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COLONOSCOPY WITHDRAWAL TIME AND POLYPS ADENOMA DETECTION RATE

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ABSTRACT

Introduction: The best moment to stop having colonoscopies is still up for debate. While some research show that adenoma detection rate is increased by a longer withdrawal time, others have shown the opposite. **Methods:** We examined all original publications between the study's beginning and December 2021, including studies comparing the two cohorts, (a) a colonoscopy withdrawal time of 9 minutes, (b) a colonoscopy withdrawal time of 6 to 9 minutes. (1) Sessile Serrated Adenoma Detection Rate, (2) Advanced Adenoma Detection Rate, and (3) Adenoma Detection Rate (ADR) were the outcome measures. The meta-analysis was performed using 2-tailed statistics. **Results:** Following a thorough study of the literature, 7 research met the inclusion criteria. The results showed that a 9-minute CWT had a considerably better chance of detecting adenoma than a 6-9-minute CWT (OR 1.54, 95 percent CI 1.30 – 1.82; I2=93.7). Additionally, CWT of at least 9 minutes was associated with significantly trend toward higher odds of advanced adenoma detection (OR 1.38, 95 percent CI 0.98 – 1.95, I 2=90) and higher odds of sessile serrated adenoma detection (OR 1.68, 95 percent CI 1.28 – 2.22; I2=0) and when compared to colonoscopy withdrawal time of 6-9 minutes. **Conclusion:** This meta-analysis investigation adds to growing body of data indicating lengthier CWT group had considerably greater ADR and SDR than the at least 6 minute CWT cohort.

INTRODUCTION

Colorectal cancer is the third leading cause of cancer-related mortality in both women and men in the United States.[1] More than 136,000 additional cases of colorectal cancer were expected to be detected in 2014, with over 50,000 individuals dying from the disease. Colorectal adenomas, which affect one-third of the American and European population, is responsible for the bulk of colorectal cancers.[2] Adenomatous polyps evolve into colorectal cancer via the adenoma–carcinoma sequence, which has been well-established.[3] Colonoscopy with polypectomy for screening has been linked to a lower prevalence of colorectal cancer as well as death from colorectal cancer.[4] All average risk, asymptomatic people should have a screening colonoscopy, according to published recommendations.[5] The endoscopist's ability to detect and remove adenomatous polyps determines the success of colonoscopy in reducing CRC risk. Endoscopists are increasingly calling for quality measurements in colonoscopy as they become more aware of varied adenoma detection.[6] The united state Multi-society Task Force on Colorectal Cancer and the American Society of Gastroenterology have both developed quality colonoscopy recommendations. according to these criteria, adenoma detection rates of individual endoscopists should be tracked and reported on a regular basis.[7] While ADR objectives for screening colonoscopies have been defined, there are no guidelines for colonoscopies conducted for other reasons. When comparing surveillance colonoscopy to screening colonoscopy, It has been observed that detection of adenoma is more accurate during surveillance colonoscopy. However, nothing is known regarding the frequency of adenomas in people who have a colonoscopy for another reason. Furthermore, the proximal colon is the most prevalent site for CRC.[1] In the past, screening colonoscopy has shown to provide less protection against proximal colon malignancies than distal abnormalities.[8] In the last decade, It has become fairly obvious that colonoscopy is not an ideal method of preventing colorectal cancer.[9] A colonoscopy is a useful screening method for detecting and removing asymptomatic adenomas.[10] However, The performance of colonoscopies varies greatly, and inadequate screenings can miss severe abnormalities.[11] As a result, a number of quality parameters have been recommended, including a withdrawal time of at least 6 minutes and adenoma detection rate of at least 25% (20% for females and 30% for males).[12] This is the most efficacious

method for the detection and removal of a premalignant adenomatous polyp. Nonetheless, interval cancer (discovered after a routine colonoscopy) affects a considerable proportion of the reviewed population.[13] Several quality indicators were developed and verified to improve the colonoscopy technique. These include a withdrawal duration of more than 6 minutes, adenoma detection rate and colon preparation quality.[12] Physicians who have a low ADR or a quick withdrawal time may miss advanced adenomas and malignancies. Interval colorectal cancer (CRC) develops in less then five years of a clear colonoscopy and is defined as a lesion that was prevalent but not discovered at the period of the original test or that was only partially eliminated.[14]

The number of colonoscopies with at least one adenoma, calculated as a percentage of the total number of colonoscopies conducted, is known as the ADR. A negative connection between ADR and interval advanced neoplasia in the colon was recently discovered.[15] The Adenoma Detection Rate (ADR), which measures the completeness of the endoscopic examination, has been shown in several studies to be an important quality indicator for colonoscopy.[12]

A variety of factors have been identified as having an impact on the reliability of endoscopic investigation and, as a result, on ADR.[12] The average colonoscopy withdrawal time is one of the elements that impact ADR (CWT). CWT is the time spent examining the colonic mucosa while withdrawing the colonoscope from cecum to anal canal.[12] This excludes time spent clean up the colon or procedures such as polypectomy. Despite the fact that current professional society recommendations call for a minimum of 6 minutes of CWT as a quality indicator, striking an equilibrium between ADR and optimal withdrawal duration remains a source of debate.[16] While numerous research have found that a longer withdrawal period is linked to a greater ADR and serrated polyp detection rate.[14] other investigations have found the opposite.[17] This meta-analysis analyses outcomes Sessile serrated adenoma detection rate, Advanced Adenoma Detection Rate, and ADR between 6 but less than 9 minutes of CWT and 9 minutes of CWT to fill this knowledge gap.

METHODOLOGY

The research was conducted in order to observe with the Statement on Preferred Reporting Items for Meta-Analyses. A PRISMA guideline and additional data have been provided as extra content.

Search Strategy We developed the the search strategy and put it into action. Following that, from beginning to December 2021, we examined Cochrane CENTRAL, Scopus, CINAHL, EBSCO, MEDLINE, and PubMed, as well as clinical trial registries, to assess the influence of colonoscopy withdrawal time and polyp adenoma detection rate using the key words "colonoscopy" and "withdrawal time." Following that, all publications and abstracts found were screened for potentially suitable investigations. In addition to the computerized search, A manual search of the included studies' references was carried out.

Eligibility Criteria The inclusion criteria for the meta-analysis were as follow. (1) any retrospective, prospective, and randomized controlled trials in people over the age of 18 who are undergoing a colonoscopy for monitoring, diagnosis, or curative purposes. (2) research comparing the two cohorts – (a) colonoscopy withdrawal time of 6 to 9 minutes, and (b) CWT of 9 minutes. (3) all participants in the studies who had enough information to assess the sessile serrated adenoma detection rate, advanced adenoma detection rate, and adenoma detection rate. There are four full-text articles accessible in English. retrospective studies, prospective studies and randomized controlled trials studies reporting adenomas observed in the two comparator groups were thus included in our analysis. The study was exempt from the IRB because the data was publicly available. The analysis did not include any unpublished data.

On the basis of past research, a 9 minute CWT was chosen.[14,18-22] A ceiling impact was found when CWT was increased above 9-10 minutes in length.[19,22]

Because current professional society guidelines require a 6 minute average colonoscopy withdrawal time, all trials with a CWT of less than 6 minutes were excluded from the study.[12,16]

Quality assessment and Study Characteristics The recommended ROBINS-I method was used to assess non-randomized research, whereas Cochrane Risk of Bias tool was used to find randomized trials.[23] Randomized studies were assessed for randomization procedures, allocating concealing, and baseline variable abnormalities using the Cochrane risk of bias tool.[24] Quality evaluations were also carried out separately, with any inconsistencies handled by consensus.

Outcome measures The following are the outcome measures for the meta-analysis: (1) Sessile Serrated Adenoma Detection Rate, (2) advanced adenoma detection rate, (3) ADR. The results of the two cohorts (6 but less than 9 minutes of CWT and 9 minutes of CWT) were compared.

Data Extraction We assessed and retrieved each qualified study's outcomes. the most robust study's data was extracted, with data from other studies being included to the bibliography. We sorted the data at every stage of the study process, including data collection, extraction, and quality evaluation.

Quantitative data synthesis All of the data were examined using the Comprehensive Meta Analysis software programme (Biostat, Englewood, NJ, USA).[25]

Random effects models were used to get the final pooled risk estimates.[24] To examine heterogeneity between trials, the I2 statistics and Cochrane Q were generated. Significant heterogeneity was evaluated as P30 percent.[24] Subgroup analyses was also suggested as a way to mitigate the selection bias in retrospective research.[24] The research strategies were separated into two categories: retrospective studies and prospective/RCT studies. One study was omitted from the sensitivity analysis.

RESULTS

From Scopus, EMBASE, CENTRAL, Medline, and PubMed, the initial library search yielded 1002 possibly relevant citations. Following that, 211 duplicates were eliminated. Following title and abstract evaluations, 761 items were eliminated. Publications that did not include data on the results of the 2 CWT cohorts, as well as papers, editorials, comments, and review articles that were not published in English, were excluded. The rest 30 publications were scrutinised thoroughly, and 23 were disqualified because they did not meet the inclusion requirements or did not provide enough data for the study. The PRISMA Flowchart is shown in Figure 1. As a result, 7 studies were retained, as shown in Table 1. Three retrospective investigations, two cancer registries, and Two randomised clinical trials were included in the cohort, which totaled 69,651 individuals.[18,20,26-30]

Adenoma Detection Rate: The ADR of the two groups was compared in seven studies. In comparison to 6-9 minutes of CWT, 9 mints of colonoscopy withdrawal time showed substantially greater odds of ADR (OR 1.54, 95 percent CI 1.30 – 1.82). There was a lot of variation (I2=93.7%). Due to a lack of data comparing the two cohorts, subgroup analysis of the left and proximal colon was not possible. According to Zhao et al, Proximal colonic lesions were more probably to be recognized as CWT increased.[26]

Advanced Adenoma Detection Rate Four studies examined the rates of advanced adenoma detection in the 2 groups. In comparison to 6-9 minutes of CWT, 9 minutes of CWT showed a non-significant greater risk of advanced adenoma detection (OR 1.380, 95 percent CI 0.980 – 1.950).

Sessile Serrated Adenoma Detection Rate: The detection rates of sessile serrated adenoma in the 2 groups were compared in 3 studies. The results showed that 9 minutes of CWT had a considerably greater chance of detecting sessile serrated adenoma than 6-9 minutes of CWT (OR 1.68, 95 percent CI 1.28 – 2.22).

Subgroup Analysis: The studies that have been included were divided into two categories depending on their research designs: randomised controlled trials and retrospective studies. In the retrospective study sub-group, five studies were considered. When compared to the six mint colonoscopy withdrawal time cohort, the 9-minute CWT cohort exhibited substantially greater chances of ADR (OR 1.41, 95 percent CI 1.09-1.83; I2=95). When comparing the RCT cohort to the 6 mint colonoscopy withdrawal time, the randomised controlled trial cohort had a substantially greater risk of ADR (OR 1.64, 95 percent CI 1.31-2.04; I2=0). There was no significant difference between the two groups (p=0.48). For advanced adenoma detection rate and SDR subgroup analysis, there was a shortage of data. Similarly, there was a lack of data to compare the reactions of the two groups to a second colon examination on the right side. For the one-study omitted analysis, a sensitivity analysis was carried out. One research found that 9 minutes of CWT resulted in a substantially greater likelihood of detection of adenoma (OR 1.22, 95 percent CI 1.08-1.41; p=0.43; I2=64).

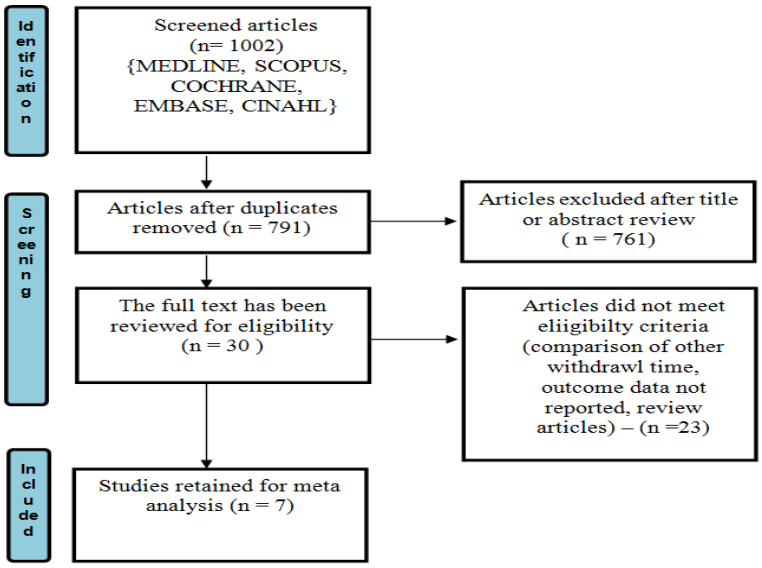

Figure 1: Prisma flow diagram.

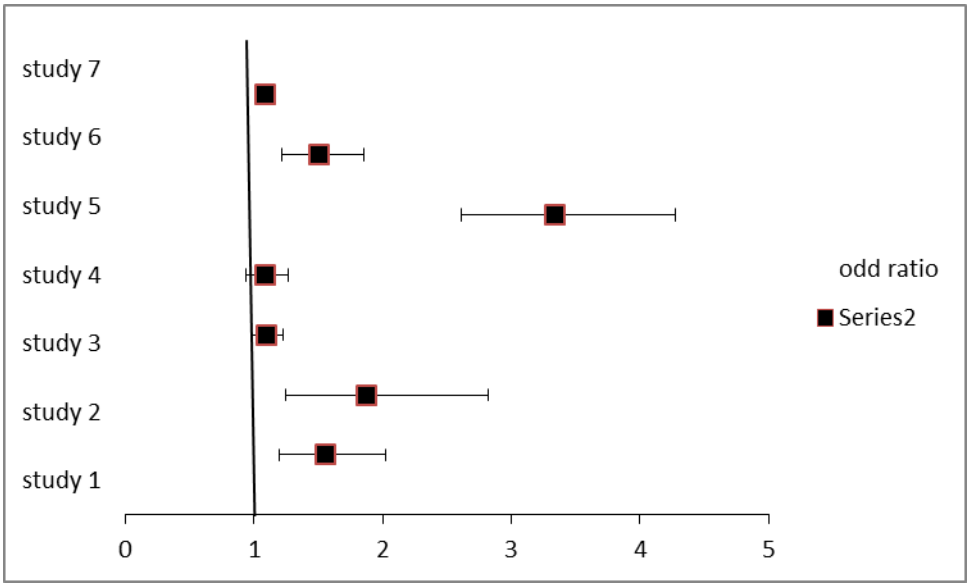

Figure 1: Forest plot comparing ADR between cohorts.

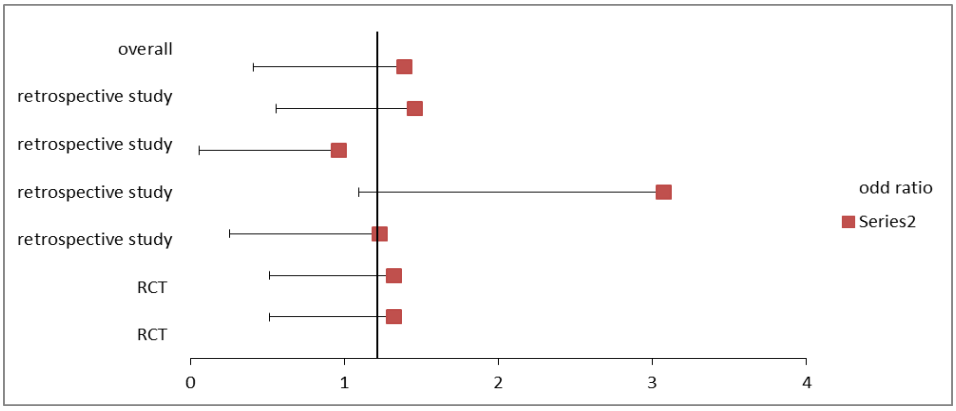

Figure 2: Forest plot comparing advanced ADR between cohorts.

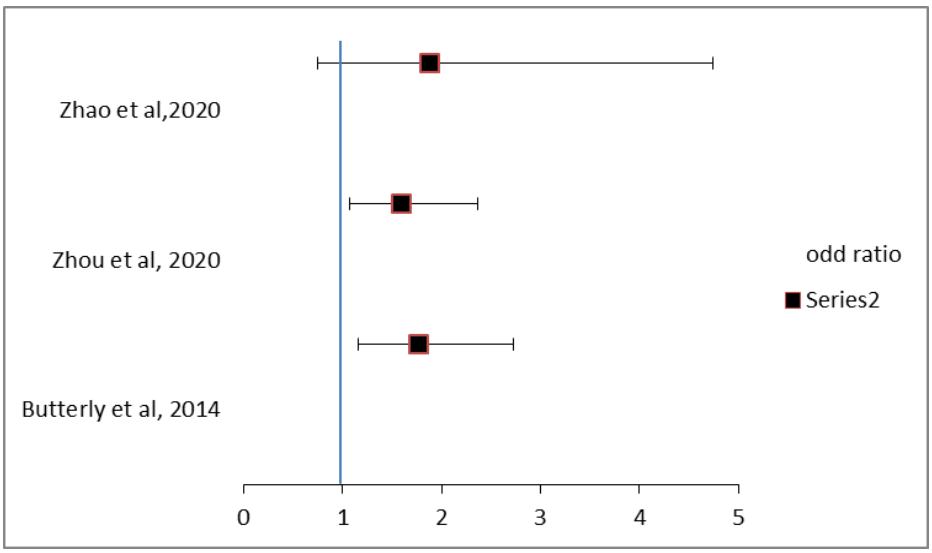

Figure 3: Forest plot comparing SDR between cohorts.

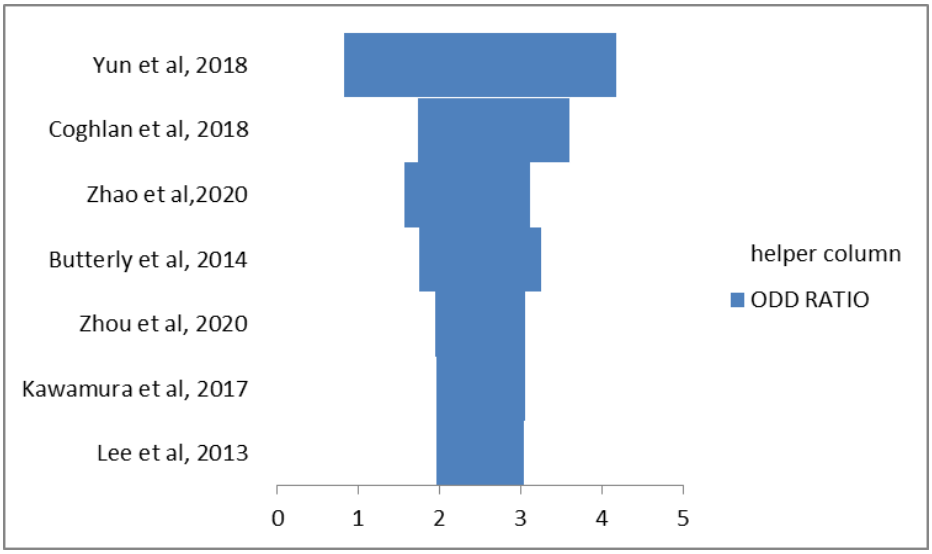

Figure 3: Funnel plot comparing ADR between cohorts.

Table 1: Study Characteristics.

Study name	Study Design	Study Sample	6 minutes Colonoscopy Withdrawal Time		9 mint withdrawal time	
			Total number of colonoscopies	Overall ADR	Total number of colonoscopies	Overall ADR
Lee et al, 2013 (29).	Data from National Bowel Cancer Screening Programme from 2006 to 2009.	147 endoscopists performed 31,088 colonoscopies.	8,731	3,966	19,060	9026
Butterly et al, 2014 (18).	Patients were enrolled in a state - wide, population-based registry in New Hampshire between April 2009 and March 2011, which included a prospective research.	The study comprised 17,428 participants who had screening and surveillance colonoscopies at 14 different locations.	The study reported adjusted odds ratios for a 9-minute CWT versus a 6-minute CWT comparison. ADR: 1.50 (1.21-1.85)			
Yun et al, 2018 (28).	Between March 2015 and February 2016, Retrospective Design was implemented at one facility in Korea.	The study comprised 6,462 participants having average risk screening colonoscopies.	In comparison to 6 minutes of CWT, the adjusted odds ratio for ADR for 9-10 minutes of Colonoscopy withdrawal time was 3.34 (2.61 - 4.27, p<0.001).			
Kawamura et al, 2017 (27).	Four endoscopic centres took part in a multicenter, historical cohort study from April 2010 to April 2011.	For screening and monitoring purposes, patients must be at least 40 years old.	2,741	1,267	920	445
Coghlan et al, 2018 (20)	From Feb 2013 to June 2014, and again from April 2016 to Oct 2016, an RCT was conducted in Argentina from a single centre.	All people aged Fifty to seventy five who underwent a screening colonoscopy were included in the study.	1044	411	102	56

Zhou et al, 2020 (30)	From January 2012 to June 2018, an only one centre in the The US was used to create a retrospective design.	All individuals over the age of 50 who get an outpatient screening colonoscopy	1862	527	8,023	2,421
Zhao et al,2020 (26).	From January 2018 to July 2019, a randomised controlled trial was conducted at 12 Chinese endoscopy centres.	Patients between the ages of fourty and eighty five were tracked for the purposes of screening, monitoring, and diagnosis.	513	139	514	188

Table 2:

Study name	6 minutes Colonoscopy Withdrawal Time			9 mint withdrawal time		
	Total number of colonoscopies	ADR Proximal colon	ADR Left colon	Total number of colonoscopies	ADR Proximal colon	ADR Left colon
Lee et al, 2013 (29).	8,731	1522	2444	19,060	5049	3977
Butterly et al, 2014 (18).	3798	294	310	4198	485	227
Yun et al, 2018 (28).	3304	948	960	3158	1245	1358
Kawamura et al, 2017 (27).	2,741	687	580	920	249	196
Coghlan et al, 2018 (20)	1044	261	10	102	27	29
Zhou et al, 2020 (30)	1862	304	223	8,023	1468	953
Zhao et al,2020 (26).	513	61	97	514	110	101

DISCUSSION

Longer CWT improves SDR, ADR, and lowers the risk of cancer formation, according to considerable data from retrospective and prospective investigations.[14,18,20,26,28] However, similar effects have not been consistently reported in other investigations.[19,22,31,32] Our data back up the theory that raising the average colonoscopy withdrawal time from 6 to 9 minutes boosted the rate of adenoma detection and improved the detection of flattened polyps during colonoscopy. The ≥ 9 mint colonoscopy withdrawal time cohort had a significantly higher risk of adenoma detection rate (OR 1.54, 95 percent CI 1.30 – 1.82) than the 6-minute cohort. According to these findings, endoscopists should pay considerable time examining the intestinal mucosa to discover polyps. The incidence of adenoma diagnosis, according to Rex et al, was determined by evaluating the proximal sides of folds and flexures, as well as the time taken examining the mucosa.[33] As a result, a lengthier examination is more likely to give time for inspection and result in a greater adenoma detection rate. These discoveries have far-reaching ramifications for endoscopists worldwide. An experienced endoscopist may be able to fulfil the current ADR objective (20% in women and 30% in males) with a mean of 6 mint of colonoscopy withdrawal time. This discovery is especially significant for student endoscopists, since it has been observed that trainees had a greater adenoma detection rate with a colonoscopy withdrawal time of 10 minutes.[34] As a result, extended withdrawal duration would help trainees and even beginning endoscopists. Zhao et al. further validated this idea, stating that the 9-minute CWT was most beneficial to less experienced endoscopists.[26] When compared to the control group, the ≥ 9-minute CWT Cohort had a substantial rise in SDR (OR 1.67, 95 percent CI 1.29 – 2.23). This is consistent with previous research.[14,18,26,29,30]

Serrated polyps are frequently flat and nearly undetectable from natural mucosa. These polyps are typically covered with mucus, making identification difficult.[35] As a result, it's been suggested that proximal serrated lesions are very hard to spot than other types of lesions. Sessile serrated polyps are most commonly found in the proximal colon.[35] As a result, endoscopists are strongly urged to perform a second examination of the right colon, which can be done by second forward view or retroflexion.[36,37] The cohort with the second look in the right colon, according to Kushnir et al, experienced a somewhat longer withdrawal time.[36] This means that taking a proper look may take longer, and so increasing the CWT might result in an increase of serrated polyp detection.[18,19,38,39] Despite a statistically significant increase in the likelihood of advanced adenoma detection in the 9-minute colonoscopy withdrawal cohort (OR 1.38, 95 percent CI 0.98–1.95), it did not reach statistically significant values. The small sample size was most likely to blame. Furthermore,

despite the fact that ADR and the diagnosis of advanced adenomas are most likely inherently linked.[40,41] This trend toward better diagnosis of advanced adenomas with increased CWT is promising and warrants further research.

A high sample size is used in the meta-strengths analyses, which are spread out among numerous endoscopic sites. The 9-minute CWT threshold was selected based on previous research as well as practical considerations. A 9-minute CWT has been demonstrated in several trials to significantly enhance ADR and SDR.[14,18-22] A spike in CWT lasting more than 9-10 minutes, on the other hand, is associated with a ceiling effect.[19,22] Another benefit of the study assessments is that they are of high to exceptional quality, which shows the analysis's strength. Nonetheless, despite its obvious advantages, the meta analysis has certain inherent limitations. In endoscopy-related studies, endoscopist blinding is often not achievable, which can lead to performance bias in RCTs. Due to a lack of data comparing these cohorts, assessing ADR in separate pathological and anatomical categories, such as polyp versus colorectal cancer detection and right versus left colon, was not possible. Finally, the significant heterogeneity of the study is most likely due to the underlying population variation being investigated, as well as practice-specific features such endoscopic withdrawal method and endoscopist skill. Unfortunately, there is no way to account for these practice-specific factors in the meta-analysis. Despite the fact that endoscopic pullout technique and experience are strong predictors of ADR, Kumar et al discovered that after correcting for endoscopist skill and technique, CWT remained an important independent predictor of ADR.[21] Sub-group analysis was used to investigate heterogeneity and lessen the risk of selection bias in observational research. The outcomes did not differ significantly between the two cohorts, indicating that the findings were reliable. The current professional organization standards provide for an average CWT of 6 minutes.[12,16,42] However, evidence is growing that a CWT of 6-7 minutes results in significant adenoma miss rates and a lower probability of detecting sessile serrated adenomas.[18,19,39,43] Numerous studies have found that having a longer CWT leads to an increase in ADR.[14,20,26,27,30,38,39] According to this comprehensive review and meta-analytical studies, increasing the CWT from 6 minutes to 9 minutes or more significantly increases ADR and SDR. As a result, our findings add to the growing body of data suggesting a mean CWT of at least 9 minutes is a good indication of colonoscopy quality.

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Conflict of interest

The authors report no conflicts of interest for this work.

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