdrawal Phase of Colonoscopy from Left Lateral Decubitus to Supine Position on Increasing Adenoma Detection Rate: A Randomized Controlled Trial. *J Gastro & Digestive Systems*, 7(1), 13-18.

Abstract

Background: Improvement in adenoma detection rate (ADR) reduces colorectal cancer incidence by increasing the colonoscopy quality. Using dynamic patient position changes during the withdrawal phase has shown promise in increasing ADR. We conducted this study to assess the effectiveness of the supine position on the improvement of ADR to improve its feasibility and avoid frequent patient position changes, particularly in sedated patients.

Methods: This was a randomized, single-blind, parallel-group, single-center study implemented in the Mehregan private in Babol. Inclusion criteria were 40 to 85 years old, 4 L application of polyethylene glycol from the day before the procedure, no history of inflammatory bowel disease, bowel surgery, musculoskeletal problems, and negative familial history of colorectal cancer. Patients were allocated in a 1:1 ratio to the supine or left lateral positions during the withdrawal phase. All colonoscopies were performed by a single physician using a Fujifilm colonoscope. A P-value of <0.005 was considered statistically significant.

Results: A total of 880 patients were assessed for eligibility, of which 472 patients were included in the final analysis; 53.4% were female, the mean age of participants was 55.86±10.30 years old, 95.1% of patients had adequate bowel preparation, and adenomatous polyps were the most common histopathologic type (63.7%). Despite the intervention group's higher rate of ADR and PDR (19.5% vs. 17.7% for ADR and 27.2% vs. 26.5% for PDR), no statistically significant difference in ADR or PDR was detected (P=0.613 and 0.866, respectively).

Conclusion: No statistical significance was observed despite the increase in ADR when the supine position was used exclusively during the withdrawal phase. As a result, we recommend that the dynamic position change method be used if a position change is required. Nonetheless, additional research is required to determine a more effective alternative to dynamic position change in obese or heavily sedated patients.

Keywords: Early Detection of Cancer, Colonoscopy, Quality Indicators, Colorectal Neoplasms, Patient Positioning, Supine Position, Colonic Polyps

1. Introduction

Colorectal cancer (CRC) is the third most common type of cancer worldwide and the fourth leading cause of cancer-related death, and early detection has a significant impact on its mortality and morbidity [1,2]. Several screening methods for CRC have been developed, with colonoscopy serving as the gold standard [3]. Given the possibility that any screening method may miss some lesions, several tools have been introduced to evaluate the method's quality. Currently, adenoma detection rate (ADR), defined as the proportion of colonoscopies with at least one adenoma, is one of the most significant colonoscopy quality indicators [4]. Dynamic position change during the withdrawal phase of colonoscopy has been introduced as an effective measure for increasing ADR, in which each section of the colon is examined in the prespecified position (left lateral decubitus for the cecum to the hepatic flexure, supine for the transverse colon, and right lateral position for the hepatic flexure to the rectum) [5]. However, this method has limitations, particularly in obese or heavily sedated patients, due to the difficulty and time required for multiple position changes [5,6].

According to Li et al., an increase in ADR following a dynamic position change was significant only in the transverse colon, which is best examined in the supine position [5]. The present study was conducted to evaluate the effectiveness of a patient's position change from the left lateral decubitus to the supine position during the withdrawal phase of colonoscopy on increasing the ADR. Additionally, Secondary outcomes were polyp detection rate (PDR), quality of bowel preparation, and colonoscopy withdrawal time.

2. Methods

2.1. Subjects

This single-center study was implemented in the Mehregan private hospital affiliated with the Babol University of Medical Sciences located in Babol, Mazandaran Province, Iran. All patients referred to the endoscopy unit for colonoscopy were included in the study population. Inclusion criteria were age between 40 to 85 years old, 4 L application of polyethylene glycol from the day before the procedure, no history of inflammatory bowel disease or bowel surgery, musculoskeletal problem preventing patient position change during colonoscopy, and negative familial history of colorectal cancer. Inability to reach the cecum, using anti-spasmodic drugs, inability to access pathology reports, any complication leading to procedure termination, and the physician's decision to perform the withdrawal phase of the colonoscopy in a position other than the pre-assigned position for the patient were considered as exclusion criteria.

2.2. Study Design

This study was a randomized, single-blind, parallel-group trial with a 1:1 ratio. The ethics committee for biological research at Babol University of Medical Sciences approved the study (IR.MUBABOL.HRI.REC.1398.370), and the study protocol was registered with the Iranian clinical trial registry (trial ID: IRCT20110721007080N5, registration date: 2020-05-04). Additionally, informed consent was obtained from all recruited patients. Patients were randomly assigned to the intervention or control group using the randomization.com website's block ran-

domization method. For the intervention group, the withdrawal phase of the colonoscopy was performed entirely in the supine position; for the control group, it was performed entirely in the left lateral position.

The physician evaluated the quality of bowel preparation using the Boston Bowel Preparation Scale (BBPS). The colon is divided into three segments in the BBPS: right colon (includes the cecum and the ascending colon), transverse colon (includes the hepatic flexure, the transverse colon, and the splenic flexure), and left colon (includes the descending colon, the sigmoid, and the rectum). In this scale, after the measures taken to clearance of intestinal secretion, the quality of the preparation for each segment is evaluated based on a numerical criterion from zero (unprepared segment inhibiting visualization of the mucosa) to three (complete visualization of the mucosa without any residual materials), and summed together to indicate the overall score of bowel preparation [7]. A total score of ≥ 6 with a minimum score of 2 in each segment is considered an adequate bowel preparation [8]. The duration of the procedure (excluding the time required for the removal of lesions), findings and their characterizations (location and shape), and pathology reports (if a biopsy was taken) were recorded by one of the researchers.

2.3. Study Procedure

Before the procedure, the patients' medical records ascertained the gender, age, and reason for the colonoscopy. All colonoscopies were performed by a single physician using a Fujifilm colonoscope. After confirming the reach of the cecum (based on the physician's visualization of its landmarks), a research staff member informed the physician of the patient's prespecified position. If required, the patient's position was changed to the supine position with the assistance of the endoscopy staff. Otherwise, the withdrawal phase was conducted in the left lateral position. The insertion and withdrawal phases were recorded in minutes, and the lesions' location and shape were imported into the patient's pre-prepared form. Biopsy was performed as indicated, and tissue samples were sent to the laboratory for additional histologic examination. The pathologist and data analyzer were both blinded to the patient's group. Complete blinding for the physician was not possible due to the nature of the colonoscopy. Nonetheless, we attempted to mitigate its effect by informing the physician of the patient's position upon reaching the cecum.

2.4. Statistics

Based on the findings of the Koksai et al. study, 312 patients in each arm of the trial (a total of 624) were required to detect at least a 9.8% difference in the ADR, with a power of 80% and a type I error of 5% [9]. However, due to COVID-19, the number of colonoscopy sessions was lower than expected. Thus, colonoscopy sessions were fewer than expected due to COVID-19. As a result, we terminated the study due to the limited time and sample size of 499 cases. Frequency, mean, and percentage were used to show variables' tendencies. We also used Chi-square and independent student t-test to assess any relationship between study variables. SPSS software version 26 was used for all analyses (SPSS Inc, Chicago, Illinois, United States). A P-value of <0.005 was considered statistically significant.

3. Results

Between May 2020 and December 2021, 880 patients were evaluated for eligibility, of which 472 were included in the final anal-

ysis. The number and reason for deleted samples in each step are shown in Figure 1.

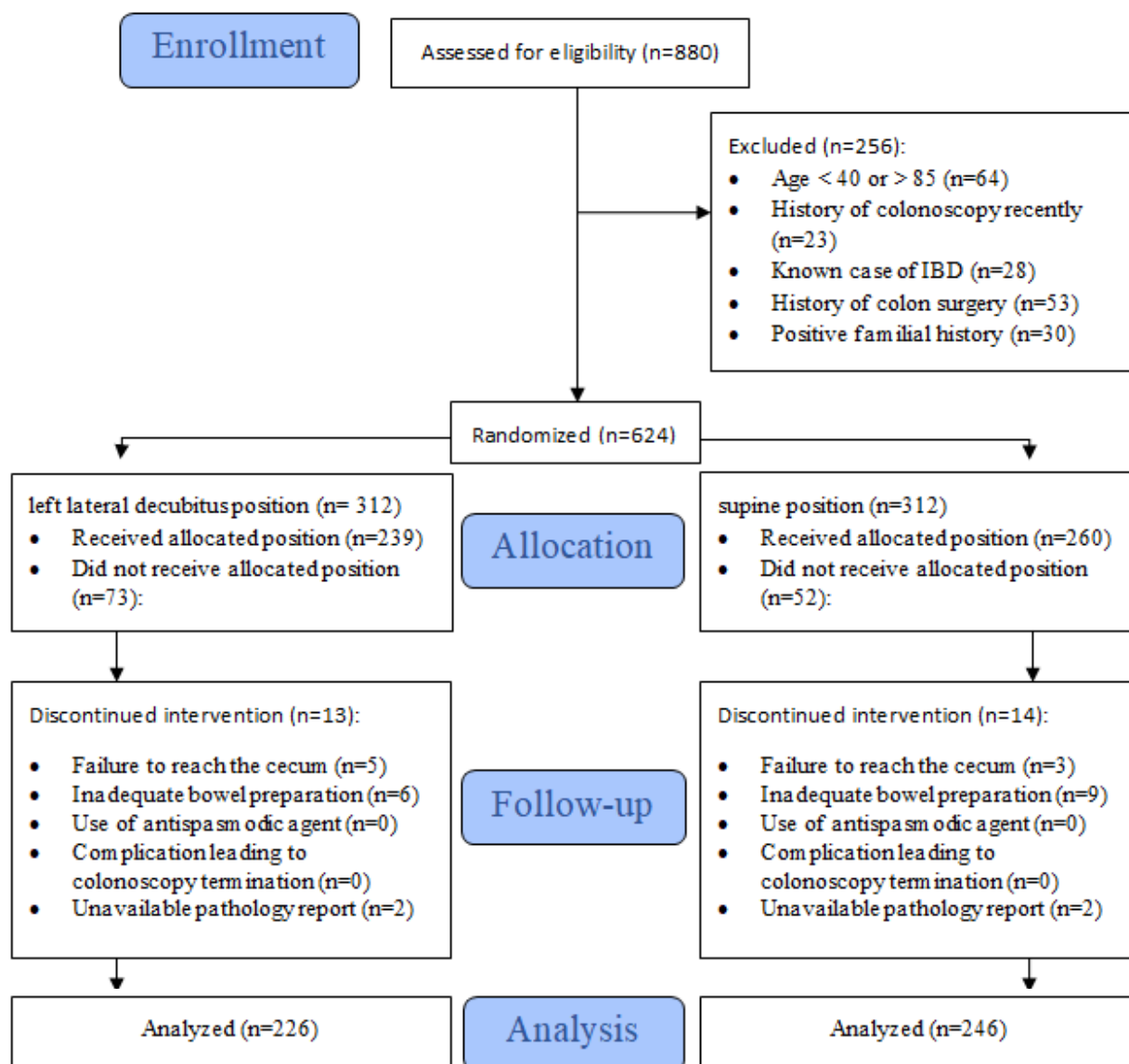


Figure 1: Consort 2010 Flow Diagram

A total of 252 patients (53.4%) were female. Despite the greater frequency of females in the intervention group versus the control

group (54.1% vs. 52.7%), no statistical gender difference was detected between the two groups (P=0.759), as shown in Table 1.

Gender	Intervention group (%)	Control group (%)	P-value
Male	113 (45.9)	107 (47.3)	0.759
Female	133 (54.1)	119 (52.7)	
Intervention group: supine position during the withdrawal, control group: left lateral position during the withdrawal			

Table 1: Gender Distribution in the Study Groups

The mean age of participants was 55.86±10.30 years old, and the mean body mass index (BMI) of participants was 26.99±4.48 kg/m². As shown in Table 2, there were no statistically significant

differences in age or BMI between the study groups (P=0.553 and 0.146, respectively).

Variable	Intervention group	Control group	P-value	CI95%	
				Lower	Upper
Age mean \pm S.D (in years)	56.13 \pm 9.97	55.57 \pm 10.66	0.553	-1.3	2.4
BMI mean \pm S.D (in kg/m ²)	26.70 \pm 4.10	27.30 \pm 4.85	0.146	-1.4	0.2

SD: Standard Deviation, CI: Confidence Interval

Table 2: Mean and Standard Deviation of Age and Body Mass Index for the Study Groups

Screening, abdominal pain, and change in bowel habits were the most common indication for colonoscopy, with the frequency of 40, 30.7, and 13.3%, respectively. The total BBPS score was 8.26 \pm 1.20, and 95.1% of patients exhibited adequate bowel preparation (total BBPS \geq 6 and \geq 2 per segment). Although the intervention group (95.5%) had a higher rate of adequate bowel

preparation than the control group (94.7%), this difference was not statistically significant (P=0.673). Table 3 details the association between position changes and colonoscopy duration and demonstrates that no statistically significant relationship was detected.

Colonoscopy duration mean \pm S.D (in minutes)	Intervention group	Control group	P-value	CI 95%	
				Lower	upper
Insertion phase	6.99 \pm 2.37	7.20 \pm 2.53	0.347	-0.6	0.2
Withdrawal phase	4.98 \pm 1.18	4.84 \pm 0.97	0.158	-0.3	0.1
Total	12.19 \pm 2.96	11.84 \pm 2.70	0.176	-0.8	0.1

SD: Standard Deviation, CI: Confidence Interval

Table 3: Association between Colonoscopy Duration and Position Change

The ADR and PDR evaluations are detailed in Table 4. Despite the intervention group's higher rate of ADR and PDR, no sta-

tistically significant difference in ADR or PDR was observed (P=0.613 and 0.866, respectively).

	Intervention group (n=246)	Control group (n=226)	P-value
ADR	19.5 %	17.7 %	0.347
PDR	27.2 %	26.5 %	0.866

ADR: adenoma detection rate, PDR: polyp detection rate

Table 4: Evaluation of ADR and PDR in the Study Groups

Table 5 shows the association between ADR and PDR with gender, age, BMI, and duration of the withdrawal phase. As expected, males had a higher rate of PDR and ADR (P<0.001). Patients

with at least one polyp or adenoma had a statistically greater mean age and withdrawal duration than patients without polyp or adenoma (P<0.001).

Variable		Polyp detection		P-value	Adenoma detection		P-value
		Yes	No		Yes	No	
Gender (%)	Male	81 (36.8)	139 (63.2)	*<0.001	58(26.4)	162(73.6)	*<0.001
	Female	46 (18.3)	206 (81.7)		30(11.9)	222(88.1)	
Age mean \pm S.D (in years)		59.13 \pm 10.61	54.66 \pm 9.93	*<0.001	59.18 \pm 10.47	55.10 \pm 10.12	*<0.001
BMI mean \pm S.D (kg/m ²)		27.47 \pm 4.02	26.81 \pm 4.63	0.159	26.85 \pm 3.91	27.02 \pm 4.60	0.751
Withdrawal phase mean \pm S.D (in minutes)		5.50 \pm 1.56	4.69 \pm 0.72	*<0.001	5.58 \pm 1.76	4.75 \pm 0.77	*<0.001

S.D: standard deviation, BMI; body mass index

Table 5: Association between ADR and PDR with Gender, Age, BMI, and Duration of the Withdrawal Phase

The descending colon, sigmoid, and rectum accounted for 55.4% of the 193 polyps detected. Furthermore, the most prevalent morphologic type was sessile polyps (177 polyps, 91.7%). The outcome of the histopathologic assessment for the study groups is shown in Table 6. In total, 63.7% of polyps were ade-

nomatous, and the frequency of hyperplastic polyps was higher in the intervention group (18%) than in the control group (11%). However, no statistically significant difference in histopathologic results was observed between groups (P=0.152).

Histopathologic type	Intervention group (n=72)	Control group (n=71)	Total (n=143)	p-value
Inflammatory polyps	9 (12.5%)	18 (25.4 %)	27 (18.9 %)	0.152
Hyperplastic polyps	13 (18 %)	8 (11.2 %)	21 (14.6 %)	
Adenomatous polyps	47 (65.3 %)	44 (62 %)	91 (63.7 %)	
adenocarcinomas	3 (4.2 %)	1 (1.4 %)	4 (2.8 %)	

Table 6: Histopathologic Assessment of Polyps in the Study Groups

4. Discussion

Multiple research with varying designs has been conducted to determine the effectiveness of changing the patient's position on ADR. For example, Ball et al., Koksall et al., and East et al [9,10,11]. designed crossover trials in which each colon's segment was examined twice during the withdrawal. In each of the studies cited above, changing the patient's position resulted in a significant improvement in ADR and PDR. When interpreting the findings of these studies, it is critical to consider the effect of re-examination of each section of the colon on physician awareness, withdrawal time, and the direct relationship between increased withdrawal time and increased ADR [12]. Moreover, Yamaguchi et al. demonstrated a significant increase in ADR after position changing during the withdrawal phase [13]. However, they changed the patient's position based on the physician's preferences, which are assumed to be influenced by the patients' weight and cooperation with the endoscopy staff.

On the other hand, Ou et al. and Lee et al. designed parallel-group randomized control trials (RCT) [14,15]. Thus, a comparison of the current study's results to their findings is more

rational, given their design similarities. Participants' mean ages were comparable, and females were more prevalent in all three studies. In Ou et al. and Lee et al., nine and seventeen physicians performed colonoscopies, respectively, whereas we chose to perform all colonoscopies by a single physician to eliminate the confounding effect of physician experience on ADR [14-16]. Additionally, in contrast to Ou et al. and Lee et al., we did not use any anti-spasmodic to rule out the possibility of an anti-spasmodic effect on ADR [14,15]. However, prior RCTs failed to demonstrate a statistically significant benefit of using these drugs to increase ADR. As a result, we recommend conducting additional studies to determine the efficacy of anti-spasmodic medications in reducing ADR.

Ou et al. and Lee et al. used dynamic position change as the intervention group [14,15]. In comparison, we chose the supine position as our intervention based on the findings of Li et al., who reported only a significant increase in ADR after transverse colon examination in the supine position and the feasibility of the supine position versus dynamic position changes, particularly in obese and sedated patients [5].

	ADR (%)			PDR (%)			Mean \pm S.D of W.T.		
	Control	Intervention	P-value	Control	Intervention	P-value	Control	Intervention	P-value
Ou et al. (14)	37.9	40.7	0.44	56.5	58.2	0.64	7.31 \pm 2.41	8.11 \pm 2.58	<0.001*
Lee et al. (15)	33	42.4	0.002*	47.3	53.5	0.048*	8.9 \pm 0.1	9.1 \pm 0.1	0.711
Present study	17.7	19.5	0.347	26.5	27.2	0.866	4.84 \pm 0.97	4.98 \pm 1.18	0.158

S.D: Standard Deviation, LLD: left lateral decubitus, DPC: dynamic position change, S.P.: supine position, W.T.: withdrawal time (in minutes)

Table 7: Comparison of the current study's findings to Ou et al. and Lee et al

As shown in Table 7, all three studies found an increase in ADR and PDR, but the Lee et al. study found a significant increase (P=0.002 and 0.048, respectively) [15]. One possible explanation for the lack of statistically significant increase in ADR in the Ou et al. study is that their baseline ADR rate was 40%, and they hypothesized that position change would be ineffective in increasing ADR in physicians with a higher ADR rate [14]. However, due to the absence of baseline ADR data for Iranian physicians, we were unable to assess the relationship between baseline ADR and the effectiveness of position changing in reducing ADR. Thus, additional research is required to determine the baseline ADR prevalence among Iranian physicians and its impact on colonoscopy quality improvement programs.

Changing positions increased withdrawal time in all three studies, but the effect was only statistically significant in the Ou et al. study [14]. Whether the increase in withdrawal time was significant or not, we believe it should not be a factor in determining position changes, given the independent effect of increased withdrawal time on the increased ADR [17].

As with all studies, we encountered some limitations, including an inability to reach the expected sample size due to COVID-19 and decreased patient recruitment rate, an inability to blind the physician to the patient's position, which was unavoidable due to the nature of the procedure, and a lack of direct communication between the endoscopy and pathology units, which resulted

in the inability to obtain pathology reports in some cases.

5. Conclusion

Changing the patient's position during the colonoscopy withdrawal phase is a simple method for improving ADR, a critical indicator of colonoscopy quality. Presently, dynamic position change is the preferred method. Even though using the supine position to examine the entire colon during the withdrawal phase increased ADR, the increase was not statistically significant. Therefore, the dynamic position change method is recommended if a patient position change is the intended approach. However, additional research is necessary to determine an alternative method to dynamic position change in obese or heavily sedated patients.

References

1. Arnold, M., Sierra, M. S., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2017). Global patterns and trends in colorectal cancer incidence and mortality. *Gut*, 66(4), 683-691.
2. Bénard, F., Barkun, A. N., Martel, M., & von Renteln, D. (2018). Systematic review of colorectal cancer screening guidelines for average-risk adults: Summarizing the current global recommendations. *World journal of gastroenterology*, 24(1), 124-38.
3. Knudsen, A. B., Zauber, A. G., Rutter, C. M., Naber, S. K., Doria-Rose, V. P., Pabiniak, C., ... & Kuntz, K. M. (2016). Estimation of benefits, burden, and harms of colorectal cancer screening strategies: modeling study for the US Preventive Services Task Force. *Jama*, 315(23), 2595-2609.
4. Shine, R., Bui, A., & Burgess, A. (2020). Quality indicators in colonoscopy: an evolving paradigm. *ANZ journal of surgery*, 90(3), 215-221.
5. Li, P., Ma, B., Gong, S., Zhang, X., & Li, W. (2021). Effect of dynamic position changes during colonoscopy withdrawal: a meta-analysis of randomized controlled trials. *Surgical Endoscopy*, 35, 1171-1181.
6. Nutalapati, V., Desai, M., Thoguluva-Chandrasekar, V. S., Olyae, M., & Rastogi, A. (2020). Effect of dynamic position changes on adenoma detection rate during colonoscopy withdrawal: systematic review and meta-analysis. *Endoscopy International Open*, 8(12), E1842-E1849.
7. Lai, E. J., Calderwood, A. H., Doros, G., Fix, O. K., & Jacobson, B. C. (2009). The Boston bowel preparation scale: a valid and reliable instrument for colonoscopy-oriented research. *Gastrointestinal endoscopy*, 69(3), 620-625.
8. Kastenberger, D., Bertiger, G., & Brogadir, S. (2018). Bowel preparation quality scales for colonoscopy. *World journal of gastroenterology*, 24(26), 2833.
9. Köksal, A. Ş., Kalkan, İ. H., Torun, S., Taşkıran, İ., Öztaş, E., Kayaçetin, E., & Şaşmaz, N. (2013). A simple method to improve adenoma detection rate during colonoscopy: altering patient position. *Canadian journal of gastroenterology*, 27(9), 509-512.
10. Ball, A. J., Johal, S. S., & Riley, S. A. (2015). Position change during colonoscopy withdrawal increases polyp and adenoma detection in the right but not in the left side of the colon: results of a randomized controlled trial. *Gastrointestinal endoscopy*, 82(3), 488-494.
11. East, J. E., Bassett, P., Arebi, N., Thomas-Gibson, S., Guenther, T., & Saunders, B. P. (2011). Dynamic patient position changes during colonoscopy withdrawal increase adenoma detection: a randomized, crossover trial. *Gastrointestinal endoscopy*, 73(3), 456-463.
12. Butterly, L., Robinson, C. M., Anderson, J., Weiss, J. E., Goodrich, M., Onega, T. L., ... & Beach, M. L. (2014). Serrated and adenomatous polyp detection increases with longer withdrawal time: results from the New Hampshire Colonoscopy Registry. *The American journal of gastroenterology*, 109(3), 417.
13. Yamaguchi, K., Mitsunashi, K., Nakagawa, Y., & Hayashi, M. (2013). Dynamic position changes during the colonoscopy withdrawal phase decrease abdominal fullness. *Chiba Medical Journal*, 89, 9-14.
14. Ou, G., Kim, E., Lakzadeh, P., Tong, J., Enns, R., Ramji, A., ... & Telford, J. (2014). A randomized controlled trial assessing the effect of prescribed patient position changes during colonoscopy withdrawal on adenoma detection. *Gastrointestinal endoscopy*, 80(2), 277-283.
15. Lee, S. W., Chang, J. H., Ji, J. S., Maeong, I. H., Cheung, D. Y., Kim, J. S., ... & Choi, M. G. (2016). Effect of dynamic position changes on adenoma detection during colonoscopy withdrawal: a randomized controlled multicenter trial. *Official journal of the American College of Gastroenterology| ACG*, 111(1), 63-69.
16. Rogart, J. N., Siddiqui, U. D., Jamidar, P. A., & Aslanian, H. R. (2008). Fellow involvement may increase adenoma detection rates during colonoscopy. *Official journal of the American College of Gastroenterology| ACG*, 103(11), 2841-2846.
17. Shaukat, A., Rector, T. S., Church, T. R., Lederle, F. A., Kim, A. S., Rank, J. M., & Allen, J. I. (2015). Longer withdrawal time is associated with a reduced incidence of interval cancer after screening colonoscopy. *Gastroenterology*, 149(4), 952-957.